1929.

NEW ZEALAND.

PUBLIC WORKS STATEMENT

(BY THE HON. E. A. RANSOM, MINISTER OF PUBLIC WORKS).

MR. SPEAKER,—

On assuming the portfolio of Public Works I realized from the outset that it was necessary for me to become fully and personally acquainted with the special conditions concerning the various works already in hand, and to become familiar with the officers of the Department, in order that I could more readily grasp the multifarious operations in which they were involved. I therefore devoted practically all the period of the recess to travelling and to visits of inspection to the larger works which the Department had in hand. I feel that the personal touch which I have been able to establish with both the officers and the men has been for the good of all parties and for the increasing of that harmony which is so essential if the best progress is to be made. The personal knowledge gained has been of benefit to myself, and I trust will be of benefit to the country as a whole, for I have not confined my inspections to the Department's operations only, but I have endeavoured to ascertain through my own observations and through conferences with those most directly concerned just what were the most pressing requirements of the different districts. The backblock districts in particular received my earnest attention, and it is my confirmed opinion that considerably more must be done than has been done in the past in regard to the provision of improved access to those areas. I have accordingly arranged that the vote on the public-works estimates for this year for access to outlying districts is to be materially increased, in order that not only access to those districts already settled may be improved and extended, but that those areas suitable for settlement may be roaded as an inducement to further settlement. In this direction I may say the Public Works Department and the Lands Department will operate conjointly, and increased settlement of many of those areas of land at present unoccupied and reverting to second growth may confidently be expected.

Honourable members have already received the Government's proposals regarding land-settlement, and it is the Government's desire to, as far as possible, employ on the development of unsettled and unproductive lands under the provisions of the Land Laws Amendment Bill of this session many of the more experienced Public Works employees who by their long and faithful service have shown that they possess many of the necessary qualities that go to make successful settlers, and it is hoped that they will avail themselves of the opportunities of obtaining farms that are being offered under that legislation. By this means the way will be opened for employment on standard works of my Department of more of the ordinary unemployed.

Unfortunately, during last recess available time would not permit of my visiting some of the more northern parts of the country, but it is my intention and desire to devote as much time as possible to travelling in those localities as soon as can conveniently be arranged after the session.

In connection with railway-construction, during the year 106 miles 30 chains of lines have been completed and handed over to the Working Railways Department for ordinary operations. In addition to the lines handed over for incorporation in the railway system, traffic has been carried on by my Department on sixty-nine miles of railway which are either not absolutely complete or the control of which by my Department is essential in the interests of economy of construction of other portions not yet completed, but which are so interconnected with the completed portions as to indicate that the control should still be retained in the hands of the Public Works Department.

The Government, after full consideration, decided that the railway which was being built from Rotorua to Reporoa—a distance of about twenty-eight miles—should be discontinued, and also that the deviation of the Main Trunk line at Palmerston North which had been put in hand by the previous Government was not justified at present. Accordingly these works were stopped, and the men, plant, and material which had been employed on these works were transferred to the Gisborne-Napier Railway, on which it was decided to accelerate progress.

The extension of the North Auckland Main Trunk Railway is not proposed beyond Rangiahua, where the railway will make contact with the Hokianga waters. The difficulties of railway-construction in the North Auckland district are phenomenal, the instability of the ground rendering either road or railway construction particularly expensive. However, it is considered that so much money has already been spent on the final section, and also on the link which will bring the Dargaville-Kaihu Valley Railway in connection with the Northern Main Trunk line, that it is advisable to complete these portions in order that the districts to be served may have the advantage of railway convenience.

The results obtained from the working of the East Coast Main Trunk Railway, and the benefit which it is conferring upon the population up to and even beyond its present terminus at Taneatua, are such that I hope it will be found justifiable to proceed with the extension of this railway towards Opotiki when some of the other works now nearing completion are out of hand.

Prior to my assuming office the question of the route of the Napier-Gisborne Railway between Wairoa and Gisborne had been the subject of a great deal of controversy, and many reports had been made on the subject. I reviewed the whole position and with my colleagues gave the matter close attention, with the result that it was decided that what has come to be known as the coastal route should be adopted. This route, in addition to saving about eight miles in actual distance, reduces the amount of new line to be constructed by twenty-six miles, and therefore very greatly reduces the time which must be spent in construction before a through connection can be made. Work on this line is now being prosecuted vigorously, there being approximately 1,200 men engaged, as well as numerous steam-shovels, locomotives, and other mechanical plant. The construction is being attacked in three main directions—northwards from the

present railhead near Waikare, northwards from Waikokopu, and southwards from Gisborne. In view of the use which the Department is making of the Port of Waikokopu, both in connection with the railway-construction and the Waikaremoana hydro-electric development, a considerable amount of money has been spent on facilities there, and a small breakwater is under construction, the whole being in accordance with an arrangement made with the Wairoa Harbour Board under which they will later on repay to the Government a great proportion of the cost of the works. At the Gisborne end a further survey is being made to ascertain whether the distance cannot be materially shortened, it being realized that, in order that the railways may effectively compete with road transport, directness between large centres of population is essential, even though this may involve some extra expense. A considerable portion of the line between Waikokopu and Muriwai will be remote from the main road, and it has been found necessary to do a great deal of development work in the nature of access roads, trams, and jig-lines before the railway proper can be commenced. These access facilities, which are directed to the early commencement of the crucial points on the line, are now well advanced.

The Stratford Main Trunk Railway is also being vigorously prosecuted, and is manned on a maximum scale, three shifts and all available plant being worked on the governing points, which are mainly the tunnels, there being no less than four miles of tunnel between the present railheads. A coal-mine has been opened in the Tangarakau Gorge, and others are in contemplation in the same formation. Special coal-loading sidings are under consideration at Raekohua Station, so that heavy traffic on this line will soon materialize.

It has also been decided that the construction of the last link in the Picton–Bluff Railway—namely, the part between Parnassus and Wharanui—should be resumed as soon as the route had been decided upon and the necessary surveys completed. At the northern end there is a considerable distance on which only one route is available; sufficient of this has been pegged out, and a commencement with construction has been made. On the remaining length surveys are in hand and the route is being pegged.

Work on the railway designed to connect Westport and Nelson with the rest of the railways of the South Island by a junction with the present West Coast lines at Inangahua Junction is being vigorously pushed forward. Unfortunately, the disastrous earthquake which so badly damaged the northern end of the South Island on the 17th June, 1929, interrupted this work, it being necessary to transfer almost the whole of the men from the railway-works to open up road communications in the adjoining districts. The dislocation of the ground throughout the whole length to be followed by this railway has resulted in a great number of enormous slips, in addition to rendering unstable the ground which has not yet slipped. The result of this will be a great increase in the cost of this railway over and above what it would have been estimated at prior to the earthquake. The line has not yet been surveyed in detail throughout, but as soon as it is possible to open up a pack-track to allow engineering surveyors to penetrate the country the survey will be resumed.

The total vote proposed for railway-construction this year is £1,655,000, this being a very considerable increase on the £1,002,872 spent last year. The rate of progress on railway-construction has been generally expedited in accordance with the Prime Minister's policy of bringing the railways under construction to a paying-point as early as possible. The reason for this is obvious, particularly as this policy also enabled the employment of additional men on reproductive work rather than on relief works, which, although useful works and eventually necessary, were not so urgently required by the country.

In addition to the railways being constructed from the ordinary Public Works Fund, my Department has been carrying out two very large works with funds derived from what is known as the Railways Improvement Account. These deviations are in the vicinity of Auckland and Wellington. What is known as the

Westfield Deviation, which is being constructed in order to obviate the steep grades which, combined with heavy suburban traffic, cause congestion between Auckland and Penrose, is now nearing completion. Goods traffic to a limited extent is now in operation over one of the tracks (this being a double-track deviation). It will not be possible to open the deviation to traffic of all classes until the new Auckland Railway-station and the yards which form part of it are ready for use. This latter work is being carried out under a contract let by the Minister of Railways.

The Tawa Flat Deviation, which will cut out the heavy grades and circuitous lines between Wellington and Tawa Flat, is now being energetically pushed. Every available face in the tunnels is manned. The very latest tunnelling machinery has been installed, with the aid of which it is hoped to considerably further increase the number of men engaged.

During my term of office two notable forward movements have been made in connection with hydro-electric-power development in that the first unit from Waikaremoana, of 20,000 kilowatts capacity, was put on load at the end of January, 1929, thereby relieving the severe stress which for some time had been thrown on the Mangahao Station, and at the beginning of June, 1929, the first unit at Arapuni, of 15,000 kilowatts, commenced to deliver power on a commercial scale, and has since then been running practically fully loaded. The second unit is now ready, and commenced carrying load at the end of September. It is anticipated that the third unit will be operating before the end of the year. It is a source of satisfaction to the Government that its officers have been able to demonstrate that the claim made by the contractors that it was impossible to erect a power-house on its present site had no foundation in fact. In connection with this development, however, I regret to say a very extensive erosion—much more rapid than was anticipated—has manifested itself in the old bed of the Waikato River below the spillway over which the surplus water escapes. The position has been aggravated by the fact that, owing to the contractors abandoning the contract, the channel has been subjected since the end of 1927 to flows of water which were not anticipated, and which would have been considerably mitigated had the power-house been in full operation taking a large amount of water which otherwise has had to go over the spillway. As a consequence protective measures must be taken, and this work is being energetically handled. The driving is proceeding of two additional penstock tunnels, which are part of the subsequent development of the scheme, and which will be available when, through growth of load, the time arrives for the installation of additional generating machinery. It is estimated that these two tunnels, together with the other four of the present development, will be capable of taking the normal flow of the river, and any additional flow, in all but extreme floods, can be diverted through the existing bypass tunnel round the dam.

Work on the Waitaki River, where a large development is being made about four miles above Kurow, is proceeding satisfactorily. A coffer-dam of interlocked steel-sheet piling has been completed, enclosing a section in the centre of the river, and the rock has been laid bare in the bottom. When this section is concreted the dewatering and concreting of the remaining sections in the main stream will be greatly facilitated. So far the work has been quite successful, although, in common with all work carried out in rivers subject to flood, there must be considerable anxiety so long as the works are in a condition which renders them vulnerable to the attacks of a large flood. However, every precaution which can economically be taken is being taken.

For some time it has been suggested that it will be to the advantage of both parties if an agreement can be arrived at whereby the Government purchases the City of Dunedin's Waipori development, at least so far as the main generation and transformation is concerned, and negotiations have been in progress. Whether these will be finalized or not has not yet been decided, as quite a number of considerations other than strictly commercial factors surrounding this transaction must be considered.

Detailed investigations have been in hand in regard to what is known as the Gowan hydro-electric scheme in the Nelson District. The damage resulting from

the recent earthquake has affected the position, and it is not possible to give any definite indication in regard to this scheme pending further investigations, which are now in hand.

The roading operations of the Department, particularly the provision of communication facilities for the people in the backblocks, as previously stated, has been one of my closest studies. The ultimate goal to which I aspire is that of providing every landowner with such access as will enable him to transport his produce from the farm to the seaboard with celerity and economy at all times in the year, and which will furnish to him and his household the convenience of easy access to their ordinary markets and to their fellow-citizens of the Dominion. The graph contained in this Statement shows that the steady increase in the cost of roading which has been manifest in the ten years prior to my taking office is still maintained. The ever-increasing number of motor-vehicles using the roads precludes the possibility of any decrease in roading expenditure if the present high standard is to be maintained. Honourable members are perhaps aware, but there will be no harm in repeating the fact, that, when considered in proportion to the population and the number of motor-vehicles, New Zealand is in the forefront amongst the nations in its mileage of roads available for traffic in all states of the weather—in other words, hard-surfaced roads.

In preparing the public-works roads estimates for this financial year I have amended to some extent the system of allocation of the roads vote to the different districts which has been in use for some years past. A careful review of the operation of this system indicated quite conclusively that it was not applying as equitably as could be wished, and it was quite apparent that while some districts were receiving unduly liberal treatment others were being penalized. The governing factor responsible for this position appeared to be that known as "paper roads." A perusal of any standard county lithograph will show the great number of legalized but unformed roads, a great many of which there will be no necessity to construct for very many years. Under the old system of allocation of funds these were all taken into consideration in allotting the roads vote, and the greater the mileage of unformed roads the greater the amount of money the district would receive, even though perhaps many of the roads would never be formed. This appeared to be hardly reasonable or fair, and the incidence of this factor to a great extent appeared to upset the balance of the other factors. I therefore amended the system in this respect and took into consideration only those legal unformed roads which a careful review indicated might be expected in the course of development to receive attention in the next few years. Other amendments to the automatic system of a more or less minor nature have also been made, and, although a certain amount of criticism has been received as a result of the alterations from those districts whose allocations have been reduced, it is felt that so far as the whole Dominion is concerned the system will now operate in a much more equitable manner than formerly, and those districts most in need of development will get the assistance from the roads vote to which, when all factors are considered, they are justly entitled. Further details regarding this automatic allocation scheme appear further on in this Statement.

The Main Highways Board has continued the excellent work which it has done in the past, and I found that it enjoys the confidence of the local bodies with whom it is in such close touch, and that the local authorities and motorists generally are not stinting in their appreciation of the great improvement that has taken place in the roading of New Zealand since the Highways Board was constituted.

During the year the main-highway system was extended to include 3,753 miles of secondary highway, while the general maintenance subsidy for the whole system, which now comprises 10,403 miles of main highway, was increased from £1 10s. for £1 to £2 for £1. The Board in its report (which is attached) shows that, mainly in consequence of the increase in the rate of maintenance subsidy, local authorities were able to considerably reduce the amount which they paid towards the cost of maintenance of the primary highways system. The amount of this reduction, however, does not approach the amount of the increase in local-authority rates which

has taken place during the last few years. Between 1924–25 and 1927–28 the rural rates increased by £178,000 per annum, and a large percentage of this increase was accounted for by the additional expenditure which local authorities had to face in the maintenance of primary highways. 1928–29 rural rating figures are not yet available, but in view of the increased operations of the Board it is reasonable to expect that the rise of rural rating has been arrested.

Since I assumed office numerous local authorities have made representations to me for payment towards the cost of construction of roads put down in what are generally referred to as "permanent materials," and towards the cost of which the local authorities concerned did not receive a subsidy, or received a subsidy which in their opinion was insufficient in comparison with the subsidies which are now being paid. The matter is one to which I have given a good deal of consideration, as I fully appreciate the local authority point of view. I have, however, been forced to the conclusion that the finances which are available for road construction and maintenance purposes will not permit of such payments being made. The finances which are at present available are such as will meet present and future requirements only, and if retrospective subsidies in any form were to be paid, either as a direct payment to local authorities or as an annual grant towards the payment of interest and sinking-fund charges, it would be necessary to either increase taxation or reduce the present rate of subsidies, and I cannot recommend the adoption of either of such courses.

In regard to irrigation in Central Otago, the late Government set up a committee, consisting partly of Government officers and partly of settlers in Central Otago, to investigate matters relating to the irrigation schemes in operation in that locality. The settlers had contended for some time that the rates they had agreed to pay for water were too high, and that the amount of water which the Government had contracted to supply to them was insufficient. As the quantity of water and the price to be paid for it was the fundamental basis on which the schemes had been established, it became a matter of very serious consideration. When I took office I found a report already brought down. The investigating committee found in a number of cases the settlers had been too optimistic and had contracted to carry out more than their land could support, at any rate until the same was fully developed, and its full development could not be brought about for a period of years. The committee recommended certain modifications to the agreements made with the settlers; and after visiting the districts and interviewing a great many interested persons I found that the whole subject bristled with difficulties, but that nevertheless the practical result to New Zealand in the way of increased produce, thereby inducing increased traffic on the railways and increased revenue of public utilities, was so great that considerable sacrifice by the Government in the early stages would undoubtedly be offset by the benefit to the Dominion as a whole. I therefore agreed to grant for a period of five years the concessions recommended by the investigating committee, being confidently of the opinion that by that time the settlers would all be firmly established on their holdings and would be well able to pay the charges which they originally contracted to do.

The position regarding unemployment has, since my assumption of office, given me cause for grave concern, and much thought has been devoted to how the problem could best be handled. On assuming office I found that 2,935 men were engaged on relief works by my Department, at a wage of 9s. per day for single men and 12s. per day for married men, the standard rate of wages being 14s. per day. The Government considered the matter and decided that the wages of relief workers were to be raised to the standard rate of 14s., and this was immediately done. While endeavouring to arrive at a permanent solution of the unemployment problem I have not lost sight of the fact that immediate relief was urgently necessary, and my Department has used every effort to absorb the maximum number of men possible on its various works. The placing of large numbers of men on public works is, however, not a permanent means of overcoming the difficulty. The Government, realizing this fact, has given very full consideration

to various schemes which would mean the permanent removal of considerable numbers from the ranks of the unemployed, and it is anticipated that during the present summer several of these schemes will be finalized and put into operation, thus materially relieving the position so far as next winter is concerned.

As honourable members are aware, the Government has given an undertaking that all unemployed capable of employment will be placed in work at a certain date. A sub-committee of Cabinet has the matter in hand, and proposals in this direction are at the present time receiving that committee's attention.

EXPENDITURE.

The total net expenditure under all votes and accounts appearing on the public-works estimates for the financial year ended 31st March, 1929, was £8,331,884. Of this sum £3,777,006 was expended out of General Purposes Account, and the balance, £4,554,878, out of special accounts.

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, follows in tabular form :—

Class of Work.	Expenditure for Year ended 31st March, 1929.	Total Expenditure to 31st March, 1929.
Railways—	£	£
New construction	1,002,872	36,166,445
Additions to open lines	213,405	16,003,639
Payment to Midland Railway bondholders	..	150,000
Roads	833,577	17,799,274*
Public buildings	213,505	10,341,786
Immigration	50,266	3,234,549
Purchase of Native lands	..	2,061,147
Lighthouses, harbour-works, and harbour defences	17,063	1,266,276
Tourist and health resorts	39,254	499,580
Telegraph extension	624,414	9,916,361
Development of mining	..	881,585
Defence works (general)	67,652	1,347,920
Departmental	142,253	2,544,318
Irrigation and water-supply	55,197	836,472
Lands-improvement	85,861	512,381
Minor works and services	..	312,607
Plant, material, and stores	4,594	351,770
Quarries (acquisition and operating)	*Cr.* 6,030	5,114
Timber-supply and sawmills for Public Works Department	*Cr.* 5,115	390
Motor-transport services	..	33,635
Cost and discount, raising loans, &c.	438,238	3,031,051
Total General Purposes Account	3,777,006†	107,296,300
Aid to Water-power Works and Electric Supply Account	1,183,103‡	8,395,910‡
Waihou and Ohinemuri Rivers Improvement Account	52,310‡	660,299‡
Total Public Works Fund	5,012,419	116,352,509
Wellington–Hutt Railway, &c.—		
Railway	..	228,374
Road	..	101,658
Railways Improvement Account	..	641,275
Railways Improvement Authorization Act, 1914 Account	2,007,617§	6,482,284§
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
Lands for Settlement Account—Roads to open up Crown lands	..	590,025
National Endowment Account	..	53,401
Education Loans Account	375,352§	3,747,433§
Main Highways Account—Construction Fund	936,496	2,681,924
	8,331,884	131,782,917

* Includes £4,500 expended under section 16, subsection (1), Native Land Amendment and Native Land Claims Adjustment Act, 1923. † Does not include expenditure under the Ellesmere Land Drainage Act, 1905.
‡ Excludes interest during construction. § Includes proportionate cost of loan raised under these accounts.

WAYS AND MEANS.

	£
On the 1st April, 1928, the available ways and means for public-works purposes were	1,328,803
Additional funds were received as follows :—	
(*a*) Under Finance Act, 1926, section 2 (public works)	1,622,864
(*b*) Under Finance Act, 1927, section 2 (public works)	3,393,828
(*c*) Under Finance Act, 1928, section 2 (public works)	1,416,771
(*d*) Recoveries on account of expenditure of previous years ..	102,618
(*e*) Ellesmere and Forsyth Reclamation and Akaroa Railway Trust Account receipts	1,730
	£7,866,614

	£
The net expenditure on works and services against the General Purposes Account for the year was—	
(*a*) Under appropriations	3,538,768
(*b*) Under Lake Ellesmere Land Drainage Act, 1905	439
(*c*) Under Lake Ellesmere and Akaroa Railway Trust Account ..	86
(*d*) Charges and expenses of raising loans	438,238
Making a total of	£3,977,531

	£
This left a credit balance in the account for general purposes at 31st March, 1929, of	3,889,083
Balance of £7,000,000 loan (1929) outstanding at 31st March, 1929 ..	1,312,264
Legislative authority exists for raising a further	1,061,050
It is proposed to ask for further legislative authority to borrow, when required	4,000,000
Thus making available for public works, general purposes, a total of ..	£10,262,397

	£
The estimated expenditure under the account for the current financial year is	5,001,339

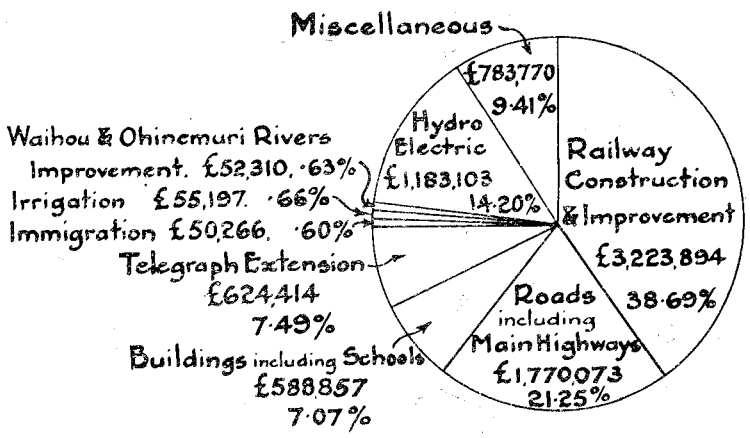
In addition to the requirements for general purposes, there are a number of special accounts for public works with separate ways and means. The most important of these are :—

Name of Account.	Balance available at 31st March, 1929.	Unexhausted Borrowing Authority at 31st March, 1929.	Balance of £7,000,000 Loan (1929) outstanding at 31st Mar., 1929.	Additional Borrowing Authority to be sought during Year.	Total available Ways and Means.
	£	£	£	£	£
Electric Supply Account	697,088	1,243,990	291,614	..	2,232,692
Waihou and Ohinemuri Rivers Improvement Account	11,907	30,000	..	..	41,907
Railways Improvement Authorization Act, 1914, Account	1,174,816	1,515,000	437,421	..	3,127,237
Main Highways Construction Fund ..	8,090	2,120,000	..	..	2,128,090
Totals for these special accounts	1,891,901	4,908,990	729,035	..	7,529,926

	£
From the foregoing figures it will be observed that at the end of last financial year the unexpended balance of the Public Works Fund for general purposes, plus existing and proposed authorities for raising further moneys, amounted to	10,262,397
While the balance at the same date in respect to some of the more important public works, under special accounts, plus existing and proposed legislative authority to raise additional loans, amounted to	7,529,926
Or a total of	£17,792,323

RATIO OF EXPENDITURE, 1928–29.

The ratios which the various classes of expenditure on works bear to the whole are indicated graphically in the diagram below.



RAILWAY-CONSTRUCTION.

The expenditure as shown on graph has been much heavier than that of the previous year, and constitutes a record. The total length of all lines under construction over which goods and passenger traffic has been run during the year is 69 miles, and these services have been of great service and benefit to the settlers who could take advantage of the railway. This is in accordance with the Department's policy of making works earn revenue at the earliest possible moment, and giving the public the advantage of the facilities as soon as can safely be done.

The schedule attached is a complete statement of the work on railways now in progress and the extent to which it is anticipated the railways can be completed during the next two years.

The work for the year on the several lines in course of construction is fully set out in the Engineer-in-Chief's report, and may be summarized as follows :—

North Auckland Main Trunk Railway.—The construction of this line was confined to the Rangiahua Section, and the work is being pushed ahead as much as possible between Okaihau and the upper waters of the Hokianga Harbour. The country is most unstable, and has given considerable trouble with slips over the whole 14 miles. So treacherous is the country that the railway has had to be deviated in many places for an aggregate distance of 2½ miles to avoid slips which developed after the ground was opened up. A quarry has been opened up near Okaihau, bins have been erected, and crushers installed to obtain ballast for the line.

Dargaville Branch Railway.—The construction of this line has made rapid progress. The formation is completed for 7 miles, with the exception of three bridge approaches along the route.

Ballasting has been completed for 4 miles, the stone being obtained from the Department's quarry at Tauraroa.

The country has been difficult to work, as the river-flats are not sufficiently strong to carry embankments. Station-yards are being constructed at Tangowahine and Wharau. Four steam-shovels are at work. Telephone-line has been erected for a distance of 10 miles.

Auckland–Westfield Deviation.—This double-track deviation, which will connect the new Auckland Railway-station with the existing line at Westfield, a distance of 8 miles 70 chains, is nearing completion. The formation, culverting, and heavy bridge work are completed. The portals of the Purewa Tunnel have been built, thus completing the work. A crushing plant has been in operation to supply metal and chips for concrete-work, ballasting the tunnel, and metalling approach roads.

Platelaying and ballasting is being carried out by the Railway Department. One track has been laid and ballasted throughout, and the rails have been laid on 2 miles of the other track. Six station buildings have been erected.

East Coast Main Trunk Railway: Waihi Eastwards.—The Tauranga to Taneatua section of the railway, 59 miles in length, was handed over to the Railway Department on the 2nd September, 1928.

The centre span of the Whakatane Bridge was widened to make a passing-place for motor traffic. The cattle-yards at Awakeri were extended for stock.

Rotorua–Taupo Railway.—On the completion of the East Coast Main Trunk Railway to Taneatua men and materials were transferred to Rotorua and a start made on the construction of the railway. Two miles of formation was completed, hutments and stores erected. On the 18th March last it was decided to discontinue the work and transfer the men and plant to the Gisborne–Wairoa Railway works.

Gisborne–Napier Railway.—The work on this railway was vigorously pushed ahead, and the rails were laid to Matahoura Station. Goods and passenger services were run from Eskdale to Matahoura. The formation of the Putorino Section is practically complete, and will be handed over to the Railway Department in a few months.

The distance from Eskdale to Putorino is 26 miles 50 chains.

The principal works completed during the year were as follows: Sandy Creek Bridge, consisting of three 60 ft. spans on steel trestles and concrete foundations; and Matahoura Viaduct, of two 60 ft., two 40 ft., and one 250 ft. span on steel trestles with concrete foundations and abutments. The latter structure is 213 ft. above the gorge.

On the Wairoa Section formation has proceeded satisfactorily. Tunnel-construction and bridge-erection are in hand. The formation is heavy, and ten steam-shovels have been employed during the year. Six and three-quarter chains of the bottom heading of the Kotemaori Tunnel have been driven, and the north portal completed.

Chimney Creek Tunnels, Nos. 1 and 2, and Waihua Tunnel, were completed. Bad conditions have been met with in the Mohaka Tunnel, in which 16¼ chains have been completed.

The Waikare Viaduct has progressed rapidly, and should be carrying the train by March next.

Extensive investigations have been made and bores put down to determine the best type of foundation for the Mohaka Viaduct, which will be the largest one on the railway. The Wairoa River Bridge is nearing completion.

Stratford Main Trunk Railway.—On the eastern end the daily goods and passenger service between Okahukura and Ohura (a distance of 19 miles) has been maintained throughout the year, and has been a great benefit to the district.

The construction work on the whole length of the Tokirima Section is now fairly well advanced. The work is heavy, and includes six tunnels aggregating just over 1¼ miles. Two tunnels have been completed; the third is being lined; in the fourth the bottom heading has been driven; and in the fifth (732 yards long) the bottom heading has been driven 149 yards; the sixth is now being manned.

On the Heao Section all work is being rapidly opened up.

On the western end the work was mainly devoted to the tunnels, these being the factors governing the completion of the line and the early establishment of through traffic. No. 2 Tunnel (55 chains long) is nearing completion, No. 3 Tunnel (64 chains long) is well in hand, and the approaches to No. 4 Tunnel are being formed. A tri-weekly passenger and goods service was maintained between Tangarakau and Tahora, which connected with the New Zealand railway service. Large quantities of coal have been carried. The workmen's accommodation has been well maintained.

Palmerston North Railway Deviation.—Four steam-shovels, seven construction locomotives, and two caterpillar tractors were employed on formation. The main-line formation was completed to within 42 chains of the northern junction with the Main Trunk Railway.

On the 18th April last the work was closed down, and most of the men and plant were transferred to other works.

Wellington - Tawa Flat Deviation.—The railway-bridge across the Hutt Road and the bridge over Ngahauranga Gorge are complete. No. 1 Tunnel has been pierced; 40 chains of heading have been done during the year. This tunnel was exceptionally wet, and four shifts of six hours each per day have been necessary throughout the work. Plant necessary for the most rapid progress practicable in this tunnel has now been installed. At No. 2 Tunnel the approach cutting was completed. The heading has been driven for 19 chains at south end and 18 chains at the north end. This tunnel is also being worked from a shaft 53 chains from the north end, the heading being driven 17 chains northward and 15 chains southward. The necessary plant is now ready for enlarging and lining, and much greater speed should be made with these sections of the work.

Midland Railway.—The formation of this railway has now been completed to Gowan station-yard, a distance of approximately 4 miles, and line has been laid and ballasted. All the station buildings at Gowan have been erected. Settlements and movements due to the earthquake of the 17th June will necessitate further ballasting-work.

Formation is now in hand for 5 miles beyond Gowan. An additional 250 men were engaged on this railway during the last six months.

Westport to Inangahua Railway.—On the Cascade and Hawk's Crag section of this railway the formation is complete for a distance of 5 miles, and is in hand over further 3 miles. Two large fillings and two tunnels on this portion are in hand.

South Island Main Trunk Railway.—A start has been made with the formation at Wharanui, on the north end, cleaning up the portion that was formed thirteen years ago. The erection of workers' accommodation is in hand.

RAILWAYS.

Additions to Open Lines.

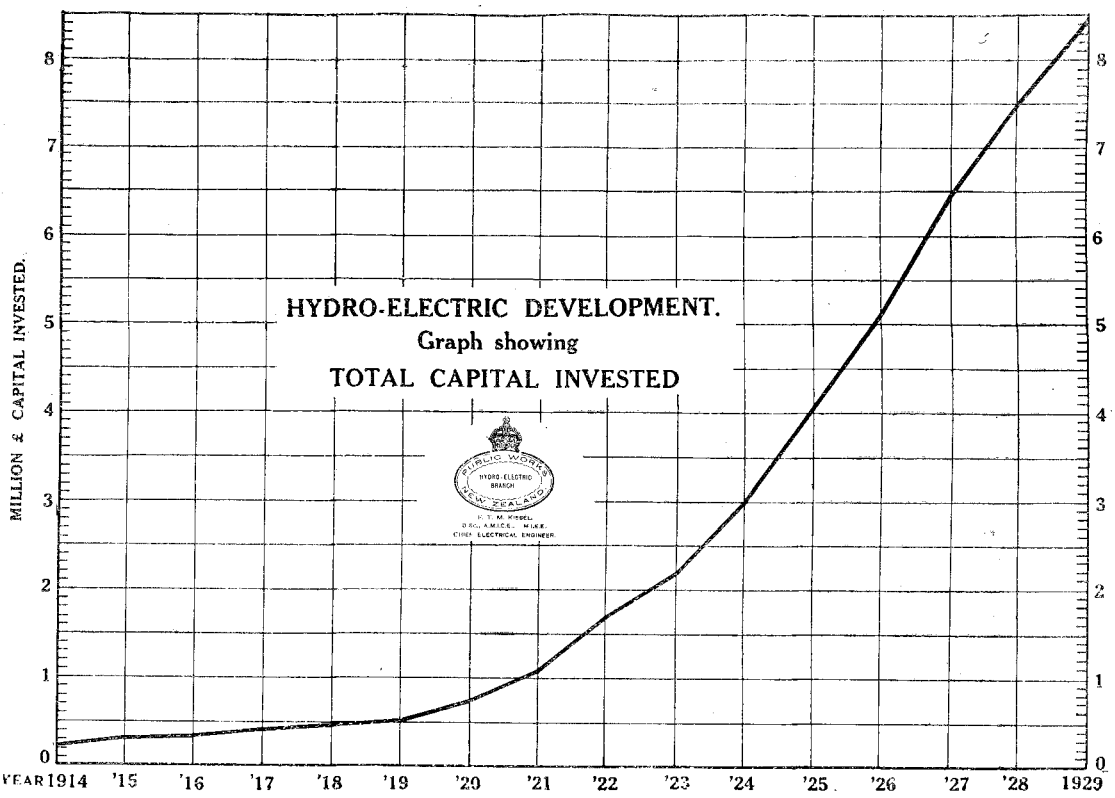
The net expenditure out of the Public Works Fund for the year ended 31st March, 1929, amounted to £213,405 2s. 3d. This sum covered the provision of new rolling-stock, motor-vehicles for road service, improvements and additions to station buildings, water-services, cranes, weighbridges, and other operating plant, train-control lines and instruments, additional dwellings, and purchase of land.

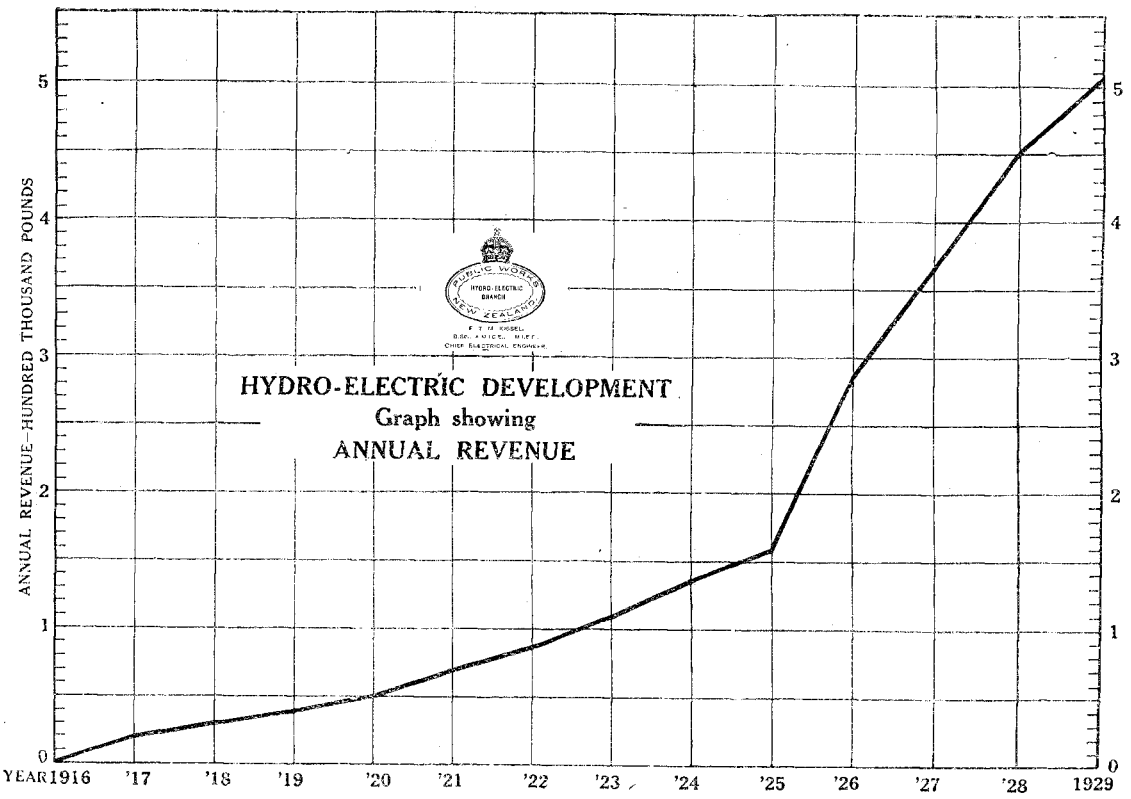
Railways Improvement Authorization Act, 1914.

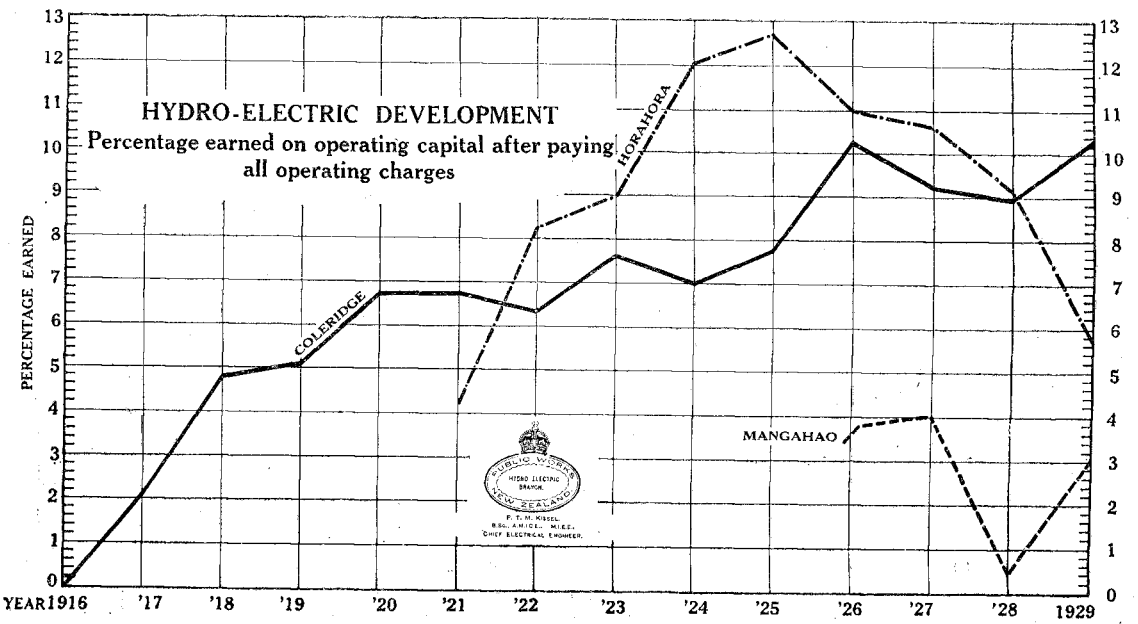
The expenditure under the Railways Improvement Authorization Act, 1914, amounted to £2,007,617, including the sum of £97,791, proportion of the cost of raising the loan. The works included in this expenditure were new stations and yards, goods-sheds, and terminal facilities at Auckland and Wellington; duplication, Horotiu–Frankton; new lines, Hutt Valley and Auckland–Westfield; new locomotive-depots at Auckland and Greymouth; deviations between Ravensbourne and Burke's, at Palmerston North, and Tawa Flat; locomotive workshops and equipment; bridge-strengthening; electrification of railway between Lyttelton and Christchurch, including electric locomotives; interlocking, automatic and power signalling, telegraph and telephones, safety appliances, and electric lighting.

HYDRO-ELECTRIC DEVELOPMENT.

The present policy of electric-supply development may be considered as having been actively commenced when work was first started at Lake Coleridge in 1910 on the first of the main Government generating-stations. That station came into operation about the end of 1914, so that the year just completed is the fourteenth year during which Government supply has been in operation. During the past year progress has been well maintained. The annual expenditure was £943,807, increasing the total capital spent on hydro-electric works from £7,523,928 to £8,467,735. A large portion of this—about £2,000,000—is represented by works, mainly at Arapuni, which had not at the end of the year come into operation, but which will gradually come in during the present year.







The first unit of the Waikaremoana Station came into operation shortly before the end of the year, but was not in for a sufficient time to give any very considerable increase in revenue. Nevertheless, the total revenue for the year shows an increase of 12·8 per cent. over that for last year, being now £516,127, as against £457,369 for the previous year. The peak load supplied amounts to 62,404 kilowatts, as compared with 54,502 kilowatts last year. As for the previous year, a large amount of power had to be purchased from outside sources before Waikaremoana came into operation to supply all load offering on the Mangahao system, and, similarly, large amounts of power had to be purchased or generated by fuel plants in the Auckland District owing to the overloaded condition of the Horahora plant, brought about by the failure of the contractors to complete their work at Arapuni. The

percentage return on the whole of the capital in operation has increased from 4·99 to 5·62. The total capital invested, the annual revenue, and the percentage earned over a period of years are shown on the three accompanying graphs.

Lake Coleridge.

The year just past has again been fairly successful. The results can be summarized as follows :—

	£
Capital investment	1,581,262
Revenue	186,963
Operating-expenses	30,130
Balance	£156,833

The balance has been used in paying interest charges and a 2-per-cent. depreciation charge, leaving a profit on the year's working of £50,374. This has been paid into the sinking fund. The scheme now has a depreciation reserve of £192,359, and a sinking fund of £112,334. The water-level in the lake has been well maintained during the year, and there has only been one interruption to supply of a serious nature. This was of one hour fifteen minutes' duration to the Christchurch supply, and was caused by flashovers on insulators during misty rain following a dry dusty spell. Inconvenience was minimized to some extent by the fact that the interruption was at half past five in the morning. It is pleasing to record that supply to the South Canterbury area has been much improved.

The main items of construction have been in the direction of providing a further 7,500 kw. unit, which will bring the capacity of the station up to 34,500 kw. This will be ready for operation at an early date. During the year the electrification of the Lyttelton–Christchurch Railway was completed in conjunction with the Railway Department, and electrical operation of traffic was commenced in February last.

Horahora.

This plant has not been so successful during the year. The financial position is summarized as follows :—

	£
Capital investment	1,142,346
Revenue	135,511
Operating-expenses	76,231
Balance	£59,280

The balance has been used in paying interest and 2 per cent. depreciation, and the net result has been a loss on the year's operations of £15,291. The scheme now has a depreciation reserve of £103,187, a sinking fund of £52,164, and a reserve fund of £32,415, the last mentioned having been depleted by the necessity for making good the loss mentioned above and the replacement of assets destroyed by fire.

The capital shown above and on which capital charges have to be paid includes £524,621 which has been spent on lines and substations which ultimately will be supplied by the Arapuni scheme, but which at present are supplied from Horahora and the other operating-stations connected to the system.

The year has been a very difficult one from an operating point of view, as the plant has had to be kept running under heavy overload conditions. There has been heavy wear on the machines consequent on the large amount of silt travelling in the river, following the Arapuni diversion. A serious fire at the Horahora transformer and switch-house on the 1st September put the plant practically out of commission for some hours, but very strenuous efforts on repairs by the staff, together with

assistance afforded by other supply authorities, enabled the Department to keep all consumers supplied on the following day and thereafter, except for occasional short periods of overload causing low voltage in places.

The steam-generating plant at Waihi and the Diesel generating plant at Penrose were both operated as required throughout the year.

Waikaremoana.

Supply from the small plant which was installed in 1923 for local supply and for construction purposes was continued during the year while the main plant was being completed. Operating-costs, including interest and depreciation on the plant in operation, amounted to £11,374; the revenue was £6,941, showing a loss of £4,433 on the year's operations. This makes a total accumulated loss of £23,190 on this plant, against which there is a depreciation reserve of £11,869.

Although there was considerable delay in the delivery of certain items of the main plant from England, construction work was pushed ahead at a fast rate, and the first unit of the main plant was supplying power at the end of January of this year. The second unit was completed and put on load early in July. The completion of these units should very materially assist the area which has previously been supplied by Mangahao, and eliminate the purchase of power from outside sources which has been necessary to meet all the demands made on the Department in this area.

Surveys have been in hand during the year to enable designs to be completed for a further stage of this development, a portion of which must be put in hand before the two units now installed can be utilized to full advantage. Surveys are also in progress on a transmission-line to interconnect Waikaremoana with Arapuni.

Mangahao.

Although the rainfall on the Mangahao area was considerably better than in the previous year, the continued growth of load made the past year a difficult one, and considerable amounts of power had to be purchased to meet the demand. On this account the financial position is not as good as it might otherwise be. It can be summarized as follows:—

	£
Capital	2,416,713
Revenue	186,712
Operating-expenses	106,907
Balance	£79,805

The balance has been sufficient to pay only 3 per cent. towards the interest charges for the year. £72,563 was spent on the purchase of power during the year, and is included in the operating-expenses shown above. Now that this station is interconnected with Waikaremoana it is expected that purchase of power will be unnecessary in future.

Arapuni.

There was an expenditure of £431,981 in connection with this scheme during the year, of which £163,148 is in connection with the headworks and power-station, £86,669 in connection with substations in various places, and £143,469 represents interest and miscellaneous capital charges on portions of the scheme not in operation. Of the total of £431,981, £160,676 has been transferred to the Horahora operating account.

Work on the power-station, the erection of which was taken over from the contractors at the end of 1927, has been pushed on, and power was made available from the first 15,000 kw. unit on the 4th June, about seventeen months after the work was taken over. A second unit has just recently been completed, and it is hoped to have the third unit in operation before the end of the year.

Certain grave allegations as to the safety of the dam were made and given much publicity just prior to my taking over the portfolio of Public Works. I had most careful inquiries made into all the points raised, and found that there was no cause for apprehension whatever. The programme provided in the original contract called for completion of the power-station at practically the same time as the dam. Owing to the delay in completion of the power-house, which has been mentioned in this and former Statements, the full flow of the river has been running over the spillway-weir and the channel between that structure and the original river course for a period of over eighteen months. Considerable erosion has taken place in the old channel some 15 to 20 chains below the overflow-weir, and has been causing some concern. This tendency to erode will, of course, be considerably reduced as more and more water is taken through the power-house for power-generating purposes. Meanwhile, and as an emergency measure to reduce the flow passing over the waterfall where the damage has been occurring, the Department has arranged to put in two of the future penstock tunnels in advance of normal requirements, and to use them to bypass sufficient water to enable protective works to be put in on the overflow channel. Contracts have been let for the necessary pipes and nozzles, and the excavation of the tunnels is in hand. Three shifts are being worked in order to have the work completed at the earliest possible date.

Waitaki.

Work on construction of this new scheme has been pushed on during the year. As is inevitable on a work of this magnitude, a vast amount of preparation work on housing workmen, collecting plant and machinery, has to be done before anything shows as part of the permanent asset. A branch railway has been built from Kurow to the works, and is being used to transport materials to the site. A section in the main river-bed has been enclosed in a coffer-dam, and at time of writing the shingle overlying the rock in this section has been excavated and a start is about to be made in pouring the first of the concrete in the main dam. The excavation at the site of the main power-station is in hand, and a start will shortly be made on the first sections of the actual building. Tenders have been accepted for practically the whole of the generating plant, and portions of it will begin to arrive on the site during the coming summer.

Waipori.

During the year negotiations have been proceeding between the Department and the officials of the Dunedin City Council with a view to the purchase of the Council's power plant at Waipori. The city is faced with the expenditure of very large sums in the next few years to provide additional power, whilst on completion of the Government station at Waitaki the Department will have power to sell which it is felt might be used to supply Dunedin and so obviate the necessity of a considerable portion of the additional capital at Waipori. There were also considerable advantages in the operation of two plants by one controlling authority.

Local Electric Supply Authorities.

The Department is to a considerable extent a partner with many of the local supply authorities in making power available to the actual consumers. Many of the supply authorities actually distribute the power generated by the Department, and all of them operate under licenses and regulations administered by the Department. The Government itself now has an investment of £8,467,735 in its hydro-electric developments, and local authorities obtaining their power wholly or in part from the Government have an investment of £11,534,318, whilst the others, who are independent of Government supply, have an investment of £6,088,424.

On the whole, the supply authorities buying their power in bulk from the Department are in a better general financial position than are those operating on their own account. Of the twenty-seven Power Boards purchasing power from the Government, only three had to resort to rates to augment their incomes, and raised a total of £8,056 by that means. Of the eleven Boards not using Government supply,

five collected rates to a total value of £68,713 during the year. Representations have been made to me at various times that the Department should reduce the price charged for current, particularly to the smaller Power Boards operating in country areas. An examination of the accounts of the various Boards and also of the accounts of the Department indicates that as a general rule the local authorities' accounts are in a better financial position than is the Government electric-supply account. There is no question, also, but that the rate at present charged the country Power Boards gives a considerably smaller return per kilowatt to the Department than does the somewhat lower rate charged the larger cities and Power Boards for much larger amounts of power.

RIVER-IMPROVEMENTS AND LAND-PROTECTION WORKS.

Wairoa River.—In this case only a small amount of work has been done, this consisting of an extension of the stone protection work on the foreshore of the Wairoa River.

Waihou and Ohinemuri Rivers.—The heavy stop-bank construction work on the Lower Waihou River was practically completed during the year, the erection of several small flood-gates and other small miscellaneous items only remaining to be finished. As a result of the heavy flood of July last year, rather extensive seepages showed in the Upper Waihou system of stop-banks, so that further strengthening and raising of the bank in places is required. This work, though heavy, is now being expeditiously gone on with, and with its conclusion the construction works involved in the scheme may then be regarded as completed.

Taieri River.—The main stop-bank system has been completed. The pumping-station for dewatering the plain is also complete, and the pumps have been satisfactorily tested. The main canal, $1\frac{1}{4}$ miles long, from the pumping-station to connect with the main system of drains on the plain is in hand. The Railway Department has completed the extension of 400 ft. to the Otokia Railway Bridge, and the old railway-embankment which it replaces is being removed. With the exception of some work required to the contour channel, the plain is now in the position of being able to receive full benefit from this protective scheme.

HARBOURS.

At Westport during the past year the Department has been considerably concerned over the persistent shoaling which took place on the bar during the earlier portion of the year. This has been dealt with by adopting an accelerated dredging programme, three dredges being in constant operation. Arrangements are now in hand, however, to extend the breakwaters, and it is anticipated that this will lessen the amount of dredging required. The protective works at Organs Island have been completed, and the harbour facilities generally have been well maintained. The recent earthquake did a considerable amount of damage to the wharves but this is well under repair.

At Karamea the reconstruction of the training-wall is being steadily proceeded with. All preliminary work was completed, and a start has been made with the depositing of stone. The recent earthquake has considerably damaged the staging and some of the work already done, but efforts are being made to repair this and push ahead as speedily as possible.

At Waikokopu a contract was let for the construction of a stone breakwater, and the contractor is making good progress, two miles and a half of tramway having been built, quarry opened up, and a quantity of stone placed in position.

A number of wharves have been erected and small harbour improvements carried out in various parts of the Dominion, for which funds have been provided either in whole or part by the Government.

LIGHTHOUSES.

During the past year the various aids to navigation round the coast of New Zealand have been added to by the installation of additional lighthouses and by the provision of apparatus for bringing some of the older installations up to date.

A new automatic flashing light has been installed at the North Cape, and should be of great assistance to shipmasters, as it provides a definite turning-point to vessels navigating these northern waters.

At Manukau Heads the older type of light has been replaced by an up-to-date automatic flashing-apparatus.

The provision of a light between Cape Palliser and Castle Point to indicate the position of the Kahu Rocks has been urged by the Merchant Service Guild for some time past, and a lighthouse complete with a modern incandescent Dalen light has been built and is now in operation. This apparatus is operated automatically throughout, and only requires tending about twice a year.

The existing light at Cape Egmont is not now suited for this locality, being a fixed light pure and simple, so that the necessary apparatus to convert it into a powerful revolving light has been procured and will be installed very shortly.

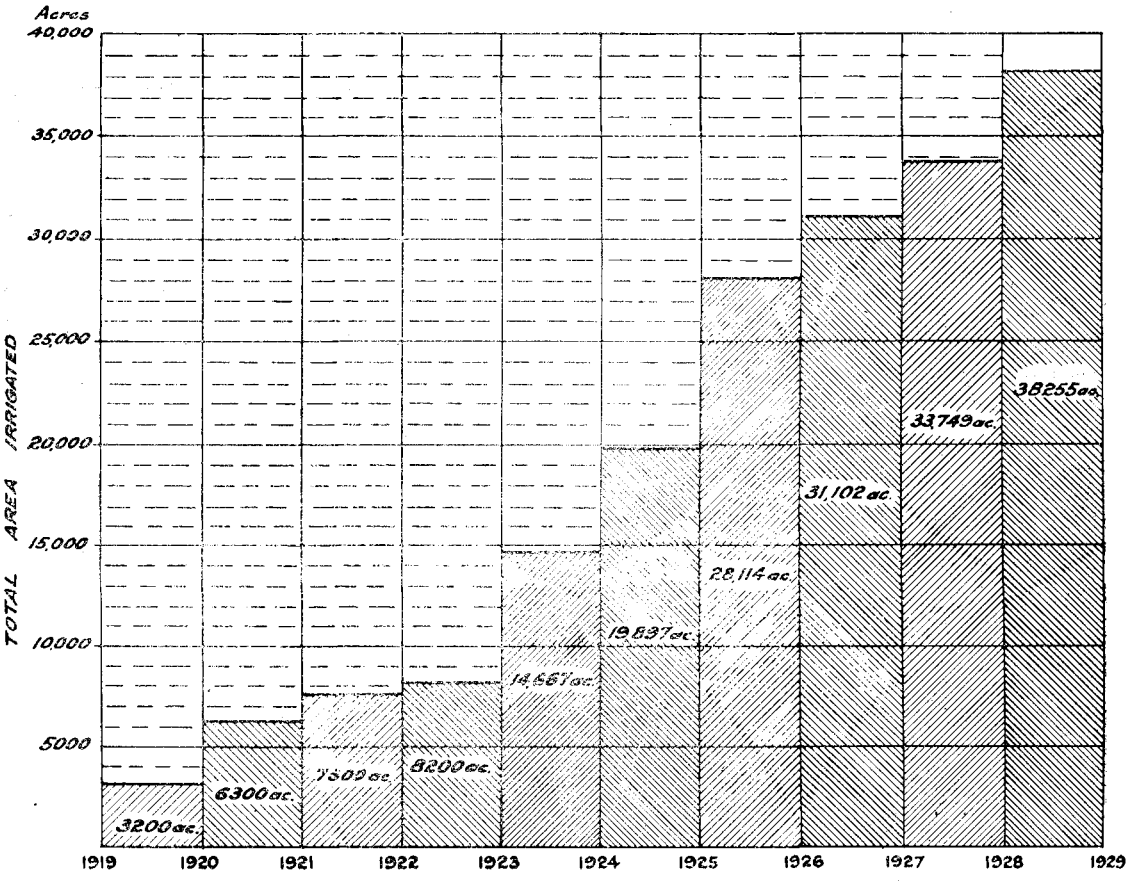
At the entrance to Tory Channel a new automatic flashing light is being erected on the West Head and the existing oil-burning leading-beacons are being replaced by more modern acetylene outfits.

Among the principal works proposed for the coming year are the transfer from Pencarrow to Baring Head and the modernizing of the old high-level light as well as the existing fog-signal, the conversion to automatic flashing of Godley Head and Moeraki Lighthouses, and the installation of a fog-signal at Taiaroa Heads.

IRRIGATION AND WATER-SUPPLY.

During the past year steady progress has been made with construction works on the Arrow, Hawkdun, and Teviot extension schemes.

The erection of the pipe-line on the Arrow scheme is now well in hand, and it is hoped to supply the full area next season. The Hawkdun scheme is now completed, and a full service can be given. On the Teviot extension scheme work was completed, and portion of the area was supplied with water.



During the year the existing schemes were maintained in good order. All lands requiring water were well served.

The total area irrigated under all Government schemes was 38,255 acres, the number of irrigators being 335.

Investigations on several small proposed schemes have been made, and surveys and foundation tests have been made at three possible dam-sites on the Upper Poolburn Stream, where a reservoir is required to supplement the Ida Valley scheme. The best site has now been selected and a start with the preliminary work authorized.

The graph appearing on the previous page shows the growth of irrigation under Government schemes for the past ten years.

ROAD-CONSTRUCTION.

During the last financial year the construction and improvement of roads throughout the Dominion were actively prosecuted, with the result that many settlers who have been handicapped in the past for want of reasonable road access have now had that handicap removed, and vast improvement has also been effected to the already partially completed roads by way of widening and surfacing.

The expenditure on the construction of roads and main highways reached the very large sum of £1,770,073, which is considerably in excess of any previous record. This figure appears very high, but I think that when consideration is given to the absolute necessity for good roads in the proper development of the country the expenditure will be found to be justified. A large portion of the expenditure mentioned was incurred on roads which were put in hand during the year for the purpose of easing the unemployment situation, a very large number of relief workers having been engaged on roadworks. Although in ordinary circumstances some of the roads so treated would not have been constructed for several years, care has been exercised in selecting only those roads which will be of benefit to existing settlement, or those likely to promote new settlement at an early date. In short, every effort has been made to utilize the services of relief workers as much as possible on reproductive works.

Good use was also made of the funds set aside in the "Access to outlying districts" vote, considerable assistance having been given during the year to many of the far-back settlers who have suffered from access difficulties for some time. The constitution of the special vote for "Backblock districts" has been so successful that I feel justified in asking Parliament to increase it for the present year.

With regard to the automatic allocation of funds under the Roads vote, the factors upon which the allocation has been based were: Area, 5 per cent.; population, 5 per cent.; amount of general and special rates, 5 per cent.; total mileage of roads in use apart from metalled or surfaced roads, 5 per cent.; loans for roads, 5 per cent.; estimated amount to complete all as metalled roads, 37½ per cent.; and value of undeveloped Crown and Native lands, 37½ per cent. The system in accordance with these factors has been in operation for several years, but as it was felt that it was not meeting requirements satisfactorily, in that it was definitely known that some districts were receiving a larger quota of the funds than their requirements over a period of years indicated as necessary, and as a result others were receiving less than they otherwise would, the question was thoroughly gone into with a view to ascertaining whether an alteration in the factors would result in a fairer distribution of the vote.

After careful investigation it was decided to amend the system by deleting "area" and "population," and adding the percentages from these factors to those for "total mileage of roads in use apart from metalled or surfaced roads" and "loans for roads," thereby increasing the allowance for those two factors to 10 per cent. in each case. In addition, the third factor was altered to allow for general rates only, in lieu of general and special, and unformed legal roads (*i.e.*, paper roads) were deleted from the computation in the sixth factor, allowance being made only for those roads upon which some formation work had been carried out, or which will soon be brought into use.

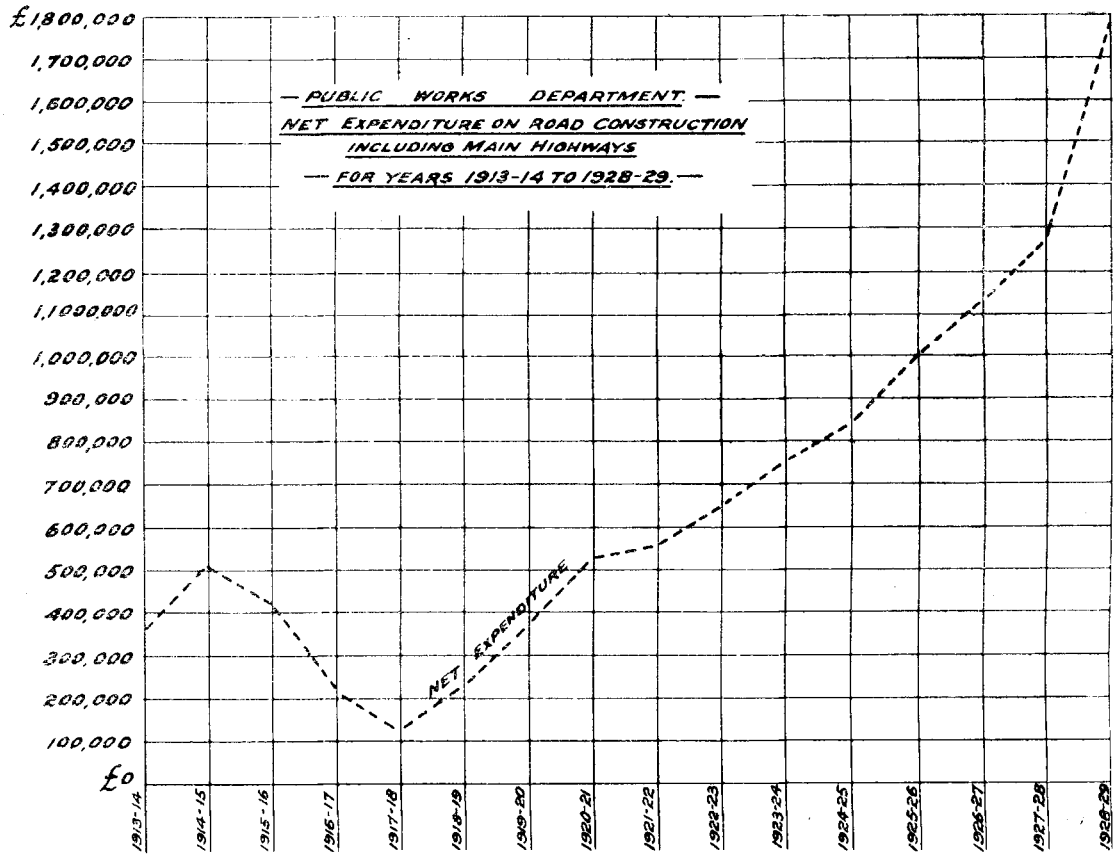
The factors in the new scheme are, therefore—Amount of general rates, 5 per cent.; total mileage of roads in use apart from metalled or surfaced roads, 10 per cent.;

loans for roads, 10 per cent.; estimated amount to complete all roads (apart from legal unformed roads) as metalled roads, 37½ per cent.; and value of undeveloped Crown and Native land, 37½ per cent.

These alterations had the desired effect, and the amended system has been put into operation this year, it being confidently anticipated that the year's experience will prove the soundness of and justification for the alteration.

The expenditure on the renewal of bridges was slightly more during the year than it was in 1927–28, with the result that many more old worn-out structures in various parts of the Dominion were replaced.

The damage caused to roads generally by floods was considerably less, but, nevertheless, a fairly large sum was expended, chiefly on minor repairs.



PUBLIC BUILDINGS.

At Wellington a new fire-alarm system was installed at the Public Works Store at Pipitea Point. Additions were made to the photographic gallery and steel windows provided in the composing and *Hansard* rooms of the Government Printing Office.

At Wanganui Public Works Office extensive alterations were carried out.

In the Taumarunui district a three-stalled brick motor-garage was erected at the Public Works Office. A landing reserve was provided and a departmental building erected at Taupo for the Taupo fisheries.

At Whangarei alterations were made to the existing garage at the Public Works Office and necessary machinery installed.

The capital expenditure on departmental buildings was £4,307.

COURTHOUSES.

A building has been acquired at Whangarei and fitted up as a Courthouse. Extensive alterations and additions were made to the Hastings Courthouse. At Foxton a new building was erected. Repairs and renovations have been carried out to a number of Courthouses throughout the Dominion.

The capital expenditure last year on Courthouses was £8,387.

Prison Buildings and Works.

With the exception of extensions needed at Invercargill to meet the demand for separate accommodation of persons committed for Borstal treatment, the present building programme of the Prisons Department is nearing its close, the approaching completion of Mount Crawford Prison at Wellington and Paparua Prison at Christchurch practically marking a halt in the need of recent years for increased accommodation of all sentenced persons. Within the last few years the policy of drafting men to prison farms has assisted to relieve the congestion of city prisons, and has enabled the capital cost of accommodation to be kept at a minimum. Hence during the last few years the demands on Public Works Fund for prison buildings have been reducing, and for 1928–29 the expenditure was relatively low, being £12,572.

The following briefly sets out what work has been carried out last year with that sum :—

At Auckland Prison the conversion of the quarry plant was completed so as to meet the changed modern-highway demands for high-class graded metal. At Waikeria Borstal Institution and Reformatory capital erections were confined to erection of a third dairy to accommodate the increasing dairy herd of this productive farm.

At New Plymouth Prison a baker's oven was installed, with the satisfactory results anticipated both from an expense-saving and a vocational point of view. Improvements were also made to the existing cell accommodation of that prison.

At Mount Crawford Prison, Wellington, work had sufficiently progressed to enable all inmates to be transferred from the old Terrace Prison and is now in full occupation. With some little additional expenditure on complement workshops, garages, &c., this prison will require no further capital expenditure for some time. The programme of cottage-erections for officers' accommodation was much advanced and is now nearing completion.

At Wi Tako Prison, Trentham, additional accommodation commenced in previous years was completed last year and is now sufficient to meet all anticipated demands. At this prison a commencement was made to lay a high-pressure water system from the Upper Hutt Borough supply. This will be completed in the current year.

At Addington Women's Reformatory, Christchurch, the erection and equipping of a modern laundry was completed for carrying out Defence and Railway laundry-work. The Public Account saving to the State by this utilization of prison labour has already exceeded the total capital cost of construction on the laundry.

At Paparua Prison, Christchurch, erection of exercise-yards was gone on with, following the completion of the buildings. These yards are now practically completed. The erection of washing and screening plant at this prison was completed, and is now, with the aid of a crusher transferred from Mangahao Hydro-electric Power Station, producing crushed and graded metal for local highways in the southern environs of Christchurch.

The remainder of principal buildings and works of the Department was confined to the Invercargill Borstal Institution. This included erection of an additional story to one of the wings to meet the demand for more accommodation, erection of a garage for the farm motor-truck, and continuance of estuary-reclamation.

Police-stations.

The expenditure on police-stations for the year amounted to £6,925. New stations were erected at Normanby, Sumner, and Lumsden, and new offices at Hastings, Mount Albert, and Lower Hutt. A contract was let for approximately £5,000 for additions to the Auckland Central Police-station to provide much-needed accommodation, and the work is now in progress.

Post and Telegraph Buildings.

The need still exists at many places for new or additional accommodation for the conduct of post and telegraph business. During the year, however, satisfactory progress was made with the building programme. Notable works were the erection of a post-office building at Waverley, the making of extensive additions to the post-office buildings at Hawera and Waipukurau, and the erection of a large garage at Dunedin.

At Napier the erection of a chief post-office building is well under way, and will be completed in 1930.

At Dunedin the old chief post-office building has been demolished, and the site has been excavated in readiness for the erection of the new building.

At Greymouth extensive alterations and additions are being made to the chief post-office building.

Among other departmental buildings the erection of which is to be proceeded with in the near future are Courtenay Place (Wellington), High Street (Christchurch), and Upper Symonds Street (Auckland). Large additions will shortly be made to the post-office buildings at Nelson, Newton, Masterton, and Whangarei. During the year a number of sites have been acquired with a view to erecting thereon post-office buildings when required.

The increase in the number of motor-vehicles in use in the Department has necessitated the provision of further garage accommodation. The practice is to erect garages at places at which suitable accommodation for renting is not available or at which the renting of accommodation would be unprofitable. In order to keep the expenditure on garages as low as possible, and to provide accommodation for motor-vehicles at places at which tradesmen are not available for the erection of garages, the Post and Telegraph Department is, by way of trial, having small movable garages constructed at a centre and forwarded in sections to the places at which they are required.

The maintenance of post-office buildings and fittings involves considerable expenditure. Control of this expenditure was assumed by the Post and Telegraph Department from the beginning of the financial year 1928–29. Previously such expenditure was controlled by the Public Works Department.

During the year buildings were erected as follows:—

Post-office buildings: Herekino, Hinds, Te Akau, Tokoroa, Waikaia, Waverley. The building at Tokoroa was erected by the local settlers, half the cost being borne by the Post and Telegraph Department.

Garages: Dunedin, Featherston, Henderson (movable type), Lumsden (small shed converted), Papakura (additional), Tokomaru Bay,* Waipu (old stable converted), Waipukurau,* Waverley.*

Increased or improved accommodation for departmental purposes has been provided at the following places: Ashburton, Ashhurst, Auckland (central telephone exchange, Wellesley Street), Avondale, Gore, Hanmer Springs, Hawera, Kaponga, Matamata, Milton, Mokauiti, Ohinewai, Papakura, Paparoa, Pembroke, Te Teko, Waikanae, Walton, Waipukurau, Wellington (Savings-bank Branch, Chief Post-office), Wellington (Radio).

The following works are in progress: Greymouth—addition and alterations; Mercer—new post-office building; Napier—new chief post-office building; Ohakune—garage and store, and accommodation for carrier-current telephone equipment; Rotorua—addition and alterations; Shirley—new post-office building.

The erection of new post-office buildings at the following places has been authorized: Courtenay Place (Wellington), Cust, New Lynn, Northcote, Dunedin, High Street (Christchurch), Palmerston (South).

Additions and alterations at the following places have been authorized: Cromwell, Invercargill, Masterton, Nelson, Newton, Wairoa, Whangarei.

On 17th June last a severe earthquake occurred in the Nelson, Westport, and Greymouth districts, causing extensive damage to the Nelson, Greymouth, and Westport Post-offices. So extensive was the damage at Westport that the building has had to be demolished, the Postal Department now carrying on its business at the Public Works office until a new building is erected.

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* Garage and store.

Sites.

A site for a post-office building was purchased at Grey Lynn, and sites for storage purposes at Invercargill and Palmerston North.

Additional land for the post-office site at Hastings was taken in March, 1928, under the Public Works Act. Agreement as to compensation has not yet been reached.

The purchase has been authorized of a post-office site at Birkenhead, and storage sites at Dannevirke and Gisborne.

A lease was entered into with the Railways Department for the use of an area of land at Newmarket, with buildings thereon. It is intended to use the buildings as workshops, &c.

In the report for the year 1924–25 reference was made to an exchange of real estate between the Government and the Auckland City Council, under which the transfer to the Council of the Auckland East (Shortland Street) Post-office building and site was proposed. Owing to difficulties which subsequently arose, and on which agreement has not been reached, the exchange has not yet been effected.

Miscellaneous.

The separate wooden public telephone-cabinets which had been in use for a number of years outside the chief post-office building, Auckland, were replaced by two sets of cabinets constructed of bronze.

At Dunedin excavation in connection with building operations on private land adjoining the automatic-telephone-exchange building made it imperative to strengthen the foundations of the exchange building. Underpinning in concrete down to floor-level of the adjacent excavation was found necessary.

At Kurow, Lincoln, Little River, Waikari, and Woodlands the postal business was separated from the railway business, separate accommodation for the post-office being provided in each case in the railway-station building. The cost of the necessary alterations to the railway-station premises was borne by the Post and Telegraph Department.

In December the railway-station premises at Kurow, in which the post-office was conducted, were destroyed by fire. Consideration is now being given to the question of erecting a separate post-office building. In the meantime the post-office is accommodated in temporary premises.

Extensive alterations were made to the accommodation occupied by the Savings-bank Branch of the Chief Post-office, Wellington, in order to relieve congestion in the public space and facilitate the transaction of business.

Improved strong-room accommodation was provided in the General Post Office building.

The net capital expenditure on Postal and Telegraph offices last year was £62,086.

MENTAL HOSPITALS.

Avondale: Extensive alterations and additions have been made to various buildings during the year, and renovations carried out as required.

Wolf Home: The buildings have been repainted and a washhouse erected.

Puhitahi: The following buildings, in wood and concrete, have been erected: Kitchen block, with dining-rooms, &c.; lavatories; dormitory for men's quarters; artisans' quarters; calf-pens and piggeries. In addition, brick and concrete stables, implement-shed, and boiler-house have been built. A temporary water-supply has been provided, with high stand and tanks and motor-pump. For the permanent supply a contract was let for carrying water from Patumahoe Springs; the reservoir, with necessary 6 in. and 8 in. pipe-lines, has been completed. Electric supply has been laid on from the Franklin Power Board's reticulation.

Tokanui: Artisans' quarters in wood have been completed during the year, and three brick villas for women are in course of erection and nearing completion.

Porirua: The new Nurses' Home, containing over a hundred rooms, was completed, furniture and furnishings installed, and the laying-out of the grounds commenced. An incinerator and two garages were erected, additions have been made to a number of buildings, and renovations carried out as required. A new

system of ventilation has been installed in the women's portion of the main building, similar to that recently installed in the men's portion. The water-supply has been improved by raising the level of the lower dam, and all fire-hydrants have been overhauled and put in good order.

Nelson and Stoke: Three large villas in brick and concrete are in course of erection; also a new bakery, meat-shop, &c.

Sunnyside: Extensive additions to the boiler-house are under construction, new boilers, &c., being provided together, with new chimney-stack, &c.

Templeton: Villa No. 2, on the same lines as Villa No. 1, is in course of erection, very satisfactory progress having been made.

Seacliff: A new laundry and kitchen block has been erected, and is ready for the installation of machinery and equipment. Additions to the Nurses' Home and a new Assistant Medical Officer's house are nearing completion. New piggeries have been erected, and extensive alterations, additions, and renovations have been carried out.

The expenditure on mental hospitals last year amounted to £96,782.

Health and Hospital Institutions.

At Queen Mary Hospital, Hanmer, the contract for the erection of a new Nurses' Home is making good progress. A new brick boiler-house has been erected, and lavatory block No. 2 has been renovated.

Extensive additions were made to the hospitals at Napier, Greymouth, and Gore, and the erection of a maternity hospital at Paeroa is well advanced. A new hospital in concrete was erected at Te Araroa.

The capital expenditure on health and hospital institutions during last year was £19,637.

The proposals this year provide for the erection of a new St. Helens Hospital at Christchurch, and the purchase of land at Auckland for extensions to St. Helens Hospital; also the purchase of land at Dunedin for a new maternity hospital, which it is proposed to erect to provide increased facilities for the teaching of obstetrics.

Provision is made for completion of the massage block and Nurses' Home at Hanmer.

Provision is also made for an ante-natal clinic at St. Helens Hospital, Wanganui, which is now nearing completion, and various additions to staff quarters at St. Helens Hospitals at Gisborne, Wanganui, and Invercargill.

Extra accommodation is arranged for at Otaki Sanatorium, owing to the separation of the hospital from the sanatorium.

Agricultural Buildings.

The amount expended last year on capital works was £2,808, being practically the same as the previous year. The principal works carried out were new piggeries at Motuihi Island erected, electric light and power installed at Te Kauwhata Farm and Wallaceville Laboratory, and an implement-shed and hothouse erected for the seed-testing branches at Palmerston North.

Education.

For the year ended 31st March, 1929, the sum of £375,352 was spent on new school buildings, additions, sites, and teachers' residences. Of this amount, £247,348 was expended in connection with primary schools, the larger works including a new infant department at Meadowbank (Auckland), a new school at Awapuni (Gisborne), and separate secondary departments at Te Karaka and Wairoa (Hawke's Bay), and at Fairlie (Canterbury). Model schools were established in connection with the Auckland Training College. Additions to schools have been provided at Taumarunui, New Lynn, Papatoetoe, Ellerslie, Hikurangi, Morrinsville, and Otorohanga, in the Auckland Education District; at Mahora, Hawke's Bay; and at Elmwood, Canterbury. The erection of numerous small schools in newly settled districts, and additions to existing schools, have also been undertaken, especially in those localities where two teachers were compelled to teach in one room.

While many of the old schools have been remodelled to provide up-to-date conditions, the Department, owing to lack of funds, has not been able during last year to carry out its intention to rebuild some of the obsolete city schools, and it is hoped that something in this direction can be done this year.

A considerable building programme is being undertaken to provide accommodation for secondary-school pupils. During last year additions were erected at the Mount Albert Boys' Grammar School, the Hutt High School, and at the Wairarapa High School. A workshop building was completed at Marlborough High School, and additional dormitories at the Dannevirke High School Hostel. At the close of the year further additions were in course of erection at Mount Albert, Auckland, and at Dannevirke.

A large sum was expended in the erection of buildings for the Massey Agricultural College, and further expenditure will be required in order to complete this institution.

Additional accommodation and workshops have been added to several technical schools, and additions are in course of erection at Auckland, Hamilton, Palmerston North, and Christchurch.

Applications are still being received for grants for the erection of open-air class-rooms, and these are being erected where the localities are considered suitable. Certain information is being collected regarding the children attending these schools, with a view to ascertaining whether this type of building is more suitable to New Zealand conditions than the standard fresh-air class-room.

The following table shows for the year ended 31st March, 1929, the amount expended by the Department on new buildings, additions, sites, and teachers' residences :—

	£
Primary schools	247,418
Secondary schools	44,382
Technical schools	23,281
Training colleges	2,223
Universities	1,564
Native schools	6,044
Special schools	12,277
Free kindergartens	967
Massey Agricultural College	32,546
Canterbury Agricultural College	4,650
Total	£375,352

TOURIST AND HEALTH RESORTS.

The expenditure was £39,254, as against £36,673 for the previous year. The erection of a hostel at Milford Sound to accommodate sixty guests was completed, and was in use during last tourist season. It is provided with electric light and every modern convenience, and tourists will now spend longer visits to this beautiful scenic resort.

A new engine for the steamer on Lake Te Anau was purchased and installed, and extensions to the Rotorua electrical system were completed.

The large additions to the hostel at Waitomo were also finished. This building will now accommodate one hundred tourists.

TELEGRAPH EXTENSION.

The expenditure for the last financial year in extending and improving the telephone, telegraph, and wireless facilities throughout the Dominion amounted to £624,414. Of the works upon which capital expenditure was incurred during the year, the following were the more important: The installation of two carrier-current-telephone channels between Auckland and Hamilton; the erection of new metallic circuits between Palmerston North and Wanganui, Te Aroha and Hamilton, Rotorua and Atiamuri, Gisborne and Morere, Carterton and Greytown, Blenheim and Seddon, Darfield and Coalgate, Christchurch and Leeston, Rangiora and Oxford,

Tokarahi and Duntroon; the laying of a submarine cable between Maraetai and Awaroa; the installation of direct-dialling circuits between Wellington and Blenheim, Wellington and Masterton, Paekakariki and Wellington, and Palmerston North and Dannevirke, and the improvement and extension generally of toll facilities; the installation of a universal-battery system in Palmerston North Telegraph-office; the opening of new exchanges at Wellsford, Towai, Waimamaku, Mangapai, Kirikopuni, and Tokanui; the installation in thirty-seven exchanges of additional switching equipment for 3,940 exclusive lines and 200 party lines; the establishment of sixty-six new public call offices (coin-in-the-slot telephones); the laying of 2,772 chains of underground telephone-ducts and 10,160 chains of underground cable; the erection of 5,260 chains of overhead cable; the erection of 850 miles of pole-line and 8,270 miles of open wire; and the connection of 12,119 new subscribers' stations.

Some idea of the extensive network of lines interconnecting the various exchanges and telegraph-offices throughout the Dominion may be gauged from the fact that on the 31st March last there were approximately 380,000 poles in use, carrying over 62,602 miles of open wire. In addition, approximately 400,000 poles and over 495,000 miles of wire of all classes were in existence in telephone-exchange subscribers' lines.

Notwithstanding the many important extensions that have been made to the system of electrical communications during the last few years, the necessity for additional facilities, particularly in the matter of telephone-lines, is just as real and just as urgent to-day as it was ten years ago. This condition is not peculiar to New Zealand—it is world-wide. In all the foremost telephone countries the difficulty is not to obtain the traffic, but to keep pace with it in the matter of providing additional circuits. Telephone service is now so intimately connected with the business and social life of the community that no sooner is telephone communication provided between cities and towns widely separated (and not previously interconnected) than there is a demand for additional circuits to relieve the traffic congestion. A striking example in that respect is the inter-Island telephone service. Two years ago telephonic communication between Wellington and Christchurch was impossible. To-day, as a result of providing an efficient means of communication between the two cities, it is necessary to double the capacity of the South Island land-line section of the Wellington–Christchurch circuit in order to relieve the congestion of traffic.

In the matter of extending and improving the long-distance telephone facilities throughout the Dominion the most important development during the year was the introduction of the system known as carrier-current telephony. The carrier-current system consists briefly in the application of radio-frequency methods to existing telephone circuits, thus enabling additional telephone speech channels to be obtained without increasing the existing wires. The new process is in reality a system of wireless communication in which the electro-magnetic waves, instead of being broadcast, are directed along the metallic conductors of the wires already erected without interfering with the purposes for which such wires were originally designed. The most important feature of the new system from the practical point of view is the large saving it effects in installation and line-maintenance costs. In addition, the system provides an excellent speaking-circuit, and as compared with the well-known metallic wire circuit it gives louder speech and is less subject to the interfering noises caused by power lines and similar disturbing influences. The initial installation in New Zealand of carrier-current equipment comprises three single-channel systems for use between Auckland and Hamilton; a three-channel system for use between Hamilton and Palmerston North, which will provide a single channel between Hamilton and Palmerston North and two channels between Wellington and Auckland; and a single-channel system to supplement the South Island land-line section of the Wellington–Christchurch telephone circuit. At the present time two channels of the Auckland–Hamilton system are in operation, and it is hoped to have the other systems working at an early date. When the three systems mentioned are in use, and the equipment is properly tuned in, high-grade and efficient telephone speech channels will be available at any hour of the day or night between Auckland and Dunedin, and between the principal centres within

those limits. In addition, much of the congestion which now exists on the long-distance lines within each of the two Islands will be considerably relieved. As soon as the above-mentioned systems are in operation consideration will be given to the question of installing carrier systems between other centres.

A great deal of work was also carried out during the year in the direction of extending and improving the facilities for short-haul traffic. In almost every part of the Dominion some facility was provided for the purpose of relieving congestion of traffic or for giving service to some backblocks settlers that had not previously enjoyed any of the privileges or conveniences of the telephone. In addition, the speech efficiency of toll circuits and the physical condition of the lines were considerably improved by the carrying-out of many reconstruction works. These works included the renewal of pole-lines, the replacing or respacing of poles, the strengthening of existing poles, the regulation of wires, the rearranging of transpositions, the substitution of copper for iron wires, and the re-erection of circuits on the twist system.

The steady expansion and growth of the local-exchange systems which has characterized telephone development in New Zealand during recent years was continued during 1928, the number of new connections installed being 12,119, as compared with an average of 12,112 per year during the preceding five years. The total number of telephone connections with departmental exchanges at the 31st March was 147,936, the number of telephones connected with toll stations and non-departmental stations 4,605, making a total of 152,541, which represents over ten telephones per hundred of the population, a telephone density exceeded only by the United States and Canada. A feature of last year's development in telephone-exchange systems was the large number of intercommunicating and extension telephones installed, the rate of increase being 7·7 per cent., as compared with 4·9 per cent. in the case of main stations. This was due to a large extent to the increased number of intercommunicating systems installed in business houses. The local intercommunicating system in most popular demand was the key-box interphone type, large numbers of which were installed in business establishments where the requirements in intercommunicating facilities did not exceed twenty positions. Next in order of demand were private branch exchanges of the full automatic type with capacities varying from twenty extension stations upwards.

The latest development in the automatic-telephone industry is the manufacture of a small type of automatic exchange suitable for rural communities and capable of giving a twenty-four-hour service. One of such systems has been obtained by the Department, and will shortly be installed in a suitable rural locality with a view to testing out its suitability in actual practice for the exacting conditions that prevail in rural exchange areas in New Zealand, and where a twenty-four-hour service under manual conditions would be economically prohibitive. Should the trial prove successful and the actual costs be reasonably low, the question of installing twenty-four-hour-service automatic exchanges in rural communities will be fully investigated. For economic reasons, however, the development of such a policy would have to proceed gradually, as a large capital expenditure would be involved.

The Christchurch Telephone Exchange, to which over 11,000 stations are connected, is one of the largest in New Zealand to be converted to full automatic operation, and will increase by approximately 14 per cent. the number of automatic telephones in use in the Dominion. The conversion to automatic working would have taken place many months ago had not there been some unfortunate delays in the delivery of the equipment. Notwithstanding these delays, however, the actual time occupied in the work of installation compares favourably with that for similar exchanges of like capacity in this and other countries where machine switching methods have been introduced. With practically all the essential equipment now in sight, an intensive effort is being made to hasten completion of the work, additional skilled labour from other parts of the Dominion having been concentrated at Christchurch to assist in the construction of the internal switching

system, as well as in the installation of subscribers' telephones and subsidiary apparatus. If the outstanding items of equipment for subscribers' stations come to hand according to schedule time, as is confidently expected, the whole of the Christchurch metropolitan area will be completed and converted to automatic working in a few months. One indirect advantage arising from the delay that has occurred is that the Christchurch area, being the last of the large centres to receive full automatic treatment, will have the benefit of a number of the very latest developments in machine switching equipment. As soon as the cut-over takes place attention will be directed to the installation of a further 2,000-line extension, so that no unnecessary delay will arise in meeting the growth that is expected to follow the introduction of automatic methods.

WORKS FOR DEFENCE DEPARTMENT.

The mobilization base and training-camp at Waikato Camp, Ngaruawahia, is practically completed. The small-arms-ammunition magazine, ordnance workshops, vehicle-shed, forage-store, and other miscellaneous small buildings—all of which were under construction at date of last Statement—have been finished. A bathhouse, drying-room, three magazines (high explosive), coal-store, and hospital building have been erected, various facilities of a minor nature provided, noxious weeds and scrub removed, and the area generally improved. On the erection of the laboratory (under construction) and the clearing and grassing of a scrub-covered area the camp will be complete.

At Trentham Camp the water-supply system has been connected to the Upper Hutt water-supply. The camp buildings, roads, and other services have been maintained.

Burnham Camp has been generally maintained, and a concrete strong-room and Ordnance workshops erected.

Various additions and improvements to fortifications, drill-halls, and miscellaneous buildings throughout New Zealand have been carried out and the buildings maintained.

Very considerable progress has been made with the development of the New Zealand Air Force Base, Hobsonville, Auckland. The area has been cleared of trees and hedges, and two houses sold for removal. The landing-ground has been levelled, rolled, and sown in grass.

A large land-plane hangar in reinforced concrete, with electrically-operated doors, workshops, and appointments, has been erected. A residence for the Officer Commanding and five houses for married airmen have been completed, while a sixth is under construction. A transport shed (for motor-vehicles), switch-hut (for power lines), small boat-house, control-tower, and meteorological hut and base office have been erected.

A sufficient water-supply was found by boring, and a water-tower, with pump-house and pumping plant, has been completed.

The seaplane apron, involving considerable excavation, filling, and a stone sea-wall, is complete except for surfacing. The reinforced-concrete slipway (40 ft. in width and 290 ft. long) from the apron seawards is under construction, while the jetty (approximately 300 ft. in length) for handling stores and launches is nearing completion. Extensive accommodation for seaplanes, consisting of marine store, two large hangars, aircraft-repair shop, engine-repair shop, plumber's and blacksmith's shops, dope-shop, and offices, is required on the apron, and will be provided in one large reinforced-concrete building, work on which is well under way.

An access road to land-plane hangar, office, and seaplane area has been completed. Extensive surface drainage, sewer-drains, septic tanks, water-reticulation, and underground power and telephone lines are proceeding as the base develops.

MECHANICAL APPARATUS.

The prosecution of the Tawa Flat Railway Deviation and other railway works has occasioned the purchase of numerous items of plant, while hydro-electric and main-highways construction has also involved certain important new purchases.

The efficient repair and maintenance of existing plant, which has been assisted by the better organization of the staff in the field, has resulted in keeping down purchases of replacements to a minimum.

Major items of plant purchased during the year include one steam crane, ten air-compressors, two stone-crushers, six air-receivers, four air-operated shovels, four motor generator sets, thirteen electric locomotives, two petrol-locomotives, four cement-guns, six concrete-mixers, seven petrol-engines, seven electric motors, seven pumps, six ventilating-fans, two winches, one electric lift, sixteen machine tools, eleven pneumatic mine-hoists, three welding plants, one motor grader, thirty-six motor-cars, thirty motor-trucks, and numerous other items of mechanical plant. This detailed list does not include the special items of plant which were purchased for main-highway work, and which are itemized in the special report of the Main Highways Board.

STAFF.

It is with sincere regret that I have to record that a number of officers of the Department died during the year.

Mr. J. W. Swaney, Power-house Superintendent, Arapuni, died suddenly of heart-failure, having worked a full day on the day of his death. Mr. G. H. Hill, Overseer, Whangarei, died of heart-trouble after an illness of four months. Mr. W. H. Boys, Chief Clerk, Gisborne, died suddenly, having worked until the day of his death. Mr. T. J. Kiley, Overseer, Kotemaori, died after an illness of three months. Mr. S. C. Collinge, fifth operator, Mangahao, died following an operation for appendicitis; and Mr. J. P. Good, cadet, Head Office, died of septicæmia after one week's illness.

The following officers retired on superannuation: Messrs. C. H. Williams, Road Engineer, Wanganui; E. Bold, Land Purchase Officer, Head Office; and G. Brown, Draughtsman, Wellington District Office.

CONCLUSION.

In conclusion, I wish to acknowledge, with thanks, the loyal support and assistance I have received from all members of my staff. The Department has been called upon to work at exceedingly high pressure. The large increase in the number of men employed and the vigorous prosecution of all the works in hand represent increased work for the permanent staff. The fact that practically no additions to the staff have been asked for, notwithstanding the heavy programme in hand, gives cause for congratulation, and is an indication that each officer from the highest to the lowest is carrying his portion of the load.

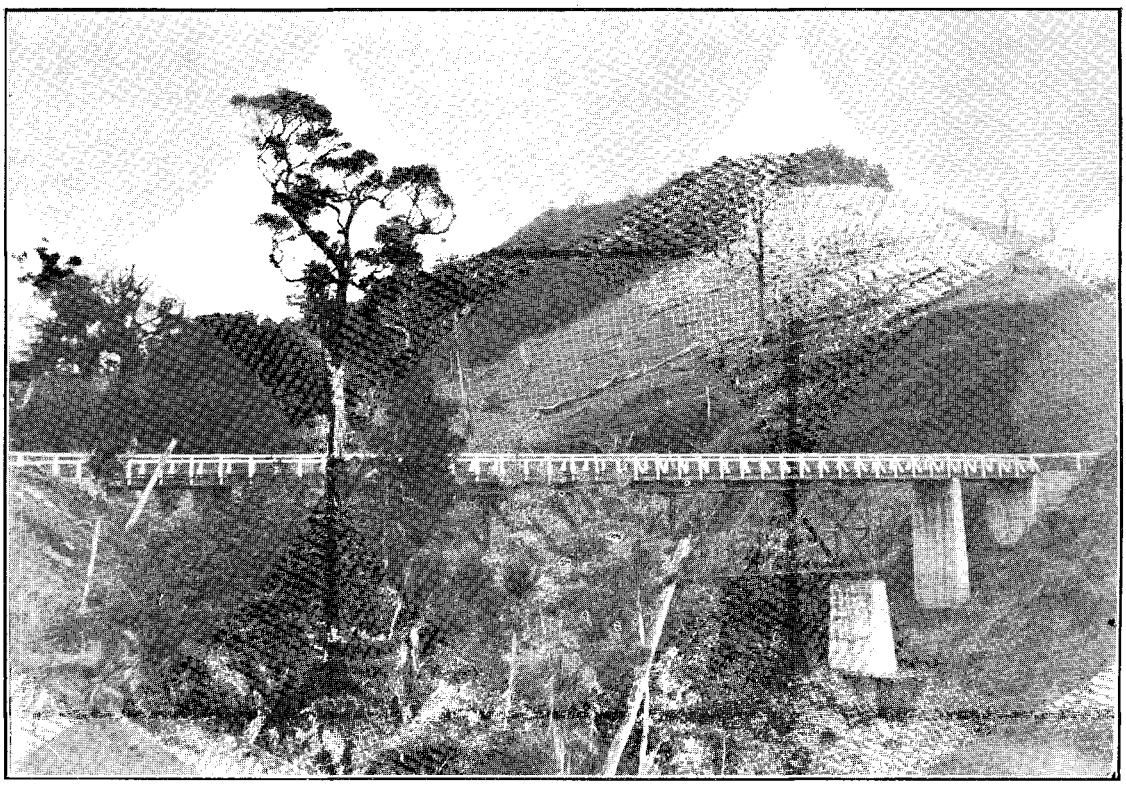
As appendices to this Statement honourable members will find full details of the principal works carried out by the Department in the reports of the Engineer-in-Chief, Government Architect, Chief Electrical Engineer, and Main Highways Board respectively.

SCHEDULE SHOWING PARTICULARS OF RAILWAY-LINES UNDER CONSTRUCTION AT 1ST APRIL, 1929.

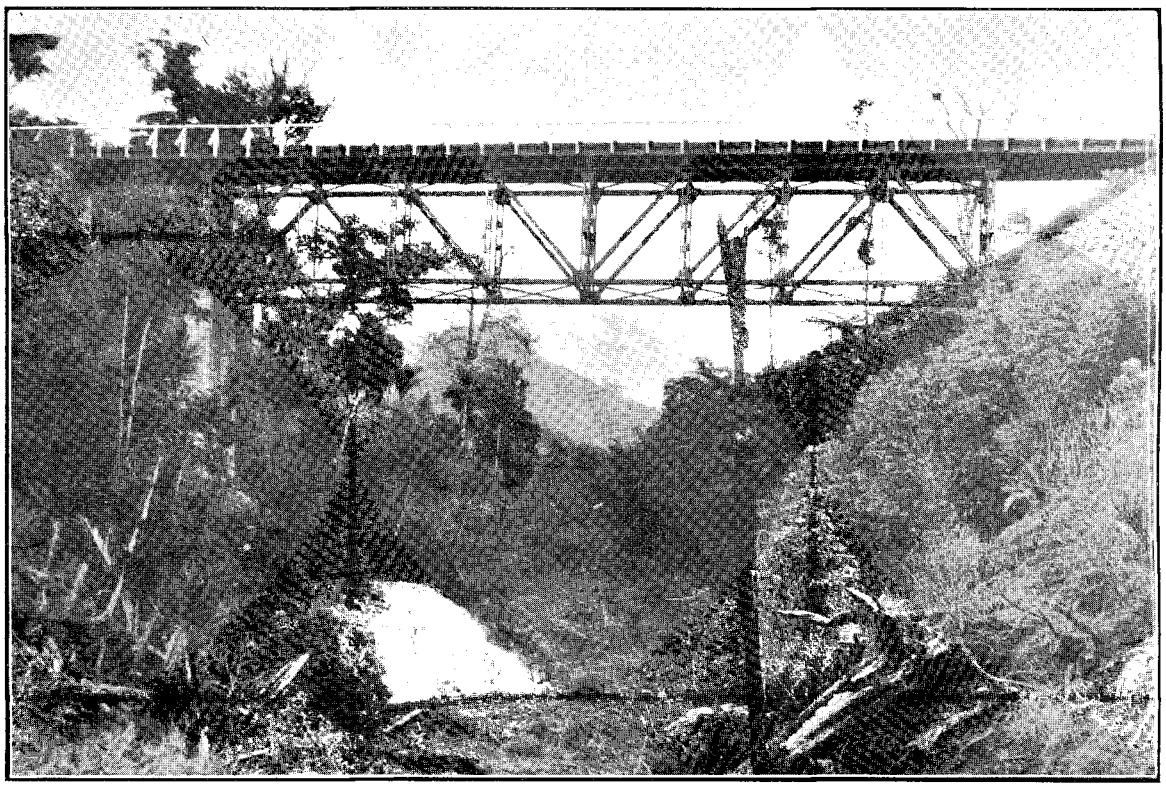
Railway.	Length of Section.	Length under Construction.	Handed over to Railway Department during Year ended 31st March, 1929.	Rails laid during Year.	Length over which Traffic is being run.	Length over which Goods Traffic only is being run.	Length ready for handing over to Railway Department.	Ready for handing over to Railway Department within One Year.	Ready for handing over to Railway Department within Two Years.	Amount spent to Date.	Estimated Amount to Complete.*
	M. CH.	M. CH.	M. CH.	M. CH.	M. CH.	M. CH.	M. CH.	M. CH.	M. CH.	£	£
North Auckland Main Trunk and Branches—											
Okaihau–Rangiahua	13 69	13 69	..	3 16	..	..	..	..	13 69	420,893	246,750
Waiotira–Kirikopuni	13 56	..	13 56	..	..	..	..	..	..	1,059,351	5,000
Kirikopuni–Dargaville	17 40	15 0	..	3 22	..	..	..	..	17 40	203,251	278,250
Auckland–Westfield Deviation	9 67	9 67	..	..	..	..	..	9 67	..	535,351	75,000
Paeroa–Pokeno	42 0	..	..	..	..	..	..	..	..	22,406	1,047,038
Rotorua–Taupo	54 40	5 40	..	..	..	..	..	..	..	39,144	800,000
East Coast Main Trunk and Branches—											
Waihi–Taneatua	101 69	..	83 42	..	..	..	..	..	..	2,588,746	7,000
Taneatua–Opotiki	26 26	..	..	..	..	..	..	..	..	217	630,000
Gisborne–Waikokopu	38 34	..	..	..	..	..	..	..	..	150,890	1,260,000
Wairoa–Eskdale	60 21	60 21	..	7 32	13 0	9 0	..	..	27 0	1,404,412	716,100
Waikokopu Section	24 58	24 58	..	..	24 58	..	24 58	..	..	582,912	49,350
Stratford–Main Trunk—											
Tahora–Ohura	22 30	17 0	..	1 48	..	..	..	..	..	443,267	735,000
Ohura–Okahukura	19 10	19 10	..	..	19 10	..	19 10	..	..	863,502	
Palmerston North Deviation	6 78	6 78	..	..	..	..	..	..	..	156,624	..
Rimutaka Deviation	13 24	..	..	..	..	..	..	..	..	6,500	970,000
Wellington–Tawa Flat Deviation	7 02	6 20	..	..	..	..	..	..	..	346,765	868,000
Midland—											
Kawatiri–Inangahua	46 43	4 40	..	..	..	..	4 0	..	..	88,891	1,680,000†
Westport–Inangahua	26 0	8 0	..	0 69	3 0	..	3 0	..	..	248,640	598,500
South Island Main Trunk—											
Wharanui–Parnassus	76 0	..	..	..	..	..	..	..	..	45,076	2,415,000
Lawrence–Roxburgh—											
Miller's Flat–Roxburgh	9 12	..	9 12	..	..	..	..	..	..	137,976	..
Totals	..	191 03	106 30	16 27	59 68	9 0	50 68	9 67	58 29	10,105,670	12,370,988

* Adjusted to include administration charges. † Subject to amendment on account of recent earthquake.

NOTE.—Estimates to complete include amounts required for maintenance and running traffic where traffic is being run.



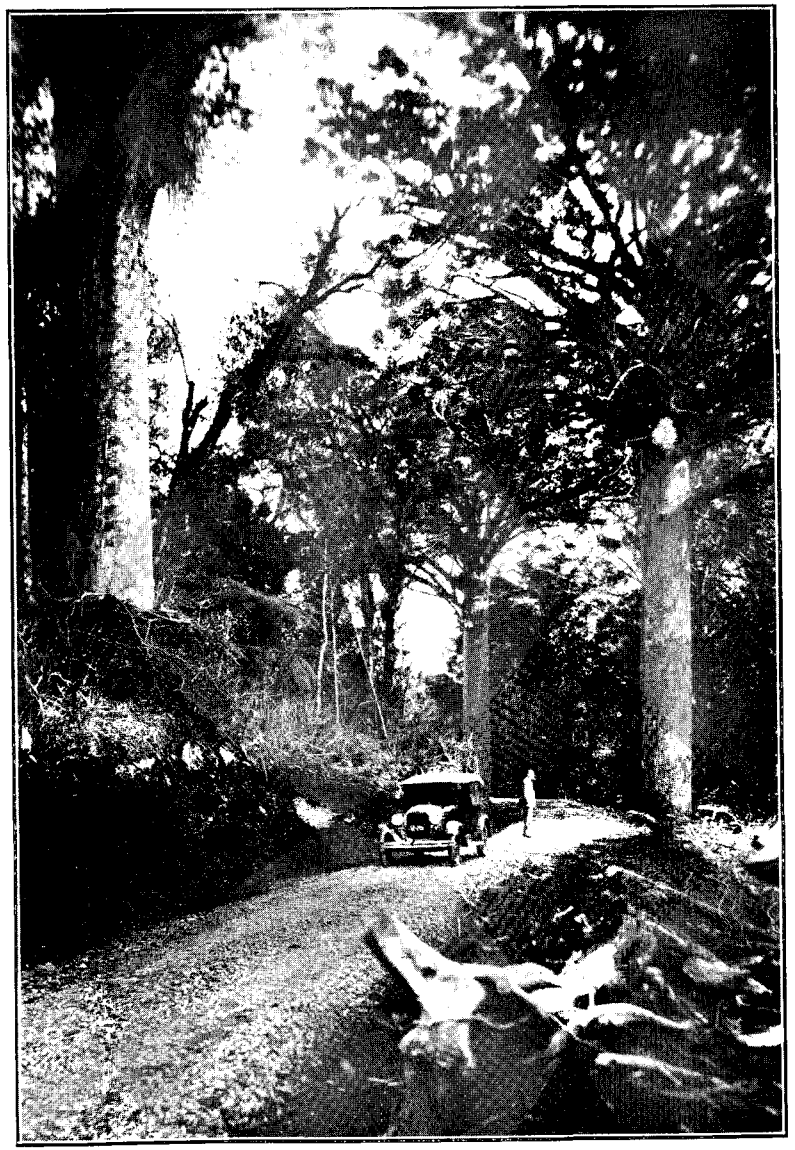
General Elevation of Bridge.
One 120 ft. steel truss and four 25 ft. timber spans.



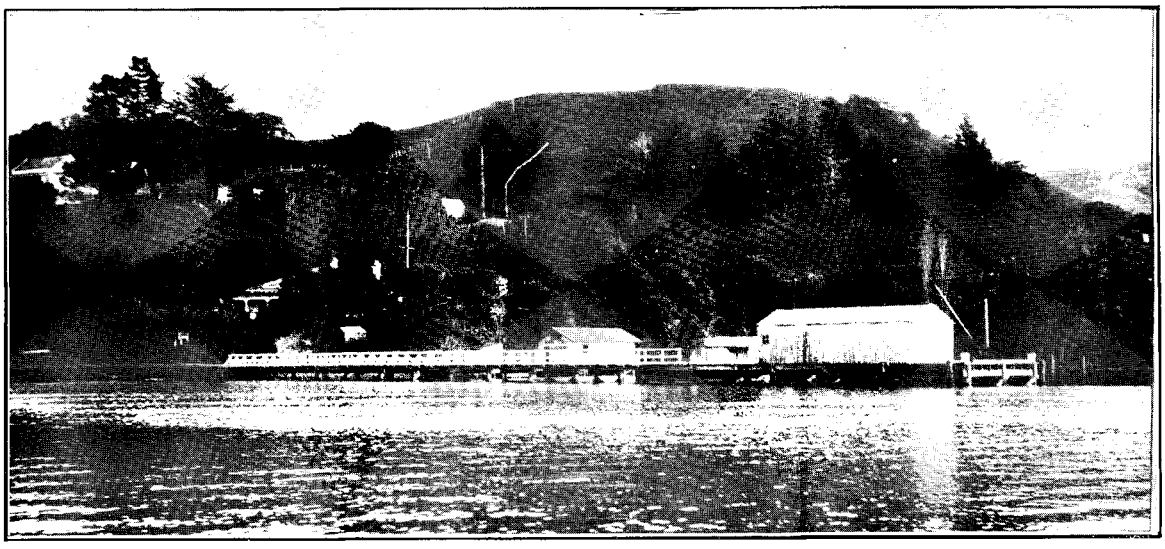
Side View of 120 ft. Truss.

MANGATIPA RIVER BRIDGE.—KIRIKOPUNI–PARAKAO ROAD.

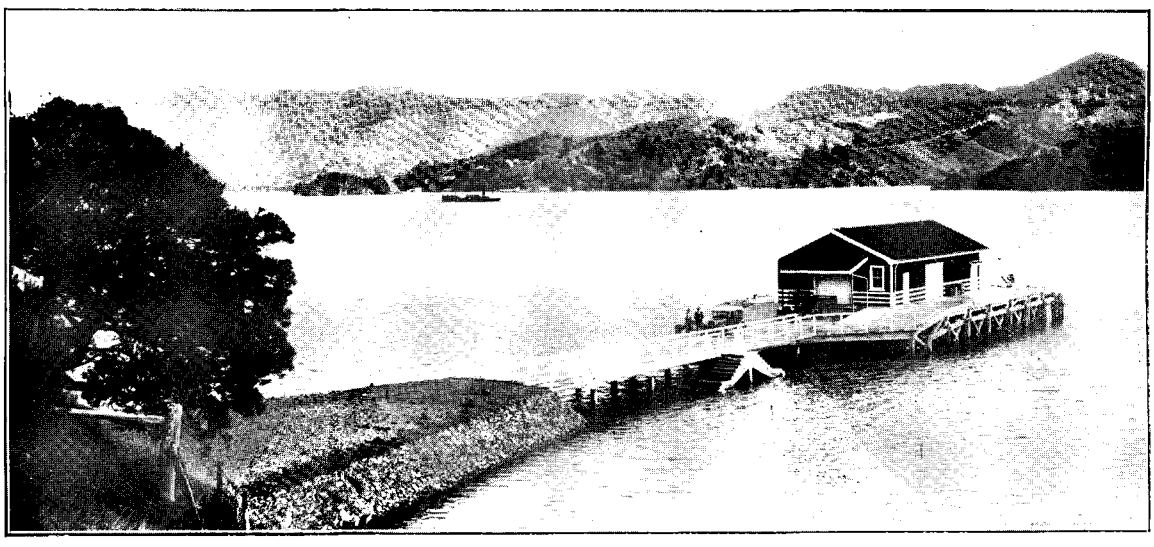




PORTION OF ROAD THROUGH KAURI GROVES, WAIPOUA STATE FOREST.



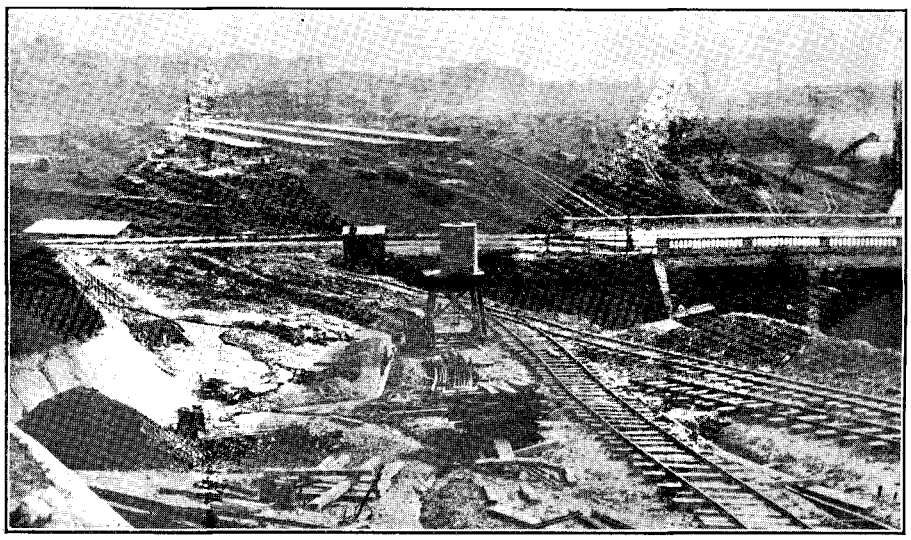
TOTARA NORTH WHARF.



WHANGAROA WHARF.
Reinforced concrete.



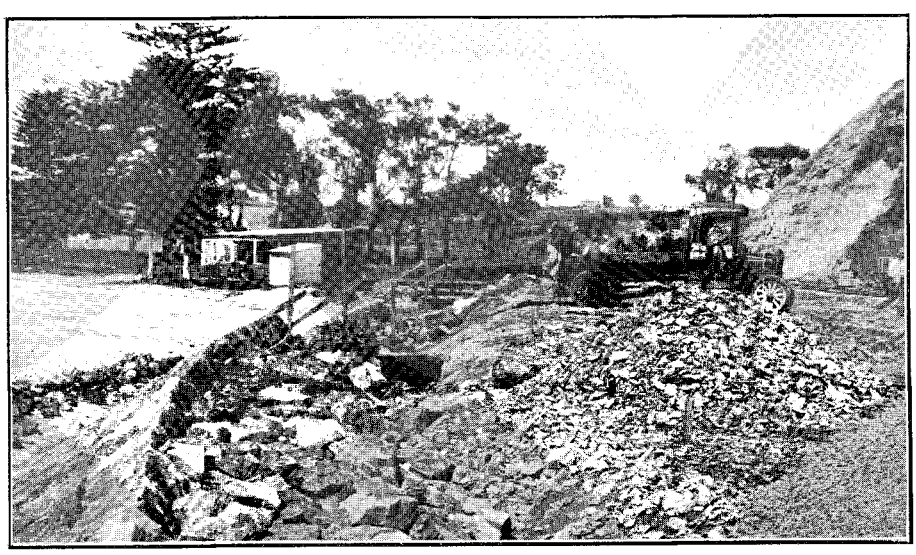
TE KARAKA WHARF.



New Traffic Outlet at 0 m. 72 ch., Campbell's Point.
New station-yard in background.

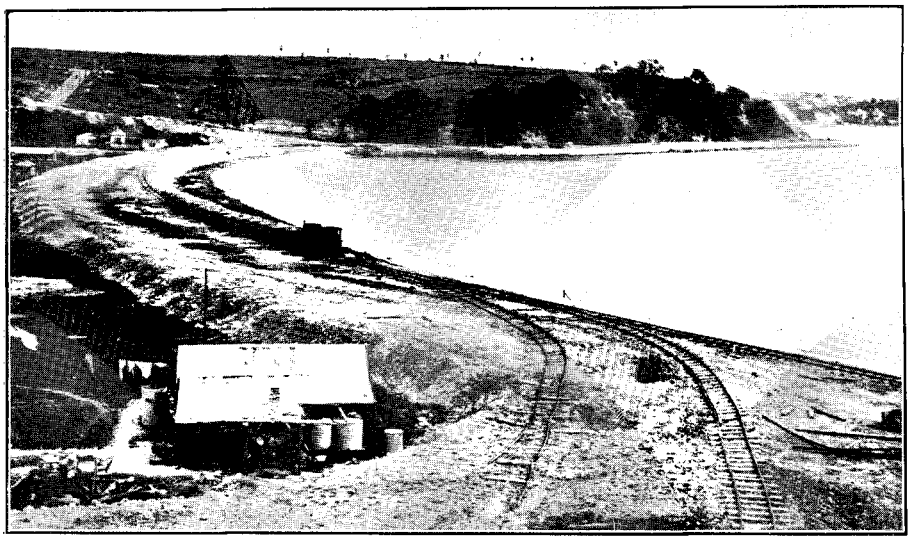


Stone Protection Work at 2 m. 20 ch.

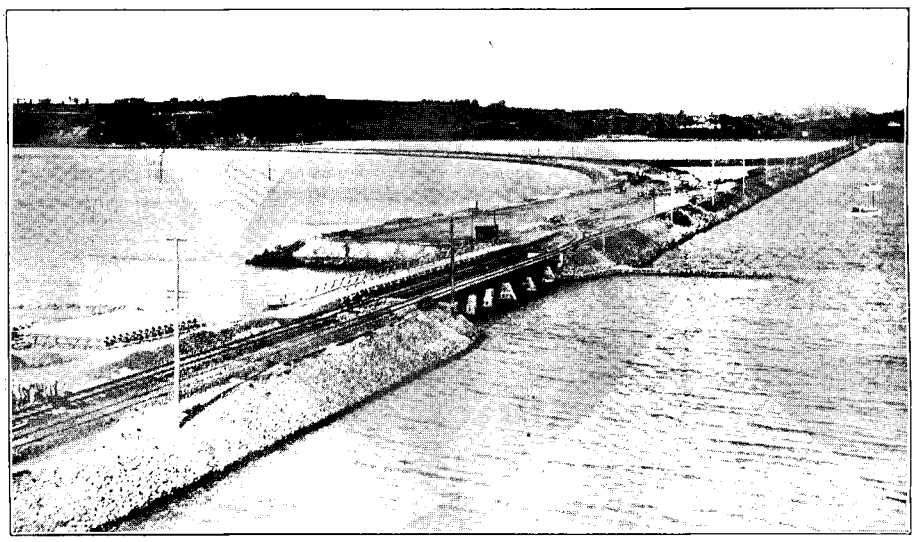


Mission Bay Extension: Stone Protection at 4 m. 0 ch.

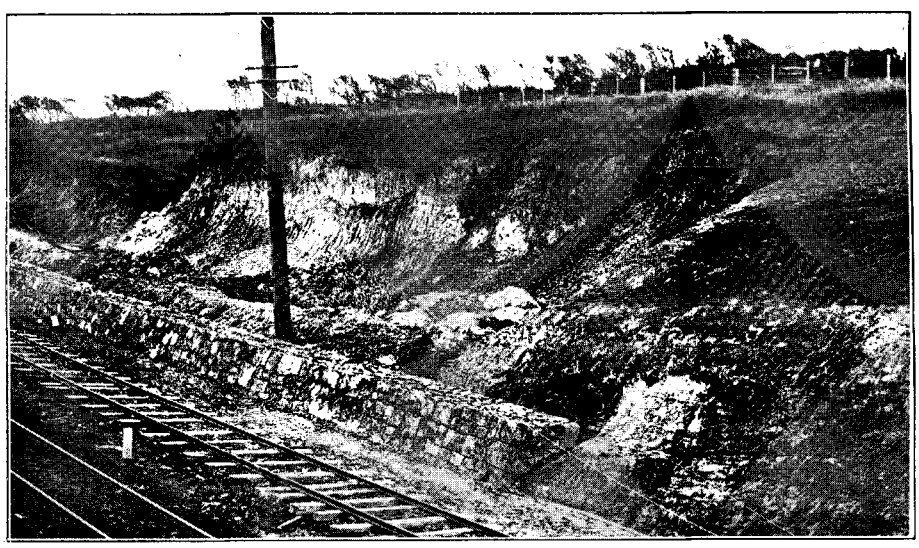
AUCKLAND-ORAKEI WATERFRONT ROAD.



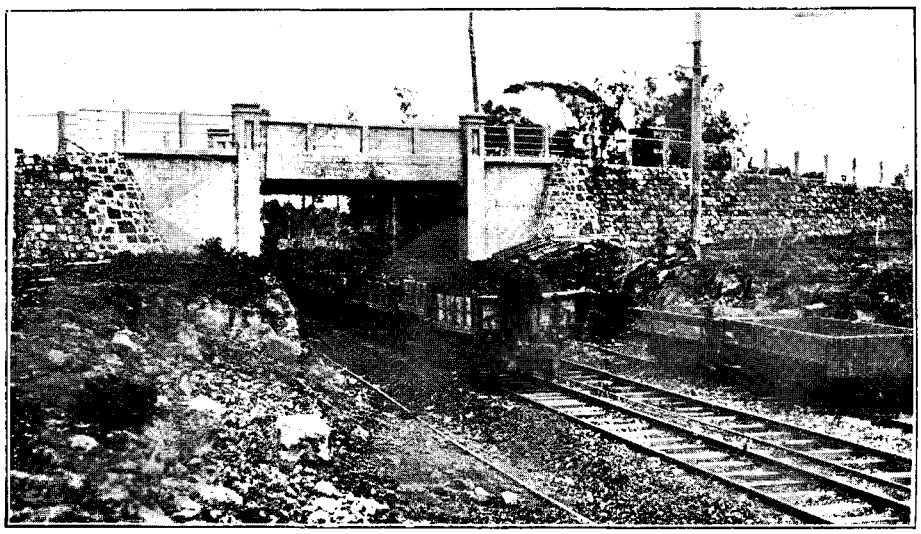
Okahu Bay.
Orakei Garden Suburb in background.
AUCKLAND–ORAKEI WATERFRONT ROAD.



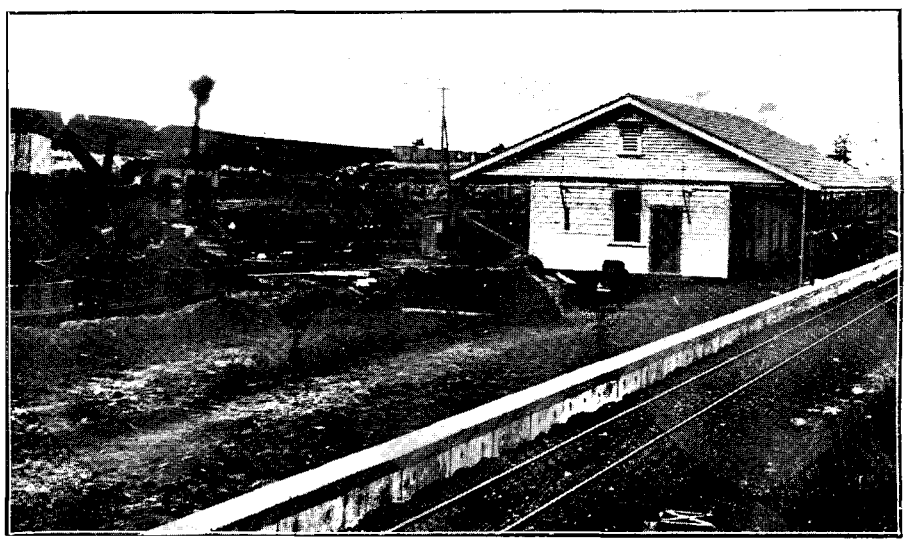
Railway and Waterfront Road, Hobson Bay.



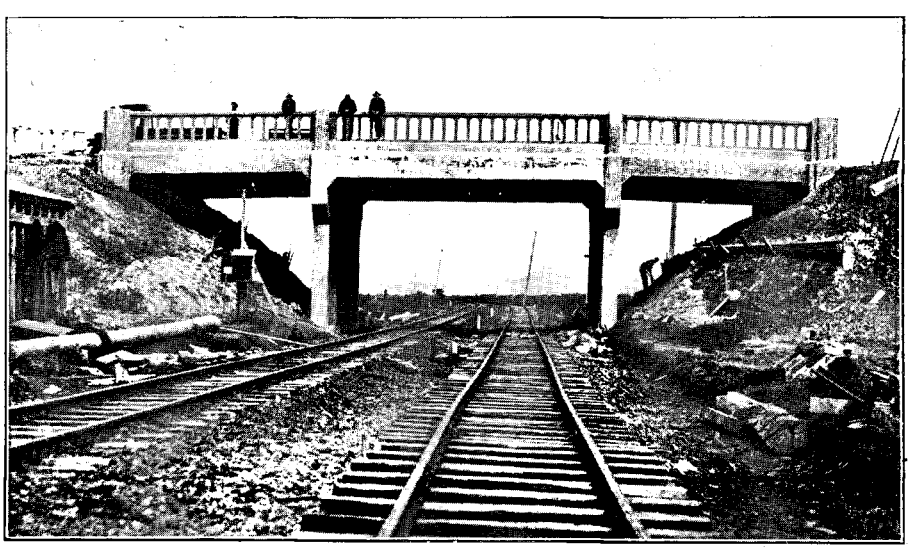
Slip at 5 m. 15 ch.
AUCKLAND–WESTFIELD RAILWAY.



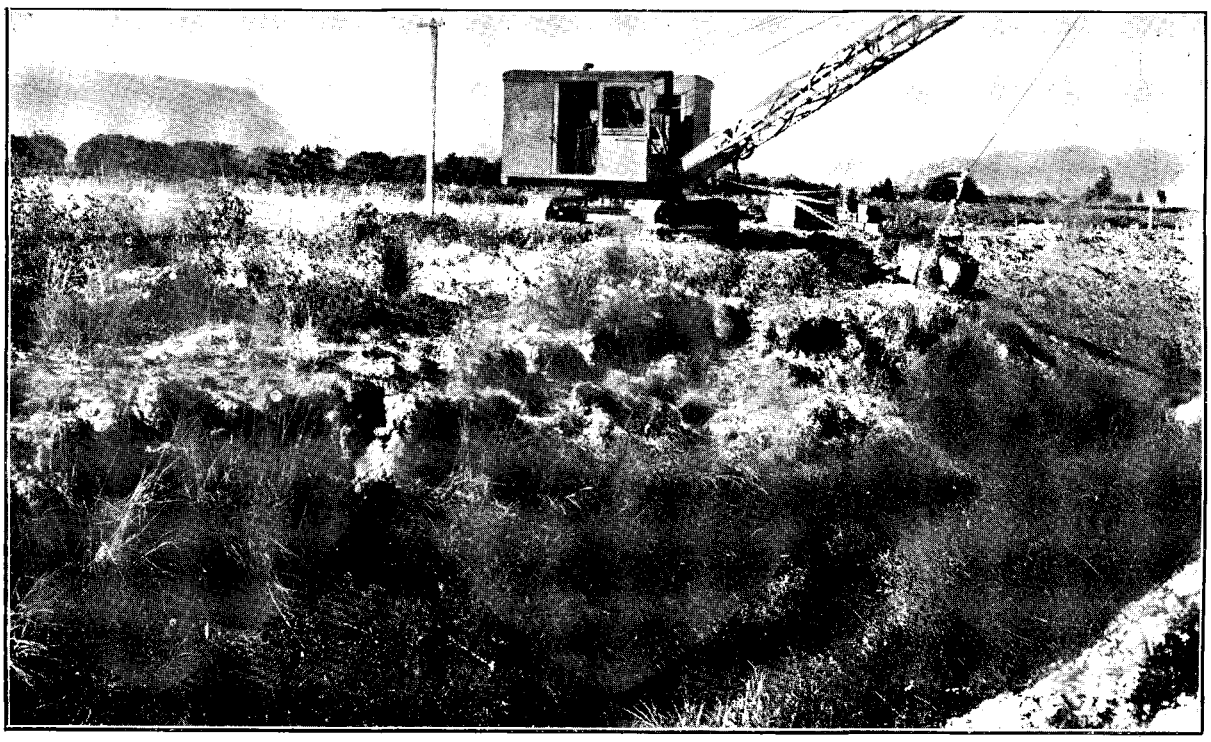
Ellerslie–Panmure Road Crossing: Overbridge at 7 m. 14 ch.



Sylvia Park Station, at 9 m. 16 ch.



Great South Road Crossing: St. Ann's Bridge, at 9 m. 39 ch.

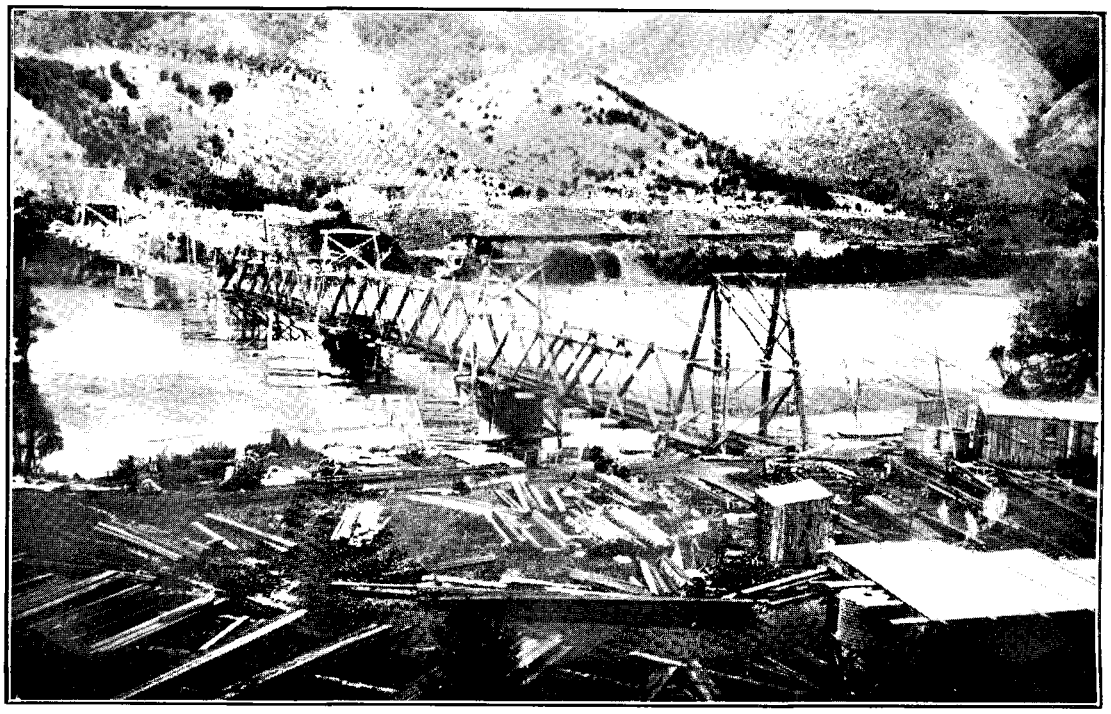


Dragline widening Drain and trimming Batters.

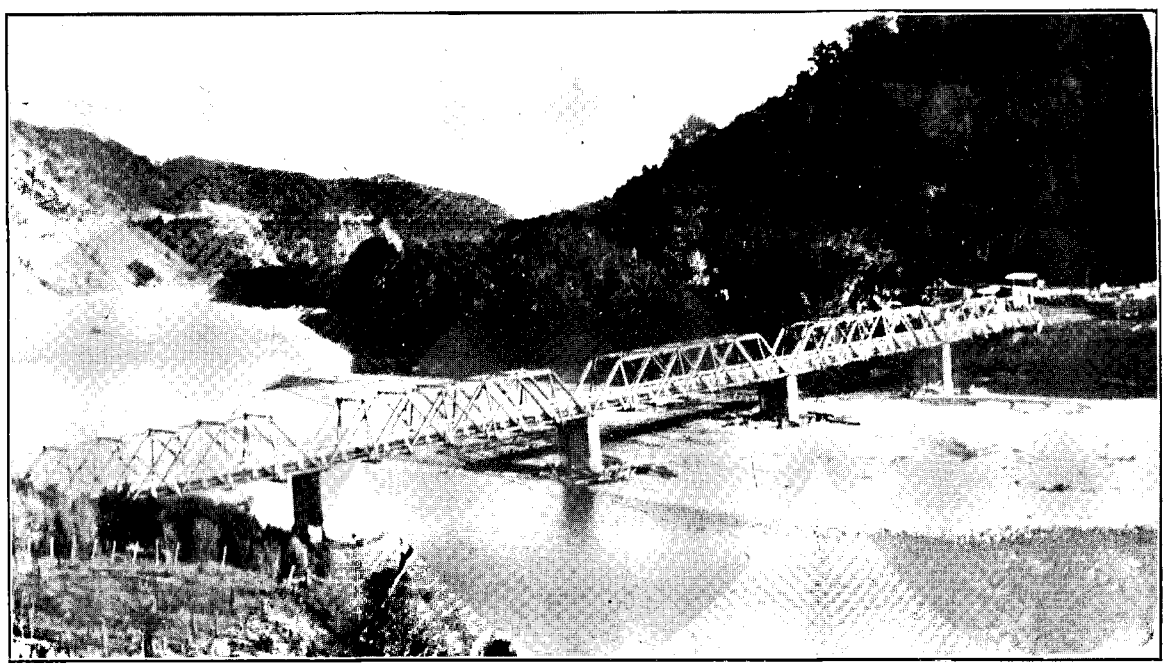


View showing Condition of Drain after widening and trimming.

WAIHOU AND OHINEMURI RIVERS IMPROVEMENT.—ALEXANDER'S DRAIN.

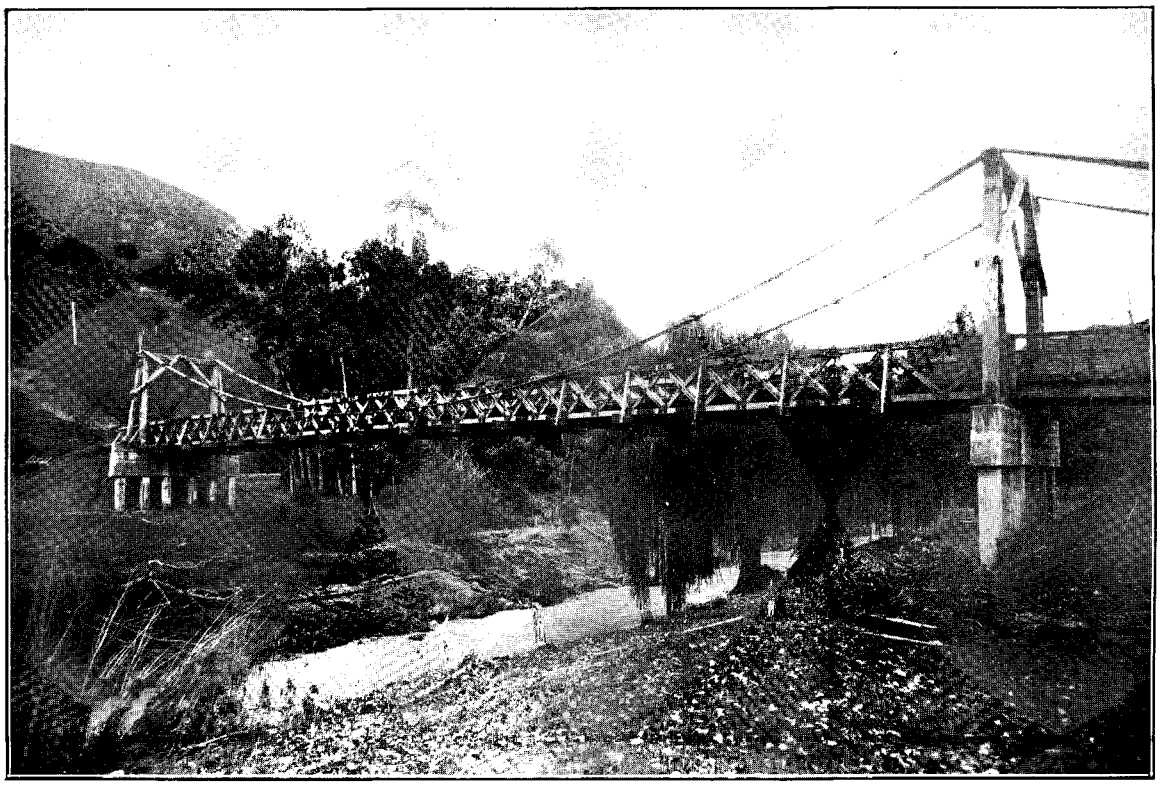


Bridge under Construction.

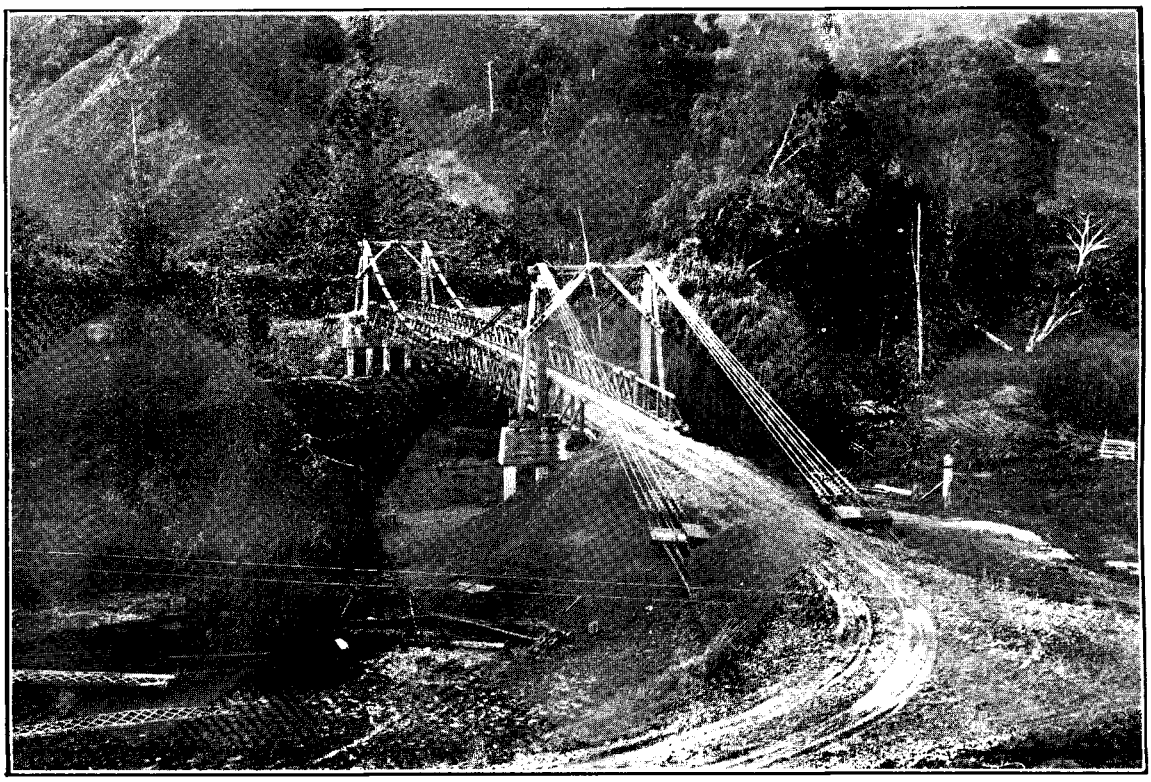


General View of Completed Bridge.
Four 110 ft. and one 80 ft. spans.

MOTU RIVER BRIDGE.—OPOTIKI–EAST CAPE ROAD.

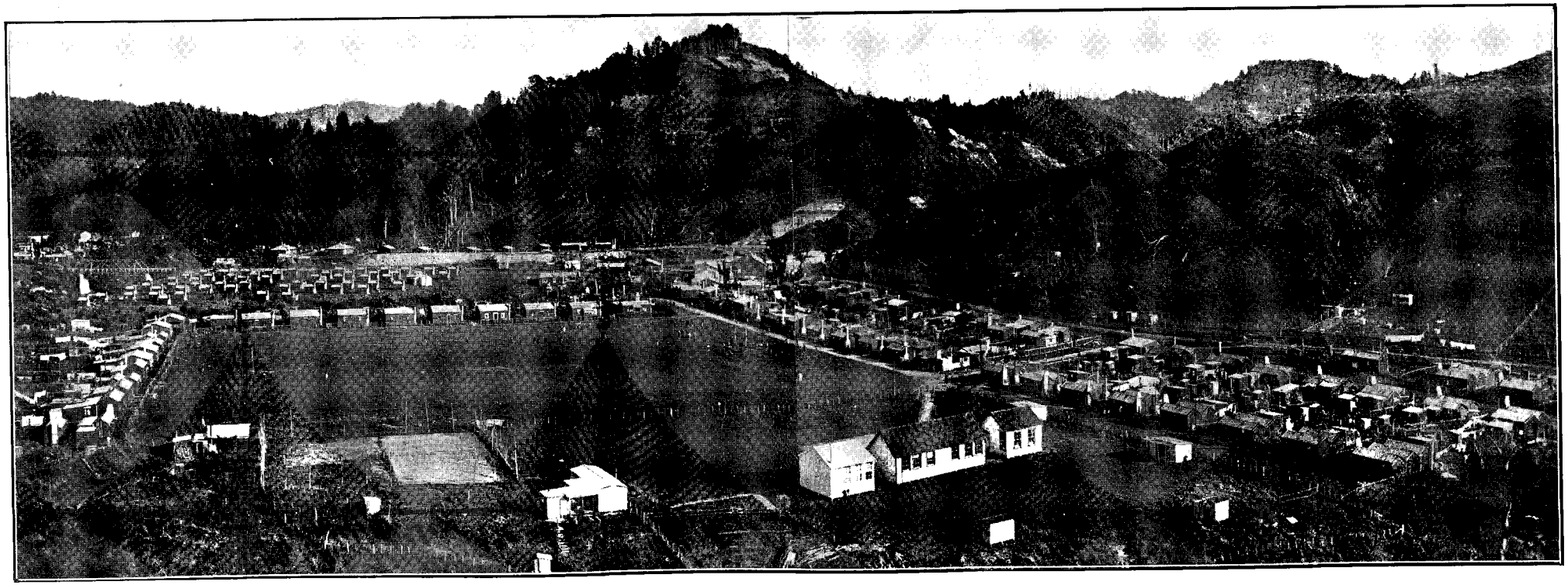


Side view.



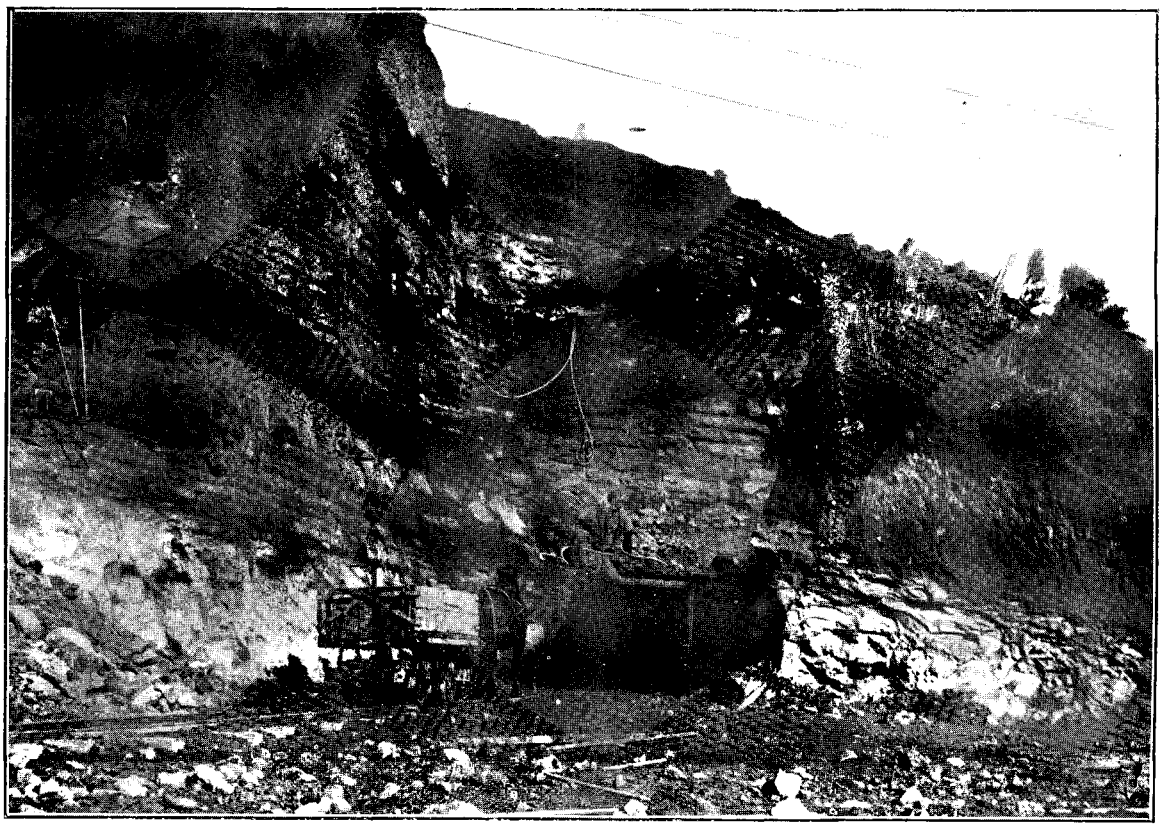
End view.

WAIMATA SUSPENSION BRIDGE.
Gisborne to Tolaga Bay via Waimata Valley, Cook County.

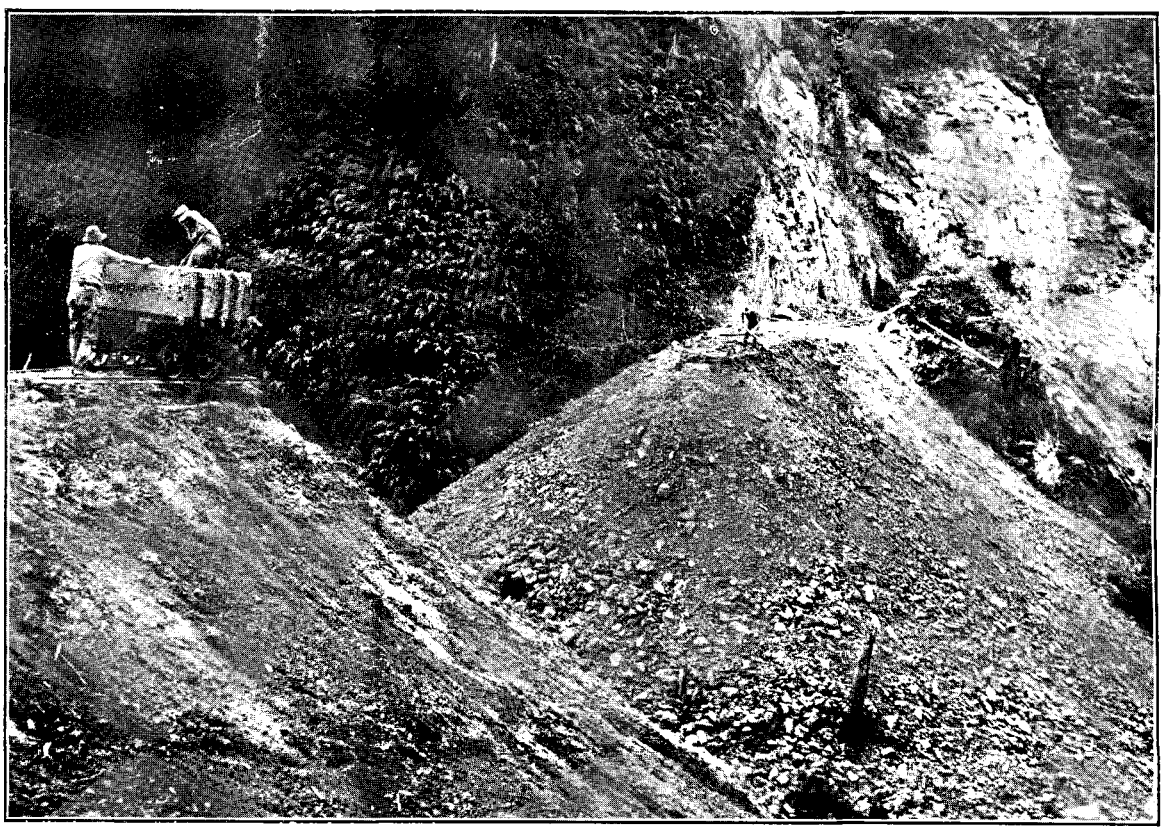


Main Camp at Tangarakau.

STRATFORD–MAIN TRUNK RAILWAY.—WEST END.



One of the Large Cuttings Near Tangarakau

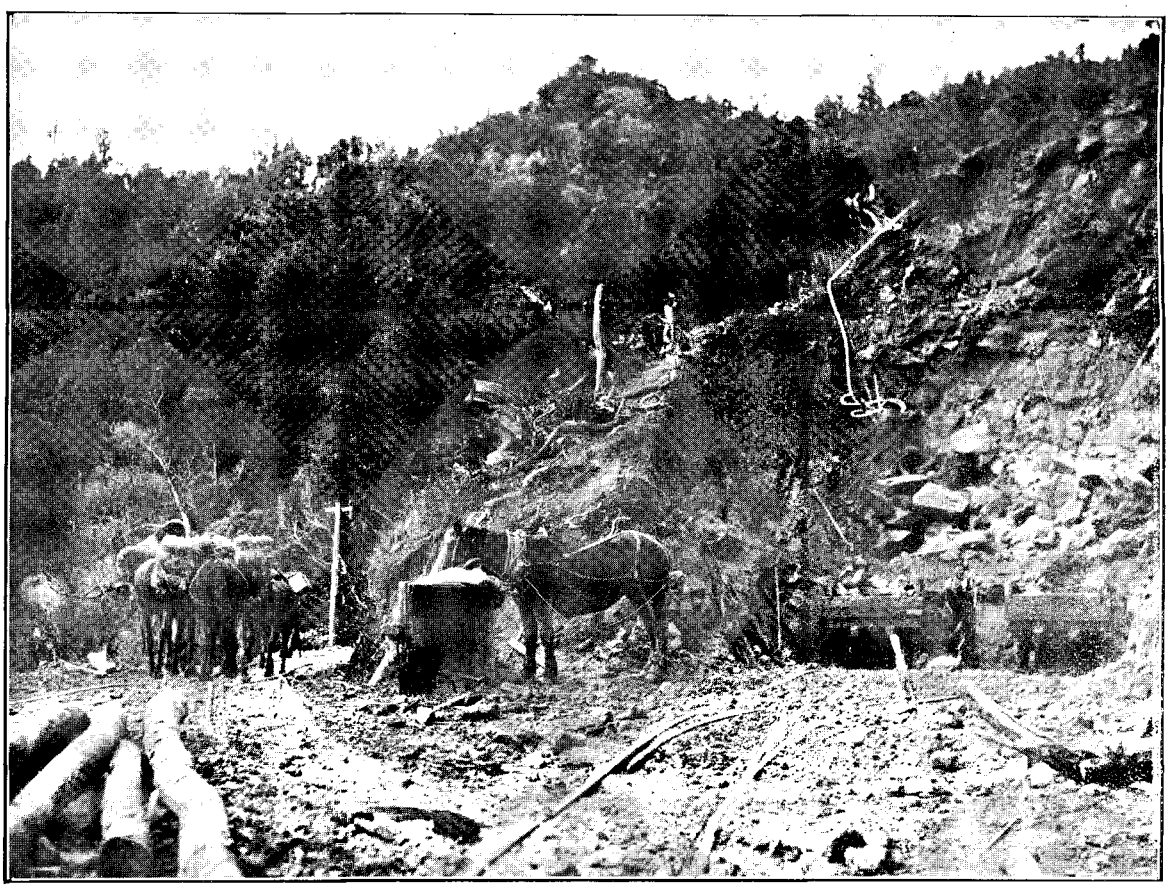


Large Filling at Mangaone.

STRATFORD–MAIN TRUNK RAILWAY.—WEST END.



PACK-HORSE TRAIN AT MANGAONE.

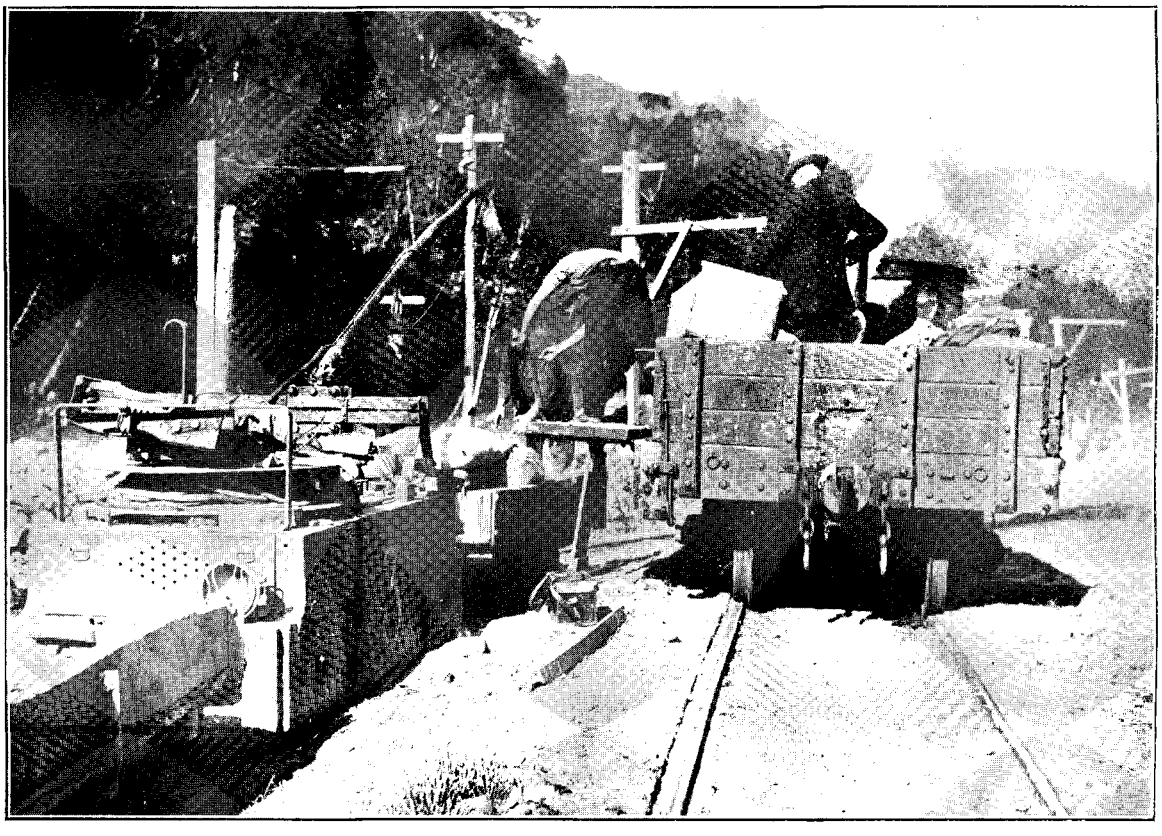


CUTTING HALF-MILE NORTH OF MANGAONE.

STRATFORD–MAIN TRUNK RAILWAY.—WEST END.

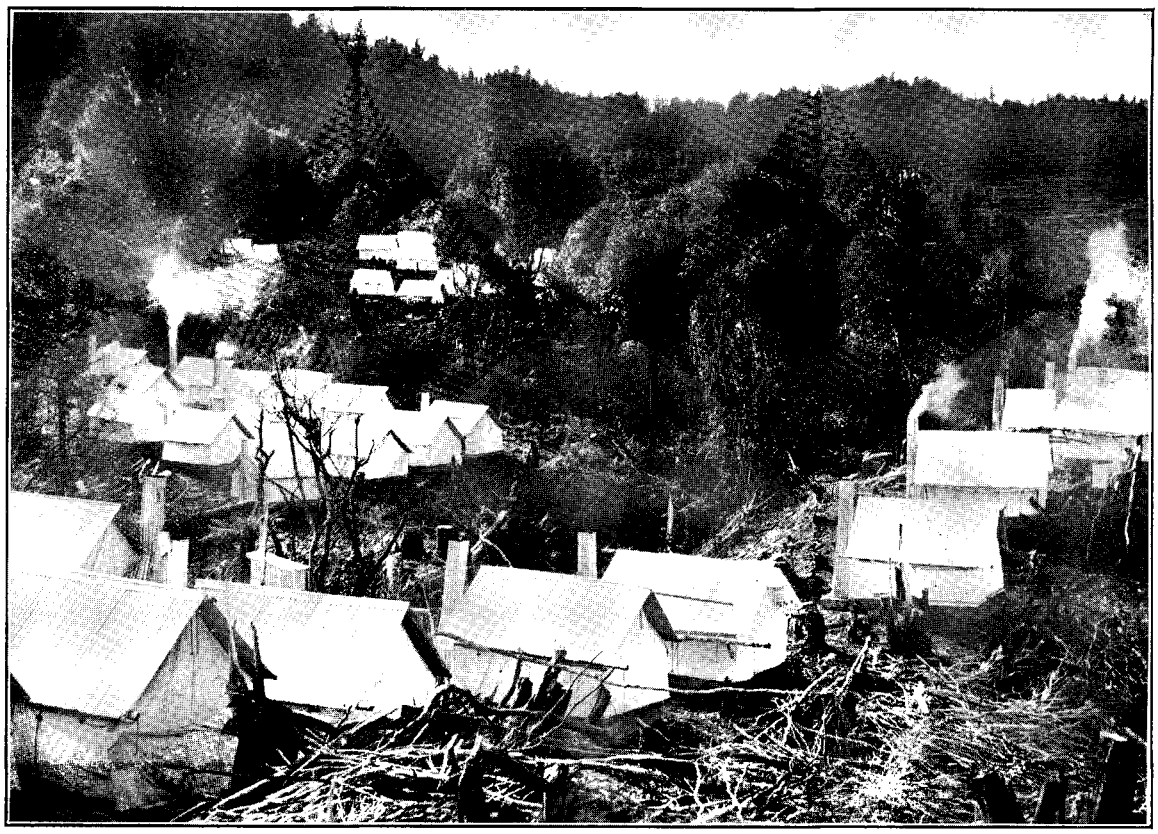


Electric Locomotive moving Spoil to Filling.

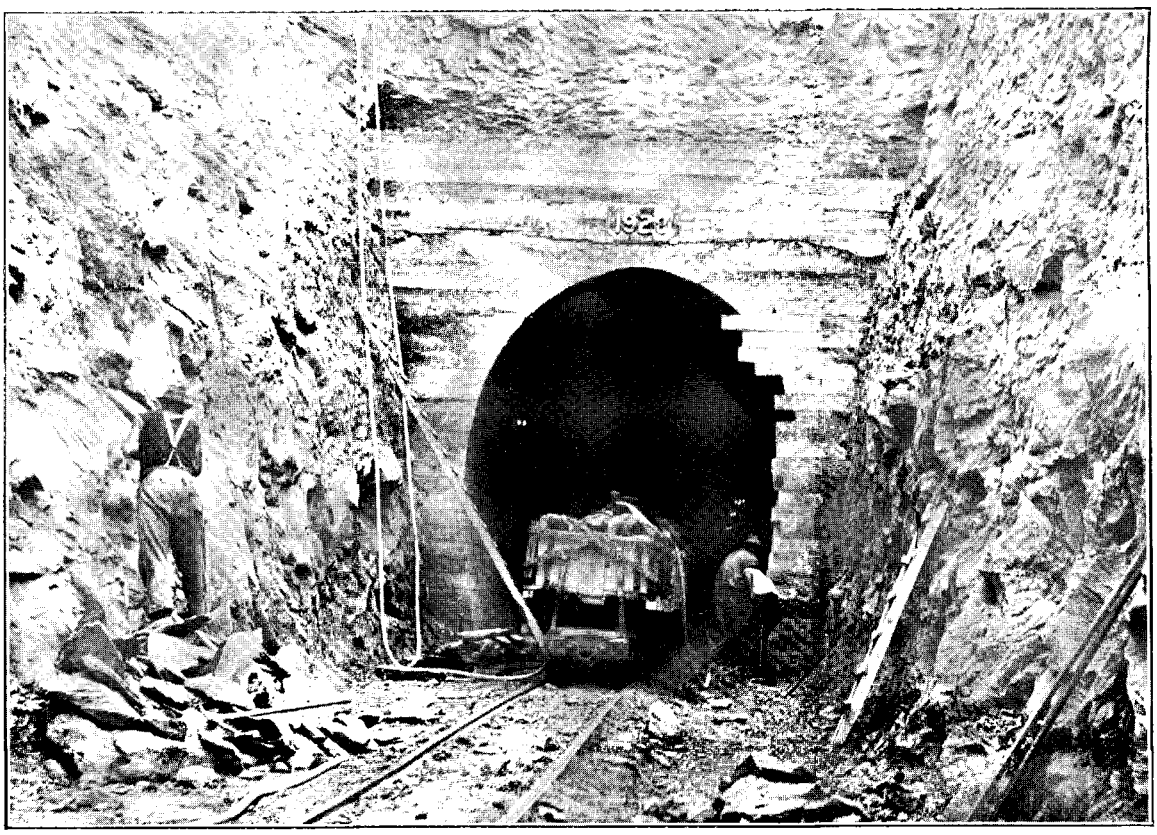


Transporting Stores from Steam Train to Electric Train.

STRATFORD-MAIN TRUNK RAILWAY.—WEST END.

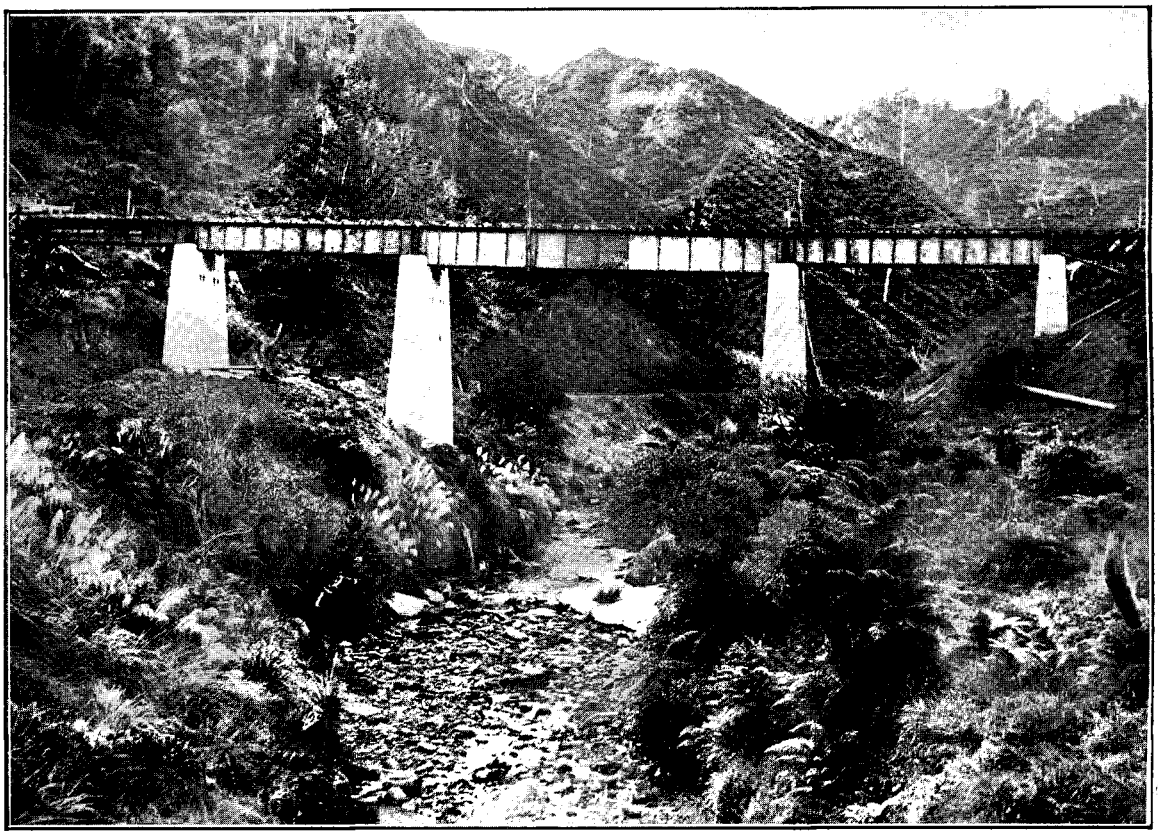


Canvas Camp at Mangatete.



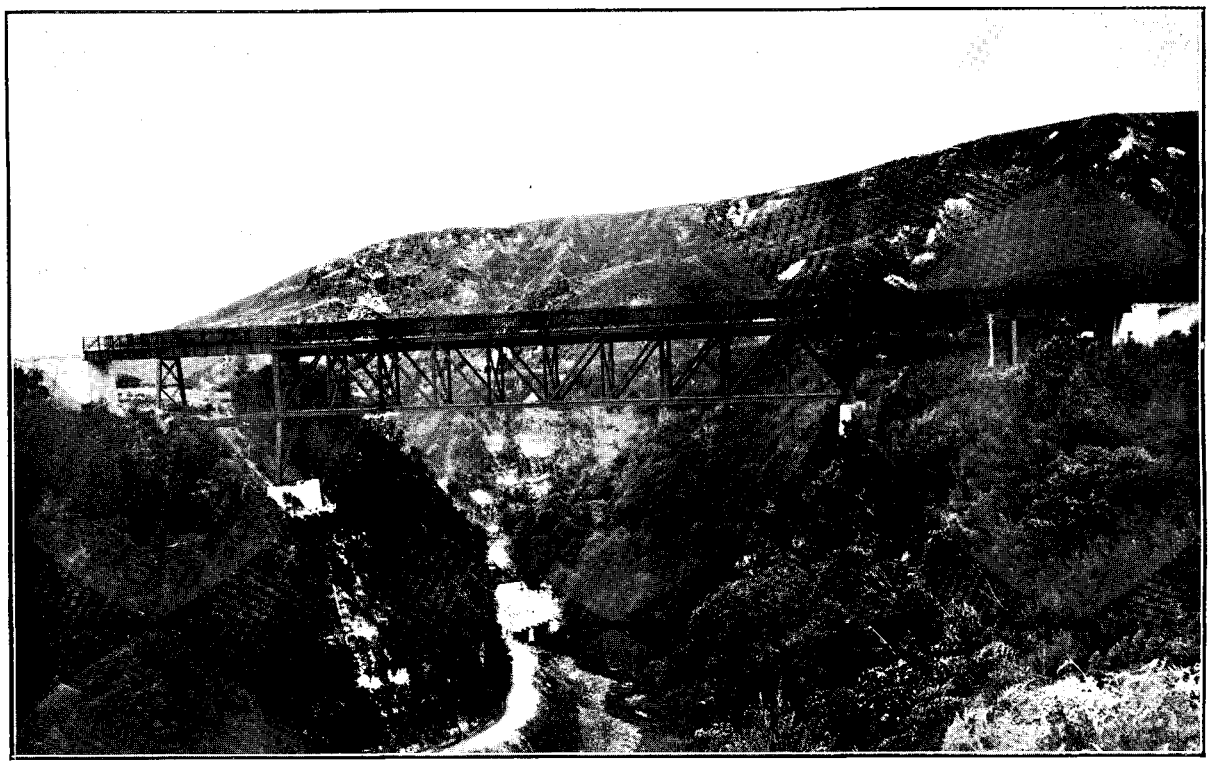
One of the Tunnels nearing Completion.

STRATFORD-MAIN TRUNK RAILWAY.—WEST END.



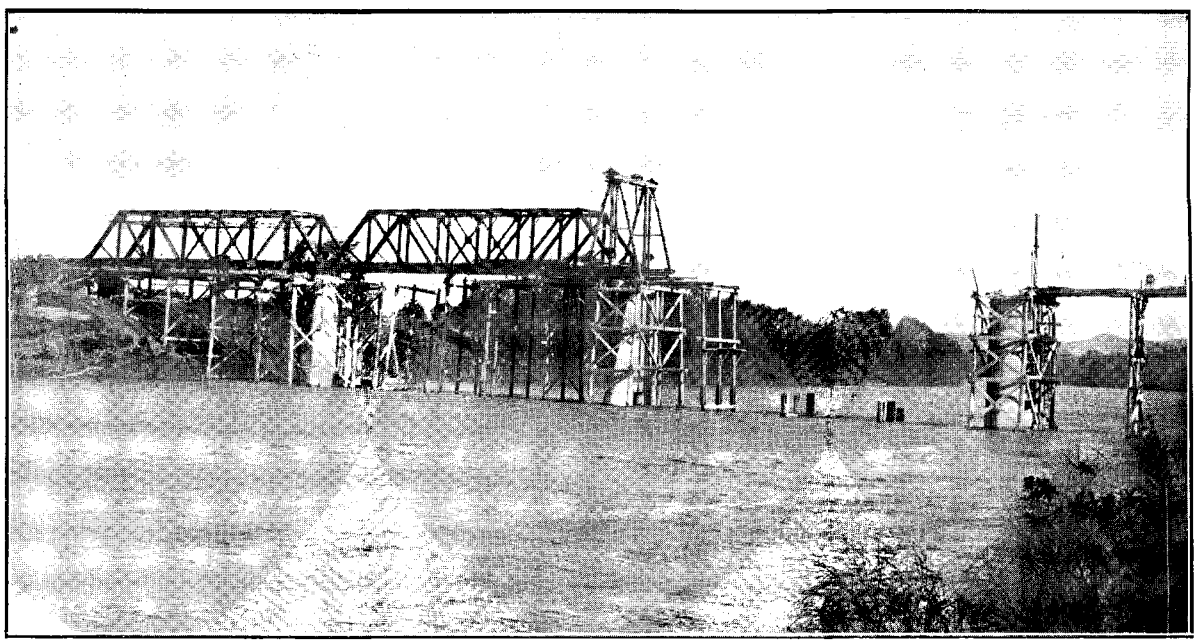
Raekohua Stream Bridge at 49 m. 16 ch.
One 60 ft., two 40 ft., one 30 ft., and one 25 ft. spans.

STRATFORD–MAIN TRUNK RAILWAY.—WEST END.

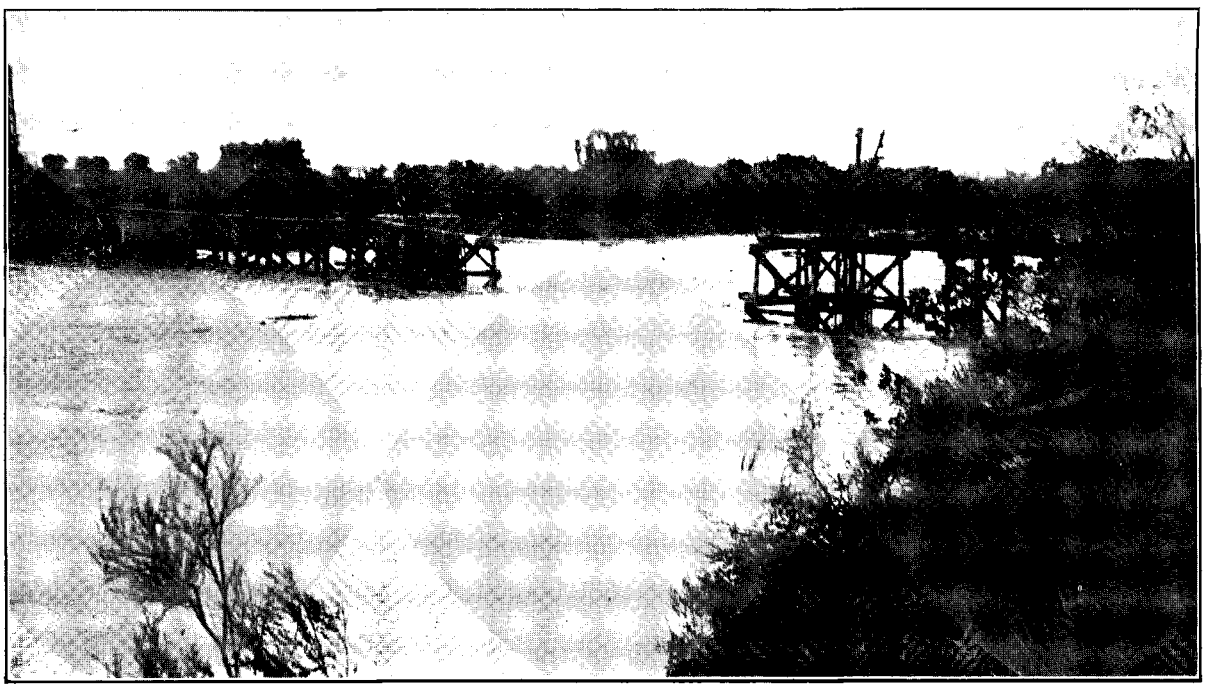


Matahoura Viaduct.
One 250 ft., two 60 ft., and two 40 ft. spans.

NAPIER–GISBORNE RAILWAY.

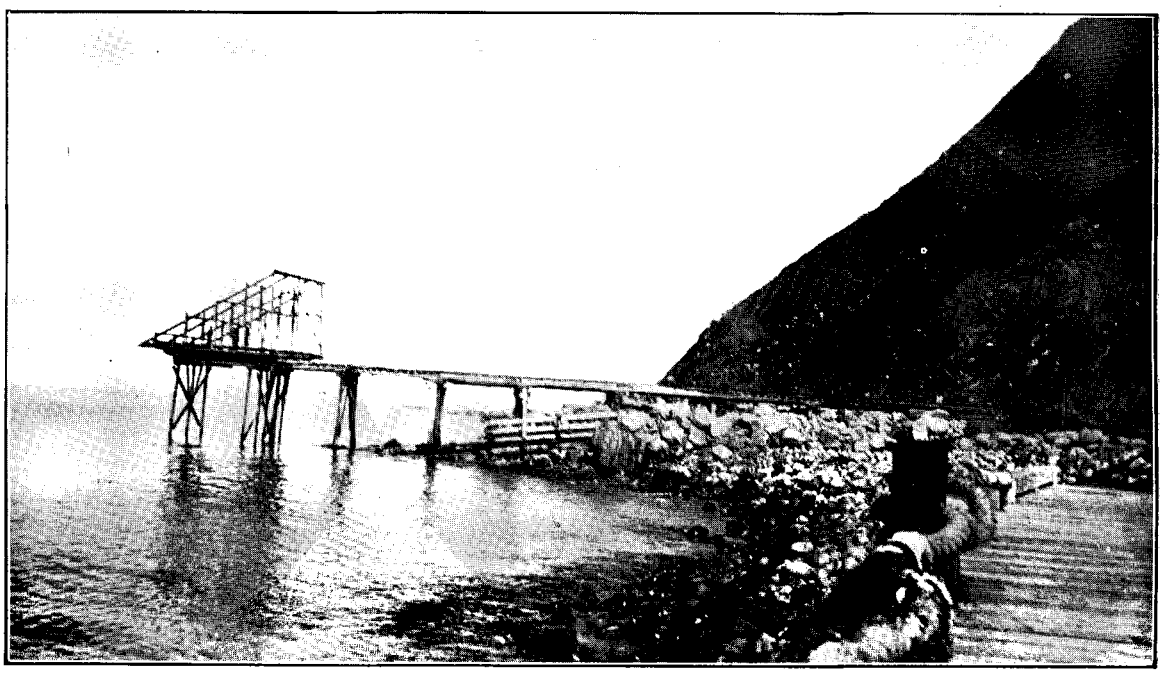


WAIROA RIVER RAILWAY-BRIDGE UNDER CONSTRUCTION.
Four 105 ft. steel through trusses, and two 15 ft. rolled-steel joist spans.



WAIROA RIVER RAILWAY-BRIDGE UNDER CONSTRUCTION.
False work of one span washed away by flood.

NAPIER–GISBORNE RAILWAY.

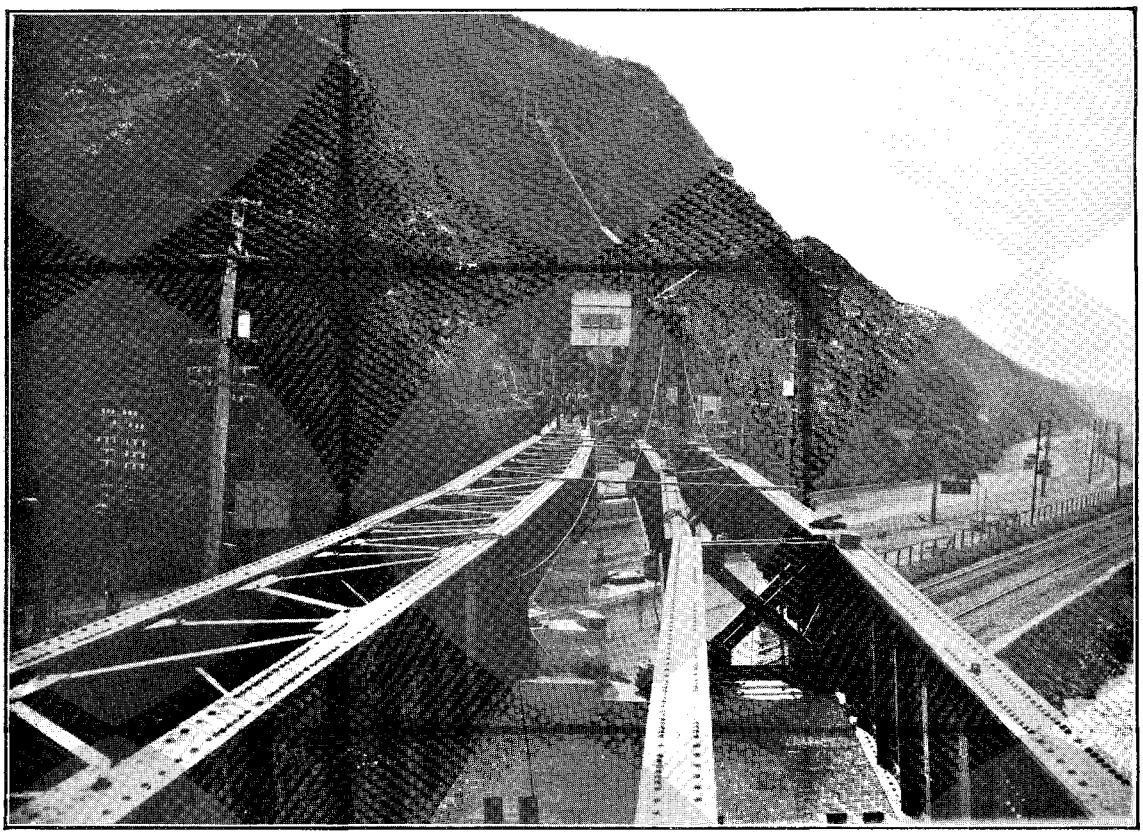


WAIKOKOPU BREAKWATER UNDER CONSTRUCTION.

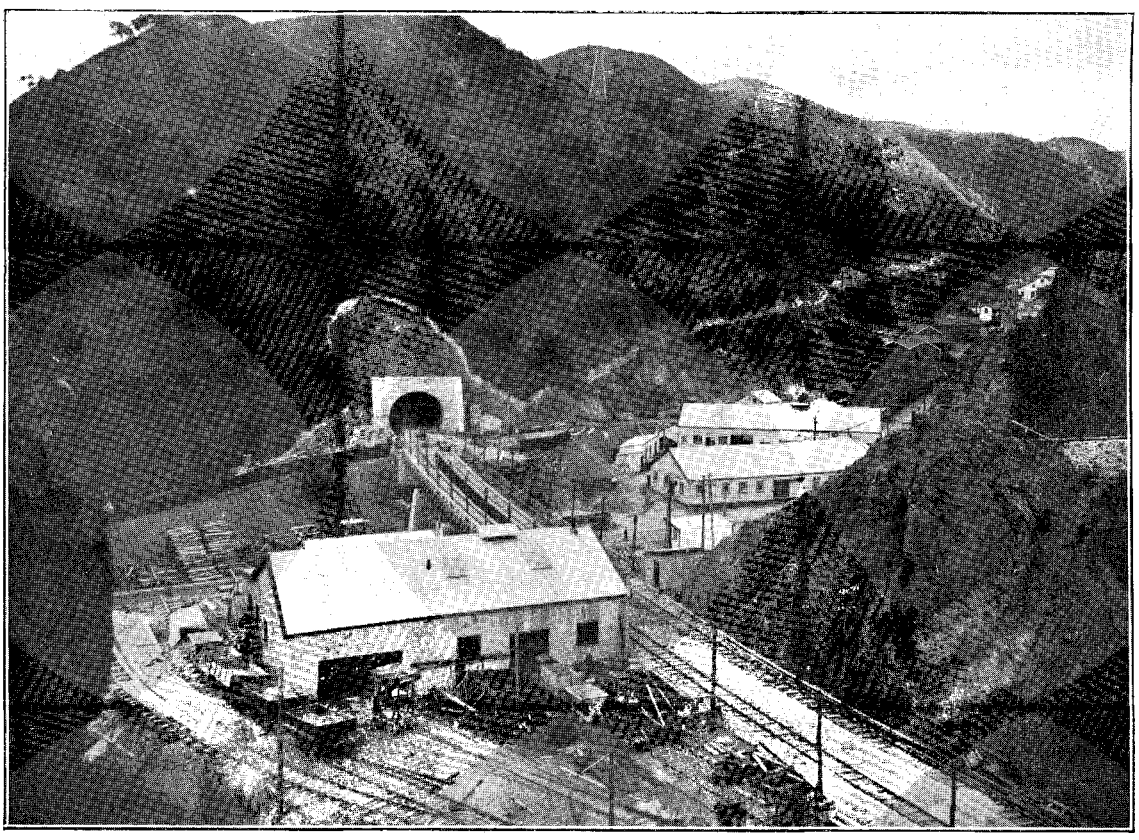


HOPURUAHINE–RUATAHUNA ROAD.

RELIEF WORKERS' CAMP BETWEEN WAIKAREMOANA AND ROTORUA.



South Portal of No. 1 Tunnel and Bridge under Construction over Hutt Road and Railway.

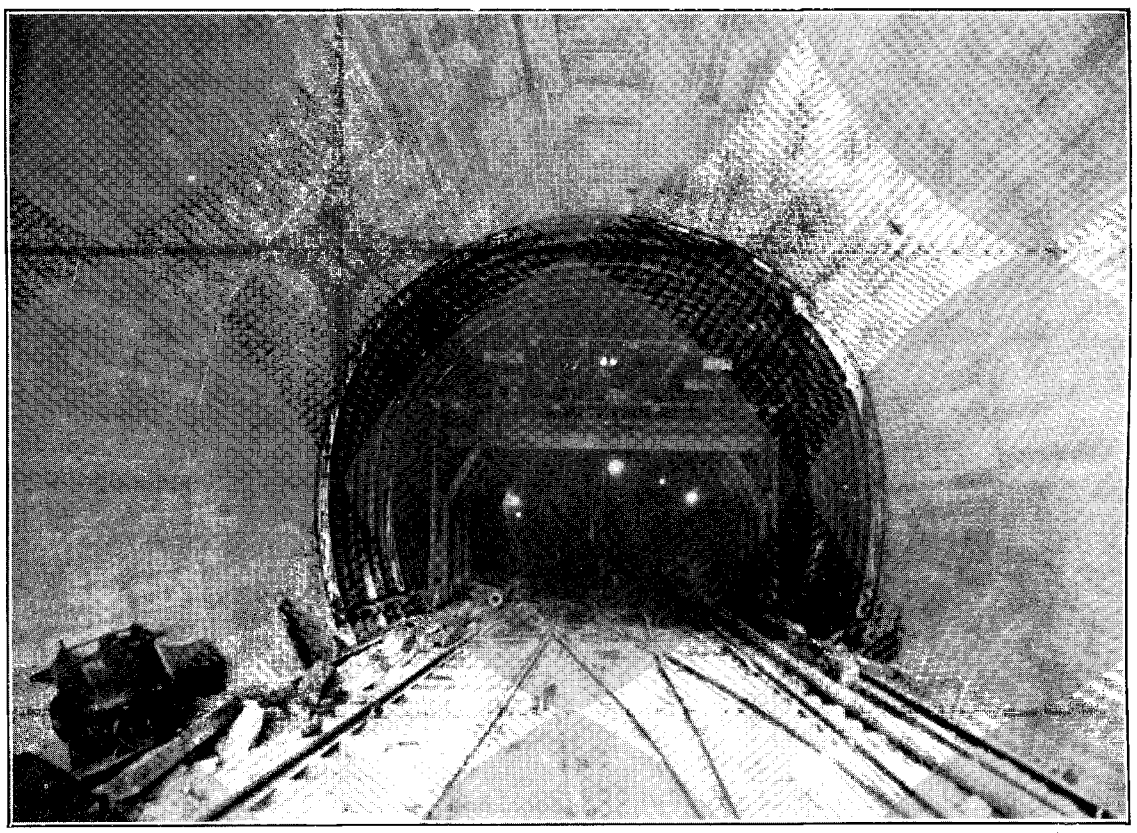


North Portal of No. 1 Tunnel, Headquarters, Stores, Workshops, Etc.

WELLINGTON–NEW PLYMOUTH RAILWAY.—TAWA FLAT DEVIATION.

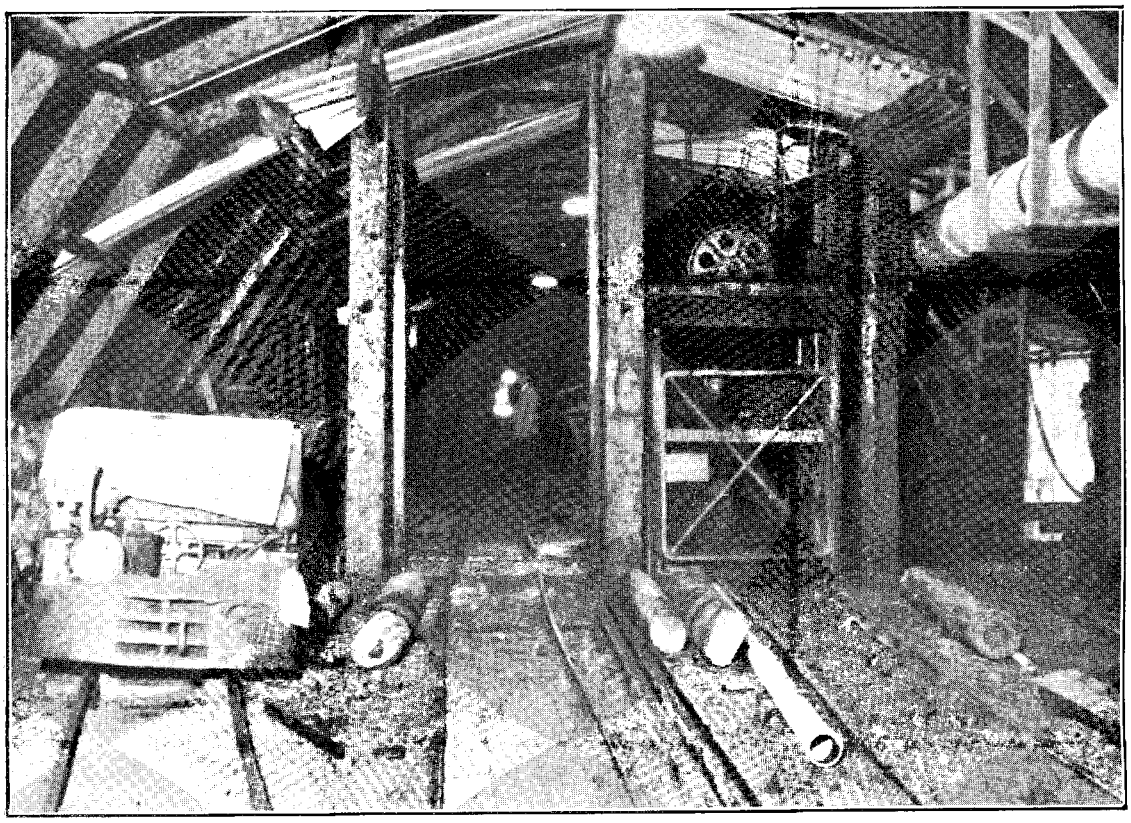


VIEW INSIDE NORTH END OF NO. 1 TUNNEL, SHOWING TIMBERING FOR EXCAVATION.

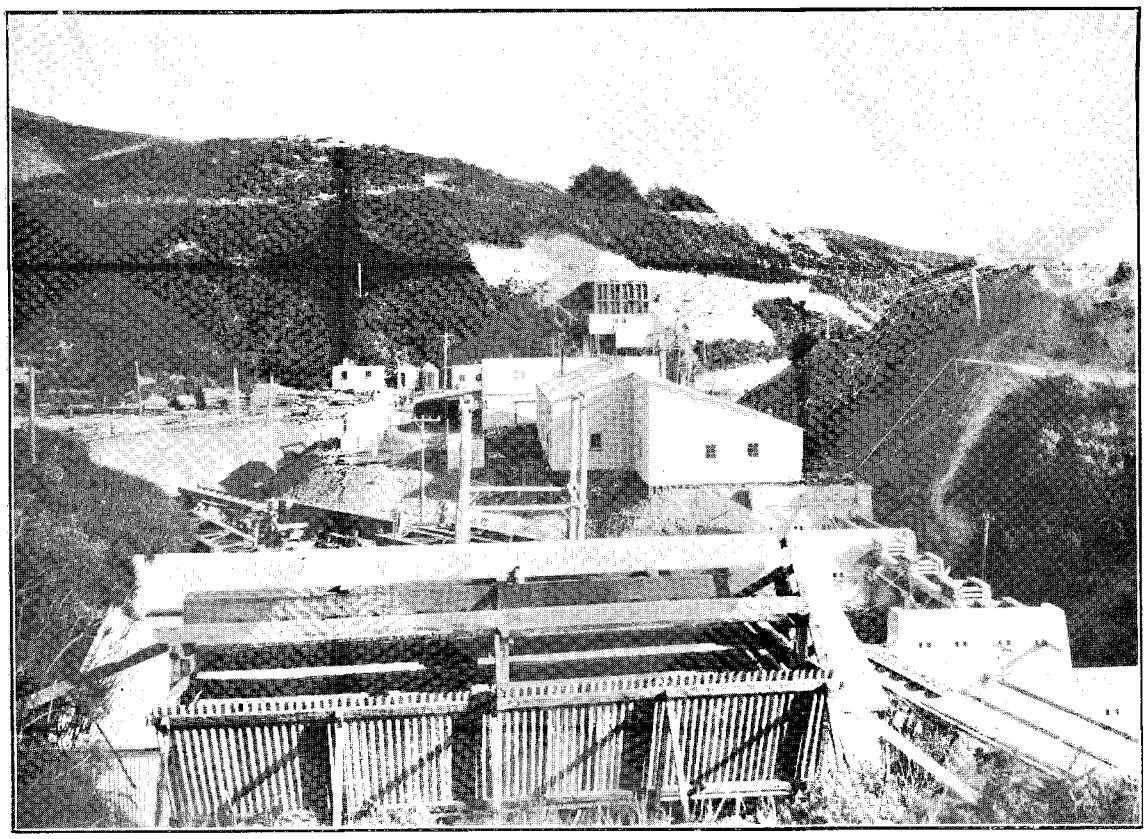


VIEW INSIDE NORTH END OF NO. 1 TUNNEL, SHOWING STEEL PROFILING FOR CONCRETING.

WELLINGTON - NEW PLYMOUTH RAILWAY.—TAWA FLAT DEVIATION.

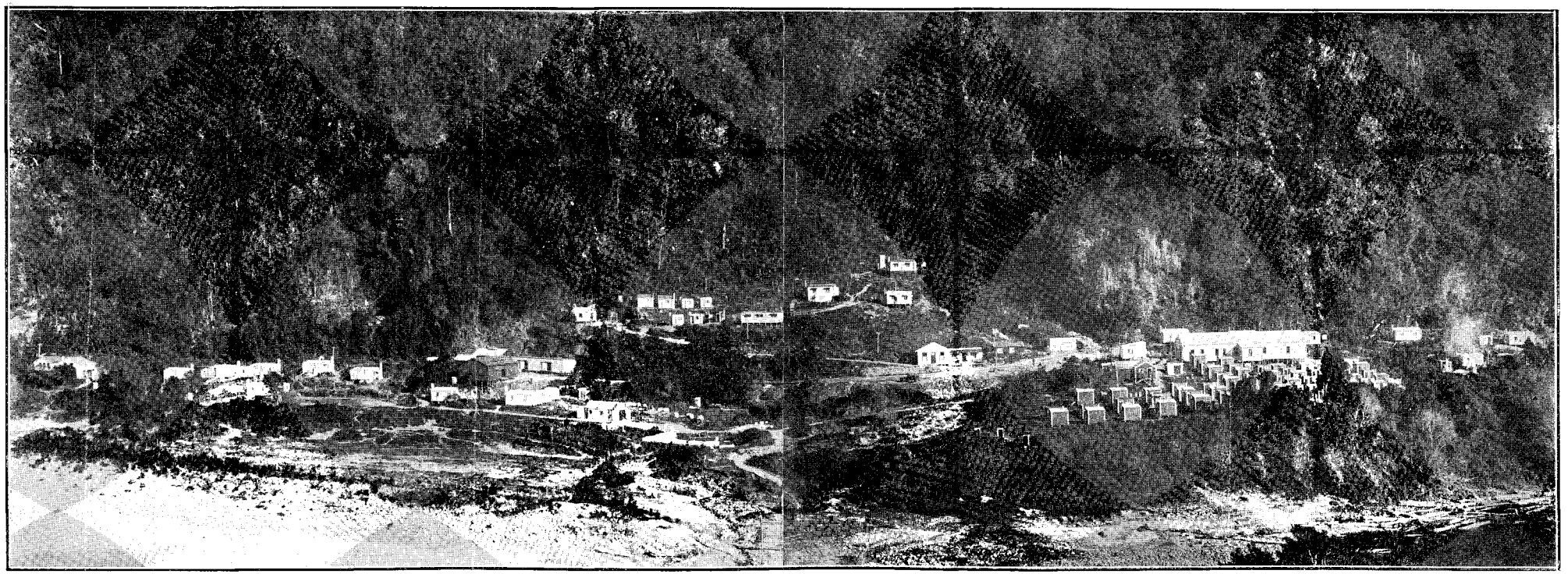


Bottom of Shaft of No. 2 Tunnel, looking towards Wellington.



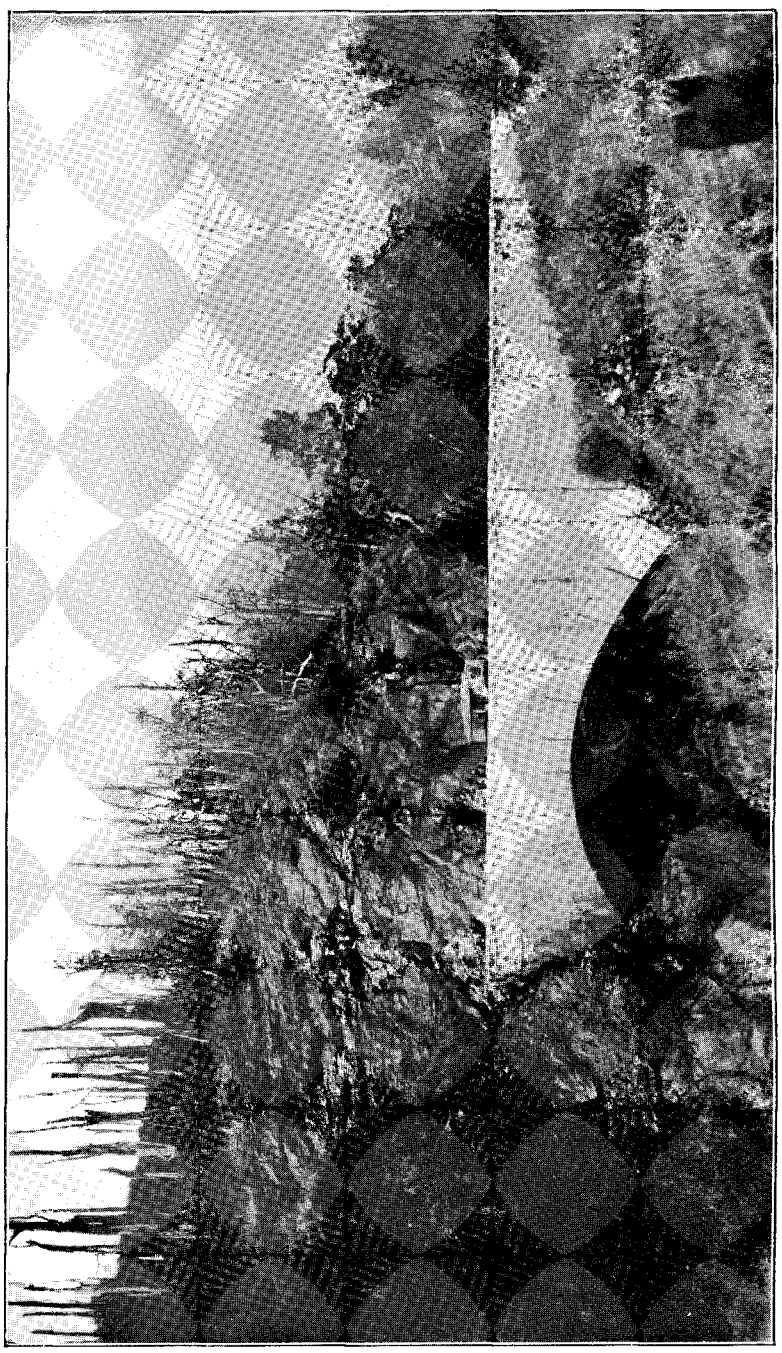
Compressor-sheds, Workshops, etc., at North End of No. 2 Tunnel.

WELLINGTON–NEW PLYMOUTH RAILWAY.—TAWA FLAT DEVIATION.

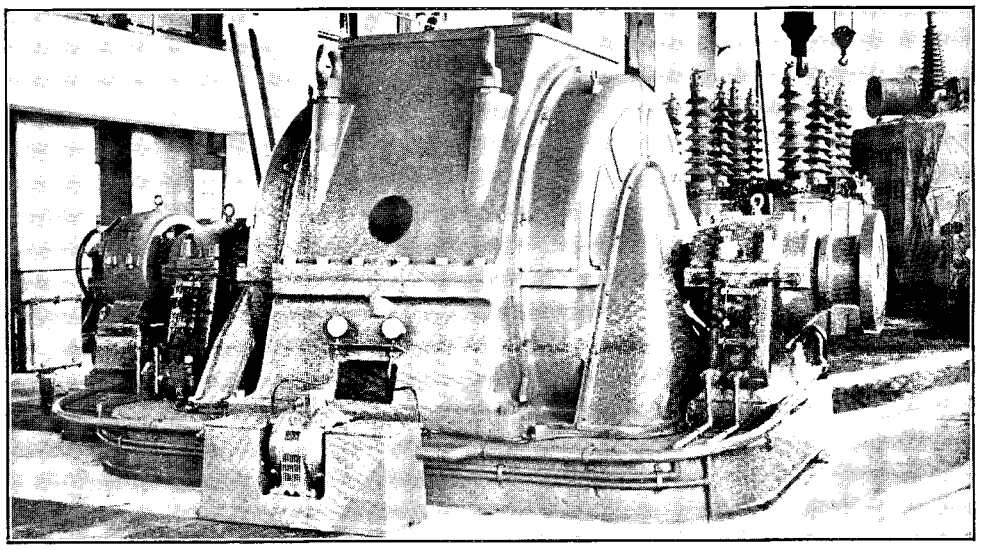


Main Construction Camp at Tiroroa, Buller Gorge.

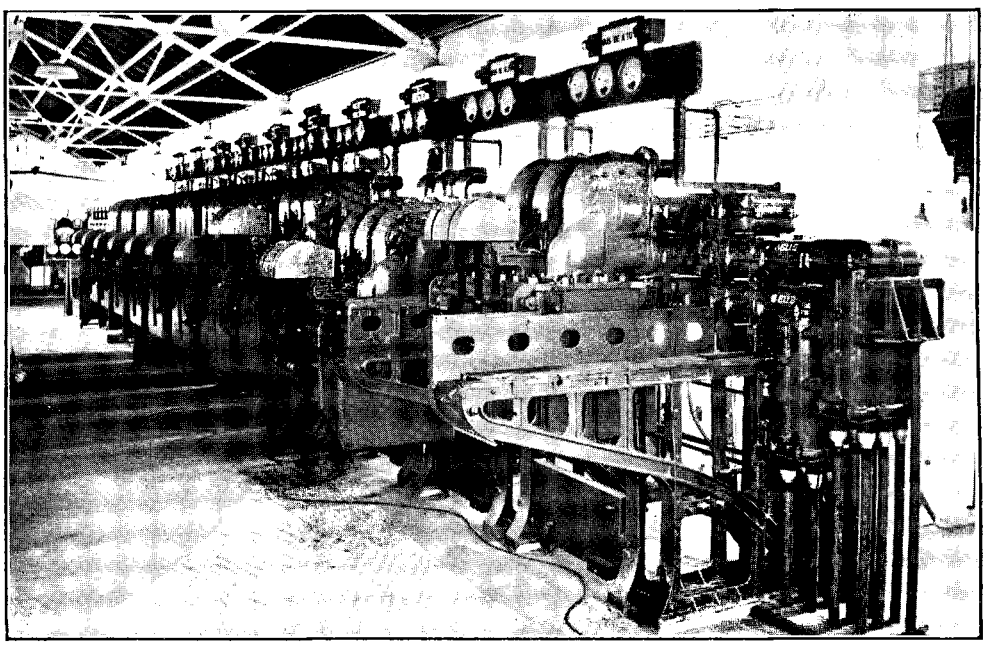
WESTPORT–INANGAHUA RAILWAY.



Concrete Arch Bridge over Matakitaki River.
Built 1923; undamaged by earthquake.

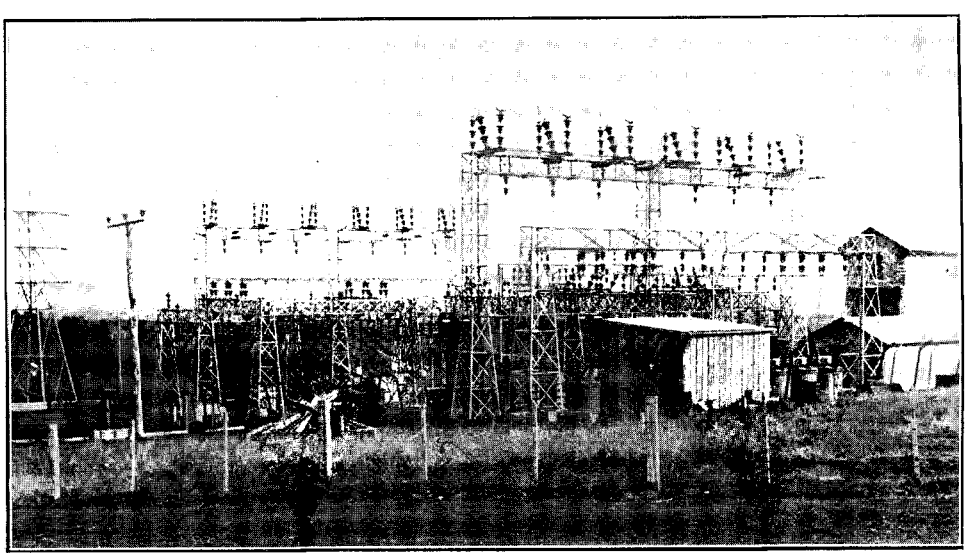


10,000 K.V.A. SYNCHRONOUS CONDENSOR.



22,000-VOLT SWITCH-GEAR.

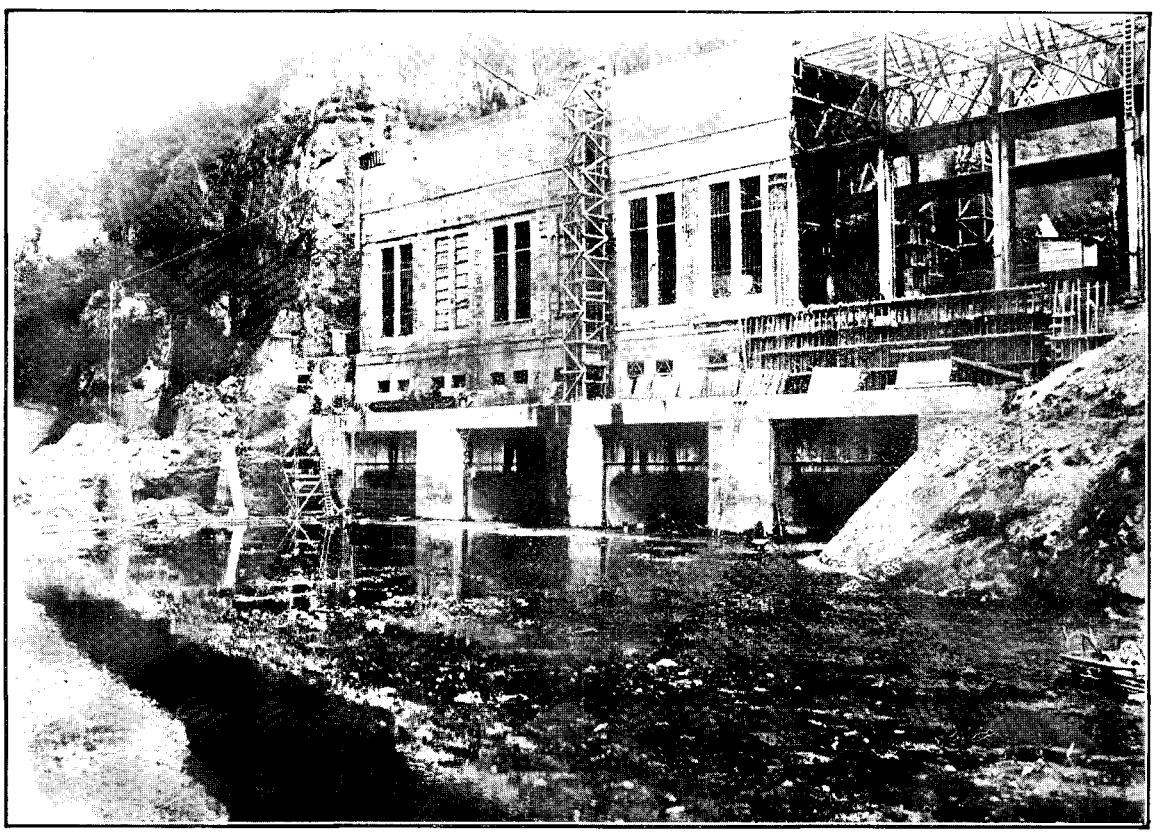
PENROSE SUBSTATION.



BOMBAY OUTDOOR SUBSTATION.

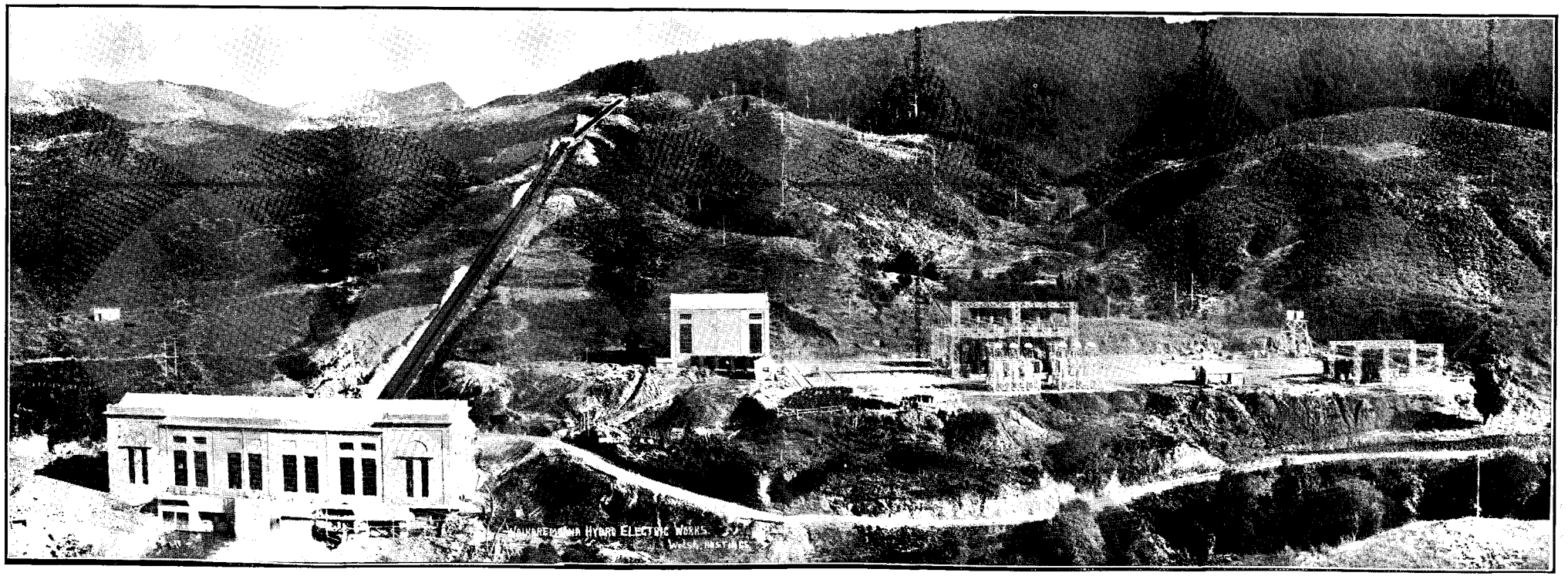


General Aerial View.



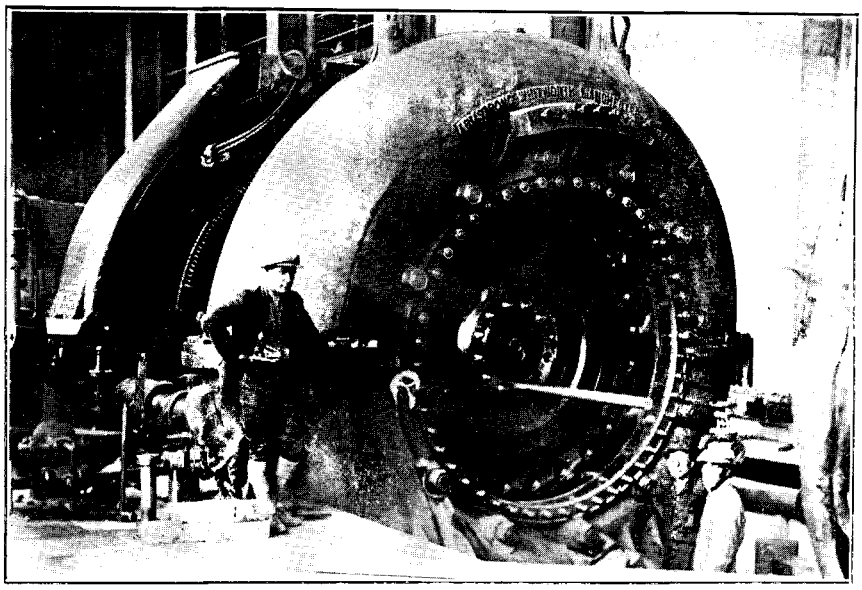
Power-house during Erection, showing Tail-race and Draught-tubes.

ARAPUNI POWER DEVELOPMENT.

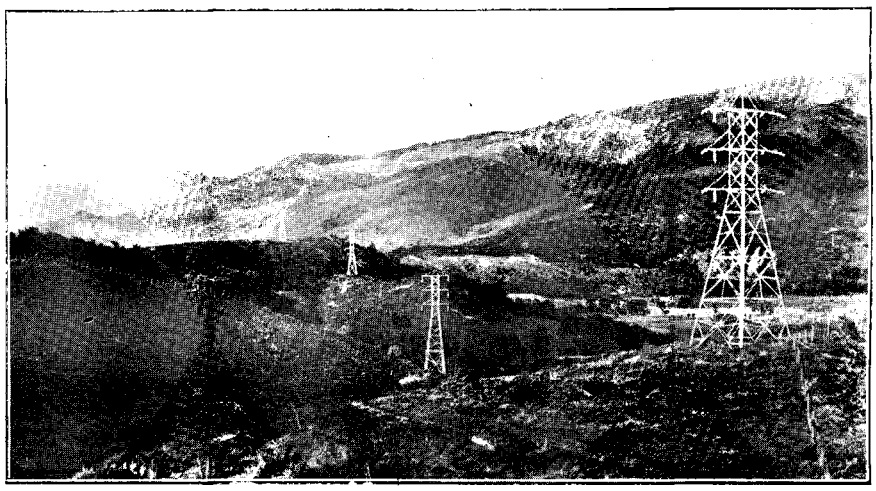


POWER-HOUSE, PIPE-LINE, AND OUTDOOR STATION.

WAIKAREMOANA POWER DEVELOPMENT.

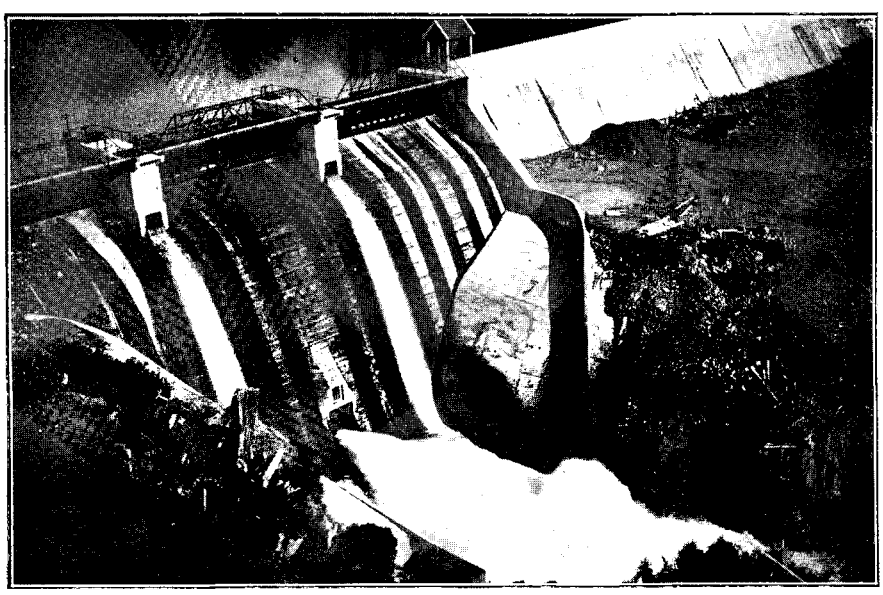


28,000 B.H.P. Turbine during Erection.



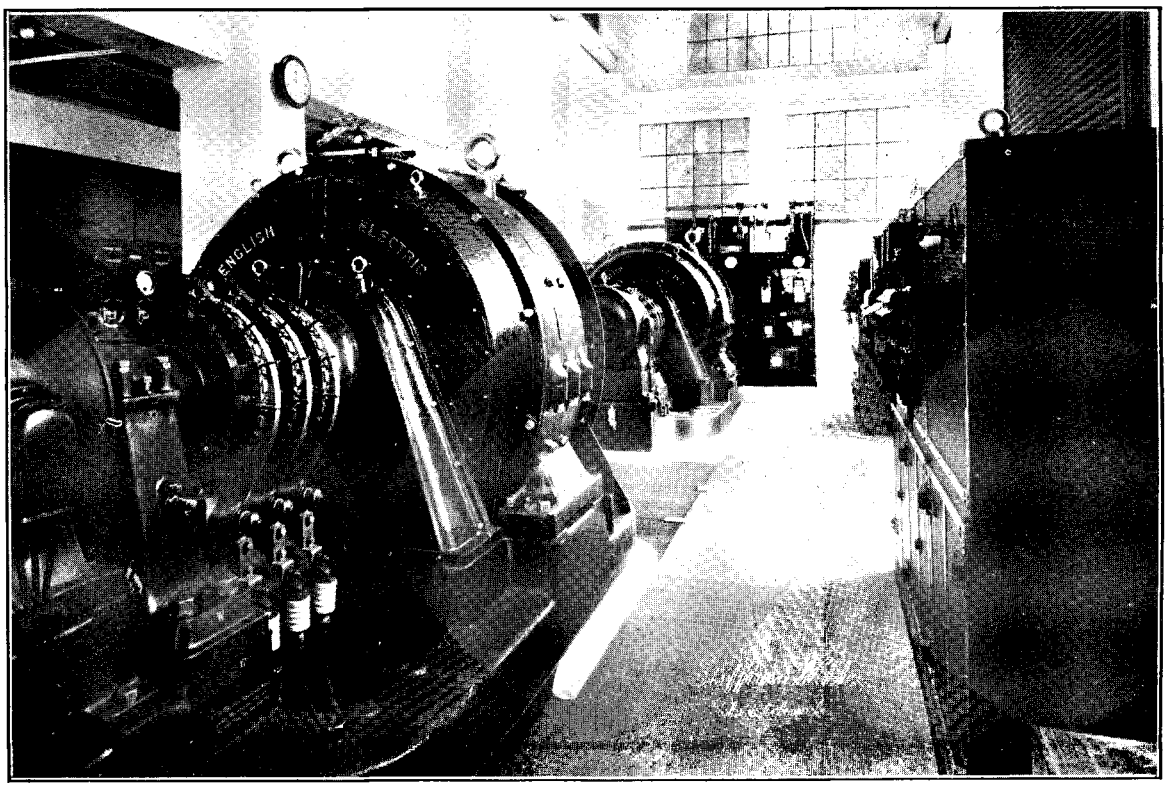
Waikaremoana–Taradale Transmission-line.

WAIKAREMOANA POWER DEVELOPMENT.



No. 3 Dam, showing Discharge from Regulating-jet Disperser.

MANGAHAO POWER DEVELOPMENT.



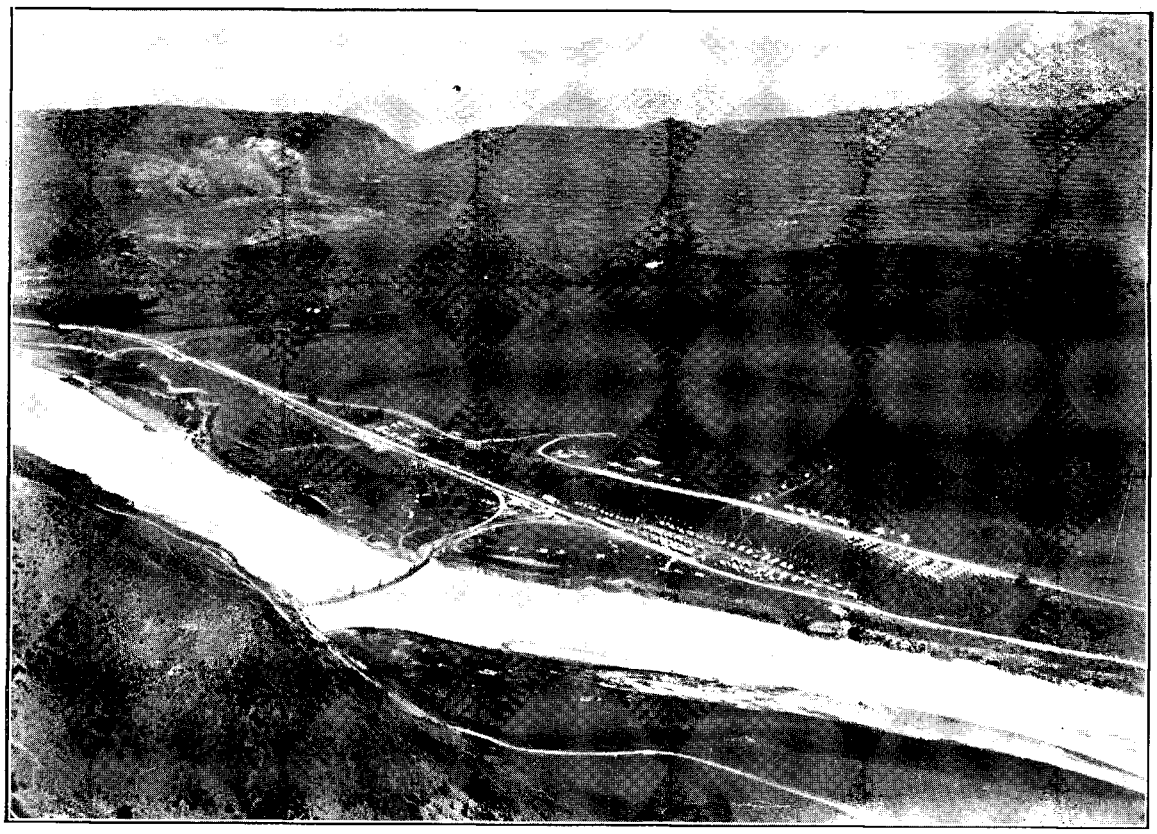
Woolston Substation: 1,350 kw. 1,500-volt. Rotary Convertor.

LYTTELTON–CHRISTCHURCH RAILWAY ELECTRIFICATION.

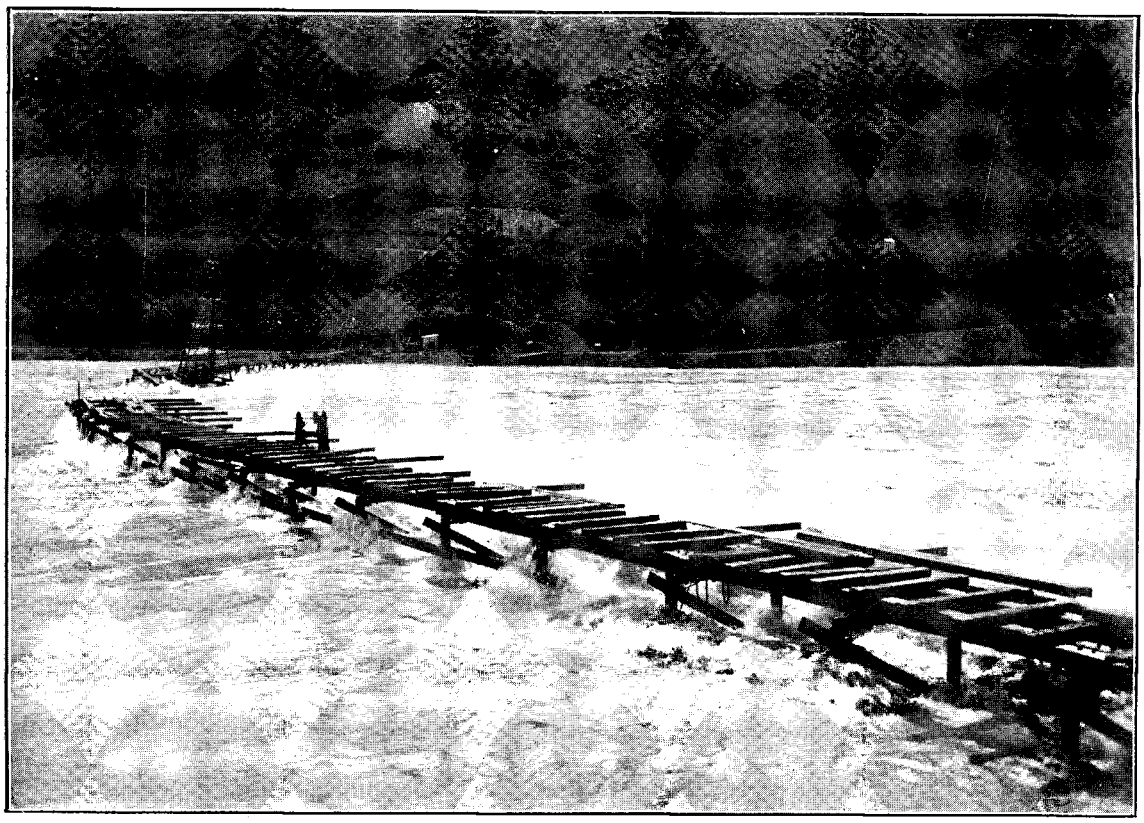


Power-house and Pipe-line.

APIA POWER DEVELOPMENT.

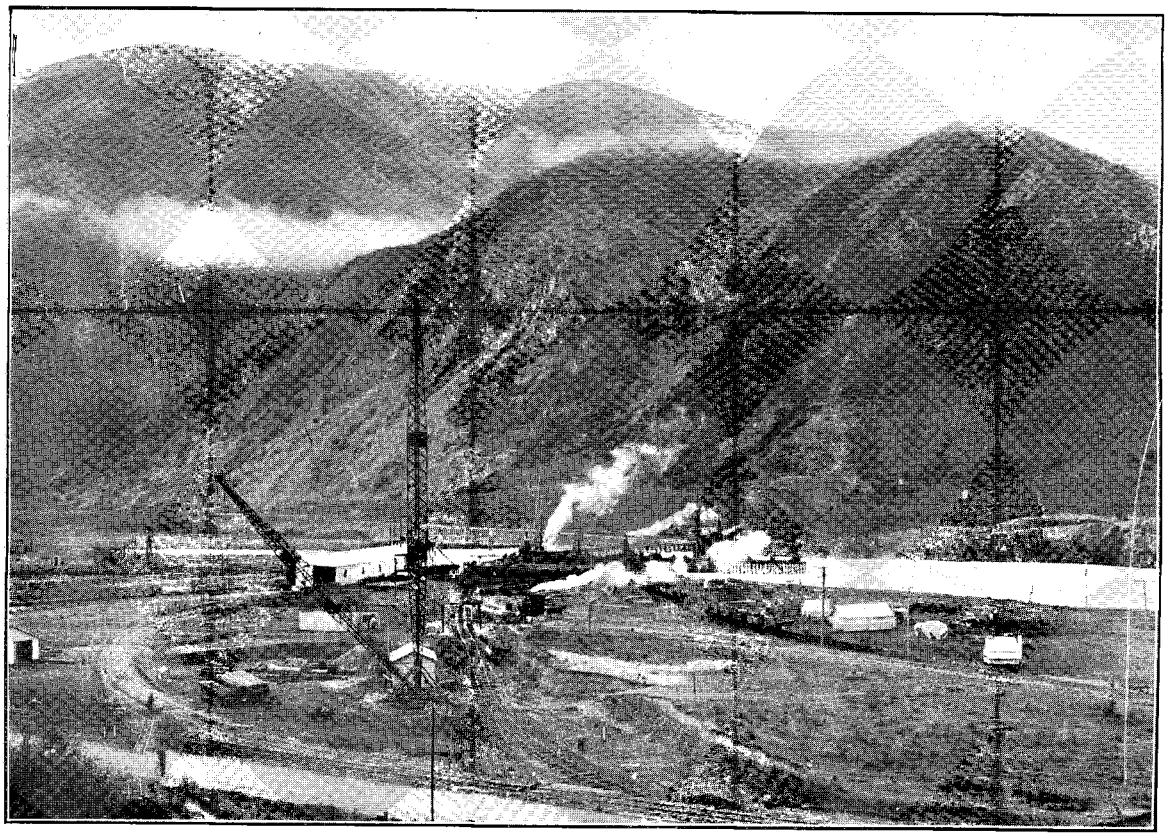


General View from Canterbury Side.

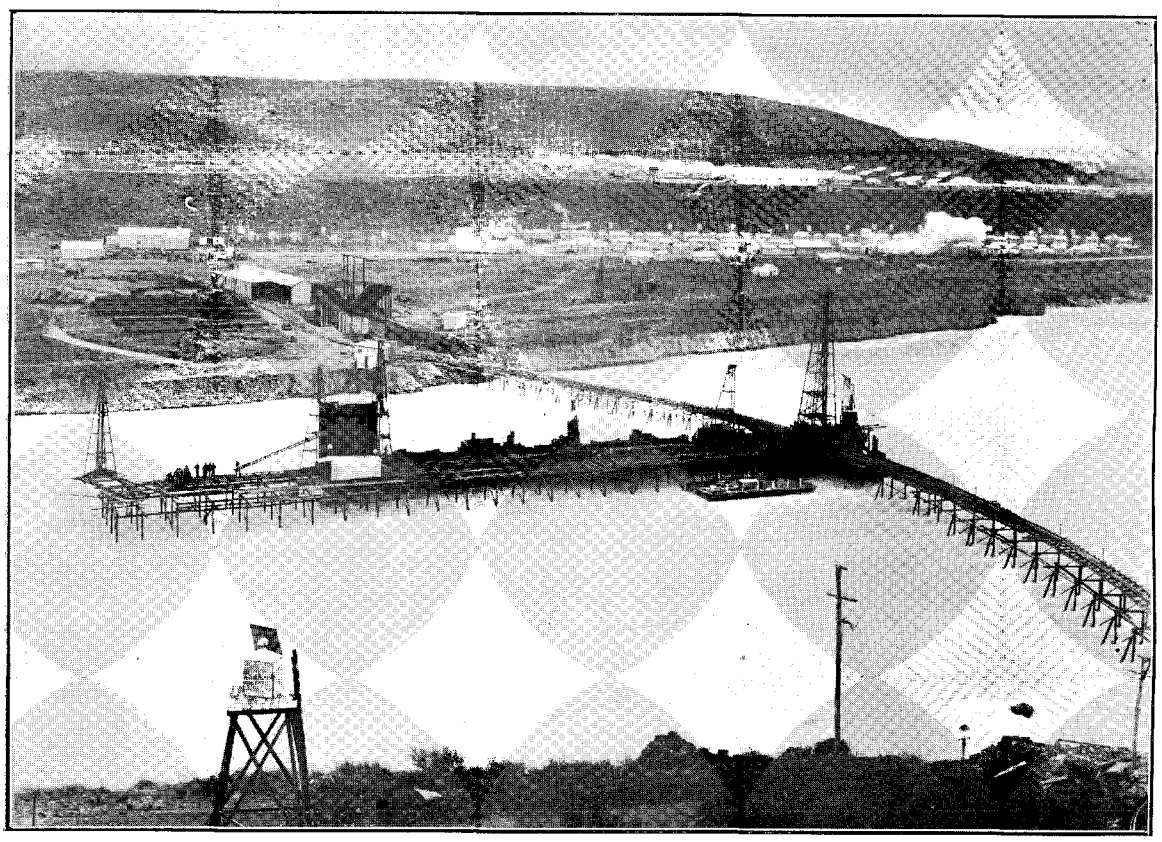


Flood in River at Dam-site.

WAITAKI POWER DEVELOPMENT.

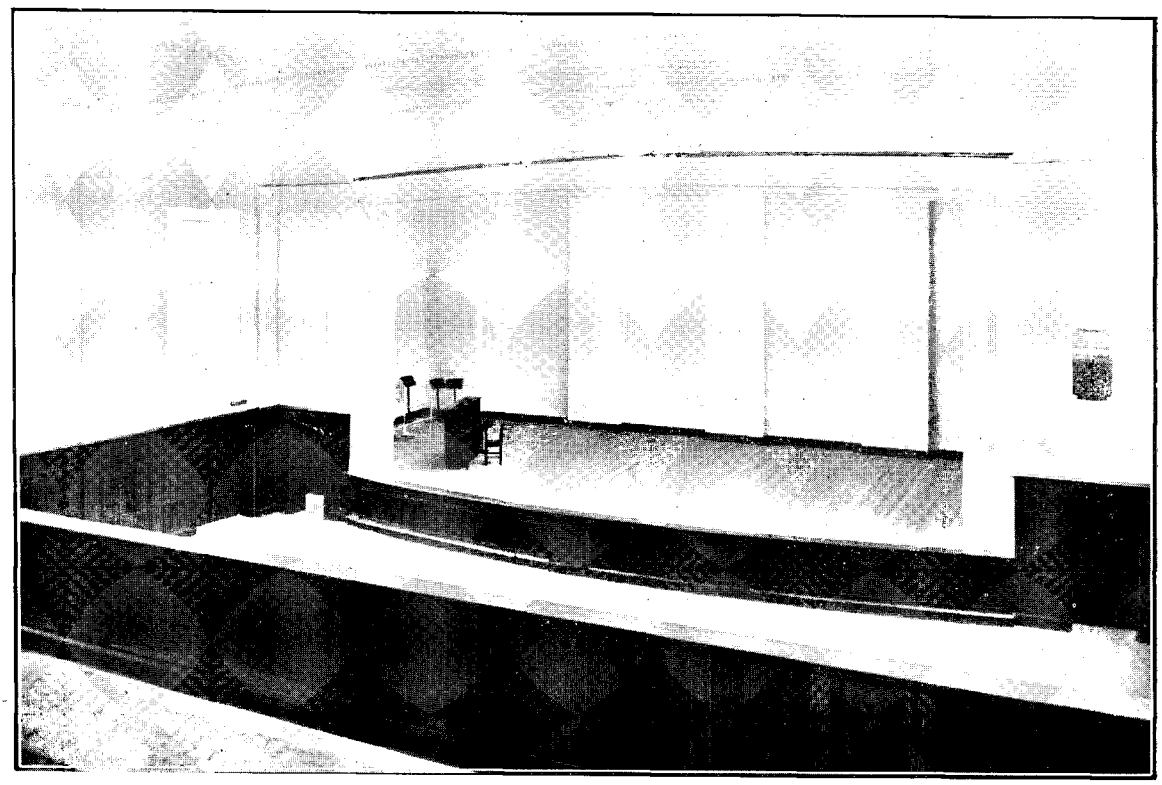


Site of Power-house and Dam.

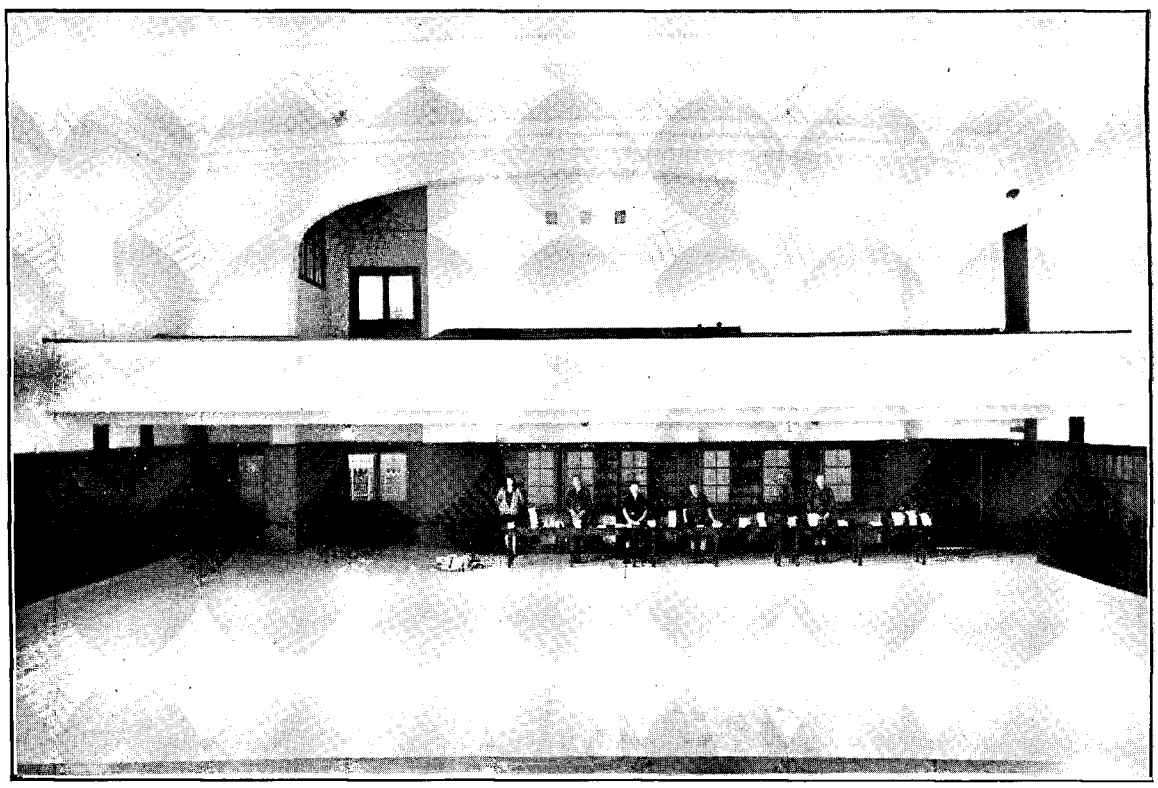


Waitaki Dam: Driving Sheet Piling.

WAITAKI POWER DEVELOPMENT.

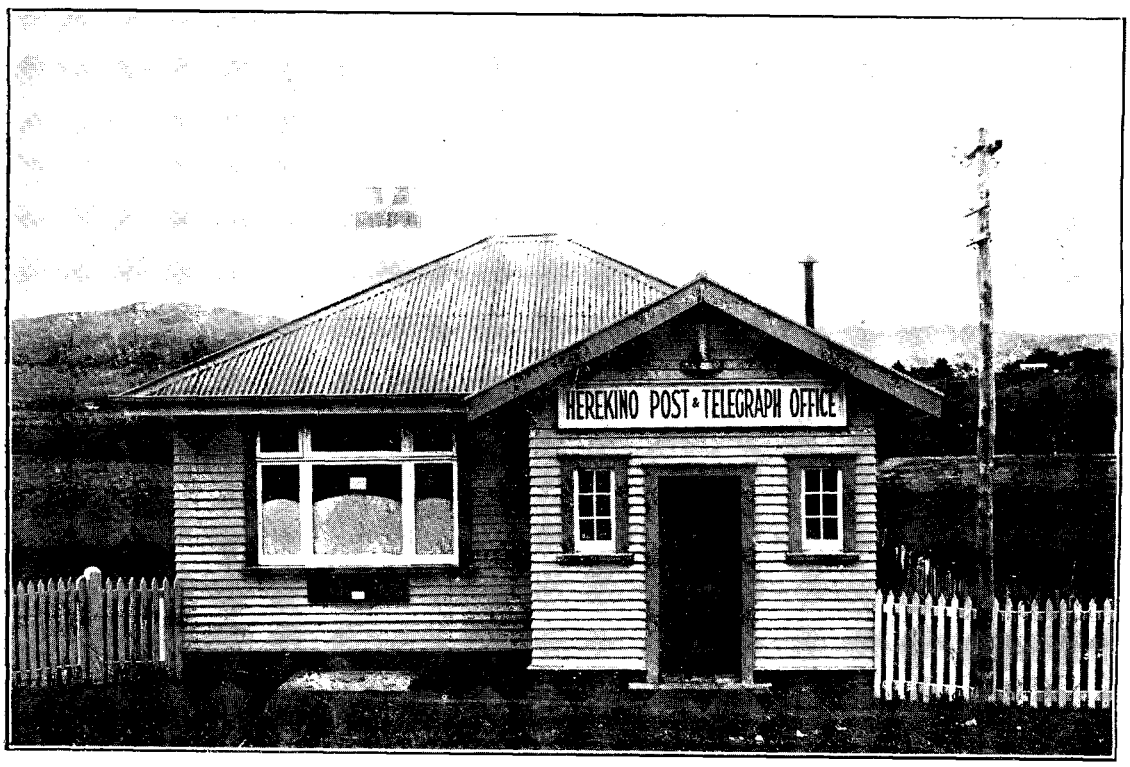


War Memorial Hall: Stage End.

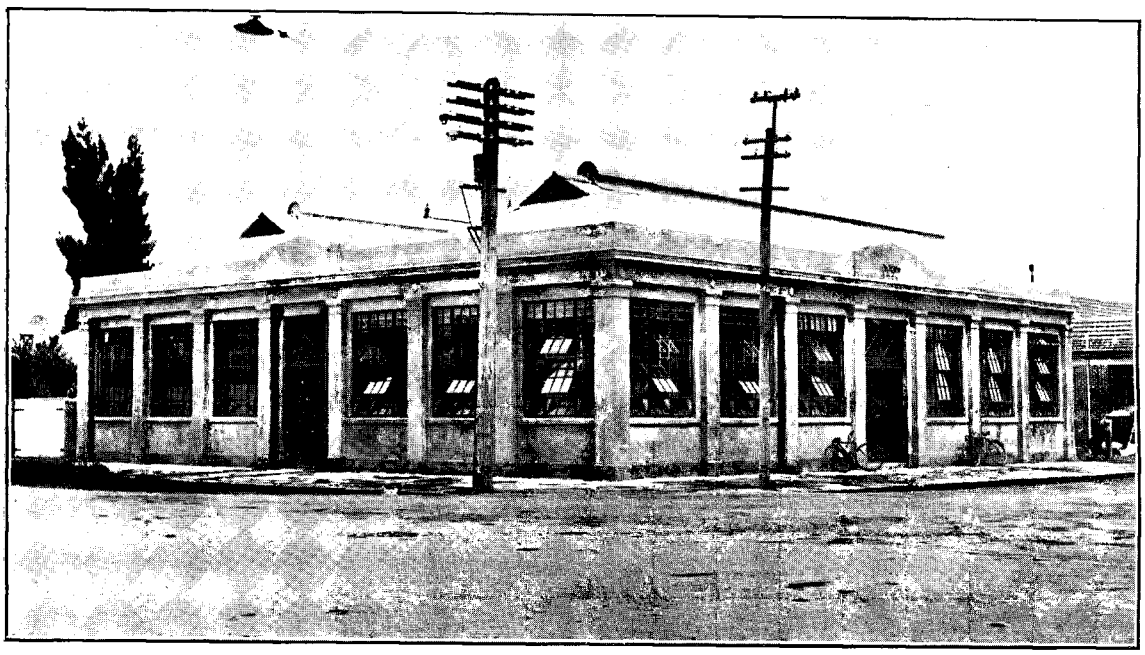


War Memorial Hall: Gallery End.

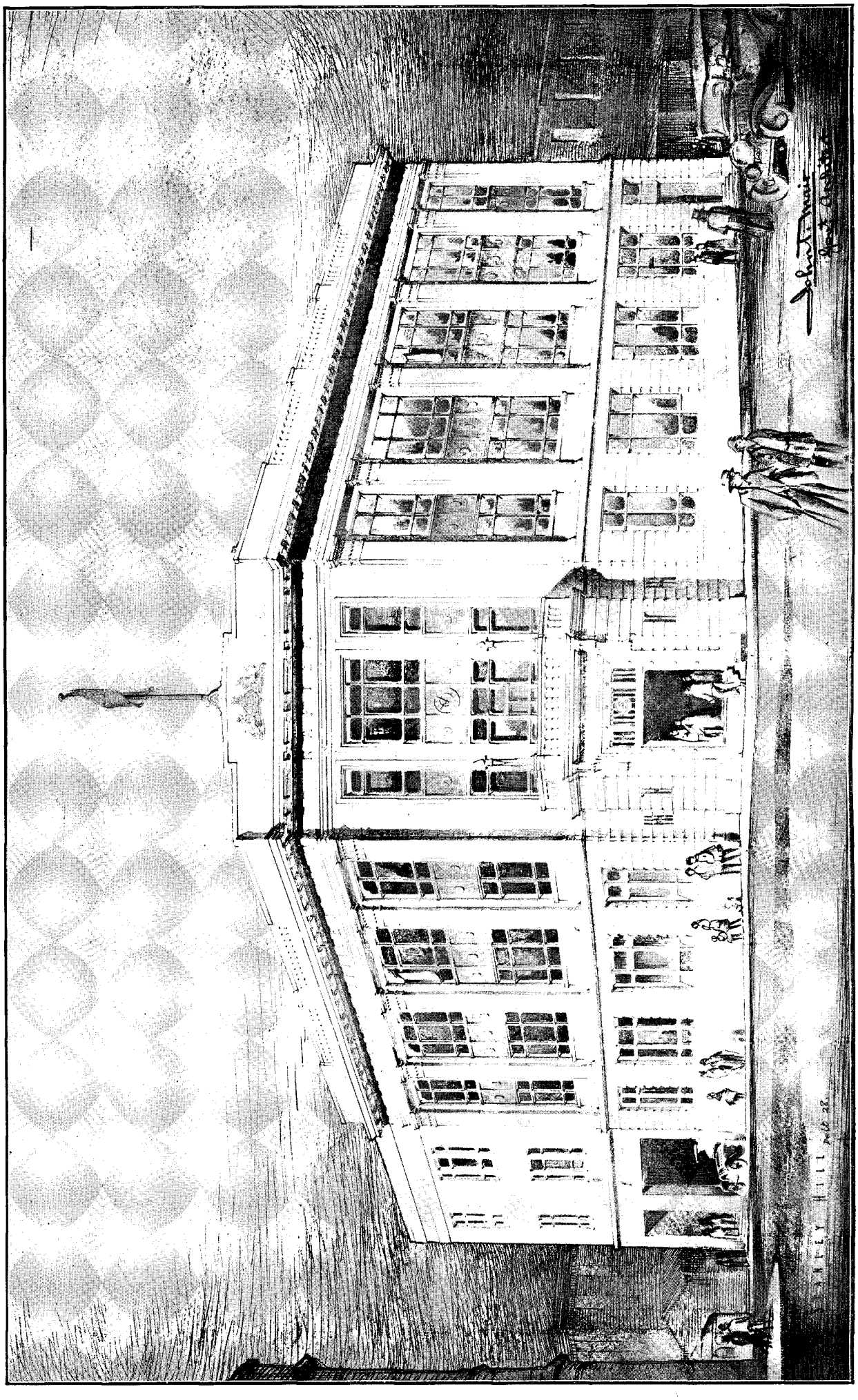
SEDDON MEMORIAL TECHNICAL SCHOOL, AUCKLAND.



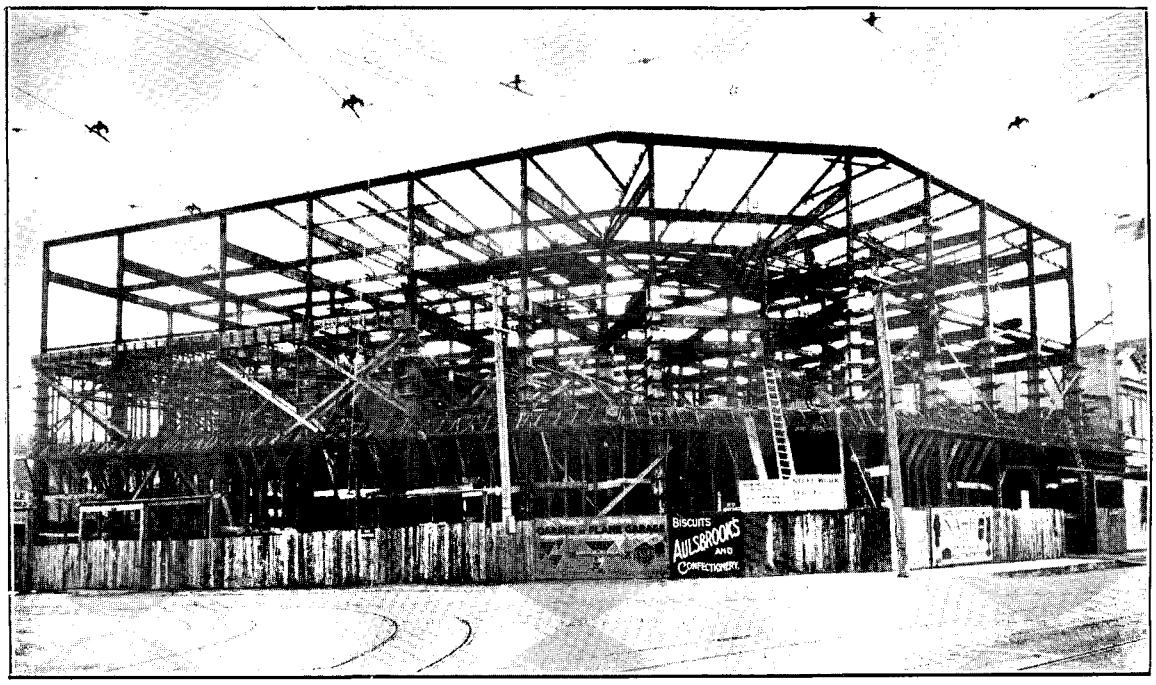
Herekino Post and Telegraph Office.



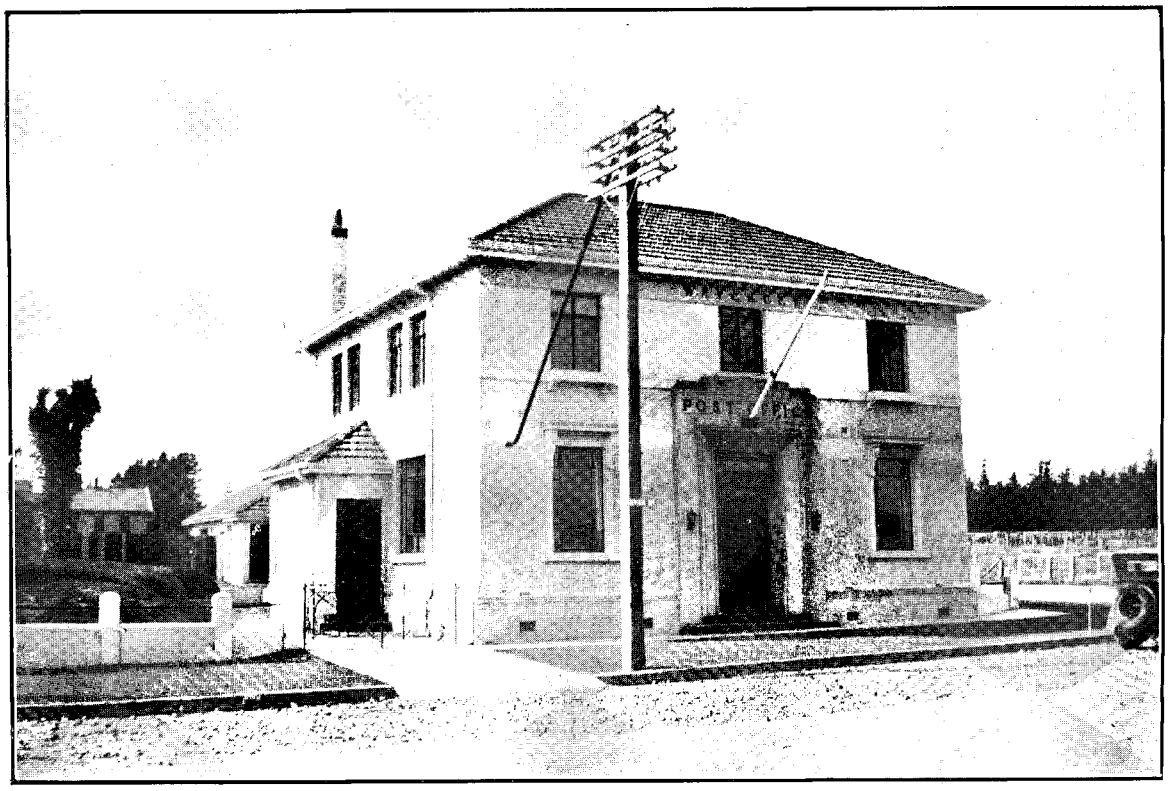
Palmerston North Technical School Workshops.



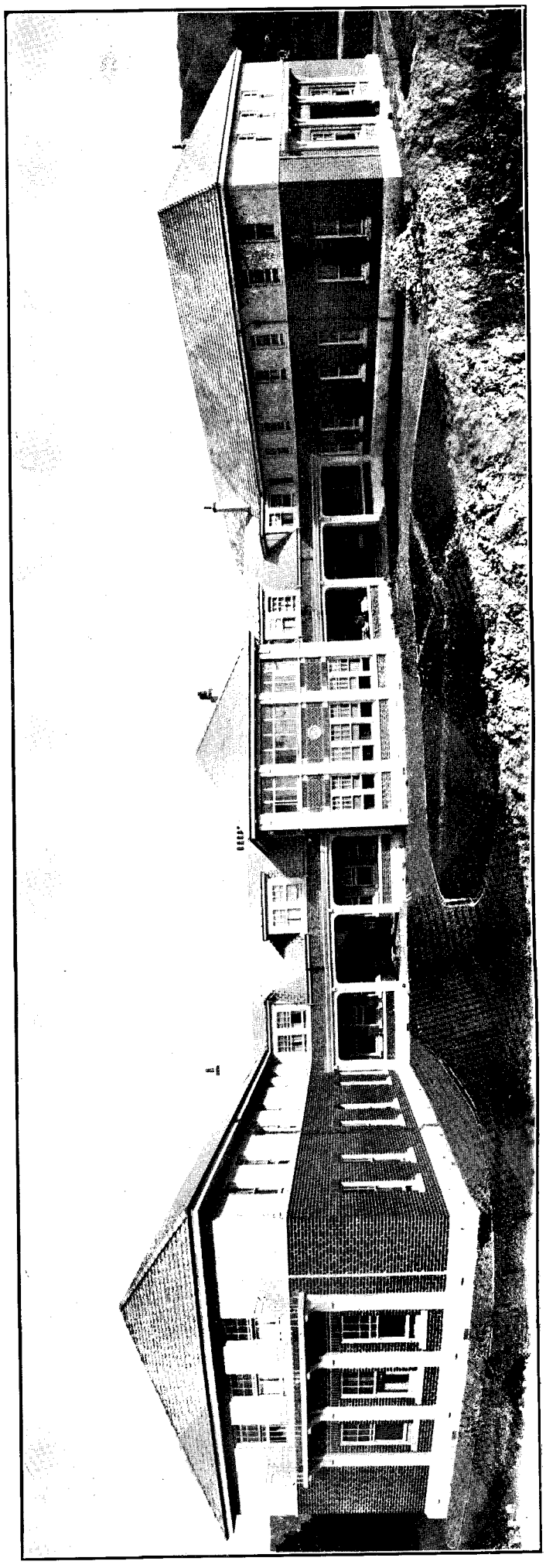
NAPIER POST-OFFICE AS IT WILL APPEAR WHEN FINISHED.



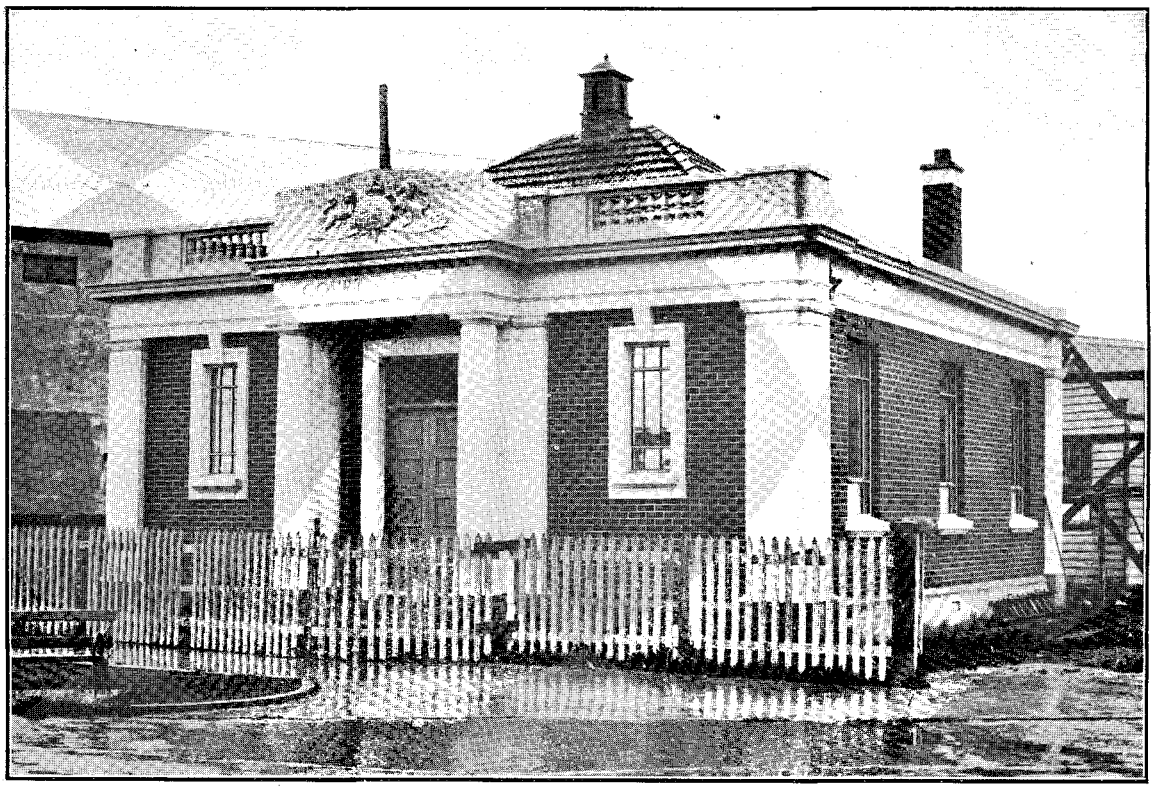
NAPIER POST-OFFICE IN COURSE OF CONSTRUCTION.



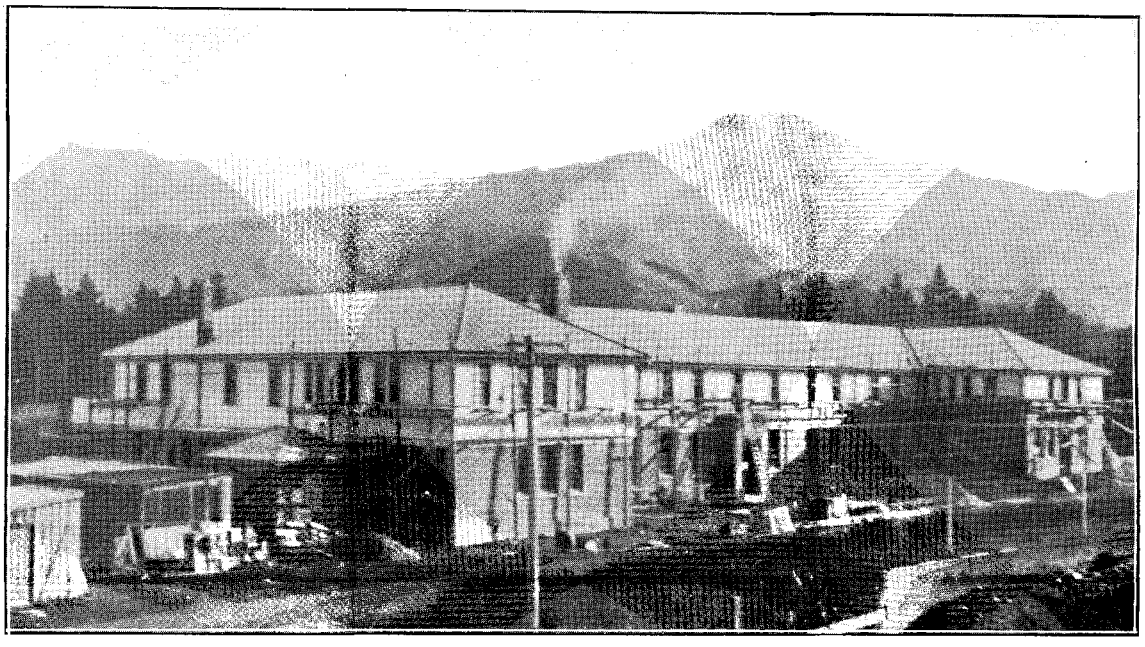
WAVERLEY POST-OFFICE.



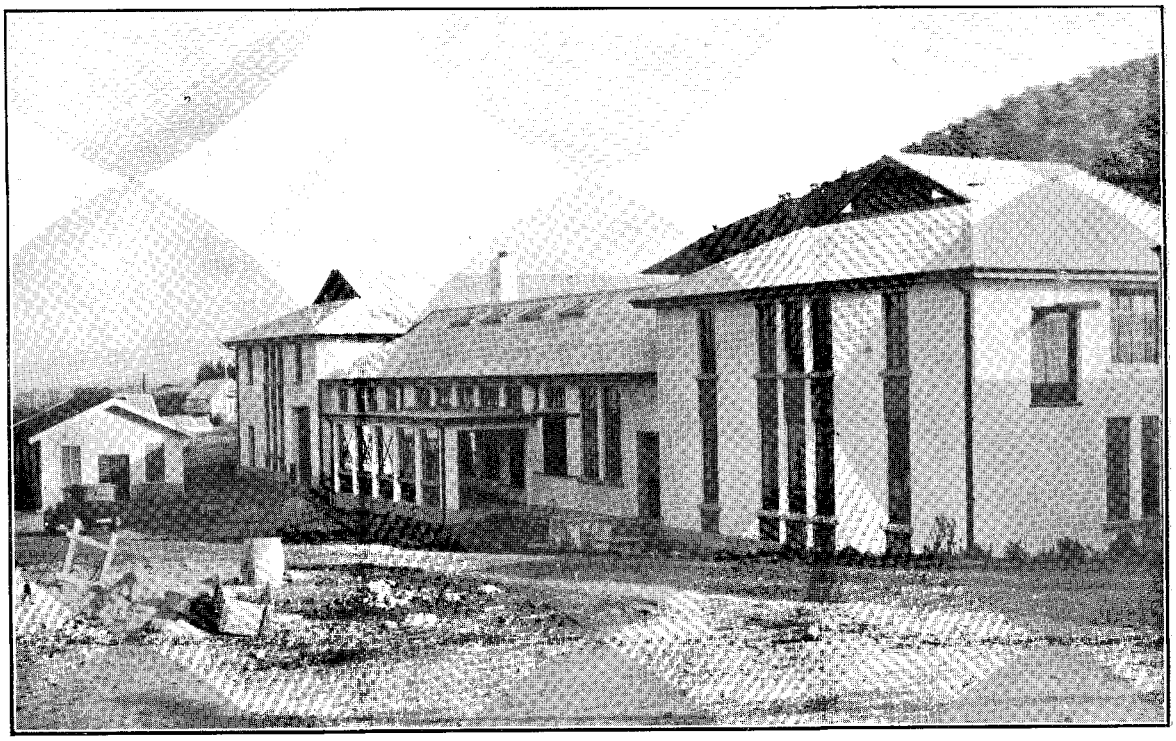
Nurses' Home, Porirua Mental Hospital.



Foxton Courthouse.

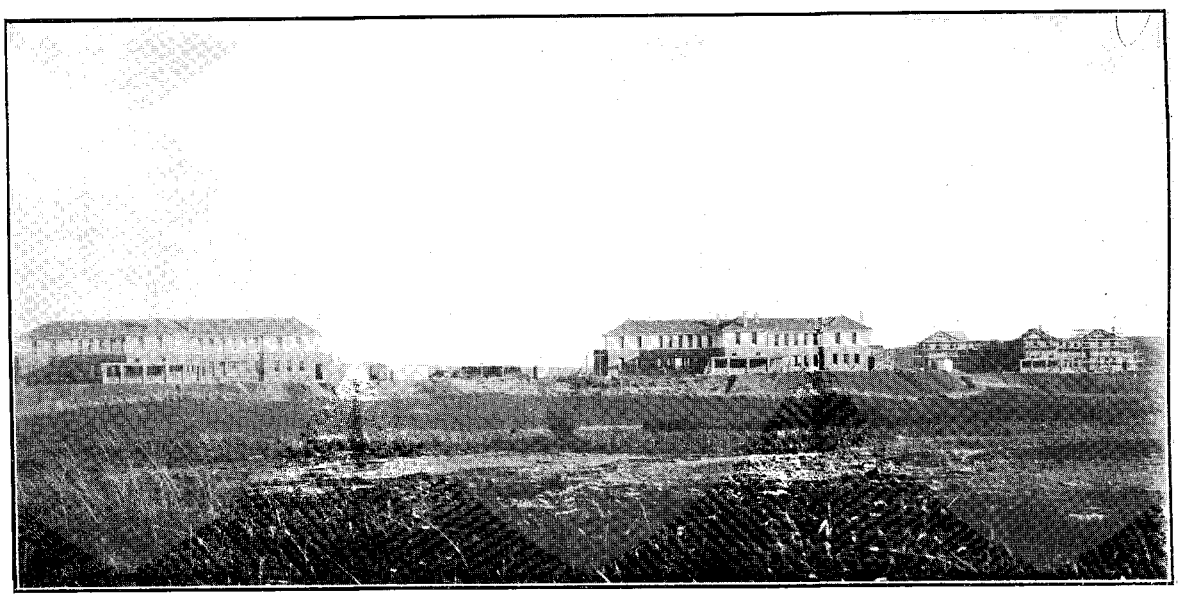


New Nurses' Home, Hanmer.



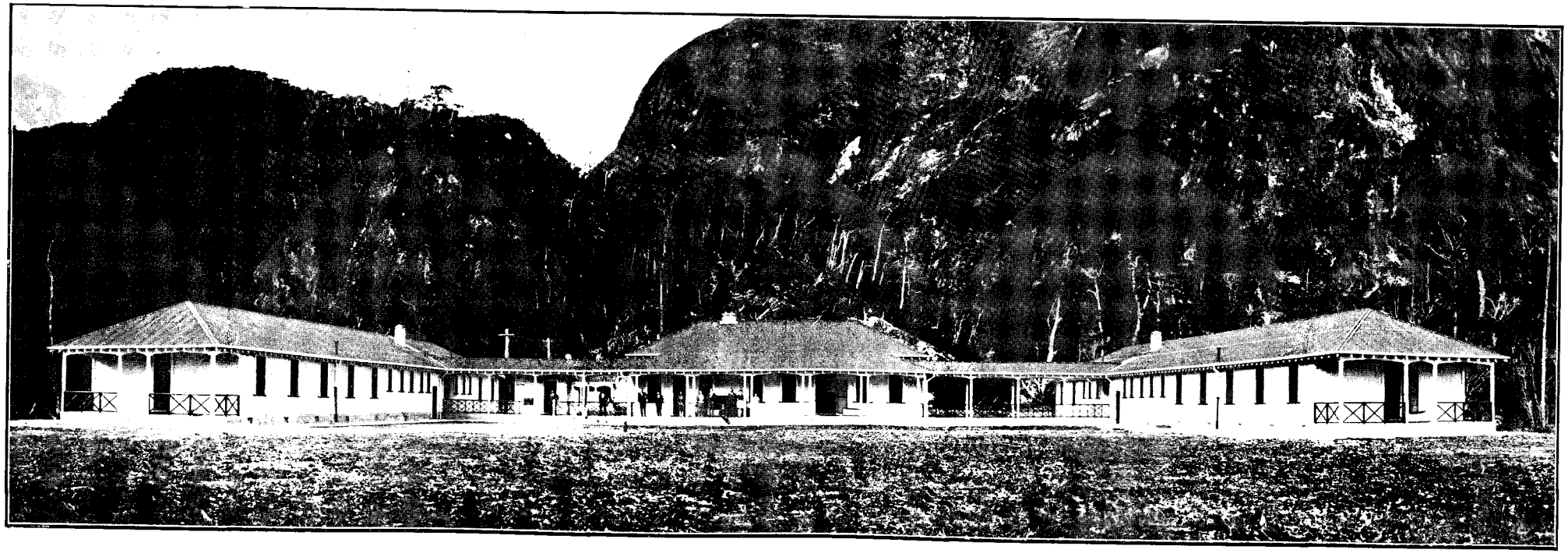
NEW KITCHEN BLOCK.

SEACLIFF MENTAL HOSPITAL.



NEW VILLAS FOR FEMALES.

TOKANUI MENTAL HOSPITAL.



GOVERNMENT HOSTEL, MILFORD SOUND.



DUNEDIN POST-OFFICE AS IT WILL APPEAR WHEN FINISHED.

PUBLIC WORKS STATEMENT, 1929.

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TABLE No. 1.

SUMMARY SHOWING THE TOTAL EXPENDITURE ON PUBLIC WORKS AND OTHER SERVICES OUT OF PUBLIC WORKS FUND (GENERAL PURPOSES ACCOUNT) TO 31ST MARCH, 1929, AND THE LIABILITIES ON THAT DATE.

Number of Table containing Details.	Works.	Total Net Expenditure to 31st March, 1928.	Expenditure during Twelve Months ended 31st March, 1929.	Recoveries on Account of Services of Previous Years.	Total Net Expenditure to 31st March, 1929.	Liabilities on 31st March, 1929.	Total Net Expenditure and Liabilities.	Works.
		£	£	£	£	£	£	
3	Railways*..	50,956,402	1,216,277	2,595	52,170,084	94,721	52,264,805	Railways.*
..	Payment to Midland Railway bondholders	150,000	..	..	150,000	..	150,000	Payment to Midland Railway bondholders.
..	Roads†	16,966,027	833,577	330	17,799,274	77,421	17,876,695	Roads.†
..	Development of mining	831,845	..	260	831,585	..	831,585	Development of mining.
..	Telegraphs	9,291,947	624,414	..	9,916,361	203,928	10,120,289	Telegraphs.
..	Public buildings	10,136,524	213,506	8,244	10,341,786	20,488	10,362,274	Public buildings.
..	Lighthouses, harbour-works, and harbour-defences	1,249,214	17,062	..	1,266,276	264	1,266,540	Lighthouses, harbour-works, and harbour-defences.
..	Departmental	2,490,565	142,252	88,499	2,544,318	3,935	2,548,253	Departmental.
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	3,184,566	50,266	283	3,234,549	8,521	3,243,070	Immigration.
..	Purchase of Native lands	2,061,147	..	..	2,061,147	..	2,061,147	Purchase of Native lands.
..	Defence	1,280,916	67,652	648	1,347,920	..	1,347,920	Defence.
..	Charges and expenses of raising loans	2,592,813	438,238	..	3,031,051	..	3,031,051	Charges and expenses of raising loans.
..	Interest and sinking fund	218,500	..	..	218,500	..	218,500	Interest and sinking fund.
..	Rates on Native lands	68,672	..	..	68,672	..	68,672	Rates on Native lands.
..	Thermal springs	14,600	..	..	14,600	..	14,600	Thermal springs.
..	Tourist and health resorts	460,766	39,254	440	499,580	2,601	502,181	Tourist and health resorts.
..	Lands improvement‡	426,607	85,861	87	512,381	2,172	514,553	Lands improvement.‡
..	Irrigation and water-supply§.. ..	781,282	55,198	8	836,472	5,968	842,440	Irrigation and water-supply.§
..	Plant, material, and stores	348,217	4,595	1,042	351,770	4,247	356,017	Plant, material, and stores.
..	Quarries (acquisition and operation) ..	11,144	*Cr.* 6,030	..	5,114	1,637	6,751	Quarries (acquisition and operation).
..	Timber-supply and sawmills for Public Works Department	5,688	*Cr.* 5,116	182	390	426	816	Timber-supply and sawmills for Public Works Department.
..	Motor Transport Services	33,635	..	..	33,635	..	33,635	Motor Transport Services.
..	Transfer to Main Highways Account, Construction Fund	826,000	200,000	..	1,026,000	..	1,026,000	Transfer to Main Highways Account, Construction Fund.
	Totals	104,447,912	3,977,006	102,618	108,322,300	426,329	108,748,629	Totals.

* Exclusive of expenditure on Hutt Railway and Road Improvement and Railways Improvement Accounts. † Includes £4,500 expended under section 16 (1) Native Land Amendment and Native Land Claims Adjustment Act, 1923. ‡ £6,727 previously expended on irrigation under this item now transferred to Irrigation and Water-supply. § 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; also £6,727 previously expended on irrigation under Lands Improvement now transferred to Irrigation and Water-supply.

TABLE No. 2.

GENERAL SUMMARY.

Showing NET YEARLY EXPENDITURE out of PUBLIC WORKS FUND (GENERAL PURPOSES ACCOUNT), 1907–1908 to 1928–29.

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.

Description of Services.	Total Net Expenditure to 31st March, 1907.	Expenditure.										
		1907-8.	1908-9.	1909-10.	1910-11.	1911-12.	1912-13.	1913-14.	1914-15.	1915-16.	1916-17.	1917-18.
	£	£	£	£	£	£	£	£	£	£	£	£
Immigration	2,177,581	9,132	15,075	17,003	9,441	11,681	14,694	33,914	33,219	10,010 *Cr. 10*	6,533	3,856
Public Works, Departmental	550,166	18,219	24,512	41,176	42,733	49,864	57,426	66,650	100,719	111,489	131,701	127,962 *Cr. 2,662*
Irrigation and Water-supply	..	..	..	..	1,562	2,794	14,689	40,329	32,090	29,874	20,794	11,650
Railways	23,119,459	1,093,535	1,116,183	1,128,400	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*
Payment to Midland Railway Bondholders	150,000	..	..	..	..	..	..	..	..	..	..	..
Roads:—												
Miscellaneous Roads and Bridges	6,477,816	285,248	422,174	297,932	229,537	383,511	337,584	353,836 *Cr. 515*	484,365	400,062	203,746	128,730 *Cr. 600*
Roads on Goldfields	742,957	38,494	47,375	40,830	25,626	41,067	36,761	24,143	30,065	24,432	17,099	6,912
Development of Thermal Springs and Natural Scenery ..	16,023	..	..	..	..	..	..	..	..	..	..	..
Lands Improvement Account*	300,930	..	..	..	..	..	..	..	..	..	..	..
Total, Roads	7,537,726	323,742	469,549	338,762	255,163	424,578	374,345	377,464	514,430	424,494	220,845	135,042
Development of Mining	778,025	8,633	32,859	18,597 *Cr. 1,000*	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*
Purchase of Native Lands	1,541,578	2,190	2,099	30,567	2,976 *Cr. 2,286*	*Cr. 2,466*	*Cr. 917*	*Cr. 857*	*Cr. 1,060*	*Cr. 972*	*Cr. 868*	*Cr. 57*
Native Lands Purchase Account	491,980	..	..	..	..	..	..	..	..	..	..	..
Total, Land Purchases	2,033,558	2,190	2,099	30,567	690	*Cr. 2,466*	*Cr. 917*	*Cr. 857*	*Cr. 1,060*	*Cr. 972*	*Cr. 868*	*Cr. 57*
Telegraph Extension	1,324,245	155,491	163,032	123,423	111,867	147,692	251,375	392,648	288,395	249,554	203,311	213,955
Public Buildings:—												
General (including Miscellaneous)	301,899	16,260	39,635	41,964	44,044	34,721	44,719	43,199	52,239	22,050	12,648	11,646 *Cr. 15,067*
Parliamentary	63,370	4,119	5,172	3,157	237	2,004	18,806	23,612	31,478	17,133	22,586	37,233
Judicial { Courthouses	} 562,231	5,788	14,473	11,119	5,759	14,556	20,097	9,423	5,171	4,902	299	21
Judicial { Prisons		4,164	5,008	4,231	7,506	9,760	6,911	4,928	14,515	17,786	15,685	13,195
Judicial { Police-stations		18,986	17,730	16,256	9,030	19,817	18,423	14,094	19,122	25,484	21,147	18,814

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

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

[*Continued on page 4.*

TABLE No. 2—*continued.*

GENERAL SUMMARY—*continued.*

Showing Net Yearly Expenditure out of Public Works Fund (General Purposes Account), 1907–1908 to 1928–29—*continued.*

Description of Services.	Total Net Expenditure to 31st March, 1907.	Expenditure.										
		1907–8.	1908–9.	1909–10.	1910–11.	1911–12.	1912–13.	1913–14.	1914–15.	1915–16.	1916–17.	1917–18.
Public Buildings—*continued.*	£	£	£	£	£	£	£	£	£	£	£	£
Post and Telegraph	484,635	43,724	62,262	68,574	117,815	130,815	122,999	78,815	60,838	35,258	22,744	33,525
Customs	46,652	47	2,507	233	..	..	..	..	..	..	..	..
Quarantine Stations	6,865	..	..	..	..	..	..	..	..	..	..	..
Mental Hospitals	541,807	7,987	15,296	19,839	12,707	8,809	46,181	26,001	53,996	54,898	44,602	26,502
										Cr. 15		
Public Health	20,271	7,497	4,402	319	..	..	376	..	..	..	..	..
Health and Hospital Institutions	79,764	15,576	11,153	7,259	1,484	12,745	8,750	1,435	998	1,426	7,570	4,080
School Buildings	1,454,249	100,197	102,340	98,103	124,926	90,535	105,000	121,954	122,940	97,972	70,367	63,082
Agricultural	16,818	1,690	5,543	6,103	1,160	3,684	6,475	4,398	2,428	2,972	3,046	5,685
									Cr. 34			
Workers' Dwellings	..	..	..	..	..	22,644	46,455	41,741	68,275	55,893	35,437	15,505
Total, Public Buildings	3,578,561	226,035	285,521	277,157	324,668	350,090	445,192	369,600	431,966	335,759	256,131	214,221
Lighthouses, Harbour-works, and Harbour-defences :—												
Lighthouses	162,855	1,417	7,481	6,762	1,470	5,428	9,031	5,174	3,887	1,415	449	561
Harbour-works	333,256	2,867	4,439	4,548	4,092	6,004	7,415	3,346	12,563	9,355	2,280	2,359
								Cr. 1,462				
Harbour-defences	521,546	2,579	7,297	5,372	2,865	1,144	339	539	681	2,903	1,038	56
								Cr. 300				
Total, Lighthouses, &c.	1,017,657	6,863	19,217	16,682	8,427	12,576	16,785	7,297	17,131	13,673	3,767	2,976
Rates on Native Lands	67,808	837	27	..	..	..	..	..	..	..	..	..
Contingent Defence	869,594	18,574	10,766	4,977	6,071	10,437	23,790	30,186	15,221	37,619	9,742	6,714
Tourist and Health Resorts	113,519	45,048	24,286	14,507	5,912	13,361	12,906	14,989	8,232	5,167	1,094	931
									Cr. 12	*Cr. 500*		
Lands Improvement*	15,014	9,561	19,542	6,910	11,125	20,394	22,550	10,269	13,810	5,936	*Cr. 2,731*	1,838
							Cr. 383	*Cr. 432*	*Cr. 522*			
Charges and Expenses of raising Loans	1,244,129	*Cr. 8,487*	575	17,715	66,367	67,470	72,950	105,449	35,495	5,037	35	1
				Cr. 12,000	*Cr. 66,392*	*Cr. 66,954*	*Cr. 71,681*	*Cr. 96,741*	*Cr. 34,865*	*Cr. 5,030*		
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
Total Ways and Means Credits	..	*8,487*	..	..	..	*10,530*	*103,524*	*105,792*	*43,400*	*11,160*	*5,713*	*43,492*
Grand Total—Net Expenditure	45,820,977	1,909,688	2,183,245	2,022,876	1,891,918	2,190,731	2,347,965	2,455,066	2,597,109	2,363,658	1,502,588	1,237,422

* 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 (GENERAL PURPOSES ACCOUNT), 1907–1908 to 1928–29—*continued.*

Description of Services.	Expenditure.											Total Net Expenditure to 31st March, 1929.
	1918–19.	1919–20.	1920–21.	1921–22.	1922–23.	1923–24.	1924–25.	1925–26.	1926–27.	1927–28.	1928–29.	
	£	£	£	£	£	£	£	£	£	£	£	£
Immigration	*Cr. 12,018*	*Cr. 62,561*	*Cr. 7,806*	247,528	90,611 *Cr. 140*	92,600 *Cr. 1,267*	136,353 *Cr. 16*	107,521 *Cr. 443*	184,918	67,157	50,266 *Cr. 283*	3,234,549
Public Works, Departmental	115,419 *Cr. 4,119*	121,677	143,280 *Cr. 6,281*	128,002 *Cr. 525*	111,367 *Cr. 131*	110,445 *Cr. 69*	127,556 *Cr. 19*	126,596 *Cr. 129*	115,866 *Cr. 35,948*	130,951 *Cr. 13,328*	142,252 *Cr. 88,499*	2,544,318
Irrigation and Water-supply*	13,665	34,115	55,344	82,713	58,131	95,467	127,995	56,227 *Cr. 31*	56,937	49,735 *Cr. 2,798*	55,198 *Cr. 8*	836,472
Railways	387,923 *Cr. 4,924*	748,649 *Cr. 105,196*	1,365,466 *Cr. 388*	3,133,200 *Cr. 751*	2,110,859 *Cr. 3,171*	1,776,413 *Cr. 1,167*	1,878,729 *Cr. 37,924*	1,988,614 *Cr. 16,875*	1,480,807 *Cr. 95,647*	1,141,822 *Cr. 1,699*	1,216,277 *Cr. 2,595*	52,170,084
Payment to Midland Railway Bondholders	..	..	..	..	..	..	..	..	..	..	..	150,000
Roads :—												
Miscellaneous Roads and Bridges	221,887 *Cr. 997*	376,097 *Cr. 603*	527,854 *Cr. 81*	552,895 *Cr. 197*	643,156 *Cr. 244*	751,370 *Cr. 188*	603,968 *Cr. 231*	564,694 *Cr. 4,810*	575,898 *Cr. 981*	669,833 *Cr. 540*	780,990 *Cr. 330*	..
Roads to give access to Outlying Districts	..	..	..	..	..	..	..	..	..	33,642	51,582	..
Roads on Goldfields	4,186	12,465	11,050	11,264	4,850	2,867	2,755	3,934	2,230	2,330 *Cr. 467*	1,005	..
Development of Thermal Springs and Natural Scenery	..	..	..	..	..	..	..	..	..	..	..	..
Lands Improvement Account	..	..	..	..	..	..	..	..	..	..	..	..
Total, Roads	225,076	387,959	538,823	563,962	647,762	754,049	606,492	563,818	577,147	704,798	833,247	17,799,274
Development of Mining	518 *Cr. 1,000*	1,173 *Cr. 7,008*	2,153 *Cr. 1,606*	2,130 *Cr. 51*	*Cr. 98* *Cr. 1,785*	1,363 *Cr. 2,310*	..	..	..	.. *Cr. 1,130*	.. *Cr. 260*	881,585
Purchase of Native Lands	..	*Cr. 57*	*Cr. 57*	*Cr. 52*	..	..	..	..	*Cr. 535*	*Cr. 56*	..	..
Native Lands Purchase Account	..	..	..	..	..	..	..	..	..	..	..	..
Total, Land Purchases	..	*Cr. 57*	*Cr. 57*	*Cr. 52*	..	..	..	..	*Cr. 535*	*Cr. 56*	..	2,061,147
Telegraph Extension	198,611	249,379	336,468	590,981	512,657 *Cr. 11,082*	717,409	957,294	931,661	558,042	625,540	624,414	9,916,361
Public Buildings :—												
General (including Miscellaneous)	43,168	64,207	39,504	87,057	113,553	8,160	30,791 *Cr. 35*	29,369 *Cr. 345*	119,864 *Cr. 429*	42,553 *Cr. 1,065*	4,272 *Cr. 420*	..
Parliamentary	..	..	..	..	..	..	..	..	..	..	35	..
Judicial — Courthouses	..	868	1,400	4,358	2,018 *Cr. 13*	2,448	5,363 *Cr. 19*	7,209	1,261 *Cr. 13*	7,531 ..	8,387 *Cr. 95*	..
Judicial — Prisons	16,299	20,981	30,038 *Cr. 800*	41,740	23,313	26,484 *Cr. 2,568*	25,279 *Cr. 86*	24,196	22,812 *Cr. 908*	22,359 *Cr. 524*	12,573 *Cr. 321*	..
Judicial — Police-stations	6,157	24,944	36,843	22,544	6,298	12,838	18,553	16,594 *Cr. 102*	7,411 *Cr. 13*	5,561 *Cr. 970*	6,925 *Cr. 605*	..

* £6,727 previously included under Lands Improvement now transferred to Irrigation and Water-supply.

[*Continued on page 6.*

TABLE No. 2—*continued.*

GENERAL SUMMARY—*continued.*

Showing NET YEARLY EXPENDITURE out of PUBLIC WORKS FUND (GENERAL PURPOSES ACCOUNT), 1907–1908 to 1928–29—*continued.*

Description of Services.	Expenditure.											Total Net Expenditure to 31st March, 1929.
	1918–19.	1919–20.	1920–21.	1921–22.	1922–23.	1923–24.	1924–25.	1925–26.	1926–27.	1927–28.	1928–29.	
	£	£	£	£	£	£	£	£	£	£	£	£
Public Buildings—*continued.*												
Post and Telegraph	26,072	66,543	93,364	112,906	77,211	108,395	65,917	89,865	86,052	77,194	62,087	..
			Cr. 560	*Cr. 675*	*Cr. 69*		*Cr. 210*	*Cr. 453*	*Cr. 1,114*	*Cr. 834*	*Cr. 1,980*	
Customs	..	..	..	..	..	..	..	..	..	..	..	
Quarantine Stations	..	35,490	15,529	4,581	154	171	284	..	..	..	..	..
Mental Hospitals	14,640	18,277	27,368	41,838	13,852	26,541	68,428	77,835	68,635	51,119	96,782	.
								Cr. 283		*Cr. 3,600*		
Public Health	..	..	..	..	..	..	..	..	..	..	..	..
Health and Hospital Institutions	2,332	8,484	4,099	26,131	20,981	7,420	27,951	31,177	15,840	14,361	19,637	..
					Cr. 1,399			*Cr. 300*		*Cr. 310*		
School Buildings	115,656	195,500	244,722	2,469	..	..	..	..	..	..	..	..
				Cr. 9,255	*Cr. 367*	*Cr. 1,090*	*Cr. 905*	*Cr. 1,050*	*Cr. 7,953*	..	*Cr. 2,428*	
Agricultural	4,229	7,227	9,345	1,115	514	282	3,242	7,932	4,164	2,863	2,808	..
					Cr. 27	*Cr. 171*	*Cr. 686*	*Cr. 865*	*Cr. 310*		*Cr. 2,395*	
Workers' Dwellings	7,293	26,674	..	..	..	..	..	..	..	..	..	..
Total, Public Buildings	235,846	469,195	500,851	334,809	255,818	188,910	243,877	280,780	315,299	216,237	205,262	10,341,786
Lighthouses, Harbour-works, and Harbour-defences:—												
Lighthouses	1,663	253	758	16,350	3,260	4,473	2,850	5,690	5,758	7,979	2,637	..
								Cr. 750				
Harbour-works	3,729	3,245	4,080	2,424	6,524	6,334	423	3,717	13,263	15,891	14,425	..
								Cr. 131	*Cr. 204*	*Cr. 165*		
Harbour-defences	..	..	..	..	..	..	..	..	..	..	..	..
					Cr. 1,235	*Cr. 16*						
Total, Lighthouses, &c.	5,392	3,498	4,838	18,774	8,549	10,791	3,273	8,526	18,817	23,705	17,062	1,266,276
Rates on Native Lands	..	..	..	..	..	..	..	..	..	..	..	68,672
Contingent Defence	8,809	10,187	8,701	15,586	1,702	4,931	27,133	89,670	34,014	39,986	67,652	1,347,920
	Cr. 922				*Cr. 463*	*Cr. 280*	*Cr. 580*	*Cr. 33*	*Cr. 751*	*Cr. 465*	*Cr. 648*	
Tourist and Health Resorts	1,620	6,194	19,041	17,996	5,435	27,264	12,343	43,486	31,981	36,673	39,254	499,580
				Cr. 110			*Cr. 81*			*Cr. 516*	*Cr. 440*	
Lands Improvement*	*Cr. 4,268*	2,964	2,064	17,478	26,204	18,182	34,172	70,493	56,267	72,898	85,861	512,381
								Cr. 19	*Cr. 135*	*Cr. 2,574*	*Cr. 87*	
Charges and Expenses of raising Loans	..	..	184	174,280	62,399	311,905	241,930	297,180	155,373	100,297	438,238	3,031,051
											Cr. 3,811	
Interest and Sinking Funds	..	..	..	..	..	..	..	..	..	..	..	218,500
Coal-exploration and Mine-development	..	..	..	..	..	..	..	..	..	..	..	10,835
Thermal Springs	..	..	..	..	..	..	..	..	..	..	..	14,600
Plant, Material, and Stores	20,638	47,682	169,910	106,432	*Cr. 19,708*	*Cr. 52,788*	..	34,471	*Cr. 24,148*	*Cr. 1,288*	4,595	351,770
	Cr. 31						*Cr. 12,230*	*Cr. 751*	*Cr. 1,992*	*Cr. 8,985*	*Cr. 1,042*	
Quarries (acquisition and operation)	..	..	..	..	..	..	1,815	12,351	6,302	*Cr. 9,325*	*Cr. 6,030*	5,114
Timber-supply and Sawmills for Public Works Department	..	..	..	16,369	14,725	3,613	*Cr. 20,537*	*Cr. 9,892*	8,512	*Cr. 6,997*	*Cr. 5,116*	390
								Cr. 104			*Cr. 182*	
Motor Transport Service	..	..	..	..	22,679	962	5,000	4,994	..	..	..	33,635
Transfer to Main Highways Account:—												
Construction Fund	..	..	..	..	..	..	226,000	..	400,000	200,000	200,000	1,026,000
Total Ways and Means Credits	*11,993*	*112,864*	*19,627*	*11,616*	*20,127*	*61,914*	*73,559*	*27,474*	*146,933*	*40,026*	*106,429*	..
Grand Total—Net Expenditure	1,207,482	2,020,714	3,121,131	5,449,351	3,892,320	4,056,423	4,632,134	4,615,585	3,988,059	3,400,664	3,977,006	108,322,300

* Expenditure on Irrigation and Water-supply—1905–6, £22; 1906–7, £750; 1907–8, £1,554; 1908–9, £1,966; 1909–10, £2,435, now transferred to Irrigation and Water-supply.

TABLE No. 3.

Expenditure on Railways to 31st March, 1929.

Lines of Railway.	Total Expenditure by General Government to 31st March, 1928.	Recoveries on Account of Expenditure of Previous Years.	Expenditure out of Public Works Fund during Year 1928-29: New Works.		Expenditure under Special Acts during Year 1928-29.*	Amounts previously charged to "Surveys of New Lines" now charged to Individual Lines.	Total Expenditure by General Government to 31st March, 1929.	Valuation of Works constructed by Provinces and Midland Railway Company.
			Construction and Surveys.	Works on Open Lines.				
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Kaihu Valley	179,067 17 0	..	..	..	64 9 3	..	179,132 6 3	..
Opua Wharf to Whangarei and Onerahi	610,499 10 10	..	..	*Cr.*3,435 2 9	2,101 18 1	..	609,166 6 2	..
Otiria to Ngapuhi	125,987 0 0	..	..	728 11 9	920 2 5	..	127,635 14 2	..
Whangarei Branch (Kioreroa to Waiotira)	420,463 17 2	..	69 3 10	..	..	..	420,533 1 0	..
North Auckland Main Trunk—								
Ngapuhi Northwards	508,961 3 10	9 3 2	136,380 7 0	..	..	..	645,332 7 8	..
Helensville Northwards	3,002,793 10 8	2 12 0	*Cr.* 22,426 14 6	3,094 1 7	51 1 8	..	2,983,509 7 5	..
North Auckland Main Trunk to Dargaville	23,920 18 10	2 0 0	179,332 6 3	..	..	..	203,251 5 1	..
Helensville to Te Awamutu	4,649,614 18 0	..	..	*Cr.*9,140 15 8	591,506 8 0	..	5,231,980 10 4	..
Waiuku Branch (Paerata to Waiuku)	208,886 2 6	..	..	23 7 0	..	..	208,909 9 6	..
Huntly to Awaroa	183,344 18 6	..	..	689 9 4	..	..	184,034 7 10	..
Waikokowai Branch	3,442 0 0	..	..	..	..	..	3,442 0 0	..
Frankton to Thames	489,302 15 0	..	..	7,017 6 7	762 19 0	..	497,083 0 7	..
Cambridge Branch (Ruakura Junction to Cambridge)	61,169 14 6	..	..	249 6 4	..	..	61,419 0 10	..
Morrinsville to Rotorua	422,276 19 9	..	105 0 0	4,360 15 11	316 13 0	..	427,059 8 8	..
Marton to Te Awamutu	3,025,407 1 4	112 17 6	..	13,367 14 6	1,761 12 0	..	3,040,423 10 4	..
Waipa Gravel Access Branch	114 0 0	..	..	..	..	..	114 0 0	..
Raetihi Branch	88,724 10 9	..	..	727 11 4	..	..	89,452 2 1	..
Rotorua to Taupo	..	..	39,144 5 6	..	..	..	39,144 5 6	..
Paeroa to Pokeno	22,405 16 5	..	..	..	..	..	22,405 16 5	..
Paeroa to Tauranga	1,155,514 6 8	119 12 0	77,269 16 0	7,482 6 11	607 18 6	..	1,240,754 16 1	..
Tauranga to Taneatua, including Te Maunga to Maunganui Branch	1,463,159 2 1	..	25,125 19 3	3,034 9 11	327 3 9	..	1,491,646 15 0	..
Gisborne to Motu	623,931 2 6	..	..	5 18 7	397 10 6	..	624,334 11 7	..
Gisborne to Ormond Tramway	4,975 1 7	..	..	..	..	..	4,975 1 7	..
Napier to Gisborne—								
Gisborne Southwards	284,285 6 7	..	3,034 14 2	..	..	..	287,320 0 9	..
Wairoa Northwards	29,886 0 7	..	613 0 3	..	..	..	30,499 0 10	..
Napier Northwards	1,311,157 8 10	79 5 0	268,345 8 3	54 3 6	..	..	1,579,477 15 7	..
Waikokopu Branch	566,656 5 4	..	16,255 12 11	..	..	..	582,911 18 3	..
Wellington to Napier—								
Napier to Woodville and Palmerston North	1,067,051 9 7	..	..	12,319 9 11	36,078 0 7	..	1,115,449 0 1	..
Wellington to Woodville, including Te Aro Extension	2,523,766 17 2	..	..	15,224 4 8	500,659 3 1	..	3,039,650 4 11	..
Featherston to Martinborough	399 0 0	..	..	..	..	..	399 0 0	..
Wellington to Waitara—								
Wellington to Longburn	1,547,723 13 11	25 0 0	..	53,272 9 11	287,265 3 8	..	1,888,236 7 6	..
Foxton to Waitara and Moturoa	1,893,458 14 8	75 0 0	..	21,747 15 7	110,058 14 8	..	2,025,190 4 11	..
Mount Egmont Branch	70,686 1 6	..	..	..	..	..	70,686 1 6	..
Moturoa to Opunake	3,105 0 0	..	..	..	..	..	3,105 0 0	..
Opunake Branch (Te Roti to Opunake)	451,698 5 2	..	19 10 1	..	..	..	451,717 15 3	..
Manaia Branch (Kapuni to Manaia)	9,648 6 0	..	..	..	..	..	9,648 6 0	..
Rangitikei River Quarry Line	206 0 0	..	..	..	..	..	206 0 0	..

* Railways Improvement Authorization Act 1914 Account.

TABLE No. 3—*continued.*

EXPENDITURE ON RAILWAYS TO 31ST MARCH, 1929—*continued.*

Lines of Railway.	Total Expenditure by General Government to 31st March, 1928.	Recoveries on Account of Expenditure of Previous Years.	Expenditure out of Public Works Fund during Year 1928-29: New Works.		Expenditure under Special Acts during Year 1928-29.*	Amounts previously charged to "Surveys of New Lines" now charged to Individual Lines.	Total Expenditure by General Government to 31st March, 1929.	Valuation of Works constructed by Provinces and Midland Railway Company.
			Construction and Surveys.	Works on Open Lines.				
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Stratford to Okahukura (East End)	720,110 5 2	..	143,392 4 1	..	..	..	863,502 9 3	..
Stratford to Okahukura (West End)	1,068,366 5 0	..	138,876 7 9	..	62 4 3	..	1,207,304 17 0	..
Nelson to Greymouth—								
Nelson to Inangahua	533,943 9 6	..	31,682 12 0	..	549 17 8	..	566,175 19 2	78,307 0 0
Stillwater to Inangahua	223,777 7 7	..	..	*Cr.* 450 6 10	108 4 2	..	223,435 4 11	279,685 0 0
Ngahere to Blackball	147,861 10 4	..	..	..	*Cr.* 166 15 4	..	147,694 15 0	..
Westport to Ngakawau	194,507 5 5	..	..	80 15 11	2,196 17 10	..	196,784 19 2	..
Westport to Inangahua	231,827 10 8	..	73,610 10 3	19 2 10	147 14 8	..	305,604 18 5	..
Greymouth to Rewanui	255,750 18 6	..	..	214 9 3	404 18 7	..	256,370 6 4	..
Point Elizabeth Branch	74,139 3 1	..	..	..	..	..	74,139 3 1	..
Greymouth to Ross and Mikonui	403,220 8 10	..	..	797 9 7	18,715 11 5	..	422,733 9 10	..
Picton to Waipara—								
Picton Southwards	656,951 15 3	147 9 10	532 6 10	*Cr.* 150 0 0	616 9 2	..	657,803 1 5	..
Waipara Northwards	381,620 15 1	..	..	10 10 10	..	..	381,631 5 11	..
Christchurch to Greymouth—								
Rolleston to Bealey	1,005,566 14 1	..	..	5,714 13 7	619 7 1	..	1,011,900 14 9	61,579 0 0
Whitecliffs Branch	25,021 0 0	..	..	..	..	..	25,021 0 0	..
Greymouth to Bealey	2,050,048 14 8	405 1 1	..	194 12 8	4,888 0 10	..	2,054,726 7 1	263,889 0 0
Hurunui to Waitaki—								
Main Line (Waiau to Waitaki)	2,423,575 16 11	..	..	4,904 5 7	151,019 16 4	..	2,579,499 18 10	316,135 0 0
Oxford Branch (Rangiora to Oxford West)	53,072 8 2	..	..	..	..	..	53,072 8 2	..
Eyreton Branch (Kaiapoi to Bennett's)	44,277 0 0	..	..	..	..	..	44,277 0 0	..
Lyttelton Branch	101,196 9 3	..	..	1,077 5 2	95,689 12 3	..	197,963 6 8	340,500 0 0
Southbridge Branch (Hornby to Southbridge)	91,738 12 5	..	..	..	21 1 2	..	91,759 13 7	..
Little River Branch (Lincoln to Little River)	110,846 11 9	..	..	6 7 1	..	..	110,852 18 10	..
Rakaia to Methven	77,233 19 4	..	..	..	..	..	77,233 19 4	..
Ashburton to Springburn	64,025 11 3	..	..	..	..	..	64,025 11 3	..
Orari to Geraldine	321 0 0	..	..	..	..	..	321 0 0	..
Fairlie Branch (Washdyke Junction to Fairlie)	70,194 7 1	..	..	88 4 5	28 3 10	..	70,310 15 4	75,124 0 0
Waimate Branch	80,660 16 10	10 0 0	..	..	18 7 6	..	80,669 4 4	..
Canterbury Interior Main Line—								
Oxford to Malvern	54,248 0 0	..	..	..	..	..	54,248 0 0	..
Whitecliffs to Rakaia	542 0 0	..	..	..	..	..	542 0 0	..
Temuka to Rangitata	5,152 0 0	..	..	..	..	..	5,152 0 0	..
Waitaki to Bluff—								
Main Line, including Port Chalmers Branch	3,677,885 13 4	..	..	21,219 12 9	212,219 9 7	..	3,911,324 15 8	82,259 0 0
Duntroon Branch (Pukeuri to Kurow)	97,683 6 11	..	..	..	..	..	97,683 6 11	37,500 0 0
Ngapara Branch (Waiareka Junction to Ngapara)	26,090 0 0	..	..	428 2 0	..	..	26,518 2 0	58,009 0 0

* Railways Improvement Authorization Act 1914 Account.

TABLE No. 3—*continued.*

Expenditure on Railways to 31st March, 1929—*continued.*

Lines of Railway.	Total Expenditure by General Government to 31st March, 1928.	Recoveries on Account of Expenditure of Previous Years.	Expenditure out of Public Works Fund during Year 1928-29: New Works.		Expenditure under Special Acts during Year 1928-29.*	Amounts previously charged to "Surveys of New Lines" now charged to Individual Lines.	Total Expenditure by General Government to 31st March, 1929.	Valuation of Works constructed by Provinces and Midland Railway Company.
			Construction and Surveys.	Works on Open Lines.				
Waitaki to Bluff—*continued.*	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Livingstone Branch (Windsor to Tokarahi) ..	83,585 0 0	..	..	38 4 11	..	..	83,623 4 11	..
Waihemo Branch (Palmerston to Dunback) ..	33,515 18 3	..	..	15 10 8	..	..	33,531 8 11	..
Fernhill Railway	1,415 0 0	..	..	..	..	..	1,415 0 0	..
Brighton Road Branch	6,474 0 0	..	..	..	..	..	6,474 0 0	12,829 0 0
Outram Branch (Mosgiel to Outram)	12,051 0 7	..	..	..	..	..	12,051 0 7	29,691 0 0
Lawrence Branch	714,221 5 5	1,580 6 6	4,333 16 0	20 18 5	..	..	716,995 13 4	..
Balclutha to Tuapeka Mouth	2,489 0 0	..	..	..	..	..	2,489 0 0	..
Catlin's River Branch (Balclutha to Tahakopa) ..	463,158 13 6	..	..	132 8 7	..	..	463,291 2 1	..
Heriotburn Branch (Waipahi to Edievale)	124,808 4 5	..	..	..	..	..	124,808 4 5	..
Waikaka Branch (McNab to Waikaka)	68,423 0 0	..	..	..	..	..	68,423 0 0	..
Gore to Lumsden	112,143 0 0	..	..	..	201 3 2	..	112,344 3 2	..
Edendale to Glenham	53,467 11 6	..	..	145 12 1	..	..	53,613 3 7	..
Riversdale to Switzers	82,304 0 0	18 16 0	..	..	..	..	82,285 4 0	..
Seaward Bush to Catlin's (Appleby to Tokanui) ..	185,335 6 0	6 15 0	..	..	..	..	185,328 11 0	..
Otago Central (Wingatui to Cromwell)	1,439,143 17 8	..	..	328 3 4	978 0 8	..	1,440,450 1 8	..
Invercargill to Kingston—								
Main Line	367,346 3 11	..	..	..	296 14 6	..	367,642 18 5	91,937 0 0
Mararoa Branch (Lumsden to Mossburn)	27,508 4 4	..	..	..	..	..	27,508 4 4	..
Winton to Heddon Bush	140 0 0	..	..	..	..	..	140 0 0	..
Makarewa to Orepuki and Waiau	359,248 6 3	..	..	..	822 5 1	..	360,070 11 4	37,097 0 0
Thornbury to Wairio	92,960 19 2	..	..	651 5 11	159 14 7	..	93,771 19 8	23,200 0 0
Forest Hill (Winton to Hedgehope)	23,337 0 0	..	..	..	..	..	23,337 0 0	..
Expenses of Railway Commissions and other Expenditure not chargeable to Individual Lines	10,337 0 0	..	..	..	..	..	10,337 0 0	..
Surveys of New Lines—								
North Island	29,680 17 10	..	181 5 2	..	..	..	29,862 3 0	..
Middle Island	5,763 0 0	..	..	..	..	..	5,763 0 0	..
Rolling-stock	10,204,494 11 0	..	..	201,587 14 0	..	..	10,406,082 5 0	..
General	12,188 19 10	..	..	987 9 1	3,335 10 4	..	16,511 19 3	..
Miscellaneous works, R.I.A.	7,741 17 0	..	..	..	*Cr.* 2,319 15 11	..	5,422 1 1	..
Suspense Account, being proportion of cost of raising loans for Railways Authorization Improvement Act 1914 Account	15,874 13 3	..	..	..	*Cr.* 15,874 13 3	..	..	..
Stock of Permanent-way Materials	16,943 2 3	1 6 3	*Cr.* 11,028 16 4	..	..	..	5,912 19 8	..
Total	56,541,247 5 10	2,595 4 4	1,104,848 14 9	368,885 16 9	2,007,616 18 4	..	60,020,003 11 4	1,787,741 0 0†

* 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	..	9,633
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
1921-22	..	..	..	..	51,471	54,379
1922-23	..	..	..	..	78,350	66,708
1923-24	..	..	..	..	49,186	70,533
1924-25	..	..	..	..	23,144	53,887
1925-26	..	..	..	..	17,181	47,908
1926-27	..	..	..	..	12,714	65,855
1927-28	..	..	..	..	6,337	59,644
1928-29	..	..	..	..	..	52,310
	697,408	206,626	165,679	53,401	424,346	660,299

* 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.

TABLE No. 5.

EXPENDITURE ON PUBLIC BUILDINGS OUT OF PUBLIC WORKS FUND TO THE 31ST MARCH, 1929, AND THE LIABILITIES ON THAT DATE.

—	Total Expenditure to 31st March, 1928.	Expenditure for Year ended 31st March, 1929.	Total Expenditure to 31st March, 1929.	Liabilities on Authorities, Contracts, &c., 31st March, 1929.	Total Expenditure and Liabilities.
	£	£	£	£	£
Judicial*	1,393,915	26,864	1,420,779	2,793	1,423,572
Postal and telegraph	2,076,606	60,107	2,136,713	6,199	2,142,912
Customs	49,441	..	49,441	..	49,441
Offices for public Departments	804,347	3,852	808,199	368	808,567
Mental hospitals	1,263,268	96,782	1,360,050	10,793	1,370,843
Alexandra Depot, Wellington†	8,084	..	8,084	..	8,084
School buildings	3,089,393	*Cr.* 2,428	3,086,965	..	3,086,965
Health and Hospital Institutions‡	342,480	19,637	362,117	311	362,428
Quarantine stations	62,464	..	62,464	..	62,464
Parliament Buildings (old buildings) ..	76,553	..	76,553	..	76,553
Parliament Buildings (new buildings) ..	393,590	35	393,625	..	393,625
Parliament Buildings (alterations to streets surrounding grounds, and purchase of land)	14,187	..	14,187	..	14,187
Government House, Wellington (land and new building)	72,645	..	72,645	..	72,645
Agricultural	98,822	413	99,235	24	99,259
Workers' dwellings	319,916	..	319,916	..	319,916
Miscellaneous	70,813	..	70,813	..	70,813
Totals	10,136,524	205,262	10,341,786	20,488	10,362,274

* Includes Courthouses, prisons, and police-stations. † Expenditure *re* Defence requirements only. Other expenditure included in "Judicial" class. ‡ Includes £32,754 previously shown under "Public Health."

TABLE No. 6.

ELECTRIC SUPPLY ACCOUNT.

STATEMENT OF ACCOUNTS AT THE 31st MARCH, 1929.

GENERAL BALANCE-SHEET AT 31st MARCH, 1929, COMPARED WITH POSITION AT 31st MARCH, 1928.

1927–28.	*Liabilities.*	1928–29.		1927–28.	*Assets.*	1928–29.	
£ s. d.		£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.
	Aid to Water-power Works and Electric Supply Accounts—			1,644,140 3 11	Lake Coleridge scheme—		
	Debentures issued—			36,884 14 0	Assets as per separate balance-sheet ..	1,685,557 18 1	
274,000 0 0	At 4 per cent. interest	..			Investments, Sinking Fund	65,396 1 11	
225,000 0 0	At 4½ per cent. interest	27,500 0 0		1,681,024 17 11			1,750,954 0 0
53,550 0 0	At 5 per cent. interest	120,570 0 0			Lake Waikaremoana scheme—		
..	At 5¼ per cent. interest	162,400 0 0		652,454 5 3	Assets as per separate balance-sheet ..	1,003,734 10 3	
103,900 0 0	At 5½ per cent. interest	97,900 0 0		18,756 14 2	Profit and Loss Account—Loss to date ..	23,190 0 2	
	N.Z. inscribed stock—						
806,560 0 0	At 5 per cent. interest (due 1930) ..	806,560 0 0		671,210 19 5			1,026,924 10 5
160,000 0 0	At 5½ per cent.	577,080 0 0					
294,100 0 0	At 5½ per cent. (due 1936)	300,100 0 0			Waikato River schemes—		
	N.Z. Consolidated Stock—				Horahora—		
542,004 10 10	At 4½ per cent. (due 1936–58) ..	2,392,357 10 2		1,010,006 16 5	Assets as per separate balance-sheet ..	1,178,859 10 11	
2,577,652 19 6	At 5 per cent. (due 1935–46).. ..	2,577,652 19 6		40,115 8 11	Investments, Sinking Fund	52,163 18 3	
1,884,642 6 3	At 6 per cent. interest (due 1936–51) ..	1,884,642 6 3		1,050,122 5 4			1,231,023 9 2
	Temporary transfer, section 40, Public						
100,000 0 0	Revenues Act, 1926	..			Arapuni—		
7,021,409 16 7			8,946,762 15 11	1,997,795 13 10	Assets as per separate balance-sheet ..	..	2,286,838 12 10
					Mangahao scheme—		
				2,450,455 1 4	Assets as per separate balance-sheet ..	2,503,087 9 9	
	Waihi Gold-mining Company (Limited)—			255,737 4 9	Profit and Loss Account—Loss to date ..	354,317 13 3	
	Purchase of Horahora works—Deed of security at 5 per cent. interest. (Due						2,857,405 3 0
212,500 0 0	1/11/1931)	..	212,500 0 0	2,706,192 6 1			
	Consolidated Fund—				Other schemes, surveys, &c.—		
	Interest accrued on loans to 31st March,			6,051 16 0	North Island	4,288 18 8	
73,089 17 7	1929	94,297 15 4		27,191 13 5	South Island	..	
137 13 4	Sundry creditors for interest unclaimed ..	1,496 8 6		..	Waitaki River scheme	118,699 19 4	
			95,794 3 10	..	Other schemes	9,196 0 11	
73,227 10 11				33,243 9 5		132,184 18 11	
					£ s. d.		
	Amount set aside as reserve to cover difference between interest payable on loans raised and interest earned from their			558 7 7	Material on hand .. 8,486 11 11		
				5 11 10	Sundry debtors .. 748 11 9		
31,531 18 8	temporary investment pending use ..	..	28,458 19 5	33,807 8 10		9,235 3 8	
							141,420 2 7
7,338,669 6 2	Carried forward	..	9,283,515 19 2	8,140,153 11 5	Carried forward	..	9,294,565 18 0

TABLE No. 6—*continued.*

ELECTRIC SUPPLY ACCOUNT—*continued.*

STATEMENT OF ACCOUNTS AT THE 31ST MARCH, 1929—*continued.*

GENERAL BALANCE-SHEET AT 31ST MARCH, 1929, AS COMPARED WITH POSITION AT 31ST MARCH, 1928—*continued.*

1927–28.	*Liabilities.*	1928–29.		1927–28.	*Assets.*	1928–29.	
£ s. d.		£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.
7,338,669 6 2	Brought forward	..	9,283,515 19 2	8,140,153 11 5	Brought forward	..	9,294,565 18 0
	Sundry Creditors—				Balance in Electric Supply Account at the end of the year—		
182,112 9 6	Arapuni scheme	30,173 16 7					
15,191 2 6	Horahora scheme	14,011 15 4		30,803 17 2	Cash in Public Account	492,186 12 0	
15,247 7 2	Lake Coleridge scheme	11,385 19 4			In hands of Government officers in New		
75,601 7 1	Mangahao scheme	22,661 17 10		185 0 11	Zealand	52 12 10	
51,307 2 1	Waikaremoana scheme	29,460 2 8			In hands of Government officers in		
..	Waitaki scheme	7,186 11 7		41,711 13 10	London	4,848 8 9	
2,632 10 11	South Island surveys	102 2 2					497,087 13 7
342,091 19 3			114,982 5 6*	72,700 11 11			
	Depreciation Reserves—				Investment Account (funds invested until		
84,271 11 6	Horahora scheme	103,186 12 8			actually required for use)	..	200,000 0 0
173,231 5 10	Lake Coleridge scheme	192,358 19 9					
101,817 2 7	Mangahao scheme	147,871 1 0					
8,924 11 7	Waikaremoana scheme	11,868 15 1		..			
368,244 11 6			455,285 8 6				
	Fire Insurance Reserves—				Proportion of 1929 loan in transit, 31st		
					March, 1929	..	60,057 17 11
..	Lake Coleridge scheme	52 0 0					
..	Mangahao scheme	99 5 4					
..	Waikaremoana scheme	57 0 8					
			208 6 0				
	Sinking Fund Reserves—			994 18 8	Interest accrued on investments to 31st		
49,847 8 11	Horahora scheme	52,163 18 3		1,317 0 5	March, 1929	2,630 2 9	
62,465 1 10	Lake Coleridge scheme	115,769 17 9			Sundry debtors for interest due but unpaid	..	
112,312 10 9			167,933 16 0	2,311 19 1			2,630 2 9
	Reserve Fund—						
53,845 2 5	Horahora scheme	..	32,415 2 11				
	Writings-off in Suspense—						
2 12 4	Lake Coleridge scheme	..	0 14 2				
8,215,166 2 5	Total	..	£10,054,341 12 3	8,215,166 2 5	Total	..	£10,054,341 12 3

* Sundry creditors—Departmental, £57,597 3s. 4d.; other Government departments, £995 4s. 2d.; non-departmental, £56,389 18s.

I hereby certify that the General Balance-sheet has been duly examined and compared with the relative books and documents submitted for audit, and correctly states the position as disclosed thereby.—G. F. C. CAMPBELL, Controller and Auditor-General.

J. J. GIBSON,
Accountant, Public Works Department.

TABLE No. 6—*continued.*

LAKE COLERIDGE HYDRO-ELECTRIC-POWER SUPPLY.

Profit and Loss Account for Year ended 31st March, 1929, compared with Year ended 31st March, 1928.

Gross Revenue Account.

1927-28.	—	1928-29.		1927-28.	—	1928-29.	
£ s. d.	To Generating expenses, headworks, and power-house—	£ s. d.	£ s. d.	£ s. d.	By Sale of energy—	£ s. d.	£ s. d.
				168,584 15 9	Wholesale	184,376 5 2	
3,226 14 10	Salaries	3,217 4 8		164 5 2	Retail	145 8 5	
1,241 0 7	Wages	1,236 9 9					184,521 13 7
57 4 1	Supplies	64 13 2		168,749 0 11			
251 11 7	Transport of stores, &c.	297 5 10					
	Maintenance and repairs—						
2,813 3 11	Harper diversion	1,200 18 0		..	Discounts forfeited, &c.	..	25 0 0
4,371 11 3	Headworks	2,048 1 11					
559 18 8	Power-house building	211 6 10					
1,599 13 1	Power-house machinery	1,683 0 0					
377 0 10	Roads and fences	436 6 7					
651 4 4	Staff residences, &c.	975 10 6			Rents—		
			11,370 17 3	1,210 15 1	Land and buildings	1,242 13 2	
15,149 3 2				223 5 1	Electric lines	312 15 2	
				411 9 4	Electric plant	232 2 5	
	Transmission-lines—						1,787 10 9
529 13 11	Salaries	540 0 0		1,845 9 6			
532 16 3	Transport, including upkeep of horses and motor-vehicles	565 0 4					
2,562 10 1	Repairs to power-lines	2,250 4 11					
558 13 5	Live-line testing	20 3 6			Fees for testing and repairing electrical appliances	..	285 3 8
			3,375 8 9	386 12 11			
4,183 13 8							
	Substation, Addington—						
1,457 15 8	Salaries	1,406 6 6					
584 10 6	Wages	599 15 0					
119 10 10	Supplies	58 4 8					
	Maintenance and repairs—						
379 5 8	Buildings and yards	300 3 9					
815 1 11	Machinery	889 19 1					
			3,254 9 0	145 17 7	Earnings, motor-vehicles	..	344 0 0
3,356 4 7							
	Distribution—						
220 0 0	Salaries	440 0 0					
68 19 7	Transport, including upkeep of motor-vehicles (not allocated)	..					
3,275 12 8	Maintenance of feeder cables, transformer stations, and tools	1,059 12 11					
4,021 10 3	Maintenance of secondary distribution ..	4,124 1 9					
319 13 11	Maintenance of and testing meters ..	197 18 1					
100 17 9	Earth-testing	242 7 4					
			6,064 0 1				
8,006 14 2							
30,695 15 7	Carried forward	..	24,064 15 1	171,127 0 11	Carried forward	..	186,963 8 0

TABLE No. 6—*continued.*

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

PROFIT AND LOSS ACCOUNT FOR YEAR ENDED 31ST MARCH, 1929, COMPARED WITH YEAR ENDED 31ST MARCH, 1928—*continued.*

Gross Revenue Account—continued.

1927–28.	——	1928–29.		1927–28.	——	1928–29.	
£ s. d.		£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.
30,695 15 7	Brought forward	..	24,064 15 1	171,127 0 11	Brought forward	..	186,963 8 0
	Management and general expenses—						
5,358 6 6	Salaries	2,950 17 11					
532 11 10	Sick and holiday pay to workmen ..	422 9 4					
629 18 4	Travelling-expenses	63 15 1					
336 0 0	Office-rent	336 0 0					
65 10 0	Rent of other buildings	65 10 0					
104 18 2	Postages and telegrams	92 10 11					
161 16 2	Telephone subscriptions	175 12 3					
47 1 1	Printing and stationery	86 15 8					
12 8 9	Advertising	13 8 9					
319 12 6	Accident pay	77 15 11					
139 15 8	Fire insurance	121 6 11					
..	Fire Insurance Reserve Account	52 0 0					
95 10 6	Audit fees	124 6 0					
266 12 6	Meter-reading and line-inspection ..	287 3 0					
238 15 3	Electrical testing	216 13 3					
26 11 7	Miscellaneous trade expenses	9 3 2					
2 12 4	Bad Debts Suspense Account	0 14 2					
	Proportion of salaries, rents, and expenses, Head Office and High Commissioner's						
1,020 0 0	Staff	970 0 0					
			6,066 2 4				
9,358 1 2							
			30,130 17 5				
40,053 16 9							
131,073 4 2	Balance to Net Revenue Account	..	156,832 10 7				
£171,127 0 11			£186,963 8 0	£171,127 0 11			£186,963 8 0

Net Revenue Account.

£ s. d.		£ s. d.	£ s. d.			£ s. d.
29,862 19 7	To Depreciation at 2 per cent. per annum on completed work ..	29,846 15 7	131,073 4 2	By Balance from Gross Revenue Account ..	..	156,832 10 7
75,629 16 9	Interest for year ended 31st March	76,611 19 2				
25,580 7 10	Balance to Profit and Loss Appropriation Account ..	50,373 15 10				
£131,073 4 2		156,832 10 7	£131,073 4 2			£156.832 10 7

TABLE No. 6—*continued.*

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

Profit and Loss Appropriation Account.

1927–28.	——	1928–29.	1927–28.	——	1928–29.
£ s. d.		£ s. d.	£ s. d.		£ s. d.
..	To Balance from previous year's statement	..	25,580 7 10	By Balance from Net Revenue Account	50,373 15 10
25,580 7 10	Sinking Fund Reserve	50,373 15 10			
£25,580 7 10		£50,373 15 10	£25,580 7 10		£50,373 15 10

Depreciation Reserve Account.

£ s. d.		£ s. d.	£ s. d.		£ s. d.
	To Amounts written off—				
4,929 11 0	Motor-vehicles, tools, plant, &c.	17,648 6 8	142,594 2 0	By Balance from previous year's statement..	173,231 5 10
173,231 5 10	Balance	192,358 19 9	5,703 15 3	Interest at 4 per cent. per annum	6,929 5 0
			29,862 19 7	Amount set aside as per Net Revenue Account	29,846 15 7
£178,160 16 10		£210,007 6 5	£178,160 16 10		£210,007 6 5

Fire Insurance Reserve Account.

£ s. d.		£ s. d.	£ s. d.		£ s. d.
..	To Balance	52 0 0	..	By amount set aside in respect to Dwellings as per Gross Revenue Account	52 0 0
..		52 0 0	..		52 0 0

Sinking Fund Reserve Account.

£ s. d.		£ s. d.	£ s. d.		£ s. d.
62,465 1 10	To Balance	115,769 17 9	35,442 19 5	By Balance at close of previous year	62,465 1 10
			25,580 7 10	Amount set aside as per Profit and Loss Appropriation Account	50,373 15 10
			1,441 14 7	Interest	2,931 0 1
£62.465 1 10		£115,769 17 9	£62,465 1 10		£115,769 17 9

Arrears of Sinking Fund contributions at 31st March, 1929 .. .. £7,561 0 0

TABLE No. 6—*continued.*

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

BALANCE-SHEET AT 31ST MARCH, 1929.

1927–28.	*Liabilities.*	1928–29.		1927–28.	*Assets.*	1928–29.	
£ s. d.		£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.
173,231 5 10	Depreciation Reserve	..	192,358 19 9	5,270 13 8	Works at Lake Coleridge— Land, including fencing and planting ..	5,300 14 2	
				10,977 19 5	Coalgate Gorge Road	10,977 19 5	
				7,566 3 8	Service roads	7,731 3 8	
				310 8 5	Service telephones	310 8 5	
62,465 1 10	Sinking Fund Reserve	..	115,769 17 9	24,125 5 2			24,320 5 8
..	Fire Insurance Reserve	..	52 0 0		Headworks—		
	Sundry creditors—			80,743 2 10	First tunnel, including inlet and outlet works	80,760 11 0	
7,373 18 6	Public Works Department	5,675 3 11			Second tunnel, including inlet and outlet		
2,568 9 9	Other Government Departments	412 18 2		237,310 10 0	works	235,701 16 0	
5,304 18 11	Non-departmental	5,297 17 3		121,524 12 0	Pipe-lines	136,180 15 8	
			11,385 19 4	3,905 7 10	Tram-lines	4,129 11 3	
15,247 7 2				5,173 2 0	Weir at lake outlet, gauges, and fencing ..	2,192 2 2	
				23,007 6 9	Harper River diversion works	23,132 11 7	
							482,097 7 8
2 12 4	Writings-off in suspense	..	0 14 2	471,664 1 5			
	Balance carried to general balance-sheet—				Power-house—		
1,681,024 17 11	Total assets as *per contra*	1,750,954 0 0		53,552 6 8	Buildings, &c.	56,469 14 1	
250,946 7 2	*Less* total liabilities as above	319,567 11 0		151,867 8 9	Machinery, &c.	151,502 9 8	
			1,431,386 9 0	238 2 1	Office furniture, fittings, &c.	238 2 1	
1,430,078 10 9				205,657 17 6			208,210 5 10
				24,571 9 7	Accommodation for staff and workmen— Buildings, fencing, &c.	..	24,610 16 7
					Transmission-lines—		
				3,924 19 2	Land	3,931 11 8	
				182,665 4 11	Power-lines to Christchurch	180,529 4 9	
				..	Power-lines to North Canterbury ..	17,588 9 8	
				113,845 18 6	Power-lines to South Canterbury ..	113,851 17 0	
				42,784 16 3	Power-lines, Timaru–Oamaru	42,805 1 11	
				2,480 7 8	Telephone-system	2,480 7 8	
				3,244 17 3	Linemen's cottages, depots, tools, and equipment	3,244 17 3	
				6,588 12 4	Alterations to public telegraph-lines ..	6,588 12 4	
				10,212 13 0	Point Switching Station	10,167 16 7	
				365,747 9 1			381,187 18 10
1,681,024 17 11	Carried forward	..	1,750,954 0 0	1,091,766 2 9	Carried forward	..	1,120,426 14 7

TABLE No. 6—*continued.*

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

BALANCE-SHEET AT 31ST MARCH, 1929—*continued.*

1927–28.	*Liabilities.*	1928–29.		1927–28.	*Assets.*	1928–29.	
£ s. d.		£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.
1,681,024 17 11	Brought forward	..	1,750,954 0 0	1,091,766 2 9	Brought forward	..	1,120,426 14 7
					Addington Substation—		
				1,643 0 5	Land	1,643 0 5	
				2,000 0 0	Cottages	2,000 0 0	
				9,573 10 5	Substation buildings	9,318 18 9	
				60,812 12 11	Machinery, &c.	65,654 0 7	
				5,991 16 3	Store buildings and workshops	6,003 0 9	
				80,021 0 0			84,619 0 6
					Primary distribution—		
				8,353 17 1	Supply cables—Christchurch City ..	8,366 1 11	
				5,204 0 4	Christchurch Tramways ..	5,204 0 4	
				7,868 8 1	Lyttelton	8,154 6 1	
				26,522 17 2	Northern	14,158 17 6	
				13,406 3 4	Southern	7,590 15 10	
				4,064 7 7	Motukarara	4,064 7 7	
				11,009 19 3	Substations—Hororata	11,974 14 6	
				14,097 6 6	Ashburton	13,791 17 7	
				26,256 10 7	Timaru	26,400 0 6	
				7,544 8 1	Oamaru	9,327 1 0	
				622 9 9	Lightning-arresters	622 9 9	
				300 4 5	Tools and equipment	300 4 5	
				1,516 12 8	Alterations to public telegraph-lines ..	1,516 12 8	
				126,767 4 10			111,471 9 8
					Secondary distribution—		
				17,001 5 3	Supply cables and reticulation	17,848 17 5	
				30,824 1 2	Local substations	27,448 3 11	
				47,825 6 5			45,297 1 4
				8,008 2 8	Service transformers and meters	..	6,869 1 10
				10,568 10 8	Motor-cars, lorries, and cycles, &c.	..	9,541 14 6
				92 12 7	Test room equipment	..	129 7 1
				17,814 10 6	Loose tools, plant, and equipment	..	18,177 12 10
				1,729 3 9	Public telephones to the lake	..	1,729 3 9
1,681,024 17 11	Carried forward	..	1,750,954 0 0	1,384,592 14 2	Carried forward	..	1,398,261 6 1

TABLE No. 6—*continued.*

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

BALANCE-SHEET AT 31ST MARCH, 1929—*continued.*

1927–28.	*Liabilities.*	1928–29.		1927–28.	*Assets.*	1928–29.	
£ s. d.		£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.
1,681,024 17 11	Brought forward	..	1,750,954 0 0	1,384,592 14 2	Brought forward	..	1,398,261 6 1
					Telephones to Christchurch City Council and Tramway Board and local offices	..	
				173 19 1			173 19 1
				255 1 0	Christchurch office—Furniture and fittings ..	..	261 6 0
				57,419 12 10	Engineering, office, and general expenses on preliminary surveys and during construction	..	56,039 10 11
				38,737 14 3	Salaries of Engineers and others on preliminary surveys and during construction	..	39,706 11 0
				18,469 0 0	Cost of raising loans	..	24,058 0 0
				61,432 11 6	Interest during construction	..	62,761 1 11
				1,561,080 12 10			1,581,261 15 0
				41,793 15 5	Stocks of material, &c., on hand	..	25,985 4 2
				167 7 2	Telephone subscriptions, fire insurance, &c., paid in advance	..	43 9 0
					Sundry debtors for current rent, work carried out, &c.—		
				357 0 10	Public Works Department	2,814 7 2	
				2,167 6 5	Other Government Departments ..	32,043 15 8	
				38,574 1 3	Non-departmental	43,409 7 1	
				41,098 8 6			78,267 9 11
					Sinking Fund—		
				36,264 9 2	Investment and cash in hands of Treasury	64,447 1 7	
				620 4 10	Interest accrued	949 0 4	
				36,884 14 0			65,396 1 11
£1,681,024 17 11			£1,750,954 0 0	£1,681,024 17 11			£1,750,954 0 0

I hereby certify that the balance-sheet and accompanying accounts have been duly examined and compared with the relative books and documents submitted for audit, and correctly state the position as disclosed thereby.—G. F. C. CAMPBELL, Controller and Auditor-General.

TABLE No. 6—*continued.*

MANGAHAO ELECTRIC-POWER SUPPLY.

Profit and Loss Account for the Year ended 31st March, 1929, compared with Year ended 31st March, 1928.

Gross Revenue Account.

1927–28.	——	1928–29.		1927–28.	——	1928–29.	
£ s. d.		£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.
	To Generating-expenses, headworks, and power-house—			150,727 10 7	By Sale of energy— Wholesale	184,332 4 4	
4,133 15 5	Salaries, wages, and allowances ..	4,207 14 7		3,501 17 2	Retail (staff cottages and construction works)	493 17 8	
626 19 7	Maintenance headworks, dams, pipe-lines, and tail-race	1,495 7 6		154,229 7 9		184,826 2 0	
1,266 2 11	Maintenance power-house building and machinery	1,712 3 2		111,744 14 11	Less stand-by, &c.	72,563 6 6	
762 4 11	Maintenance staff-village and roads, transport and general	771 15 10		42,484 12 10			112,262 15 6
6,789 2 10			8,187 1 1				
	Transmission-lines, patrol maintenance, &c.—				Rents—		
2,952 12 7	Mangaore–Khandallah	2,755 4 7		1,522 0 2	Cottages, &c.	1,574 17 6	
3,273 14 9	Mangaore–Wanganui	2,811 2 5		96 7 0	Poles and plant	241 18 2	
2,218 13 2	Bunnythorpe–Dannevirke	1,553 6 6		1,618 7 2			1,816 15 8
2,407 8 5	Woodville–Masterton	1,566 1 5					
2,634 4 11	Dannevirke–Napier	2,186 10 1		8 12 0	Tests and inspections	..	68 14 4
56 18 3	Miscellaneous 11,000-volt lines ..	161 6 0		0 3 2	Penalty interest	..	..
13,543 12 1			11,033 11 0				
	Substations — Operating, maintenance, &c.—						
2,013 7 8	Khandallah	2,025 16 6					
3 19 6	Otaki	11 14 8					
401 7 3	Bunnythorpe	460 0 3					
405 7 3	Dannevirke	555 16 10					
381 15 2	Waipukurau	211 2 0					
422 4 4	Woodville	500 19 10					
402 14 0	Mangamaire	610 0 3					
294 3 0	Masterton	176 11 2					
204 6 10	Wanganui	304 13 1					
583 1 1	Napier	609 18 8					
5,112 6 1			5,466 13 3				
	Management and general expenses—						
4,041 12 0	Management and office salaries, &c. ..	2,645 9 11					
2,667 18 6	Distribution salaries and expenses and transport	1,734 14 9					
437 6 1	Postages, telephones, &c.	429 0 7					
7,146 16 7	Carried forward	4,809 5 3	24,687 5 4	44,111 15 2	Carried forward	..	114,148 5 6

TABLE No. 6—*continued.*

MANGAHAO ELECTRIC-POWER SUPPLY—*continued.*

PROFIT AND LOSS ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 1929, COMPARED WITH YEAR ENDED 31ST MARCH, 1928—*continued.*

Gross Revenue Account—continued.

1927–28.	——	1928–29.		1927–28.	——	1928–29.	
£ s. d.		£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.
7,146 16 7	Brought forward	4,809 5 3	24,687 5 4	44,111 15 2	Brought forward	..	114,148 5 6
	To Management and general—*continued.*						
302 10 10	Printing, stationery, and advertising..	177 4 6					
277 18 6	Motor-cars and general travelling-expenses	737 11 3					
42 15 1	Accident, sick, and holiday pay ..	223 4 8					
42 12 3	Fire insurance	10 6 8					
93 17 0	Legal expenses and Audit fees ..	143 2 3					
..	Stores administration	1,021 17 10					
563 0 11	Miscellaneous expenses	2,647 11 3					
			9,770 3 8				
8,469 11 2							
33,914 12 2							
10,197 3 0	Balance to Net Revenue Account ..	..	79,690 16 6				
£44,111 15 2			£114,148 5 6	£44,111 15 2			£114,148 5 6

Net Revenue Account.

£ s. d.		£ s. d.	£ s. d.		£ s. d.
..	To Fire Insurance Reserve	99 5 4	10,197 3 0	By Balance from Gross Revenue Account..	79,690 16 6
	Depreciation at 2 per cent. per annum on completed works		131,544 2 8	Loss for year	98,580 8 6
35,300 13 4	at 31st March, 1929	42,713 17 7			
106,440 12 4	Interest for year ended 31st March, 1929	135,458 2 1			
£141,741 5 8		£178,271 5 0	£141,741 5 8		£178,271 5 0

Profit and Loss Appropriation Account.

£ s. d.		£ s. d.	£ s. d.		£ s. d.
124,193 2 1	To Balance from previous year	255,737 4 9	255,737 4 9	By Balance	354,317 13 3
131,544 2 8	Balance from Net Revenue Account	98,580 8 6			
£255,737 4 9		£354,317 13 3	£255,737 4 9		£354,317 13 3

Arrears of Sinking Fund contributions to 31st March, 1929: £90,562.

TABLE No. 6—*continued.*

MANGAHAO ELECTRIC-POWER SUPPLY—*continued.*

PROFIT AND LOSS ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 1929, COMPARED WITH YEAR ENDED 31ST MARCH, 1928—*continued.*

Depreciation Reserve Account.

1927–28.	——	1928–29.	1927–28.	——	1928–29.
£ s. d.		£ s. d.	£ s. d.		£ s. d.
308 19 11	To Motor-vehicles	158 12 10	64,255 5 0	By Balance at close of previous year	101,817 2 7
..	Meters and regulators	574 0 0	2,570 4 2	Interest at 4 per cent. per annum	4,072 13 8
101,817 2 7	Balance	147,871 1 0	35,300 13 4	Amount set aside as per Net Revenue Account.. ..	42,713 17 7
102,126 2 6		£148,603 13 10	£102,126 2 6		£148,603 13 10

Fire Insurance Reserve Account.

1927–28.	——	1928–29.	1927–28.	——	1928–29.
£ s. d.		£ s. d.	£ s. d.		£ s. d.
..	To Balance	99 5 4	..	By Amount set aside as per Net Revenue Account.. ..	99 5 4
..		£99 5 4	..		£99 5 4

BALANCE-SHEET AS AT 31ST MARCH, 1929.

1927–28.	*Liabilities.*		1928–29.	1927–28.	*Assets.*		1928–29.
£ s. d.		£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.
101,817 2 7	Depreciation Reserve		147,871 1 0	9,990 4 7	Headworks—		
				73,065 5 8	Land, headworks, &c.	9,989 4 7	
..	Fire Insurance Reserve		99 5 4	11,666 15 2	Roads, tram-lines, &c.	73,225 0 6	
				476,658 16 0	Local electric line	11,179 9 2	
75,601 7 1	Sundry creditors		22,661 17 10	152,300 19 10	Dams 1, 2, and 3	503,369 8 4	
				108,788 11 3	Tunnels 1 and 2	159,619 19 10	
	Balance carried to General Balance-sheet—			15,045 7 10	Pipe-line, &c.	113,279 16 5	
2,706,192 6 1	Total assets as *per contra*	2,857,405 3 0			Surge-chamber	15,720 7 6	
177,418 9 8	Less total liabilities as above ..	170,632 4 2		847,516 0 4			886,383 6 4
			2,686,772 18 10				
2,528,773 16 5				63,864 4 4	Power-house—		
				205,852 12 2	Buildings, &c.	66,758 1 4	
				12,870 8 8	Machinery, &c.	205,049 1 4	
				18,619 11 0	Tail-race	12,870 8 8	
					Village, cottages, and water-supply ..	18,680 16 3	
				301,206 16 2			303,358 7 7
					Transmission-lines (110,000-volt)—		
				147,122 1 2	Shannon–Khandallah	147,545 16 10	
				97,742 19 4	Shannon–Wanganui	98,307 13 10	
				45,582 5 7	Bunnythorpe–Dannevirke	45,894 0 4	
				68,717 13 9	Woodville–Masterton	69,163 19 1	
				76,235 4 0	Dannevirke–Napier	76,481 17 2	
				..	Wanganui–New Plymouth	4,346 8 8	
				435,400 3 10			441,739 15 11
2,706,192 6 1	Carried forward		2,857,405 3 0	1,584,123 0 4	Carried forward		1,631,481 9 10

TABLE No. 6—*continued.*

MANGAHAO ELECTRIC-POWER SUPPLY—*continued.*

BALANCE-SHEET AS AT 31ST MARCH, 1929—*continued.*

1927–28.	*Liabilities.*	1928–29.		1927–28.	*Assets.*	1928–29.	
£ s. d.		£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.
2,706,192 6 1	Brought forward	..	2,857,405 3 0	1,584,123 0 4	Brought forward	..	1,631,481 9 10
					Transmission-lines (11,000-volt)—		
				3,004 10 11	Mangaore–Shannon	3,034 3 8	
				4,556 10 0	Khandallah–Petone	4,592 12 2	
				7,561 0 11			7,626 15 10
					Substations—		
				78,126 6 9	Khandallah	89,941 5 2	
				1,973 12 11	Otaki	1,981 12 3	
				32,621 8 1	Bunnythorpe	32,922 0 10	
				21,312 18 7	Wanganui	21,385 8 5	
				19,368 13 7	Dannevirke	22,529 10 7	
				21,871 17 5	Waipukurau	22,373 7 9	
				34,409 11 10	Napier	38,919 2 6	
				12,394 15 4	Woodville	12,633 14 8	
				23,584 7 1	Mangamaire	26,505 8 10	
				12,636 10 10	Masterton	13,026 11 10	
				130 0 0	Marton	166 12 5	
				258,430 2 5			282,384 15 3
				3,738 11 1	Motor-cars, lorries, &c...	..	5,779 15 9
				963 19 10	Office furniture	..	922 12 3
				14,472 18 1	Service buildings	..	14,531 7 2
				130,306 15 6	Salaries and expenses, &c., of engineers and others on preliminary surveys and during construction	..	131,996 18 7
				56,303 18 7	Construction-tools, plant, and equipment, &c.	..	19,397 2 5
				58,692 19 10	Housing workmen, &c...	..	57,624 0 5
				236,993 9 8	Interest during construction	..	239,587 5 4
				22,333 19 6	Cost of raising loans	..	25,380 19 6
				2,373,920 15 9			2,416,713 2 4
				39,088 16 11	Stocks on hand, 31st March, 1929 (including 10 per cent. to cover administration, &c.)	33,421 8 2	
				7,793 4 5	Stocks issued but not used	8,634 15 2	
				..	Stock Adjustment Account	113 9 0	
				46,882 1 4			42,169 12 4
				29,640 9 9	Sundry debtors for current, rents, &c. ..	..	44,203 15 1
				11 14 6	Telephone subscriptions, &c., paid in advance	..	1 0 0
				255,737 4 9	Net loss	..	354,317 13 3
£2,706,192 6 1			£2,857,405 3 0	£2,706,192 6 1			£2,857,405 3 0

I hereby certify that the Profit and Loss Account and Balance-sheet of the above-named electric-power scheme has been duly examined and compared with the relative books and documents submitted for audit, and correctly state the position as disclosed thereby.—G. F. C. CAMPBELL, Controller and Auditor-General.

TABLE No. 6—*continued.*

WAIKATO ELECTRIC-POWER SUPPLY.—HORAHORA SCHEME.

PROFIT AND LOSS ACCOUNT FOR YEAR ENDED 31ST MARCH, 1929, COMPARED WITH YEAR ENDED 31ST MARCH, 1928.

Gross Revenue Account.

1927–28.		1928–29.		1927–28.		1928–29.	
£ s. d.	To Generating expenses, headworks, and power-house—	£ s. d.	£ s. d.	£ s. d.	By Sales of electrical energy to wholesale consumers	£ s. d.	£ s. d.
3,379 5 6	Salaries and wages	3,653 10 4		123,017 19 8		132,720 16 5	
103 16 5	Supplies	622 9 2		347 2 1	*Less* discounts and rebates	73 4 4	
50 12 6	Transport	45 6 10					132,647 12 1
			4,321 6 4	122,670 17 7			
	Maintenance and repairs—						
761 2 3	Headworks and buildings	1,231 17 8					
1,310 2 1	Power-house machinery	678 8 10					
231 13 5	Staff village	222 0 3		9 10 0	Hire of plant	7 10 0	
			2,132 6 9	780 4 11	Rent of lines	778 11 0	
5,836 12 2				1,490 14 2	Miscellaneous rents	1,647 12 5	
							2,433 13 5
	Operation and maintenance of—						
10,608 19 6	Waihi Grand Junction steam-plant	17,835 12 6		2,280 9 1			
..	Diesel Station, Penrose	14,930 6 1					
11,268 8 7	Power purchased in bulk	16,641 14 8					
			49,407 13 3				
21,877 8 1							
	Operation and maintenance of main transmission-lines (50,000-volt)—			297 7 7	Testing, oil-drying, and repairs for consumers	..	361 10 5
1,431 19 8	Horahora–Waikino	2,208 5 8					
280 18 10	Horahora–Hamilton	371 8 8					
180 13 1	Mystery Creek – Te Awamutu	339 11 10					
66 11 4	Te Awamutu – Hangatiki	67 17 0					
50 6 5	Waiorongomai–Waihou	146 10 8					
56 12 10	Horahora–Arapuni	165 12 5					
99 3 6	Arapuni–Ngongotaha	163 12 4		63 0 0	Fees for inspection of lines and testing of instruments	..	68 5 0
145 5 1	Arapuni–Hamilton	..					
3,928 7 1	Hamilton–Penrose	..					
64 19 5	Penrose–Waitemata	225 3 4					
369 9 3	Katikati–Waikino	290 16 8					
58 9 11	Bombay–Waikino	561 13 6					
..	Ngongotaha–Opotiki	821 15 7					
			5,362 7 8				
6,732 16 5							
34,446 16 8	Carried forward	..	61,223 14 0	125,311 14 3	Carried forward	..	135,511 0 11

TABLE No. 6—*continued.*

WAIKATO ELECTRIC-POWER SUPPLY.—HORAHORA SCHEME—*continued.*

PROFIT AND LOSS ACCOUNT FOR YEAR ENDED 31ST MARCH, 1929, COMPARED WITH YEAR ENDED 31ST MARCH, 1928—*continued.*

Gross Revenue Account—continued.

1927-28.	——	1928-29.		1927-28.	——	1928-29.	
£ s. d.		£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.
34,446 16 8	Brought forward	..	61,223 14 0	125,311 14 3	Brought forward	..	135,511 0 11
	To Transmission lines (110,000-volt)—						
..	Arapuni–Hamilton	100 12 4					
..	Hamilton–Penrose	952 10 3					
			1,053 2 7				
	Operation and maintenance of main sub-stations (50,000-volt)—						
771 5 1	Waikino	714 2 9					
593 15 0	Hamilton	735 0 3					
273 8 2	Te Awamutu	309 13 3					
265 18 1	Hangatiki	358 16 7					
334 17 4	Waihou	593 7 8					
24 3 11	Arapuni	14 12 2					
287 10 8	Ngongotaha	318 16 11					
5 7 2	Mamaku	70 0 6					
22 1 1	Bombay	..					
..	Edgecumbe	29 0 3					
913 0 0	Penrose	..					
213 17 8	Henderson	247 6 11					
272 7 10	Takapuna	332 16 5					
0 11 11	Kerepeehi	116 9 1					
			3,840 2 9				
3,978 3 11							
	Operation and maintenance of main sub-stations (110,000-volt)—						
..	Penrose	1,014 9 9					
..	Bombay	165 19 5					
			1,180 9 2				
202 15 3	Operation and maintenance of distribution substations (11,000-volt)	..	190 16 0				
38,627 15 10	Carried forward	..	67,488 4 6	125,311 14 3	Carried forward	..	135,511 0 11

TABLE No. 6—*continued.*

ELECTRIC SUPPLY ACCOUNT—*continued.*

WAIKATO ELECTRIC-POWER SUPPLY.—HORAHORA SCHEME—*continued.*

PROFIT AND LOSS ACCOUNT FOR YEAR ENDED 31ST MARCH, 1929, COMPARED WITH YEAR ENDED 31ST MARCH, 1928—*continued.*

Gross Revenue Account—continued.

1927–28.		1928–29.		1927–28.		1928–29.
£ s. d.	——	£ s. d.	£ s. d.	£ s. d.	——	£ s. d.
38,627 15 10	Brought forward	..	67,488 4 6	125,311 14 3	Brought forward	135,511 0 11
	To Operation and maintenance of distribution-lines (11,000-volt)—					
367 10 0	Horahora–Hamilton–Frankton	333 1 9				
14 9 8	Waikino–Waihi	13 0 6				
381 19 8			346 2 3			
1,927 3 9	General supervision and management of transmission and distributing systems	..	2,187 3 1			
	Management and general—					
3,678 12 5	Salaries, wages, and audit fees ..	3,878 4 10				
339 9 0	Accident insurance, sick and holiday pay	392 7 1				
353 8 4	Travelling-expenses and motor-cars ..	374 3 6				
295 15 2	Postages, telegrams, and telephones ..	284 4 10				
65 12 6	Fire insurance	72 9 0				
160 5 6	Printing, stationery, and advertising ..	199 1 10				
265 16 0	Office rent, cleaning, and lighting ..	268 7 5				
197 5 8	Experimental testing and miscellaneous expenses	382 2 10				
269 12 11	Testing, oil-drying, repairs, &c., for consumers	355 7 0				
5 5 0	Legal expenses	3 8 0				
5,631 2 6			6,209 16 4			
46,568 1 9			76,231 6 2			
78,743 12 6	Balance to Net Revenue Account ..	..	59,279 14 9			
£125,311 14 3			£135,511 0 11	£125,311 14 3		£135,511 0 11

TABLE No. 6—*continued.*

ELECTRIC SUPPLY ACCOUNT—*continued.*

WAIKATO ELECTRIC-POWER SUPPLY.—HORAHORA SCHEME—*continued.*

PROFIT AND LOSS ACCOUNT ENDED 31ST MARCH, 1929, COMPARED WITH YEAR ENDED 31ST MARCH, 1928—*continued.*

Net Revenue Account.

1927–28.		1928–29.	1927–28.		1928–29.
£ s. d.	——	£ s. d.	£ s. d.	——	£ s. d.
44,189 14 1	To Interest on purchase-money for plant purchased from Waihi Gold-mining Co., Ltd., and on advances from Treasury	53,044 11 2	78,743 12 6	By Balance from Gross Revenue Account	59,279 14 9
			..	Balance to Profit and Loss Appropriation Account ..	15,291 9 2
18,646 6 0	Depreciation on completed works (2 per cent.) and on stocks	21,526 12 9			
15,907 12 5	Balance to Profit and Loss Appropriation Account ..	..			
£78,743 12 6		£74,571 3 11	£78,743 12 6		£74,571 3 11

PROFIT AND LOSS APPROPRIATION ACCOUNT FOR YEAR ENDED 31ST MARCH, 1929, COMPARED WITH YEAR ENDED 31ST MARCH, 1928.

£ s. d.		£ s. d.	£ s. d.		£ s. d.
..	To Balance from Net Revenue Account	15,291 9 2	15,907 12 5	By Balance from Net Revenue Account	..
9,732 0 0	Sinking Fund contribution as required by section 12 of the State Supply of Electrical Energy Act, 1917	..	..	Balance to Reserve Account	15,291 9 2
6,175 12 5	Reserve Fund	..			
£15,907 12 5		£15,291 9 2	£15,907 12 5		£15,291 9 2

DEPRECIATION RESERVE ACCOUNT.

£ s. d.		£ s. d.	£ s. d.		£ s. d.
385 6 5	To Cost of replacing Horahora–Waikino Line—six towers and telephone line and hut	..	63,782 3 2	By Balance at close of previous year	84,271 11 6
			2,551 5 9	Interest for year	3,370 17 3
322 17 0	Amount written off for plant sold and replaced	528 10 5	18,646 6 0	Amount set aside as per Net Revenue Account	21,526 12 9
..	Amount written off for plant transferred and replaced ..	3,094 0 0			
..	Amount written off equal to value set aside in respect to assets destroyed by fire at Horahora on 1/9/28	2,359 18 5			
		5,982 8 10			
84,271 11 6	Balance to general balance-sheet	103,186 12 8			
£84,979 14 11		£109,169 1 6	£84,979 14 11		£109,169 1 6

TABLE No. 6—*continued.*

ELECTRIC SUPPLY ACCOUNT—*continued.*

WAIKATO ELECTRIC-POWER SUPPLY.—HORAHORA SCHEME—*continued.*

SINKING FUND ACCOUNT.

1927–28.	——	1928–29.	1927–28.	——	1928–29.
£ s. d.		£ s. d.	£ s. d.		£ s. d.
49,847 8 11	To Balance	52,163 18 3	38,515 1 9	By Balance at close of previous year	49,847 8 11
			9,732 0 0	Amount set aside as per Profit and Loss Appropriation Account	..
			1,600 7 2	Interest	2,316 9 4
£49,847 8 11		£52,163 18 3	£49,847 8 11		£52,163 18 3

RESERVE FUND ACCOUNT.

£ s. d.		£ s. d.	£ s. d.		£ s. d.
..	To Balance from Profit and Loss Appropriation Account ..	15,291 9 2	47,669 10 0	By Balance at close of previous year	53,845 2 5
	Damage by fire at Horahora—		6,175 12 5	Amount set aside as per Profit and Loss Appropriation Account	..
..	Assets destroyed and replaced	4,148 17 8			
..	Assets destroyed but not replaced	1,989 12 8			
		21,429 19 6			
53,845 2 5	Balance carried to general balance-sheet	32,415 2 11			
£53,845 2 5		£53,845 2 5	£53,845 2 5		£53,845 2 5

TABLE No. 6 —*continued.*

ELECTRIC SUPPLY ACCOUNT—*continued.*

WAIKATO ELECTRIC-POWER SUPPLY.—HORAHORA SCHEME—*continued.*

BALANCE-SHEET AT 31ST MARCH, 1929.

1927–28	*Liabilities.*	1928–29.		1927–28.	*Assets.*	1928–29.	
£ s. d.	Electric Supply Account—	£ s. d.	£ s. d.	£ s. d.	Works, &c., at Horahora—	£ s. d.	£ s. d.
846,967 0 0	Balance carried to general balance-sheet ..	1,029,246 0 0		2,168 5 9	Roads and bridges	2,168 5 9	
15,191 2 6	Sundry creditors	14,011 15 4		1,039 15 3	Land and fencing	1,039 15 3	
84,271 11 6	Depreciation reserve	103,186 12 8		11,491 11 6	Accommodation for staff and workmen ..	11,822 5 1	
49,847 8 11	Sinking Fund	52,163 18 3		177,934 2 7	Headworks	178,011 12 10	
53,845 2 5	Reserve Fund	32,415 2 11		73,750 6 2	Generating-station	73,988 18 11	
			1,231,023 9 2	40,626 9 8	Transformer building and machinery ..	38,826 4 6	
				1,639 18 7	Tools and equipment	796 8 6	
				308,650 9 6			306,653 10 10
					Auxiliary plants—		
				10,298 19 1	Waihi Grand Junction steam-plant ..	9,202 5 0	
				..	Diesel Station, Penrose	63,656 17 2	
							72,859 2 2
					Transmission-lines (50,000-volt)—		
				38,660 1 3	Horahora–Waikino	38,767 2 0	
				11,048 13 5	Waikino–Katikati	11,067 17 11	
				4,561 6 6	Waiorongomai–Waihou	4,561 6 6	
				138 19 2	Waihou–Hamilton	138 19 2	
				22,332 6 7	Horahora–Hamilton	22,332 6 7	
				7,803 2 6	Mystery Creek – Te Awamutu	7,803 2 6	
				12,116 18 5	Te Awamutu – Hangatiki	12,158 18 5	
				4,873 0 0	Horahora–Arapuni	4,896 2 7	
				18,903 2 0	Arapuni–Ngongotaha	18,943 3 5	
				..	Ngongotaha–Opotiki	29,449 16 10	
				148 15 9	Arapuni – Te Kuiti	..	
				34,921 4 5	Arapuni–Hamilton	..	
				100,491 0 10	Hamilton–Penrose	..	
				45,878 12 8	Penrose–Takapuna	46,215 9 2	
				31,727 15 8	Bombay–Waikino	31,806 1 1	
				1,543 0 7	Linemen's cottages	1,550 9 6	
				335,147 19 9			229,690 15 8
					Transmission-lines (110,000-volt)—		
				..	Arapuni – Te Kuiti	148 15 9	
				..	Arapuni–Hamilton	35,234 11 0	
				..	Hamilton–Penrose	100,195 1 4	
							135,578 8 1
1,050,122 5 4	Carried forward	..	1,231,023 9 2	654,097 8 4	Carried forward	..	744,781 16 9

TABLE No. 6—*continued.*

ELECTRIC SUPPLY ACCOUNT—*continued.*

WAIKATO ELECTRIC-POWER SUPPLY.—HORAHORA SCHEME—*continued.*

BALANCE-SHEET AT 31ST MARCH, 1929—*continued.*

1927–28.	*Liabilities.*	1928–29.	1927–28.	*Assets.*	1928–29.	
£ s. d.		£ s. d.	£ s. d.		£ s. d.	£ s. d.
1,050,122 5 4	Brought forward	1,231,023 9 2	654,097 8 4	Brought forward	..	744,781 16 9
				Main substations (50,000-volt)—		
			34,432 0 6	Waikino	31,042 4 5	
			10,311 2 0	Hamilton	10,522 16 5	
			6,964 5 7	Te Awamutu	6,966 7 9	
			12,140 2 5	Waihou	10,195 18 8	
			6,885 13 4	Hangatiki	6,858 5 9	
			2,318 19 5	Arapuni	2,369 13 6	
			4,183 2 2	Ngongotaha	4,164 10 5	
			1,614 6 9	Mamaku	1,393 13 11	
			..	Edgecumbe	3,905 1 8	
			3,452 10 3	Bombay	..	
			35,770 19 11	Penrose	..	
			13,966 14 2	Henderson	13,535 7 7	
			12,588 13 0	Takapuna	11,529 18 4	
			604 3 11	Kerepeehi	621 8 1	
			145,232 13 5			103,105 6 6
				Main substations (110,000-volt)—		
			..	Penrose	37,537 8 6	
			..	Bombay	13,452 10 3	
						50,989 18 9
				Distribution-lines (11,000-volt)—		
			33,581 10 5	Horahora–Frankton	33,581 10 5	
			704 11 11	Branch to Waihi Grand Junction ..	704 11 11	
			6,000 0 0	Waikino–Waihi	6,000 0 0	
			3,314 14 3	Bombay–Pukekohe	3,314 14 3	
			43,600 16 7			43,600 16 7
				Distribution substations (11,000-volt)—		
			6,450 14 0	Waihi Grand Junction Co.	8,642 18 6	
			2,278 0 1	Taps for consumers	2,269 12 6	
			8,728 14 1			10,912 11 0
1,050,122 5 4	Carried forward	1,231,023 9 2	851,659 12 5	Carried forward	..	953,390 9 7

TABLE No. 6—*continued.*

ELECTRIC SUPPLY ACCOUNT—*continued.*

WAIKATO ELECTRIC-POWER SUPPLY.—HORAHORA SCHEME—*continued.*

BALANCE-SHEET AT 31ST MARCH, 1929—*continued.*

1927–28.	*Liabilities.*	1928–29.	1927–28.	*Assets.*	1928–29.
£ s. d.		£ s. d.	£ s. d.		£ s. d. £ s. d.
1,050,122 5 4	Brought forward	1,231,023 9 2	851,659 12 5	Brought forward	.. 953,390 9 7
				Hamilton Area—	
			3,997 14 6	Land at Ruakura	3,997 14 6
			8,127 7 1	Stores buildings, fittings, and railway-siding, Ruakura	9,778 8 10
			4,380 5 11	Staff residences, Ruakura	4,397 8 2
			3,678 16 6	Loose tools and equipment	4,163 6 11
			4,101 18 0	Motor lorries, cars, and cycles	4,264 0 6
			924 0 5	Office furniture, Hamilton	696 7 2
			227 9 6	Office accommodation	227 9 6
			11,683 19 5	Engineering office and general expenses on surveys and on construction	12,853 14 8
			22,619 14 5	Salaries of officers on survey and on construction	37,712 8 6
			49,568 5 5	Interest during construction	66,013 11 5
			11,528 0 0	Cost of raising loans	29,865 0 0
			120,837 11 2		173,969 10 2
			675 10 9	Arapuni Area— Electric lines and distribution ..	.. 675 15 6
			973,172 14 4		1,128,035 15 3
			8,710 9 6	General stocks of material on hand ..	.. 14,310 0 3
				Debtors—	
			28,011 14 11	For electricity and sales of materials ..	36,498 6 10
			111 17 8	For payments in advance	15 8 7
			28,123 12 7		36,513 15 5
				Sinking Fund—	
			39,451 5 10	Investments and cash in hands of Treasury	51,406 18 5
			664 3 1	Interest accrued	756 19 10
			40,115 8 11		52,163 18 3
£1,050,122 5 4		£1,231,023 9 2	£1,050,122 5 4		£1,231,023 9 2

NOTE.—The sum of £524,621 4s. 6d., representing various assets which form part of the permanent works of the Arapuni scheme, but which are in the meantime operated in production of Horahora revenue, is included in the above figures. In connection therewith, maintenance (£38,357 6s. 5d.), interest (£25,815 0s. 8d.), and depreciation (£9,812 8s. 5d.) are charged against the Horahora scheme.

The Audit Office having examined the balance-sheet and accompanying accounts, required by law to be audited, hereby certifies them to be correct.—G. F. C. CAMPBELL, Controller and Auditor-General.

TABLE No. 6—*continued.*

WAIKATO ELECTRIC-POWER SUPPLY.—ARAPUNI SCHEME.

BALANCE-SHEET AT 31ST MARCH, 1929.

1927–28.	*Liabilities.*	1928–29.	1927–28.	*Assets.*	1928–29.	
£ s. d.		£ s. d.	£ s. d.		£ s. d.	£ s. d.
			9,108 15 11	Works, &c., at Arapuni—		
	Electric Supply Account—Balance carried to general			Land and fencing	10,703 12 11	
1,815,683 4 4	balance-sheet	2,256,664 16 3	25,893 0 9	Roads and bridges	25,900 18 10	
182,112 9 6	Sundry creditors	30,173 16 7	5,408 9 9	Houses	5,408 9 9	
			6,206 7 10	Offices and temporary buildings ..	6,204 17 10	
						48,217 19 4
			46,616 14 3			
				Headworks—		
			19,649 14 7	Engineering and preliminary works ..	25,281 12 8	
				Dam and other headworks under Arm-		
			1,194,751 5 8	strong-Whitworth's contract ..	1,238,988 10 9	
				Tailrace, power-house, machinery, &c.,		
			17,816 0 6	constructed by Department ..	131,095 1 1	
						1,395,365 4 6
			1,232,217 0 9			
				50,000-volt lines—		
			25,488 6 10	Ngongotaha–Opotiki	..	
			4,654 19 0	Hamilton–Huntly	8,773 9 0	
			0 9 11	Henderson – North Auckland ..	380 7 5	
						9,153 16 5
			30,143 15 9			
				110,000-volt lines—		
			196,629 18 9	Arapuni–Penrose (tower) No. 1 ..	202,400 2 11	
			2 9 1	Arapuni–Penrose (tower) No. 2 ..	1,571 12 3	
			..	Arapuni–Waikaremoana	93 18 8	
						204,065 13 10
			196,632 7 10			
				50,000-volt substations—		
			30,178 17 3	Bombay	..	
			42 13 10	Huntly	4,666 5 11	
			6,989 0 0	Kerepehi	11,198 9 0	
			1,126 7 0	Edgecumbe	8,185 19 6	
			1,052 6 2	Waiotahi	8,395 12 3	
			2,530 11 5	Matamata	7,495 2 4	
						39,941 9 0
			41,919 15 8			
				110,000-volt substations—		
			82,633 3 1	Penrose	103,962 1 8	
			3,701 15 6	Hamilton	13,832 19 2	
			..	Bombay	27,009 4 4	
						144,804 5 2
			86,334 18 7			
			45,802 3 11	Penrose Auxiliary Station Diesel plant ..	..	..
1,997,795 13 10	Carried forward	2,286,838 12 10	1,679,666 16 9	Carried forward	..	1,841,548 8 3

TABLE No. 6—*continued.*

WAIKATO ELECTRIC-POWER SUPPLY.—ARAPUNI SCHEME—*continued.*

BALANCE-SHEET AT 31ST MARCH, 1929—*continued.*

1927–28.	*Liabilities.*	1928–29.	1927–28.	*Assets.*	1928–29.	
£ s. d.		£ s. d.	£ s. d.		£ s. d.	£ s. d.
1,997,795 13 10	Brought forward	2,286,838 12 10	1,679,666 16 9	Brought forward	..	1,841,548 8 3
				General—		
			4,088 3 11	Motor-vehicles	2,220 11 1	
			6,729 10 4	Loose tools, plant, and equipment ..	3,154 16 11	
				Engineering, office, and general expenses on preliminary survey and during construction	53,085 8 11	
			52,702 14 0	Supervision and office expenses on transmission-lines and substations during construction	27,077 2 0	
			25,482 13 9	Interest during construction	242,907 19 1	
			151,940 17 4	Cost of raising loans	69,928 12 4	
			48,007 0 0			398,374 10 4
			288,950 19 4			2,239,922 18 7
			1,968,617 16 1			
			28,218 16 11	Stocks of material on hand	..	44,012 7 9
			959 0 10	Sundry debtors	..	2,903 6 6
£1,997,795 13 10		£2,286,838 12 10	£1,997,795 13 10			£2,286,838 12 10

NOTE.—The sum of £524,621 4s. 6d., respecting various assets which form part of the permanent works of the Arapuni Scheme, but which are in the meantime operated in production of revenue by the Horahora Scheme, has been transferred to the accounts of the latter scheme. In connection therewith maintenance (£38,357 6s. 5d.), interest (£25,815 0s. 8d.), and depreciation (£9,812 8s. 5d.) are charged against the Horahora Scheme.

I hereby certify that the balance-sheet and accompanying accounts have been duly examined and compared with the relative books and documents submitted for audit, and correctly state the position as disclosed thereby.—J. H. FOWLER, Deputy Controller and Auditor-General.

TABLE No. 6—*continued.*

WAIKAREMOANA ELECTRIC-POWER SUPPLY.

PROFIT AND LOSS ACCOUNT FOR YEAR ENDED 31ST MARCH, 1929, COMPARED WITH YEAR ENDED 31ST MARCH, 1928.

Gross Revenue Account.

1927–28.		1928–29.		1927–28.		1928–29.	
£ s. d.	To Generating-expenses, headworks, and power-house (temporary development)—	£ s. d.	£ s. d.	£ s. d.	By Sale of electricity—	£ s. d.	£ s. d.
				2,100 0 0	Wholesale consumers	5,722 0 0	
253 13 9	Operating salaries and wages	859 17 2		128 10 8	Retail consumers	357 0 1	
7 13 2	Operating supplies	112 15 6					6,079 0 1
	Maintenance—			2,228 10 8			
..	Headworks	0 10 9					
78 0 7	Pipe-lines	88 4 9			Rents—		
1 15 2	Power-house building	25 16 1		111 11 9	Cottages, &c.	781 3 5	
2 9 11	Turbines and generators	50 4 0		33 0 0	Land	73 10 0	
2 0 0	Transformers	0 7 0		..	Transmission-line poles	7 4 4	
6 18 11	Switchgear, meters, &c.	35 6 4		2,700 0 0	Plant and land leased to Wairoa Power Board	..	
4 15 6	Staff houses	265 17 8					861 17 9
..	Hostel and single men's quarters ..	17 17 11		2,844 11 9			
..	Permanent electric lines	11 8 6					
..	Water-supply, sewerage, &c.	1 6 11					
..	Removal of refuse	31 15 0					
			1,501 7 7				
357 7 0							
	Operation and maintenance of transmission-line, Waikaremoana–Wairoa—						
	Linesmen's wages and expenses ..	55 1 3					
	Transport of linesmen	20 3 9					
	Repairs and maintenance	8 1 5					
			83 6 5				
	Management and general—						
15 0 0	Salaries and allowances	65 11 5					
..	Travelling-expenses	8 0 0					
10 8 6	Fire insurance	..					
2 0 0	Printing and stationery	9 10 6					
..	Advertising	1 9 9					
8 0 0	Postages and telephone subscriptions ..	25 0 0					
5 0 0	Audit fees	10 0 0					
15 0 0	Head Office expenses	48 0 0					
			167 11 8				
55 8 6							
			1,752 5 8				
4,660 6 11	Balance to Net Revenue Account ..	..	5,188 12 2				
£5,073 2 5			£6,940 17 10	£5,073 2 5			£6,940 17 10

TABLE No. 6—*continued.*

WAIKAREMOANA ELECTRIC-POWER SUPPLY—*continued.*

PROFIT AND LOSS ACCOUNT FOR YEAR ENDED 31ST MARCH, 1929, COMPARED WITH YEAR ENDED 31ST MARCH, 1928.

Net Revenue Account.

1927-28.	——	1928-29.	1927-28.	——	1928-29.
£ s. d.		£ s. d.	£ s. d.		£ s. d.
	To Depreciation at 2 per cent. per annum on completed works		4,660 6 11	By Balance from Gross Revenue Account	5,188 12 2
2,345 9 9	at 31st March, 1929..	2,587 3 10	3,706 9 7	Loss for year	4,433 6 0
6,021 6 9	Interest for year ended 31st March, 1929	6,977 13 8			
..	Contributions to Fire Insurance Reserve for year ended 31st March, 1929	57 0 8			
£8,366 16 6		£9,621 18 2	£8,366 16 6		£9,621 18 2

PROFIT AND LOSS APPROPRIATION ACCOUNT.

£ s. d.		£ s. d.	£ s. d.		£ s. d.
15,050 4 7	To Balance from previous year	18,756 14 2	18,756 14 2	By Balance	23,190 0 2
3,706 9 7	Balance from Net Revenue Account	4,433 6 0			
£18,756 14 2		£23,190 0 2	£18,756 14 2		£23,190 0 2

DEPRECIATION RESERVE ACCOUNT.

£ s. d.		£ s. d.	£ s. d.		£ s. d.
8,924 11 7	To Balance	11,868 15 1	6,326 1 0	By Balance at close of previous year	8,924 11 7
			253 0 10	Interest on £8,924 11s. 7d.	356 19 8
			2,345 9 9	Amount reserved for year	2,587 3 10
£8,924 11 7		£11,868 15 1	£8,924 11 7		£11,868 15 1

FIRE INSURANCE RESERVE ACCOUNT.

£ s d.		£ s. d.	£ s. d.		£ s. d.
..	To Balance	57 0 8	..	By Amount reserved for year	57 0 8
..		£57 0 8	..		£57 0 8

TABLE No. 6—*continued.*

WAIKAREMOANA ELECTRIC-POWER SUPPLY—*continued.*

BALANCE-SHEET AT 31ST MARCH, 1929.

1927–28.	*Liabilities.*	1928–29.	1927–28.	*Assets.*	1928–29.	
£ s. d.		£ s. d.	£ s. d.		£ s. d.	£ s. d.
8,924 11 7	Depreciation reserve	11,868 15 1	34 17 11	Temporary development— Supervision	34 17 11	
..	Fire insurance reserve	57 0 8	741 1 6	Headworks	741 1 6	
	Sundry creditors—		25,962 10 10	Pipe-lines	25,962 10 10	
	Other Government Departments	95 16 3	26,348 12 9	Power-house and machinery	26,348 12 9	
51,307 2 1	Public Works Department	10,129 12 0	3,625 14 2	Turbines and generators	3,625 14 2	
	Non-departmental—Persons or bodies	19,234 14 5	901 15 7	Transformers and lightning-arresters	901 15 7	
610,979 5 9	Balance carried to general balance-sheet	985,538 12 0	79 15 4	Switch-gear	79 15 4	
			442 11 4	Workshop and equipment	442 11 4	
			58,136 19 5			58,136 19 5
				Lower development—		
			313 16 5	Kahutangaroa Dam	..	3,206 5 11
				Main development—		
				Headworks—		
			2,530 7 1	Supervision	3,746 3 6	
			1,941 6 5	River-diversion weir	6,093 4 11	
			6,347 3 1	River-diversion race	6,451 2 0	
			5,034 12 1	Earth dam, Kaitawa	5,939 16 2	
			4,304 17 10	Approach canal to tunnel	5,457 0 3	
			16,928 18 3	Tunnel	21,989 4 0	
			17,269 1 5	Surge-chamber	18,193 18 9	
			59,754 3 11	Pipe-lines	75,450 2 9	
			..	Tail-race	216 16 11	
			1,533 8 5	Tram-line	1,546 17 11	
			3,035 6 9	Access road	3,035 6 9	
			118,679 5 3			148,119 13 11
				Main power-station—		
			1,118 8 7	Supervision	2,989 14 1	
			44,388 6 1	Power-house building	69,307 6 10	
			4,360 13 2	Power-house crane	5,173 18 5	
			1 10 10	Turbines, piping, and valves	26,195 13 3	
			10 5 10	Generators	36,768 5 11	
			..	Exciters	1,222 5 9	
			213 19 6	11 kv. switchgear, metering and control equipment	10,863 13 1	
			..	Low-tension power cables	708 7 5	
			3,489 0 5	Battery and booster	3,881 8 8	
			417 4 5	Local-service transformer	473 12 4	
			172 11 10	Electric wiring and lighting	1,929 8 4	
			..	Telephone equipment, water-recorders, &c.	1,772 14 2	
£671,210 19 5	Carried forward	£1,026,924 10 5	£177,130 1 1	Carried forward	£161,286 8 3	£209,462 19 3

TABLE No. 6—*continued.*

WAIKAREMOANA ELECTRIC-POWER SUPPLY—*continued.*

BALANCE-SHEET AT 31ST MARCH, 1929—*continued.*

1927–27.	*Liabilities.*	1928–29.	1927–28.	*Assets.*	1928–29.	
£ s. d.		£ s. d.	£ s. d.		£ s. d.	£ s. d.
671,210 19 5	Brought forward	1,026,924 10 5	177,130 1 1	Brought forward	161,286 8 3	209,462 19 3
			..	Main power-station—*continued.*		
			1,318 11 11	Load-testing tank	979 14 2	
			1,324 0 2	Access road to power-house	1,337 14 5	
			109 1 10	Workshop and test-room equipment ..	2,387 8 11	
			..	Power-station earths	514 9 11	
				General testing of plant	4 3 8	
						166,509 19 4
			56,923 14 7			
			58,645 14 9	Outdoor station	..	89,568 12 5
			21,459 19 5	Staff village	..	26,986 2 11
				Transmission-lines—		
			93,307 7 10	Waikaremoana–Napier (110 kv.)	155,048 6 2	
			9,589 4 9	Waikaremoana–Gisborne (50 kv.) ..	35,662 8 6	
			22,748 12 8	Waikaremoana-Wairoa (50 kv.	23,620 14 7	
			..	Waikaremoana-Arapuni (110 kv.) ..	1,038 17 6	
			..	Waikaremoana-Maori Pas (400 v.) ..	231 18 4	
						215,602 5 1
			125,645 5 3			
				Substations—		
			5,339 0 5	Gisborne	14,220 9 2	
			2,659 18 1	Wairoa	3,816 18 6	
						18,037 7 8
			7,998 18 6			
				Management and general—		
			479 4 8	Exploration, preliminary survey, &c. ..	585 15 0	
			19,947 11 11	Engineering and office expenses	30,559 5 9	
			8,736 14 2	Salaries (office, &c.)	14,327 12 5	
			1,712 10 5	Travelling and transfer expenses	3,221 6 1	
						48,693 19 3
			30,876 1 2			
			15,798 18 11	Workers' accommodation	..	15,741 10 3
			81 19 5	Accident appliances	..	142 7 8
£671,210 19 5	Carried forward	1,026,924 10 5	494,560 13 1	Carried forward	..	790,745 3 10

TABLE No. 6—*continued.*

WAIKAREMOANA ELECTRIC-POWER SUPPLY—*continued.*

BALANCE-SHEET AT 31ST MARCH, 1929—*continued.*

1927–28.	*Liabilities.*	1928–29.	1927–28.	*Assets.*	1928–29.	
£ s. d.		£ s. d.	£ s. d.			£ s. d.
671,210 19 5	Brought forward	1,026,924 10 5	494,560 13 1	Brought forward	..	790,745 3 10
				Temporary service buildings—		
			4,791 8 8	Tuai and Kaitawa	5,478 12 3	
			4,640 3 4	Wairoa and Napier	4,697 8 1	
			9,431 12 0			10,176 0 4
			3,734 2 4	Harbour facilities—Waikokopu	..	3,767 16 1
			39,801 17 3	Main road and bridges	..	46,482 10 2
			11,641 12 1	Land and fencing	..	13,432 10 2
			1,064 10 4	Telephone-line to Wairoa	..	1,064 10 4
			205 11 8	Works telephone-lines	..	229 10 2
			3,659 2 2	Temporary power-lines	..	3,759 2 1
			958 3 0	Temporary water-supply	..	933 1 0
			58 10 9	Tuai crusher installation	..	..
			105 4 0	Kaitawa crusher installation	..	..
			20 0 0	Insley excavator installation	..	..
			10,366 0 0	Construction plant	..	7,220 0 0
			70 18 10	Office fittings	..	..
			1,489 9 3	Holiday pay to workmen	..	3,483 5 9
			698 11 1	Accident compensation	..	2,230 17 1
			22,623 17 3	Interest during construction	..	45,899 1 2
			13,403 0 0	Costs of raising loans	..	40,193 0 0
			613,892 15 1			969,616 8 2
				Sundry debtors—		
				Other Government Departments ..	269 15 0	
			3,735 6 5	Public Works Department	18,155 3 2	
				Non-departmental persons or bodies ..	2,714 17 6	
			3,486 10 7	Plant and material transferred (within vote)	1,060 12 11	
						22,200 8 7
			31,339 13 2	Stocks of materials, tools, &c.	..	11,917 13 6
			18,756 14 2	Profit and Loss Account—Accumulated loss to date	..	23,190 0 2
						1,026,924 10 5
£671,210 19 5		£1,026,924 10 5	£671,210 19 5			£1,026,924 10 5

I hereby certify that the Profit and Loss Account and Balance-sheet of the above-named electric-power scheme have been duly examined and compared with the relative books and documents submitted for audit, and correctly state the position as disclosed thereby.—G. F. C. CAMPBELL, Controller and Auditor-General.

TABLE No. 7.

IRRIGATION AND WATER-SUPPLY.

SCHEDULE OF SCHEMES COMPLETED OR UNDER CONSTRUCTION.

Scheme.	Source of Supply.	River Discharge (Minimum).	Main Canal Discharge (Maximum).		Average Rainfall from Records available.	Rainfall, 1928.	Area commanded (Gross).	Area irrigated at Present.	Works authorized.		Works completed.		Expenditure to 31st March, 1929.	Remarks.
			As per Design.	During 1928–29.					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	..	20·18 (Steward Settlement)	16·35	18,000	..	14 60	50 31	14 60	50 31	12,115	Completed.
Otekaike ..	Otekaike River ..	9	15	..	22·12 (Duntroon)	20·55	1,500	800	14 37	3 47	14 37	3 47	3,631	Completed. Used only on west side of river.
Ida Valley ..	Manorburn, Poolburn, and Moa Creek. (Storage Manorburn Dam)	..	110	100	16·12 (Moa Creek)	16·66	28,918	11,248	73 0	54 0	73 0	29 50	175,784	Completed.
Galloway ..	Manorburn Dam ..	..	30	27	14·10 (Galloway)	14·79	3,450	2,403	10 50	10 7	10 50	10 7	22,397	Completed.
Manuherikia – Alexandra–Clyde No. 1	Manuherikia River	77	100	82	15·55 (Alexandra, Ophir, and Clyde)	15·64	11,000	5,635	23 0	46 20	23 0	46 20	234,359	Completed.
Ardgour	Lindis River ..	35	20	20	19·46 (Tarras)	21·83	2,000	1,494	13 0	2 40	13 0	2 40	34,114	Completed.
Arrow River ..	Arrow River ..	40	50	..	27·41 (Arrowtown and Frankton)	32·79	6,536	..	..	..	7 51	18 77	77,347	Construction is nearing completion.
Hawkdun (formerly Mount Ida)	Tributaries of Manuherikia River and Eweburn Reservoir	..	60	29	24·65 (Naseby and Naseby Plantation)	27·16	10,000	4,474	66 0	101 0	66 0	90 12	63,259	Practically completed.
Earnscleugh (Fraser River)	Fraser River ..	10	47 (all races)	53	14·45 (Earnscleugh)	16·13	2,743	1,954	11 30	17 60	11 30	17 60	11,358	Extension has been completed, and whole scheme is in working order.
Last Chance (Fruitlands and Earnscleugh Tops)	Shingle, Coal, Gorge, and Butcher's Creek	8	20	12	14·67 (Earnscleugh and Roxburgh East)	16·64	4,300	2,960	22 0	5 70	20 78	5 70	28,877	Completed.
Tarras	Lindis River ..	35	70	40	19·46 (Tarras)	21·83	7,000	4,373	21 70	17 55	21 70	17 55	138,860	Completed.
Bengerburn ..	Bengerburn ..	1	4	4	..	..	1,000	144	2 6	..	2 6	..	694	Completed.
Teviot River ..	Teviot River and Lake Onslow dam	40	80	59	14·90 (Roxburgh East)	17·15	3,300	2,850	16 51	10 55	16 51	10 55	53,097	Completed and serving all land requiring water.
Teviot River Extension	Ditto	40	80	59	14·90 (Roxburgh East)	17·15	2,000	647	3 77	4 2	3 77	4 2		Completed.

TABLE No. 7—*continued.*

IRRIGATION AND WATER-SUPPLY—*continued.*

SCHEDULE OF SCHEMES UNDER INVESTIGATION.

Scheme.	Source of Supply.	River Discharge (Minimum).	Main Canals Discharge (Maximum), as per Design.	Average Rainfall from Records available.	Rainfall, 1928.	Area commanded (Gross).	Length of Main Canal.	Length of Distributaries.	Expenditure to 31st March, 1929.	Remarks.
		Cusecs.	Cusecs.	Inches.	Inches.	Acres.	Miles.	Miles.	£	
Maniototo (Upper Taieri)	Taieri River and storage dam	25	500	17·54 (Waipiata)	17·32	100,000	60	..	257	Modified scheme for complete irrigation of 5,000 acres is possible without storage, or for reasonable partial irrigation of 15,000 acres.
Cromwell Flat and Low burn (Roaring Meg)	Roaring Meg Stream (gravity), Kawarau River (pumping)	29 3,000	40	21·16 (Luggate)	21·88	15,000	10	30	3,367	Development would be costly.
Upper Manuherikia ..	Manuherikia and Dunstan Rivers, and storage dam in Manuherikia River at Falls	77	500	20·70 (Clyde, Ophir, and Blackstone Hill)	25·10	96,000	130	..	5,334	Further investigations into water requirements and areas available, and revised estimates have been made.
Hawea Flats (first alternative)	Timaru Creek (gravity)	20	30	26·01 (Hawea Flat)	20·58	4,000	11	20	49	To irrigate lower flat only.
Hawea Flats (later alternative)	Hawea River (pumping)	..	..	26·01 (Hawea Flat)	20·58	17,600	..	..	..	Latest tentative proposal. Electric power not necessary, but water to be pumped by direct application of power generated by low-pressure turbines at outlet of Lake Hawea. This appears preferable to alternative No. 1, and appears to be a promising scheme. Further closer survey and estimates are necessary.
Chapman's Gully ..	Butcher's Creek, Conroy's Creek, and storage dam	..	..	14·57 (Alexandra)	13·45	100	..	..	16	..
Bendigo Flat	Lindis River and storage dam	35	30	19·46 (Tarras)	21·83	3,000	7	..	..	The greater portion of this area is now served.
* Teviot River Extension	Teviot River and Lake Onslow dam	40	80	14·90 (Roxburgh East)	17·15	2,300	..	..	207	To irrigate a limited area in the vicinity of Ettrick, on west side of Clutha River. To be commenced in July.
Miller's Flat	Minzionburn	6	..	..	..	2,000	..	..	192	Survey and proposals completed.
Luggate Burn	Luggate Burn ..	..	12	21·16 (Luggate)	21·88	1,200	..	..	273	To supply water to part of Mount Pisa settlement lands.
Scandinavian	Tributaries of Manuherikia River	..	20	30·94 (St. Bathan's)	34·99	4,000	..	..	..	For lands about St. Bathan's. Includes £12,000 towards cost of Falls dam, Upper Manuherikia scheme.
Soil Survey (Central Otago)	..	..	..	..	..	..	..	..	3,065	This soil survey in the irrigation districts is now complete, and plans are being prepared. 250,000 acres were surveyed this year.
Investigation of proposed schemes	..	..	..	..	..	..	..	..	247	Includes the reading of river and rain gauges.

* Put under Teviot River scheme with which it will be ultimately amalgamated.

APPENDICES TO THE PUBLIC WORKS STATEMENT, 1929.

APPENDIX A.

AUDITED STATEMENT OF EXPENDITURE ON PUBLIC WORKS OUT OF THE PUBLIC WORKS FUND FOR THE YEAR 1928–29.

Prepared in compliance with Section 8 of the Public Works Act, 1928.

SIR,— Public Works Department, Wellington, 25th June, 1929.

In compliance with the 8th section of the Public Works Act, 1928, 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.,
E. A. RANSOM,
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 1928–29.

Vote.	Summary.	Appropriation.	Gross Expenditure.	Credits-in-Aid.	Net Expenditure.
	General Purposes Account—	£	£ s. d.	£ s. d.	£ s. d.
41	Public Works, Departmental	139,265	265,042 10 1	122,866 11 6	142,175 18 7
42, 43	Railways	*1,884,000	1,491,808 15 11	275,531 18 11	1,216,276 17 0
44–51	Public Buildings	317,933	215,723 5 6	2,217 19 1	213,505 6 5
52	Timber-supply and Sawmills, &c., for Public Works Department	15,000	7,859 19 6	12,975 4 4	*Cr.* 5,115 4 10
53	Acquisition and Operation of Quarries for Public Works Department	20,000	31,184 0 8	37,213 18 4	*Cr.* 6,029 17 8
54, 55	Lighthouses and Harbour-works	25,700	18,719 3 6	1,656 11 3	17,062 12 3
56	Development of Tourist Resorts	40,500	41,730 7 2	2,476 10 3	39,253 16 11
57	Department of Immigration	75,000	106,133 10 1	55,867 3 11	50,266 6 2
58–60	Roads, Bridges, and other Public Works ..	*1,014,500	957,668 19 9	124,091 14 4	833,577 5 5
61	Telegraph Extension	650,000	686,131 3 11	61,717 3 3	624,414 0 8
62	Contingent Defence	50,000	68,129 4 2	476 18 11	67,652 5 3
63	Lands, Miscellaneous	115,000	87,499 9 6	1,638 5 11	85,861 3 7
64	Irrigation, Water-supply, and Drainage ..	75,000	61,102 9 4	5,905 11 3	55,196 18 1
65	Plant, Material, and Stores	40,000	79,564 2 4	74,970 1 0	4,594 1 4
66	Transfer to Main Highways Account, Construction Fund	200,000	200,000 0 0	..	200,000 0 0
..	Unauthorized—Services not provided for ..	..	431 9 4	354 16 0	76 13 4
	Totals, General Purposes Account ..	4,661,898	4,318,728 10 9	779,960 8 3	3,538,768 2 6
67–68	*Electric Supply Account*	*1,360,000	1,229,507 4 1	46,404 0 9	1,183,103 3 4
..	*Waihou and Ohinemuri Rivers Improvement Account*	..	58,945 8 9	6,635 15 9	52,309 13 0
	Totals, Public Works Fund	6,021,898	5,607,181 3 7	833,000 4 9	4,774,180 18 10

* Includes the following additional amounts appropriated by Finance Act, 1928: First Session, Twenty-third Parliament—Railway-construction, £500,000; roads, &c., £100,000; development of water-power, £100,000.

APPENDIX A—*continued.*

	Name of Vote.	Appropriation.	Gross Expenditure.	Credits-in-Aid.	Net Expenditure.
	PUBLIC WORKS FUND.	£	£ s. d.	£ s. d.	£ s. d.
	General Purposes Account—				
41	Public Works, Departmental	139,265	265,042 10 1	122,866 11 6	142,175 18 7
	Railways—				
42	Railway construction	*1,484,000	1,081,521 13 4	78,649 18 7	1,002,871 14 9
43	Additions to Open Lines	400,000	410,287 2 7	196,882 0 4	213,405 2 3
	Public Buildings—				
44	General	11,000	4,435 6 9	128 0 0	4,307 6 9
45	Courthouses	15,000	8,387 2 1	..	8,387 2 1
46	Prison Buildings and Works	25,500	12,818 12 3	246 6 4	12,572 5 11
47	Police-stations	10,200	6,925 4 0	..	6,925 4 0
48	Postal and Telegraph	105,783	62,126 15 7	40 6 5	62,086 9 2
49	Agricultural	3,950	2,843 18 9	36 7 2	2,807 11 7
50	Mental Hospital Buildings	125,000	96,930 18 0	148 15 3	96,782 2 9
51	Health and Hospital Institutions	21,500	21,255 8 1	1,618 3 11	19,637 4 2
52	Timber-supply and Sawmills, &c., for Public Works Department	15,000	7,859 19 6	12,975 4 4	*Cr.* 5,115 4 10
53	Acquisition and Operation of Quarries for Public Works Department	20,000	31,184 0 8	37,213 18 4	*Cr.* 6,029 17 8
	Lighthouses and Harbour-works—				
54	Lighthouses	9,500	2,709 3 7	71 13 3	2,637 10 4
55	Harbour-works	16,200	16,009 19 11	1,584 18 0	14,425 1 11
56	Development of Tourist Resorts	40,500	41,730 7 2	2,476 10 3	39,253 16 11
57	Department of Immigration	75,000	106,133 10 1	55,867 3 11	50,266 6 2
	Construction and Maintenance of Roads, Bridges, and other Public Works—				
58	Roads, &c.	*956,000	904,919 11 4	123,929 11 10	780,989 19 6
59	Roads to give access to Outlying Districts ..	55,000	51,744 5 1	162 2 6	51,582 2 7
60	Roads, &c., on Goldfields	3,500	1,005 3 4	..	1,005 3 4
61	Telegraph Extension	650,000	686,131 3 11	61,717 3 3	624,414 0 8
62	Contingent Defence	50,000	68,129 4 2	476 18 11	67,652 5 3
63	Lands, Miscellaneous	115,000	87,499 9 6	1,638 5 11	85,861 3 7
64	Irrigation, Water-supply, and Drainage ..	75,000	61,102 9 4	5,905 11 3	55,196 18 1
65	Plant, Material, and Stores	40,000	79,564 2 4	74,970 1 0	4,594 1 4
66	Transfer to Main Highways Account, Construction Fund	200,000	200,000 0 0	..	200,000 0 0
..	Unauthorized—Services not provided for ..	..	431 9 4	354 16 0	76 13 4
	Totals, General Purposes Account ..	4,661,898	4,318,728 10 9	779,960 8 3	3,538,768 2 6
	Electric Supply Account—				
67	Development of Water-power	*1,090,000	1,008,542 15 8	42,983 2 5	965,559 13 3
68	Working Expenses and Maintenance	270,000	220,964 8 5	3,420 18 4	217,543 10 1
..	*Waihou and Ohinemuri Rivers Improvement Account* ..	..	58,945 8 9	6,635 15 9	52,309 13 0
	Totals, Public Works Fund	6,021,898	5,607,181 3 7	833,000 4 9	4,774,180 18 10

* Includes the following additional amounts appropriated by Finance Act, 1928: First Session, Twenty-third Parliament—Railway-construction, £500,000; roads, &c., £100,000; development of water-power, £100,000.

This statement includes only the expenditure on works, and does not include expenditure such as interest, sinking funds, and charges and expenses of loans.

J. J. GIBSON,
Accountant.

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

Examined and found correct.

G. F. C. CAMPBELL,
Controller and Auditor-General.

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 July, 1928, to the 30th June, 1929.

RAILWAYS.

Abstract.

The following table shows the expenditure on Government railways in New Zealand up to the 31st March, 1929:—

Name of Railway.	Total Length of Railway or Section.	Open for Traffic.	Expenditure to 31st March, 1929.
	M. ch.	M. ch.	£
Kaihu Valley	24 32	24 32	179,132
Otiria–Ngapuhi	13 45	13 45	127,636
Opua Wharf–Onerahi	58 6	58 6	609,166
Kioreroa–Waiotira	19 79	19 79	420,533
North Auckland Main Trunk Railway (from Helensville)	189 75	44 39	3,832,093
Helensville–Te Awamutu, with Branches (including Auckland–Westfield Deviation)	215 35	160 63	5,628,366
Frankton Junction–Thames, with Branches	127 35	125 23	1,821,663
Thames Valley–Rotorua	69 33	69 33	427,059
Rotorua–Taupo	54 40	..	39,144
Tauranga–Opotiki, with Branches	145 32	59 09	1,491,647
Gisborne–Opotiki	93 44	49 32	624,335
Napier–Gisborne (including Waikokopu Branch)	231 44	23 44	2,480,209
Wellington–Napier and Palmerston North (including Te Aro Extension, Greytown and Martinborough Branches, and Hutt Valley Railway)	258 62	235 76	4,155,498
Wellington–Waitara, with Branches	350 11	308 42	4,448,790
Stratford–Okahukura	112 47	47 40	2,070,807
North Island Main Trunk (Marton–Te Awamutu), including Raetihi Branch and Waipa Gravel-access Branch	225 79	218 39	3,129,990
Picton–Waipara (South Island Main Trunk Railway)—			
Picton southwards	92 38	56 6	657,803
Waipara northwards	90 45	44 14	381,631
Nelson–Greymouth	177 51	129 50	789,611
Stillwater–Arthur's Pass	51 41	50 41	2,054,726
Rolleston–Arthur's Pass (including Whitecliffs Branch)	92 59	84 45	1,036,922
Westport–Ngakawau	19 56	19 56	196,785
Westport–Ngakawau Extension to Mokihinui*	7 12	7 12	..
Mokihinui Colliery Line†	3 69	3 69	..
Westport–Cape Foulwind‡	7 0	7 0	..
Westport–Inangahua	26 0	5 74	305,605
Ngahere–Blackball	3 40	3 40	147,695
Greymouth–Rewanui and Branches	11 34	11 34	330,509
Greymouth–Waitaha	50 32	38 68	422,734
Waipara–Waitaki, with Branches	459 34	413 70	3,369,986
Canterbury Interior Main Line—Oxford–Temuka	83 0	11 44	59,942
Waitaki–Bluff, with Branches	600 21	570 14	5,982,200
Otago Central	182 51	147 27	1,440,450
Invercargill–Kingston, with Mararoa Branch	117 4	97 44	395,291
Forest Hill Railway—Winton–Hedgehope§	12 40	12 40	23,337
Western Railways	94 8	78 49	453,843
Preliminary surveys	..	..	35,625
General charges not yet apportioned	..	..	21,934
Miscellaneous	..	..	10,337
Stock of permanent-way on hand	..	..	5,913
Rolling-stock	..	..	10,406,082
Total	4,373 54	3,302 69	‖60,015,029
Provincial Government Lines, etc.			
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	4,373 54	3,302 69	61,807,745

* 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 funds for this line—namely, £93,450—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.
¶ Includes value for £150,000 paid to debenture-holders under the Midland Railway Petitions Settlement Act Amendment Act, 1903.

North Auckland Main Trunk Railway.

Rangiahua Section (24 m. 25 ch. to 38 m. 34 ch.).—The construction of this extension of the North Auckland Main Trunk Railway has been continued under the most difficult conditions, due to the unstable nature of the country. A certain amount of trouble was anticipated with slips in the first 6 m. of the section, as surface indications pointed in that direction, but it was expected that the remaining 8 m. would be reasonably stable. This has not been the case, and extensive slips have developed in all cuttings, often extending chains uphill, and a large number of banks have slumped away, carrying the foundation country away with them.

The original formation was completed during the year to 38 m. 10 ch., but so serious have been the slips that it has been necessary to deviate the line to a new centre-line over a total length of 2½ m.

Involved in the construction of the line are over 5 m. of main-highway deviations, and owing to the slippy nature of the country it has been necessary to keep this work as light as possible by the use of short grades and vertical curves. The whole of the earthwork on these deviations has been done and sufficient metal placed to keep the road open for traffic.

Permanent-way has been laid to 33 m. 36 ch., of which 3 m. 36 ch. was done during the current year.

A total of sixty-four culverts have been placed, varying from 10 ft. diameter down to 12 in.

Contracts have been let for the erection of station buildings and four platelayers' cottages at Waihou Station at 34 m. 9 ch.

A quarry has been opened up, served by a railway-track 1¼ m. long joining the main line at 25 m. 16 ch. The installation of bins, crushers, engine-house, and plant is now practically completed, and crushing of ballast will commence immediately. It is hoped to sell considerable quantities of metal from this plant to local bodies, and also to supply metal for main-highways construction and maintenance for roadmaking purposes.

Considerable work has been done during the year in stabilizing the embankments by means of large stone drains and small drainage-tunnels filled with stone. In the slipped cuttings the only thing to do is to keep taking away the material until the toe can be held with a stone wall. This sort of work upsets the whole original estimate of cost; indeed, it is humanly impossible to predict what the work will cost in this type of country. Steam-shovels have been used constantly in clearing slips, and without these it would be impossible to get the line open. Extensive willow-planting is being done in the broken country in order to assist in holding the ground against future slips.

Kirikopuni Section (107 m. 0 ch. to 121 m. 0 ch.).—This section was handed over to the Railway Department on the 15th May, 1928, and during this year the formation, bridging, and metalling of the Paradise access road was completed.

Tauraroa Quarry.

This quarry, which has now been in operation for twelve years, and has a total output of 560,000 cub. yd. of crushed metal and 22,000 cub. yd. of spalls, has been under continuous operation during the year, the output being 87,641 cub. yd. of metal. This metal has been used principally on the Dargaville Branch Railway, on the Oakleigh–Waipu Road, and on the Auckland–Maungaturoto Main Highway, these works being in the hands of the Public Works Department. In addition, considerable quantities have been sold to Rodney, Hobson, Otamatea, Mangonui, and Bay of Islands Counties, to the Borough of Dargaville, and the Kamo Town Board.

It is pleasing to note that very little time has been lost through mechanical breakdowns, and by careful management 2½ in. metal has now been made saleable f.o.r. Tauraroa at 4s. 6d. a cubic yard.

A heavy programme is anticipated for the coming year in ballast for the Dargaville Branch Railway, and the various grades of road-metal for the Auckland–Maungaturoto Main Highway.

Dargaville Branch Railway.

During the year the construction of the Dargaville Branch Railway has advanced rapidly. A few difficulties have been encountered owing to the river-flats not being sufficiently strong to carry enbankments. As the embankment sinks into the ground, there is a corresponding upheaval clear of the bank, and this condition is usually cured by spreading the weight of the embankment by the addition of "berms" outside the bank proper. A very large slip on the banks of the Wairoa River at 10 m. 70 ch., which has given trouble for years, is now being dealt with by trenching through it to a depth of 22 ft. into sandstone and filling this trench with stone; this trench crosses the toe of the slip and will have outlet drains leading to the river.

Generally the formation is of a light nature, and by the use of maximum grades and curves heavy work has been avoided where possible. Despite these precautions, several slight deviations of the line had to be made to avoid country which opened up badly.

A feature in the construction of the railway has been the great advantage of the proximity of the Northern Wairoa River. Transportation of material has in consequence been a very simple matter. Steam-shovels, drag-line, and locomotives have been loaded on to barges using their own power, towed to new locations, and then unloaded in the same manner.

Formation earthwork has been put in hand from 0 m. to 15 m. 60 ch., and, with the exception of bridge approaches at 1 m. 19 ch., 4 m. 35 ch., and 7 m. 0 ch., has been completed as far as 7 m. Formation requires widening in several places between 7 m. 12 ch. and 9 m. 40 ch. and is complete between 9 m. 50 ch. and 10 m.

Tangowahine and Wharau station-yards are under construction.

Four steam-shovels have been in use on excavations, and a drag-line has done very useful work, including 3 m. of heavy ditching through the Opiako Swamp.

The railway-formation has necessitated the relocation of the Dargaville–Whangarei Main Highway over a distance of approximately 2 m., and the construction of this new roading is well advanced.

A total length of 13 m. of fencing has been completed.

Culverting is well in hand, and a total of forty-five have been built during the year, ranging from 4 ft. arches to 12 in. pipes. Owing to lack of bearing-power in foundations, nine of these have required driven-pile foundations.

Bridging has proceeded as far as the supply of hardwood piles will allow, and a total length of 330 ft. has been completed.

Platelaying has kept pace with the completion of formation, and rails are now laid to 6 m. 70 ch. Ballasting has been carried as far as 4 m., the stone being obtained from the Department's quarry at Tauraroa.

Pukehuia is the main encampment and distributing centre for the works, but it has been necessary to build a considerable new encampment at Tangowahine and a lesser one at 14 m. At the former place twenty-eight four-roomed married men's quarters, and eighty single men's huts have been erected, with the usual cookhouse, bathhouses, drainage, and water-services. These buildings were transferred from Pukehuia, as were also the nine married men's quarters and twenty-four single men's huts erected at 14 m.

Three launches and six barges have been in constant use transporting men and materials. The telephone-line is in hand, poles being erected as far as 12 m., and the wires to Tangowahine at 10 m.

Auckland–Westfield Deviation.

This double-track deviation will connect the new Auckland Railway-station with the existing main south line at Westfield Railway-station, and the portion from the southern end of the new station-yard in Auckland to Westfield, a length of 8 m. 70 ch., is being constructed by the Public Works Department. Substantial progress has been made during the year, and the completion of the work is now in sight. The men are now being concentrated into the central camp at Purewa Tunnel, and the outer encampments dismantled and huts transferred to other jobs.

Earthworks are complete and trimmed, with the exception of a small earthwork job at Purewa station-yard due to an alteration in alignment. The long embankment across Hobson Bay has not shown any appreciable loss of height, but there has been a minor subsidence in the bank across Orakei basin, and this is being brought up to grade with stripping from the Railway Department's ballast-pit.

The portals of the Purewa Tunnel have been built, the floor has been cleaned out, and a clean stone-spall foundation laid with central pipe-drainage system. This central drain has been continued through the approach cuttings, with adequate cross-drains filled with coarse scoria. A large slip at the south portal gave trouble, but after cleaning out the toe with a steam-shovel a heavy stone wall was built and this has held the country.

The rock-cutting from 6 m. 60 ch. to 7 m. 14 ch. has been widened to the full width of the reserve and all the stone used. A crushing plant has been in operation and 8,000 cub. yd. of metal and chips produced for concrete-work for ballasting the tunnel and for metalling approach roads.

For the pitching of embankments on the railway and Waterfront Road 22,600 cub. yd. of heavy rock have been quarried, and transported by time-table service over temporary lines and newly laid permanent-way.

The heavy bridging programme on the line is now practically completed. Three overbridges 40 ft. wide have been completed, also two 22 ft. wide and one 30 ft. wide, and all are now in use.

The culverts over the mud-flats, 9 m. 40 ch. to 9 m. 65 ch., all on pile foundations, have been finished, completing the culvert programme.

Platelaying and ballasting have been in hand by the gangs from the Railway Department, and the left-hand track is now completed throughout and ballasted. Two miles of the right-hand track are laid, also the Marama and Panmure station-yards.

The six station buildings have been erected by contract, and there only remains a small amount of drainage work and the installation of permanent water-supply.

Platforms are being built of 6 ft. lengths of precast concrete, and all are now finished except the right-hand side of Orakei and Sylvia Park platforms.

East Coast Main Trunk Railway—Waihi Eastwards.

During the year the length of this railway between Tauranga and Taneatua, a distance of 59 m., was completed and handed over to the Railway Department for operation. Regular passenger and goods traffic was maintained on the line until the handing-over.

Te Maunga, Te Puke, Paengaroa, Pongakawa, Otamarakau, and Matata Sections (41 m. 5 ch. to 79 m. 16 ch.).—The sidings into the Te Puke and Matata quarries were pulled up and rails sent to the Rotorua–Taupo Railway. All huts that were in reasonably good condition were also sent to Rotorua. During July and August the output from Te Puke quarry was 4,432 cub. yd. of metal, 1,223 cub. yd. of screenings, and 20 cub. yd. of spalls, and from Matata quarry 2,803 cub. yd. of metal. Extensions were made to the stockyards at Te Puke and Papamoa. General maintenance was carried out until the line was handed over to the Railway Department on the 2nd September.

Rangitaiki, Awakeri, and Taneatua Sections (79 m. 16 ch. to 100 m. 5 ch.).—The centre span of the Whakatane Bridge was widened to make a passing-place for motor traffic. The cattle-yards at Awakeri were extended for stock. All huts were pulled down and transferred to the Rotorua–Taupo Railway. General maintenance was attended to until the 2nd September, when the line was handed over.

Mount Workshops.—150 tons of steel was fabricated into girders for the Auckland–Westfield Railway, and 160 tons for the Waikare Bridge on the Napier–Wairoa line. The Te Puke quarry plant was overhauled, boiler retubed, and 150 elevator buckets made, and the whole transferred to Dunedin. Ten locomotives were overhauled, and nine of these sent to other districts. One locomotive was dismantled. Rolling-stock repairs were attended to, seven passenger-cars, three vans, and 261 wagons being overhauled and repaired.

Rotorua–Taupo Railway.

On the completion of the East Coast Main Trunk Railway men and materials were transferred to Rotorua, and a start made on the construction of the Rotorua–Taupo Railway. Erection of hutments commenced on the 10th July, 1928, and construction work was continued until the 18th March, 1929, when instructions were received to close down the works and transfer men and plant to the Gisborne–Wairoa Railway. Two stores were erected—one at Rotorua and one at 7 m. 131 double huts, 219 single huts, and 171 washhouses were transferred from the East Coast line and erected between 3 m. and 8 m. The store at 7 m. and the best of the huts were dismantled and transferred to the Wairoa–Gisborne line after the works closed down.

Hemo Section (0 m. to 3 m. 60 ch.).—Clearing, culverting main-road deviations, and formation were put in hand, but not much has been done.

Ohinewai Section (3 m. 60 ch. to 7 m. 20 ch.).—Work was put in hand over the whole of this section. Service roads were formed, and nine temporary bridges erected to give access to cuttings. Two miles of formation in all have been completed, and 1,161 ft. of culverting laid, varying from 30 in. to 12 in. diameter.

Pareheru Section (7 m. 20 ch. to 8 m. 40 ch.).—The whole of the section was cleared and five cuttings opened up. 229 ft. of culverting was installed.

Gisborne–Napier Railway.

Putorino Section (10 m. 56 ch. to 37 m. 35 ch.; length, 26 m. 59 ch.).—This section adjoins the opened line at Eskdale, and as far as Tutira the section has been open for goods and passenger traffic for the whole of the year, and for several months traffic facilities have been extended to Matahoura Station.

The year's work generally has comprised completion of the earthwork to Putorino; the completion of the Matahoura Viaduct, Sandy Creek Bridge, and subway at 34 m. 10 ch.; the laying of permanent track to Putorino Station; and the ballasting of the whole line up to the Matahoura Viaduct.

The formation is practically complete throughout the section with the exception of cleaning up and widening certain portions, and muck-trains have been employed completing narrow cuttings and filling along narrow banks.

After the completion of the Matahoura Viaduct the cutting on the north side was completed and the material delivered to the embankment on the south side, the permanent-way in the meantime being carried on a trestle over the filling. The cuttings between Matahoura Viaduct and Putorino have also been completed during the year, extra shifts being worked at any point where delay in the progress of the rail-head was likely.

All road-deviations in connection with the railway have been completed and metalled, and the access road to Putorino station-yard has also been completed and is in use.

A grade-elimination proposal for the highway crossing the railway at 32 m. 44 ch. has been prepared, and the work of forming the approaches and erecting the overbridge is in hand.

The fencing on this section is now practically complete, 124 ch. of fencing having been erected during the year.

Five pipe culverts and one 4 ft. and one 6 ft. arched culverts were constructed and a retaining-wall at 20 m. 6 ch. built during the year.

At the Waikoau Viaduct, at 26 m. 60 ch. the footways, inspection platform, and wind-screen have been completed and the whole structure painted throughout.

The Sandy Creek Bridge, at 29 m. 10 ch., consisting of three 60 ft. spans on steel trestles and concrete foundations, was completed and painted.

The construction of the Matahoura Viaduct, at 33 m. 42 ch., consisting of two 60 ft., two 40 ft., and one 250 ft. span on steel trestles, with concrete foundations and concrete abutments, was the most important bridge-work of the year. It stands 208 ft. above the level of the stream and is very similar to the recently erected Waikoau Viaduct, so that the staging and cableway used for the former was dismantled and worked in very satisfactorily for the Matahoura. The erection of the steelwork proceeded without a hitch, and the work throughout was carried out efficiently and in quick time.

The structure has now been painted and is complete except for guard-rails, while the workers' accommodation and most of the equipment has been moved ahead to the Waikare Viaduct, at 38 m. 15 ch.

The concrete-work for subway at 34 m. 10 ch. was completed early in the year, and traffic was carried over a temporary trestle until the steel arrived a few months ago. This has now been erected and the work is practically complete.

Permanent-way has been laid to the end of the section, at 37 m. 35 ch., 4 m. having been laid during the year, and sidings have been completed at Matahoura station and are in hand in Putorino yard.

Platelaying is now proceeding northward to Waikare Viaduct to facilitate delivery of steel to that work. The line is completely ballasted to Tutira Station, at 28 m. 5 ch., and partially to the end of the section, approximately 20,000 cub. yd. of ballast being placed during the year.

At Tutira station-yard (28 m. 5 ch.) the platelayers' cottages were completed, latrines, shelter-sheds, passenger-platform, and loading-bank, and 6,000-gallon vat were erected, and a good water-supply was provided.

At Matahoura Station (32 m. 36 ch.) a shelter-shed and loading-bank have been erected, and temporary stockyards were built to deal with the present traffic requirements.

Four platelayers' cottages are in hand at Putorino station-yard (at 37 m. 20 ch.), while the goods-shed is practically completed.

The Department's sawmill at Makomako has cut 870,206 sup. ft. of timber, most of which has been used on the Putorino and Wairoa sections.

Regular trains have connected with the Railway Department's services to Eskdale, and good use has been made of the service by the settlers in the neighbourhood, both for goods and passenger traffic.

Wairoa Section (37 m. 35 ch. to 70 m. 67 ch.; length, 33 m. 32 ch.).—The works which have received most attention on this section comprise the heavy earthwork, tunnels, and bridges.

The formation on this section is heavy, and, in addition to hand gangs and scoop teams, ten steam-shovels have been employed throughout the year, with their attendant locomotives and trucks, the leads in some places being over a mile. This work is well in hand, and will be completed in ample time to enable the platelaying to proceed as soon as the larger tunnels and bridges are finished.

The northern portal of the Kotemaori Tunnel, at 42 m. 15 ch.—42 m. 56 ch., has been erected, and the bottom heading has been driven 6¾ ch. back to 42 m. 49 ch. The driving is rather wet, but the country is quite sound, being a soft sandstone, and indications point to better conditions when enlarging the heading. Pumping and ventilation machines have been installed, and the concrete layout is complete.

The Chimney Creek Tunnel No. 1, at 46 m. 25 ch., 15 ch. in length, was completed in February of this year, and Chimney Creek Tunnel No. 2, at 47 m. 9 ch., 14½ ch. in length, was completed in October last. The formation of road-deviation at 44 m. 79 ch. has been completed, and at 47 m. 67 ch. to 48 m. 8 ch. the formation and metalling is finished and a start has been made with the overbridge.

In the Mohaka Tunnel, at 53 m. 2 ch., bad conditions generally have been experienced, and, although conditions have improved during the last six months, the tunnel is still very wet and rotten in patches, and a third shift has been started to speed up construction. A total of 16¼ ch. has been completed.

The Waihua Tunnel, at 60 m. 70 ch., 14·07 ch. long, was completed in November last, including both portals. Several slips occurred at the south portal, but these are all practically cleaned up.

Between 55 m. 45 ch. and 65 m. 25 ch. the railway fouls the road in a number of places, and several deviations to avoid this and eliminate crossings have been put in hand. The largest of these, 55 m. 43 ch. to 56 m. 53 ch., is almost completed, and metalling is in hand.

Creek-diversions have been excavated at 52 m. 37 ch. and between 62 m. and 64 m., several of those between the latter chainages having been carried out by means of scoop teams. The culverts and water-drives throughout the section are well in hand, approximately twenty culverts and water-drives having been put in during the period, and the balance will be completed in ample time to synchronize with the early completion of the formation.

Approximately 400 ch. of fencing has been erected.

The Waikare Viaduct, at 38 m. 15 ch., consisting of five 50 ft., one 60 ft., and three 100 ft. spans on steel trestles with concrete foundations, was commenced just after Christmas, and rapid progress has been made. The rail-level on this viaduct is 250 ft. above river-level. The concrete abutments A and F and concrete piers B and B1 are complete. The excavation of pier E is complete, and that of Pier C is well in hand. The approach trestle to the viaduct has been erected, and the cableway for the erection of the steel will be complete in the very near future.

Extensive investigations have been made and bores put down to determine the best type of foundation for the Mohaka Viaduct, which will be the largest and most imposing of these viaducts, and an early start will be made with these foundations.

The Wairoa River Bridge, at 68 m. 59 ch., consisting of one 107 ft. 6 in., two 106 ft. 3 in., and two 15 ft. 2 in. spans, is nearing completion.

The six cylinders which form the river piers are practically complete, and the pile pier on the north bank is completed and a start has been made with the erection of the steel superstructure. A good deal of trouble has been experienced on this work with floods, and at one time a part of the temporary staging was carried away.

The programme generally from the Wairoa end is to prepare all works from Wairoa River to Waihua River for platelaying, so that this work can proceed as soon as the Wairoa River Bridge is completed. The light formation from 66 m. to 69 m. is nearly completed, and good progress should then be made with the platelaying.

A temporary hold-up may be experienced at the Waihua River Bridge, which has not yet been commenced, but after that everything should be complete to the Mohaka Tunnel. This latter work is well under way, and should by that time be nearly completed, so that track may be continued to the Maungaturanga Viaduct.

Owing to the additional men employed on this work, especially over the latter half of the period, additional workmen's accommodation has been necessary, and this has been provided partly by the transfer of some of the huts from the Waikaremoana hydro works and partly by the building of some additional cottages.

STRATFORD MAIN TRUNK RAILWAY—EAST END.

Matiere Section (0 m. to 10 m.).—This section is practically finished, and the work of the year included general maintenance and a small amount of construction to complete station-yard facilities and private crossings.

Ohura Section (10 m. 0 ch. to 19 m. 10 ch.).—The section is now practically completed. Ohura station-yard was finished during the year with the erection of the station buildings, stationmaster's house, engine-shed, ashpit, loading-bank, and latrines. Five platelayers' cottages were built, and a water-supply installed, including dam, 10,000 ft. 4 in. pipe, 6,000-gallon water-vat, 2,000-gallon feed-vat, and 2,000-gallon washout vat.

Passenger-, goods-, and work-train services were maintained on this and Matiere section.

Tokirima Section (19 m. 10 ch. to 29 m. 70 ch.).—Activities during the year have been concentrated on this section, and formation of the whole length has been vigorously pushed ahead. The formation is fairly heavy, including considerable road-access works and road-deviations. Two station-yards are included in the length, but the really heavy expenditure is in the construction of six tunnels aggregating a length just over 1¼ m.

No. 1 tunnel, at 19 m. 48 ch. (length, 170 yd.), has been completed.

No. 2 tunnel, at 20 m. 54 ch. (length, 170 yd.), is also completed.

No. 3 tunnel, at 23 m. 60 ch. (length, 488 yd.): Bottom drive has been completed, the north end portal built, and lining commenced.

No. 4 tunnel, at 24 m. 38 ch. (length, 61 yd.): Bottom drive is complete.

No. 5 tunnel, at 25 m., is 732 yd. long. At the north end the portal is in place, the bottom drive is in 149 yd., and lining completed for 44 yd. At the south end very heavy ground necessitated the concreting of the floor of the tunnel and the use of lining 30 in. thick. It is anticipated that better country will soon be reached and the work speeded up. The portal is complete and 21 yd. of lining.

No. 6 tunnel, at 28 m. 62 ch. (length, 583 yd.), is now being manned. The north approach is in hand. Formation on the section is manned to full capacity and is now 75 per cent. complete. The formation is ready for platelaying to 22 m. All road-alterations, new access roads, and stream-diversions are complete.

Fencing is well in hand.

The heavy culverting programme is complete, and forty-one have been placed, ranging in size from 10 ft. in diameter to 12 in. pipes. A 10 ft. subway bridge has been placed at 19 m. 70 ch.

Several district roads have to be metalled in order to transport construction material. In all, 6½ m. have been metalled, with considerable benefit to the district.

Permanent-way is now laid to 20 m. 34 ch., and ballasting is in hand to 19 m. 63 ch.

Heao Section (29 m. 70 ch. to 31 m. 70 ch.).—The Heao Station access road, 2 m. 70 ch. long, has been formed and metalled to connect the railway-construction works with the Stratford–Taumarunui Main Highway, and will be used for transport of all material. This road taps the railway at 30 m., and from there a tramway is being built to serve the heavy formation and two tunnels in the Heao Valley.

All work on this section is now being rapidly opened up.

STRATFORD MAIN TRUNK RAILWAY—WEST END.

Raekohua Section (47 m. 40 ch. to 50 m. 60 ch.; length, 3 m. 20 ch.).—This section was not prosecuted very vigorously during the previous period and for the first six months of this year, the main effort being directed towards the prosecution of the tunnels further ahead, these being the factors governing the final completion of the line and the establishment of through traffic between New Plymouth and Auckland. During the last six months, however, the opening-up of the Egmont Colliery Co.'s works and the desirability of providing suitable rail access for their coal traffic has necessitated the expediting of this section and the number of men employed has been increased to enable this to be done. The objective is to open the permanent line as far as 50 m. 40 ch. for coal traffic by September of this year.

The formation is well in hand and only about 24 ch. yet remains to complete.

The bottom heading of No. 1 tunnel on this section, at 49 m. 6 ch., 7 ch. in length, has been driven right through and breaking down has commenced, while tunnel No. 2, at 49 m. 74 ch., 10 ch. long, has been lined and completed, together with portals.

The following bridges have been completed: At 48 m. 15 ch., two 25 ft. and one 30 ft. spans; at 48 m. 24 ch., one 45 ft. span; at 49 m. 16 ch., one 25 ft., one 30 ft., two 40 ft., and one 60 ft. spans; at 49 m. 63 ch., two 30 ft. and one 40 ft. spans. The piers of these bridges were completed during the previous period, but the steel girders for the superstructure were assembled, erected, and the permanent sleepers laid during last year.

Four concrete culverts with a total length of 293 ft. were constructed, and the permanent fencing erected on the right from 49 m. 62 ch. to 50 m. 3 ch. and on the left from 49 m. 37 ch. to 49 m. 67 ch.

A start has been made with platelaying, and rails have been laid from 47 m. 56 ch. to 48 m. 54 ch., the first and second lifts of ballasting being placed from 47 m. 60 ch. to 48 m. 34 ch.

A tri-weekly passenger service was maintained between Tangarakau and Tahora, where it connected with the New Zealand Railway service, and during the year 13,000 tons of goods were hauled over the section.

The workmen's accommodation at the main camp at Tangarakau was well maintained during the period.

At the beginning of 1929 the Egmont Colliery Co., whose property is about 4 m. up the Tangarakau Valley, commenced building operations, and a start was made on the earthworks of their siding.

Heao Section (50 m. 60 ch. to 57 m.; length, 6 m. 20 ch.).—During the first half of the period operations on this section were largely confined to the No. 2 and No. 3 tunnels, but later in the period additional men were engaged and the formation between tunnels No. 3 and No. 4 was put in hand to enable a start to be made with No. 4 tunnel, and bottom headings were pushed forward to facilitate transport ahead and enable future operations to be carried on without resorting to the use of long and expensive jigs or roads over the ridges.

Good progress was made with the earthwork in the Mangaone and Mangatete Valleys until the wet weather set in towards the end of the year and caused several heavy slips, which held up the cutting-work somewhat.

Between 50 m. 60 ch. and 53 m. 46 ch. formation is well on towards completion, and from 53 m. 46 ch. to the start of No. 4 tunnel at 55 m. 17 ch. it should be completed in about another six months.

At tunnel No. 2 (52 m. 10·50 ch. to 52 m. 65 ch.) the bottom heading has been completed and the tunnel enlarged and lined to 52 m. 45·60 ch. at the west end and to 52 m. 51·58 ch. from the eastern end, and this leaves approximately 6 ch. yet to enlarge and line.

No. 3 tunnel (53 m. 46 ch. to 54 m. 30 ch.): The bottom heading was advanced to 53 m. 74·76 ch., and the enlarging and lining was completed from 53 m. 52·05 ch. to 53 m. 62·44 ch. in heavy and wet ground.

No. 4 tunnel (55 m. 17·50 ch. to 55 m. 68 ch.): The approaches to this tunnel are in hand, the west end proving very dirty, while the east end promises to be a solid face.

An 8 ft. by 6 ft. water-drive at 53 m., 90 ft. long was completed with face-walls and another 12 ft. by 10 ft., at 53 m. 25 ch., 231 ft. in length, was driven through very heavy ground, which made progress slow, and lined. A 6 ft. by 4 ft. water-drive at 54 m. 51 ch., 118 ft. long was driven, but is not yet lined.

Two stream-diverts, totalling 10 ch. were completed, but a good deal of extra work was involved due to slips.

The Mangaone quarry, which has been providing stone for the concrete lining in No. 3 tunnel, was kept in full operation for the greater part of the period, until the breaking-through of No. 2 tunnel enabled stone to be brought forward from Raekohua. During the period 2,762 cub. yd. were quarried and crushed.

Transport on this section is difficult owing to the necessity for pushing the work on the forward tunnels before the earlier ones are holed through. This has necessitated hauling over the ridges which are in process of being tunnelled. In order to haul material to No. 3 tunnel before No. 2 was holed through it was necessary to construct a service road over the saddle and into the Mangaone Valley, and all material was satisfactorily transported by motor-lorries.

Similarly tracks have had to be made over the ridges into the Mangatete and Tikapuiti Hill valleys.

All power for the works as far as No. 3 tunnel was generated at the central power-house at Tangarakau Flat and transmitted by power and air lines to the various localities. This outfit has operated very satisfactorily throughout the period.

In January of this year the Mangatete Valley was practically virgin forest. With the increase in the number of men accommodation had to be provided both in this and the Tikapuiti valleys. A large cookhouse was built to serve a hundred men, and fitted with a salamander and hot and cold water. A bathhouse, with hot and cold showers, with a similar capacity was also built.

Eighty tents, fitted with floors, chimneys, and galvanized-iron roofs, were erected in the Mangatete Valley, and a temporary cookhouse and twenty tents in the Tikapuiti Valley.

Palmerston North Railway Deviation.

At the date of my last report approximately one-quarter of the formation work on the deviation, including drainage-work, culverting, and fencing, had been completed.

During the past year more locomotives and excavating plant became available, and the excavation of the large goods-yard area, involving the removal of half a million cubic yards of material, was pushed rapidly ahead, the conditions for the operation of steam-shovels being very favourable.

The clearing of the reserve was finally completed and a further 1,236 lin. ft. of culverting constructed, this completing the culvert system with the exception of two small culverts.

The first of the seven road-overbridges, that at Milson's Line, was completed and opened for traffic on the 10th December. The construction of other overbridges was not started. Five test piles were driven at the Mangaone Stream Bridge site. In order to improve the site for this bridge and to straighten the course of the stream, a diversion channel 19 ch. long was excavated, requiring the removal of 22,000 cub. yd. of material.

Four steam-shovels, seven construction locomotives, and two caterpillar tractors were employed on formation, two shifts being worked during the summer period. The embankments, with the exception of a small corner of the goods-yard and the site for the main passenger-station building, have been completed. Approximately three-quarters of the excavation of the goods-yard has been completed, the balance of the spoil being required for overbridge ramps. During the shortened construction period of nine months and a half 207,000 cub. yd. of earthwork were excavated. The main-line formation was completed to within 42 ch. of the northern junction with the existing Main Trunk Railway. The average number of men employed on this work for the period was 204.

On the 18th April last steps were taken to cease operations as a result of the decision by the Government that the construction of the Palmerston North Railway Deviation should not continue. Arrangements were at once made for the transfer of workmen to other works. Most of the plant and material has been transferred elsewhere, and the balance is being sold by auction.

Wellington - Tawa Flat Railway Deviation.

The protection of the embankment along the sea-front has been continued for a distance of 3 ch., just sufficient distance to protect the spoil from the tunnels as it is deposited into the sea. Several big blasts have been fired in the quarry, but there is unfortunately only a small percentage of the rock suitable for the sea-wall, the balance being disposed of for road metal.

The railway-bridge across the Hutt Road has been completed.

In No. 1 tunnel the heading has now been completed, 14 ch. having been done during the year under the co-operative contract system at the south end and 26 ch. by the contractors from the north end. An adit 13 ch. long was driven to expedite the progress of the heading and the tunnel enlargement. The heading was exceptionally wet, and four shifts per day have been necessary throughout the work. At both ends a small amount of enlargement and concrete lining has been done—8 ch. at the south end and 5 ch. at the north end. The full plant necessary for the more rapid progress of this tunnel is now installed, and good progress is expected under the co-operative contract system.

At No. 2 tunnel the approach cutting at the south end was completed during the year. The heading has been driven for a distance of 19 ch. at the south end, and 3½ ch. of enlargement have also been completed. At the shaft which was completed during the year, and which is 53 ch. from the north end of the tunnel, the heading has been driven 15 ch. southwards and 17 ch. northwards; 2 ch. of enlargement have also been done here to act as a depot for receiving trucks from the faces and for plant and materials coming down the shaft. At the northern end of No. 2 tunnel 18 ch. of heading and 2½ ch. of enlargement have been completed. The plant for this tunnel also is now ready for operating, and much greater speed should be made in the enlargement and lining.

The bridge over the Ngahauranga Gorge Road at 3 m. 29 ch. has been completed. Bridges at 6 m. 18 ch. and 6 m. 38 ch. were also completed. Foundations for the bridge-piers at 7 m. 25 ch. have been excavated, and the piers are completed for the bridges at 7 m. 37 ch. and 7 m. 63 ch. The Takapau Road overbridge is in hand.

Stream-diversions have been completed at 6 m. 46 ch., 6 m. 57 ch., and 7 m. 8 ch.

Two cuttings have been taken out beyond No. 2 tunnel, at 6 m. 18 ch. and 7 m. 45 ch. Another cutting, at 6 m. 42 ch., has been half completed.

A road-deviation at 7 m. 58 ch. has been completed, and another one, at 7 m. 30 ch., has been commenced.

Accommodation for the workmen is nearly completed. For married men seventy-four houses were erected and a further thirty are in course of construction. For single men 170 huts were erected, and also two cookhouses and four bathrooms.

Two classes of operations are now in progress in the tunnels on this railway which have not been used successfully in tunnels in this country before. These are the loading of excavated rock by means of compressed-air shovels and the placing of concrete in the lining by means of concrete-guns or pneumatic concrete-placers. It is hoped to make comparatively rapid progress by these new processes.

Midland Railway.

Murchison Section (63 m. 10 ch. to 86 m.; length, 22 m. 70 ch.).—The main activity on this line during the first six months of the period was the completion of the section to the end of the Gowan station-yard at 67 m. 3 ch. The formation was completed early in the year, and platelaying and ballasting was put in hand. Seven culverts were built, varying from 12 in. to 8 ft., and 14 ch. of heavy road-deviation was completed, while a further 23 ch. are in hand. In the latter half of the period the work was very much accelerated, a number of additional men being employed, and formation put in hand up to 72 m. 0 ch.

Bushfelling was completed from 67 m. 6 ch. to 67 m. 33 ch., and from 68 m. 69 ch. to 69 m. 0 ch.

The largest cutting on the section now in hand is at 67 m. 52 ch., and is being taken out with a steam-shovel and locomotive, the majority of the other cuttings being smaller and more suited to hand gangs.

All the buildings at the Gowan station-yard have been completed, and plates have been laid to 67 m., including sidings. Three lifts of ballast have been placed throughout to the end of the Gowan yard at 67 m., and the final boxing-up and finishing-off is in hand.

In order to cope with the additional men employed it was necessary to provide accommodation for 250 men at very short notice. Under the circumstances, the men were placed in tents, a cookhouse was erected, and the provision of huts is in hand.

The trial-line survey has been completed to 94 m. 7 ch. on the left bank and 93 m. on the alternative right-bank route, but practically all of this will have to be done over again owing to the alterations in the surface of the ground due to the recent earthquake. The survey of the permanent line is complete to 72 m., and is in hand for a further two miles.

Westport-Inangahua Railway.

Cascade Section (5 m. 70 ch. to 8 m. 78 ch.; length, 3 m. 8 ch.).—The only work on this section during the period has been the general maintenance and the repainting of all steel structures.

Hawk's Crag Section (8 m. 78 ch. to 18 m. 0 ch.; length, 9 m. 2 ch.).—During the period the bush was felled and cleared from 13 m. to 17 m. 4 ch. From the start of the section to the 10 m. the formation had been practically completed some years ago, and this has now been cleaned up in anticipation of platelaying.

From 10 m. to 11 m. the formation has been practically completed, with the exception of two cuttings, which are well forward. Between 11 m. and 14 m. formation is well in hand, the main obstacles being the large fillings at 11 m. 40 ch. and 12 m. 20 ch., and the tunnels at 13 m. 26 ch. and 13 m. 41 ch.

In the case of the filling at 11 m. 40 ch. the material forming this has to be transported some considerable distance from cuttings farther back, and the work has been somewhat hampered by a shortage of light locomotives suitable for the work. This shortage has now been overcome by the provision of a special type of light petrol-locomotive designed by the Department and manufactured locally. Trestles have been erected at both fillings, and it is anticipated that good progress will be made.

The portion from 14 m. to 15 m. has only recently been manned. Very complete investigation has been made regarding the foundations for the bridge at 9 m. 0 ch., Cascade Creek, and for bridges at 11 m. 34 ch. and 11 m. 78 ch.

At 11 m. 39 ch. to 11 m. 45 ch. seven out of twenty spans in a temporary bridge were completed, and the excavations for six culverts and stream-diverts have been taken out.

The permanent track has been laid from 9 m. 2 ch. to 9 m. 75 ch., and rails are in hand for the next 2 m. of track.

Orikaka Section (18 m. to 25 m. 39 ch.).—Survey work has been in hand in this section, but a great deal of it will have to be done again owing to the earth-movement which has taken place, due to the recent disastrous earthquake.

A very active policy has been maintained in connection with the accommodation of workmen. Four new camps were started—namely, Hawk's Crag, Tunnel Camp, Blackwater, and Berlin's. In all, 112 huts, forty-two cottages, three medical huts, and two bathhouses were erected, while twenty-four huts were shifted from Ohika farther up the gorge. A class-room was added to the school at Tiroroa, providing accommodation for another thirty pupils. An up-to-date Y.M.C.A. building, with hall, billiard-room, reading-room, canteen, &c., has been provided, and regular entertainments are provided by the Y.M.C.A. During the latter part of the period the number of men and equipment on the works has been considerably increased.

The construction of this railway offers several unique features, in that the centre-line is located on the opposite side of the Buller River from the main highway. This side, although the most suitable for the railway location, is too steep and precipitous to allow for the railway-formation and at the same time to provide room for camps or service roads; consequently all accommodation for the workmen has had to be built on the road side of the river, and even here room for buildings is very scant. The workmen have accordingly to be transported across the river night and morning, and this is done by the provision of ferry-boats working on overhead cables, each operated by a boatman and spaced about every quarter of a mile along the river.

South Island Main Trunk Railway.

A start has been made with the formation at the northern end of the line from Wharanui southwards. The portion of line from 56 m. 5 ch. to 60 m. 22 ch., with the exception of a gap between 59 m. 25 ch. and 59 m. 67 ch., which had been constructed about thirteen years ago, has been cleaned up to full width, and marram-grass planted on the batters and adjacent sand-drifts where required.

Formation ahead is in hand to 60 m. 45 ch.

Two married men's huts and twenty single men's huts have been erected, the men having been accommodated in tents temporarily.

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

Gisborne–Wairoa Survey.

Two parties have been engaged for practically the whole year on the completion of the survey of the coastal route for the Wairoa–Gisborne Railway, between Waikokopu and Gisborne. The permanent pegging is almost completed. In the earlier part of the year the trial-line survey of the inland route via Hangaroa Valley was completed, and comparative estimates of coastal and inland routes prepared.

South Island Main Trunk Survey.

The trial-line survey on the north end has been completed, and plans prepared from 62 m. to 66 m. and from 84 m. 30 ch. to 85 m. 50 ch. Permanent-line survey has been completed, and plans prepared from 59 m. 28 ch. to 61 m. 50 ch. and from 81 m. to 84 m. On the southern end a start has just been made, and about 3 m. of trial survey have been run from Parnassus northward.

North Auckland Railway.

A survey of the suggested deviation via the flats fronting Waitemata Harbour, between Avondale and Kumeu, has been made.

CONSTRUCTION AND MAINTENANCE OF ROADS AND BRIDGES.

Huehue–Waimatenui (Bay of Islands County).—Formation on this road was widened from 10 ft. to 14 ft. for a distance of 3 m. 27 ch.

Knudsen's Road (Bay of Islands County).—This road was widened for a distance of 80 ch. from 9 ft. to 14 ft.; 6 ch. formed 20 ft. wide, 10 ch. formed 16 ft. wide, and 4 ch. formed 14 ft. wide.

Wharepunga Bridge (Bay of Islands County).—Bridge erected 74 ft. long, two 30 ft. rolled-steel-joist spans and one 14 ft. hardwood span, with 10 ch. approaches.

Kirikopuni–Parakao (Hobson and Whangarei Counties).—3¼ m. metalling were completed during the year. A maintenance gang has been employed continuously over the whole length of 12 m. A tractor and grader have also been employed periodically for the purpose of retopping and reconditioning metal surface. The metalling is now complete to the Parakao junction.

Pakotai Road (Hobson County).—35 ch. of heavy formation 13 ft. wide, together with two small bridges, have been completed.

Waimamaku–Donnelly's Crossing (Hobson and Hokianga Counties).—9 m. 31 ch. bottom-course and 16 m. 27 ch. top-course metalling have been laid down. Several bridges have been erected and four others are under way. Through traffic has used this road continuously since last October. Metalling operations have been continued under extremely difficult conditions in this wet area. The road service is an excellent one, and it is due primarily to the use of cemented gravel, which is well rolled, and was assisted by the wet conditions and to the extensive draining which has been done in the kauri swamps.

Horeke–Taheke (Hokianga County).—This road has been formed 18 ft. wide for a distance of 4 m. 30 ch. Five bridges were erected, totalling 270 lin. ft.

Iwitaua Road (Hokianga County).—90 ch. road have been widened from 10 ft. to 16 ft. and 48 ch. widened to 14 ft. 59 ch. of road have been metalled.

Mangamuka–Victoria Valley (Hokianga County).—The Mangamuka River Bridge has been extended by four 40 ft. spans, and corners have been extensively cut back. 2,976 cub. yd. of gravel has been spread on the road.

Whakarapa–Te Karaka (Hokianga County).—2 m. 42 ch. have been widened to 16 ft. The Lower Waihou Bridge, 160 ft. long, and Whanganamu Bridge, 80 ft. long, have been erected and approaches completed. 7 ch. sea-wall was also built, and 3 m. 30 ch. of road metalled.

Whangape–Rotokakahi (Hokianga County).—1 m. 30 ch. metalled. Materials for Awaiti and Mangonuiowae Bridges are being carted to the site.

Whirinaki–Taita (Hokianga County).—2 m. 74 ch. formed 14 ft. wide, 70 ch. being in rock, have been formed.

Diggers' Valley Road (Mangonui County).—This road has been widened from 9 ft. to 16 ft. over a distance of 7 m. 32 ch.; 57 ch. metalled 9 ft. by 9 in.

Kaingaroa–Lake Ohia (Mangonui County).—2 m. 40 ch. widened to 14 ft.; 36 ch. metalled 9 ft. by 9 in.

Lake Ohia–Merita (Mangonui County).—4 m. 50 ch. formed 12 ft. wide, and 2 m. 20 ch. formed 14 ft. wide.

Oruru–Fern Flat–Mangamuka (Mangonui County).—1 m. 15 ch. road widened to 18 ft., 43 ch. widened to 16 ft., and 12 ch. formed 32 ft. wide; 56 ch. have been metalled. Four bridges, totalling 295 ft., were erected. Numerous slips have been cleared during the period.

Takahue–Herekino (Mangonui County).—This road was widened to 12 ft. over 3 m. 30 ch., and to 14 ft. over a distance of 3 m. 27 ch.

Waipapakauri–Tangoake (Mangonui County).—The road was widened to 16 ft. over 7 m. 10 ch., and 3 m. 67 ch. of road was sanded.

Mareretu–Waikiekie (Otamatea County).—Four bridges were erected, totalling 250 ft., and approaches were formed.

Carter's Valley Road (Whangarei County).—1 m. 20 ch. of road metalled 9 ft. by 7½ in.

One Tree Point–Ruakaka (Whangarei County).—3 m. 68 ch. drains constructed and 1 m. of road formed 20 ft. wide.

Russell–Whangaruru (Whangarei County).—3 m. 53 ch. of road cleared and 4 m. 30 ch. formed 18 ft. wide; 2 m. 66 ch. metalling 12 ft. by 6 in. was completed. Three bridges erected, totalling 130 ft.

Taumaterau–Whangarei Heads (Whangarei County).—1 m. 72 ch. widened to 18 ft.; 2 m. 18 ch. metalled with rock from excavation, 10 ft. by 9 in.; 10 ch. retaining-wall built. Engineering surveys in hand.

Waiotira–Ararua (Whangarei County).—2 m. 69 ch. road formed 16 ft. wide, and 2 m. metalled. Two bridges erected, totalling 115 ft.

Waipu Gorge Road (Whangarei County).—3 m. 29 ch. are now widened to 18 ft. and 3 m. 43 ch. metalled 12 ft. by 6 in. The necessary materials for bridges are being carted to the sites. Most of the formation work has been finished in this gorge. It is proposed shortly to commence the manufacture of concrete piles for the bridges, which have now to be two-way bridges.

Whakapara–Helena Bay (Whangarei County).—4 m. 10 ch. widened from 9 ft. to 18 ft.; 3 m. 61 ch. metalled 10 ft. by 9 in.

Omaunu Block Roads (Whangaroa County).—1 m. 23 ch. of road has been formed 12 ft. wide and culverted.

Oakleigh–Waipu Road (Whangarei and Hobson Counties).—Some considerable difficulty was experienced with the first coat of sealing which was used from 0 m. to 7 m., and during the year this had to be repeated on more than one occasion. The final treatment was given sealing of bitumen for 6 m. out of 7 m., and on the other mile proper penetrated road was placed. From 7½ m. to 8½ m. semipenetration method was adopted. It is intended next season to finish the semipenetration from 8½ m. to the end at Waipu at the 16½ m. peg. A considerable quantity of metal has been carted on to the road in preparation for the summer programme.

Colville to Port Jackson (Coromandel County).—Formation work extending over a total distance of 8 m. 32 ch. has been carried out during the period.

Coromandel to Whangapoua Road (Coromandel County).—New formation work has been carried out over a distance of 3 m. 5 ch. A deviation has been formed of 51 ch. The total length now completed is 5 m. 26 ch. This road, when completed, will give access across Coromandel Peninsula.

Tapu to Coroglan (Coromandel County).—Metalling and blinding work on this road has been carried out over a distance of 2 m. 10 ch.

Hull–McNaughton Road (Franklin County).—Proposals were approved for 251 ch. of re-formation and 304 ch. of metalling. The formation has been completed, and a considerable quantity of metal has been carted on to the site. 16 ch. of metalling has been completed.

Quinn Road (Franklin County).—70 ch. of road were formed and 150 ch. metalled during the period.

Taurangaruru Main Road (Franklin County).—During the year 2 m. of metalling were completed by the Franklin County Council.

Waiuku to Kariotahi (Franklin County).—64 ch. of metalling 9 ft. by 6 in. were completed during the year.

Harataonga to Port Fitzroy (Great Barrier Island County).—7 m. of new 4 ft. track was completed by the Great Barrier Island County Council.

Ngataipua East Road (Hauraki Plains County).—Proposals were approved for metalling 162 ch., 110 ch. being completed.

Ngatea to Kaihere Landing Road (Hauraki Plains County).—206 ch. re-formed and metalled, and balance of road re-formed preparatory to metalling.

Patetonga Riding Roads (Hauraki Plains County).—Proposals have been approved for metalling 8 m. 20 ch. 12 ft. by 9 in. at an estimated cost of £15,340. A length of 144 ch. first course has been laid, and work will be resumed in the spring.

Waitakaruru to Morrinsville (Hauraki Plains County).—185 ch. of road have been metalled 10 ft. by 6 in.

Kawaroa Road (Kawhia County).—This road has now been formed 14 ft. wide for 9 m. 12 ch.

Taumatatotara East (Kawhia County).—144 ch. of road have been formed 14 ft. wide. Further proposals for formation and culverting are in hand and nearing completion.

Taumatatotara West (Kawhia County).—During the year 2 m. of metalling 9 ft. by 7 in. were completed. The erection of one stone and one concrete culvert is in hand.

Mill Road Bridge (Manukau County).—The erection of this concrete bridge, length 40 ft., was completed and approaches formed.

Ward's Bridge (Manukau County).—This reinforced-concrete bridge, consisting of one 40 ft. span, 12 ft. roadway, was completed during the year.

Okoroire to Tapapa (Matamata County).—110 ch. of formation, culverting, and metalling have been completed during the year.

Puketurua to Urewera (Matamata County).—This road was metalled 10 ft. wide by 9 in. deep over a distance of 70 ch.

Puketutu Road (Matamata County).—160 ch. of metalling completed 10 ft. by 6 in.

Ohinemuri River Bridge, Paeroa (Ohinemuri County).—The excavation of extra waterway at this bridge has been completed. The work progressed rather slowly on account of weather conditions.

Waihi - Whangamata Road (Ohinemuri County).—On the Waiharakeke–Parakiwai section reconstruction work has been carried out over a distance of 2 m. 17 ch. Between the Ramarama and Whiritoa Streams 1 m. 21 ch. of reconstruction work has been carried out. An engineering survey of the proposed deviation at Williamson's, 66½ ch. in length, has been completed.

Waitawheta Road (Ohinemuri County).—New relocation work has been carried out between Owharoa Bridge and top of hill, a distance of 29·47 ch. A deviation tramway 76 ch. in length has also been completed. A concrete bridge over stream at Owharoa Falls, 16 ft. arch span and 10 ft. 6 in. roadway, has also been completed.

Adams Road (Otorohanga County).—Formation 3 m. 31 ch., 14 ft. wide, was completed as relief works and handed over to local body for future maintenance.

Kawa to Pukemapou Road (Otorohanga County).—242 ch. of formation and culverting has been completed and 76 ch. metalled.

Lurman's Road (Otorohanga County).—42 ch. metalling completed 10 ft. by 8 in.

Mangawhero Road (Otorohanga County).—103 ch. of metalling completed 10 ft. by 8 in.

Otorohanga to Pirongia (Otorohanga County).—170 ch. of this road has been metalled.

Owawenga Valley Road (Otorohanga County).—Formation of 210 ch. road 12 ft. wide completed as relief works and handed over to local body for future maintenance.

Pakarau Soldiers Settlement Road (Piako County).—Metalling on this road, which was approved in January, 1927, has been completed, total distance being 5 m. 65 ch.

Te Miro Road (Piako County).—Metalling on this road has been extended 80 ch. during period.

Thomas's Road (Piako County).—This road has been metalled for a distance of 133 ch.

Waihou River Bridge (Piako County).—The erection of this bridge at a cost of £16,752 was completed during the year. It consists of ten 40 ft. beam spans, reinforced concrete on mass concrete and pile piers and abutments; width of roadway between curbs, 18 ft., with footways each side, 4 ft. 6 in. The Department's contribution was £5,000.

Klondyke Road (Raglan County).—Proposals have been approved for 160 ch. of metalling. During the year 105 ch. of first course were completed.

Opuatia Stream Bridge (Raglan County).—This bridge, consisting of one 41 ft. truss, one 25 ft. and one 20 ft. spans in hardwood, was completed during the year, together with approaches.

Pukekawa to Mercer (Raglan County).—155 ch. of metalling were completed during the year.

Whaanga Road (Raglan County).—242 ch. of formation 14 ft. wide were completed by the Department as relief works and handed over to the local body.

Ahuroa to Komokoriki (Deviation), (Rodney County).—45 ch. road-formation 20 ft. wide were completed and 27 ch. of metalling.

Wolf's Bridge and Approach Road (Rodney County).—This bridge, consisting of one 25 ft. and two 20 ft. spans, has been completed during the year. 16 ch. of approaches have been formed and metalled.

Hikuai – Whangamata Road (Thames County).—Formation work on this road has been completed over a distance of 12 m. 66 ch. Four small bridges have been erected.

Tapu-Coroglen (Thames County).—During the year 15 ch. of formation was carried out. Metalling has been completed over a distance of 5 m. 33 ch. Of the full programme of 9 m. 63 ch. only 20 ch. now remain to be completed.

Waihi to Whangamata Road (Thames County).—This section of the road, 3 m. 41 ch. in length, has been completed and handed over to the Thames County Council. Two small bridges have been erected.

Tauhei-Morrinsville (Waikato County).—86 ch. of metalling were completed 12 ft. by 9 in. during the period.

Owairaka Valley Deviation (Waipa County).—Proposals have been approved for 229½ ch. of re-formation and culverting. 90 ch. of earthwork has been completed.

Puahue Soldiers Settlement Road (Waipa County).—159 ch. of metalling were completed during the year.

Greenhithe to Cut Hill (Waitemata County).—150 ch. of metalling completed.

Silverdale to Wainui Road (Waitemata County).—48½ ch. of metalling completed.

Orakei Waterfront Road (Waitemata County).—Formation: With the exception of the approaches of one or two bridges, the earthworks have been completed throughout the road. After a period had been allowed for settlement trimming was completed for 2 m. The spoil was practically all obtained from Campbell's Point, where four steam-shovels shifted some 162,000 cub. yd. in future park and road formation.

Protection works: This has been completed on the harbour side with pitched and grouted wall and dumped apron up to 2 m. 65 ch., with the exception of the bridge-ends. On the inner side, across Hobson Bay, a dumped rubble wall only was placed. Some 55,000 cub. yd. of stone was used during the year, a large amount of this being used to form the apron or toe protection.

Surfacing: The road is being formed as a waterbound macadam founded on a hand-packed spall foundation, and finally a 2 in. wearing-coat of bitumen is being applied.

Kerbs and channels: These have been laid on both sides for a considerable distance.

Storm-water drains and cesspits: Sets consisting of two pre-cast cesspits connected by 9 in. concrete pipes and draining out through the sea-wall have been laid at 4 ch. intervals from 1 m. to 1 m. 72 ch. and from 2 m. 22 ch. to 2 m. 52 ch.

Bridges: At Point Resolution an overhead bridge of two 60 ft. bowstring spans was erected and is complete except for the stairway leading up to the Point. All the piles have been made for No. 1 bridge, and those in abutment No. 1 A and B have been driven. At bridge No. 2 some twenty piles have been made, and the construction of the remainder is being proceeded with.

Whakatakataka Bay Road (Waitemata County).—The formation is now complete. A dumped wall of large spalls is used to retain the toe of the formation and this is now being battered back and hand-pitched to a 1–1 slope. The road is being surfaced to the same standard as the Waterfront Road.

Purewa Stream Bridge (Waitemata County).—Formation: The approach cutting on the south side has been put through, and both approaches have been formed as far as possible without fouling the foundations of the abutments. All the 18 in. square concrete piles were completed, and in the north abutment holes were chopped and abutment piles placed.

Mission Bay Extension Road (Waitemata County).—Good progress was made during year, some 62,500 cub. yd. of spoil being moved, and the formation is being proceeded with satisfactorily. The necessary protective work is being proceeded with, and owing to the exposed situation a stronger section of wall is being built than was erected on the previous section.

Opotiki – East Cape Road (Motu River - Te Kaha Section), (Opotiki County).—This work was carried out as a relief work, a number of unemployed from Auckland being engaged. A start was made at the Te Wai-o-Poahu Stream, and the road was formed up to the Motu Bridge along the west bank of the river. This was all steep sidling country, and since the work was completed numerous slips have come down. On the eastern side the road was deviated to above flood-level, and work is in progress as far as Te Kaha. During the year 8 m. 31 ch. of road 16 ft. wide have been completed, 7 ch. of metalling done, and eighty-one culverts placed, total length being 2,305 ft. Most of the culverts are reinforced-concrete-pipe culverts. The following bridge plans have been prepared: Te Wai-o-Poahu Bridge, 121 ft. long; bridge at 3 m. 45 ch., 53 ft.; bridge at 3 m. 52 ch., 64 ft.; Whitianga Bridge, 93 ft.; and Waioriri Stream Bridge, 100 ft. Contracts have been let for the erection of Te Wai-o-Poahu and Whitianga Bridges.

Motu River Bridge (Opotiki County).—Good progress was made with the erection of this bridge, which consists of four 110 ft. and one 81 ft. hardwood truss spans on concrete abutments and concrete-cylinder piers. Great trouble was experienced in finding a suitable bottom for the eight cylinders, and in some cases the cylinders had to be sunk 66 ft. below the bed of the stream. In all, 450 ft. of cylinders were sunk. The bridge is nearing completion.

Orete – County Boundary (Opotiki County).—52 ch. of road were formed 14 ft. wide and a number of concrete-pipe culverts were placed.

Te Kaha – Orete Road (Opotiki County).—This work is also being carried out as relief work. 3 m. 49 ch. of road have been formed as a dray-road 16 ft. wide and culverted with concrete pipes. A traffic-bridge in hardwood was erected; length, 26 ft.

Motu–Whitikau via Marumoku (Opotiki County).—A traffic-bridge 50 ft. long and 10 ft. 4 in. between wheel-guards was erected in hardwood.

Opotiki–Matawai via Waioeka (Opotiki and Waikohu Counties).—68½ ch. of road 16 ft. wide were formed, 48 ch. metalled 12 ft. wide, and concrete-pipe culverts installed. This road has given a great deal of trouble during the year, owing to the large number of slips that have come down, the country being very steep. A contract has been let for the erection of a bridge over the Manganuku Stream. This bridge will be 111 ft. long, rolled-steel joists on concrete piers and abutments. This road, when completed, will be the main connection between Opotiki and Gisborne districts.

Petipeti Bridge (Takaputahi Road), (Opotiki County).—This bridge, consisting of one 61 ft. hardwood truss span and one 25 ft. stringer span on hardwood-pile piers and concrete abutment, was completed.

Waioeka - Opata Junction to Redpath's (Opotiki County).—28½ ch. of road 12 ft. wide formed and concrete-pipe culverts placed.

Mamaku Village Streets (Rotorua County).—50 ch. of formation 14 ft. to 16 ft. wide, 37 ch. of metalling with rhyolite 12 ft. wide, and concrete culverts were placed.

Te Matai Road (Rotorua County).—This road was metalled over a distance of 82·7 ch. with rhyolite 10 ft. wide.

Sunset Road (Rotorua County).—90 ch. of road formed 13 ft. wide and concrete-pipe culverts laid.

Pongakawa School Road (Tauranga County).—70 ch. of formation 16 ft. wide was completed and culverted.

Wharawhara Stream Bridge (Tauranga County).—One 60 ft. hardwood-timber bridge 12 ft. wide was erected.

Kopuriki Bridge (Whakatane County).—This bridge, 220 ft. long, consisting of rolled-steel joists on hardwood-pile piers was erected during the year.

McLean's Road (Whakatane County).—95 ch. of road metalled 10 ft. wide.

Urewera Block Roads (Whakatane County).—108 ch. of road was formed 12 ft. wide and culverted.

Whakatane Traffic Bridge (Whakatane County).—42 ch. of road were formed 18 ft. wide and metalled 12 ft. wide. Two hardwood bridges totalling 154 ft. in length were erected on hardwood-pile piers.

Hangaroa–Tahora (Cook County).—On this road ¾ m. of bottom course and ¾ m. of top course was put down. The bottom course is now completed on this road 20 m. from its junction with the Hangaroa Main Highway. There are still 3½ m. of top-course metal required.

Mangapoike Road (Cook County).—On this road 2 m. of formation has been carried out by the Department, and 1½ m. of bottom- and top-course metalling has been completed by the Cook County Council. There is still 5 m. of metalling required to complete to the Wairoa and Cook County boundaries.

Waiomuku Bridge (Cook County).—A light traffic suspension bridge was erected over the Waiomuku Stream; length, 110 ft. This bridge eliminates a very bad crossing and gives very much improved access to some excellent country.

Karakatuwhero (Matakaoa County).—¾ m. of formation was completed in the Karakatuwhero Valley, which cuts out a bad section of river-bed.

Potaka–Waikura (Matakaoa County).—½ m. of formation has been completed along the Oweka Stream. Surveys are in hand for the balance of this road. At present the traffic follows the bed of the Oweka Stream from Potaka to Waitangihea, 4 m.

Te Araroā - East Cape (Matakaoa County).—¾ m. of formation has been completed. It is now a formed road for 1½ m. from Te Araroa on this route. Beyond this point access is via the beach.

Armstrong - Makari Road (Waikohu County).—On this road 134 ch. of dray-road and 40 ch. of bridle-track have been completed, giving access to the Armstrong Road from the Waipaoa River.

Ngatapa–Wharekopae (Waikohu County).—2 m. of metalling has been completed. A bridge, rolled-steel joists, 54 ft. in length, has been erected across Boundary Creek.

Matawai–Hangaroa (Waikohu County).—2½ m. of formation has been completed, and the engineering surveys for a further 2½ m. to link up with the Wharekopae–Tahora Road are in hand. When completed, this road will give the Tahora and Wharekopae settlers access to the railway at Matawai.

Poroporo Road (Uawa County).—1¼ m. of formation has been completed during the year. This replaces portion of the road destroyed by flood in 1916, and will ultimately provide access to the Poroporo Block, now being subdivided for settlement.

Maraehara Road (Waiapu County).—1 m. of formation has been completed on this road, which gives access to a considerable area of Native country.

Te Hue Road (Waiapu County).—65 ch. of metalling has been completed. This road gives access to a soldier settlement.

Erua Road (Kaitieke County).—2 m. of formation and 20 ch. of metalling have been completed.

Heao Station Road (Ohura County).—2¾ m. of formation completed.

Kururau Road (Taumarunui County).—3 m. of this road has been re-formed and culverted.

Taumarunui–Taringamotu Road (Taumarunui County).—6¾ m. of this road has been re-formed and culverted.

Mangaokewa Road (Waitomo County).—44 ch. of formation and metalling have been completed.

Waipa Stream Bridges (Waitomo County).—Two bridges, total length 108 ft., have been erected.

Wiremu Road (Egmont County).—The formation of this road has been carried out as a relief work employing from thirty to forty men. 4 m. 8 ch. of 14 ft. road has been constructed.

Egmont National Park (Northern Road), (Taranaki Road).—4 m. 8 ch. of this road has been widened and reconstructed, and 3 m. 28 ch. was remetalled and sealed with bitumen.

Makakahi Road (Waimarino County).—1 m. 58 ch. of bush cleared and 1 m. 58 ch. of 12 ft. roa formed.

Mangapurua Valley Road (Waimarino County).—A 12 ft. road has been formed over a distance of 3 m. 10 ch.

Owairua Road (Waimarino County).—The formation, 12 ft. wide, has been extended a further 2 m. 34 ch.

Rakautangi–Kohura Road (Waimarino County).—Bridle-track was formed for a distance of 6 m. 66 ch., and the dray-road formation, 12 ft. wide, has been extended 4¾ ch. 7½ m. of engineering survey was carried out during the year.

Field's Track to Rangiwaea (Waimarino County).—The 12 ft. formation was extended a further 1 m. 14 ch. and maintenance carried out.

Wangaehu Valley (Koukoupo Stream Bridge), (Wanganui County).—This bridge, consisting of a truss span of 61 ft. and a stringer span of 25 ft., has been completed.

Wanganui River Road (Left Bank), Jerusalem to Ranana (Wanganui County).—The bush has been felled and cleared 63 ch., and the 14 ft. dray-road formation extended 1 m. 56 ch.

Wanganui River Road (Left Bank), Upokongaro to Jerusalem, (Wanganui County).—The 14 ft. dray-road has been formed for a further distance of 5 m. 58 ch., 848 ft. of water-drives constructed, and 13½ m. of engineering surveys were carried out.

Tapuni Road (Mangaehu Stream Bridge), (Whangamomona County).—This bridge, consisting of a 60 ft. steel-plate-girder span on concrete abutments, was completed.

Mangangarara Block Access (Dannevirke County).—137 ch. of fencing was completed.

Mangapuaka Road (Lower), (Speedy's), (Dannevirke County).—1 m. 19 ch. of road was metalled 9 ft. wide.

Arapawanui River Bridge (Tongoio–Mohaka Coast Road), (Hawke's Bay County).—A low-level bridge was erected, consisting of five 12 ft. spans on 70 lb. iron rails, with concrete deck and 10 ft. roadway.

Arapawanui Settlement Road (Hawke's Bay County).—1 m. 25 ch. of this road was metalled.

Kaiwaka South Road (Purahotangahia Settlement), (Hawke's Bay County).—2 m. 40 ch. of this road was metalled during the year 8 ft. wide and 6 in. deep.

Ohiwia Stream Bridge (Hawke's Bay County).—This bridge was erected, and consists of four 40 ft. rolled-steel-joist spans on concrete piles and abutments, with concrete deck.

Tutira–Pohokura Road (Hawke's Bay County).—8 m. 40 ch. of engineering surveys was carried out by the Department. 6 m. of road was formed, and the road is now completed for a distance of 20½ m. Good progress is being made with this work, and is being carried out as relief work. The Hawke's Bay County Council has also metalled a further 3 m. of this road.

Bergensen's Road Bridge (Waipawa County).—This bridge has been completed. It consists of one 33 ft. span, rolled-steel joists on concrete piers with timber top.

Master's Bridge, Valley Road (Waipawa County).—This bridge was erected, consisting of one 30 ft. reinforced span on concrete piles and abutments, with wing walls. Roadway 12 ft. wide.

Mangapoike River Bridge (Hinchesman's), (Wairoa County).—A light suspension bridge of 300 ft. span has been erected over the Mangapoike River.

Mohaka to Kotemaori (Old Coach-road), (Wairoa County).—1 m. 40 ch. of this road was metalled 10 ft. wide and 4 in. deep.

Ruakituri River Bridge (Ngapakira), (Wairoa County).—A suspension bridge of 210 ft. span, 7 ft. 8 in. roadway, to carry dray traffic was erected. The wooden towers are 27 ft. high, and the bridge is supported by four cables each side, 3¾ in. circumference. An approach road 18 ch. long and 14 ft. wide was also constructed.

Waikatea Road (Wairoa County).—1 m. 21 ch. of dray-road formation was carried out.

Waikaremoana–Ruatahuna.—The Department carried out 16 m. 55 ch. of engineering survey and 8 m. 40 ch. of dray-road formation, putting in culverts totalling 3,224 ft. 7 m. of this road was also maintained, and one bridge of 16 ft. span erected.

Akitio River Road (Akitio County).—159 ch. of metalling has been completed.

Pongaroa–Akitio Road (Akitio County).—160 ch. of metalling has been completed on the Waiotiake deviation, and 82 ch. on the Akitio Hill.

Hutt River Bridge (Lower Hutt Borough).—The new bridge, in reinforced concrete, has been erected, and approaches have been completed. It consists of eight 45 ft. spans, with 30 ft. roadway and two 5 ft. footpaths.

Dagg's Road (Mauriceville County).—130 ch. of metalling has been completed.

Ballance–Manawatu Gorge Road.—2 m. 6 ch. of this road widened from 12 ft. to 18 ft.

Whakataki–Mataikona Road.—4 m. 42 ch. of formation was completed as relief work.

Plimmerton – Pukerua Bay.—This road has been formed for a distance of 2 m. 60 ch., also as a relief work.

Mangarakau Bridge (Collingwood County).—The erection of a bridge of four 25 ft. beam spans on concrete-pile piers and abutments, with 9 ft. 6 in. roadway, has been completed, and formation of approaches are now in hand.

Wash to Tophouse (Marlborough County).—2 m. of metal has been blinded; 6 ch. of 16 ft. formation and 28 ch. of metalling have been completed.

Blenheim – Hope Junction (Tophouse – Hope Junction Section), (Murchison County).—Formation has now been completed throughout, with the exception of several bridge approaches. 10 m. of road have been graded, 5½ m. of metalling completed, and remainder is in hand. Numerous culverts have been placed, and retaining-walls have been erected as required on the Kawatiri – Harley's Rock section. A 35-ft.-span bridge at Black Valley is in hand. A bridge of one 81 ft. truss span has been erected at Upper Buller. Plans have been prepared for a bridge at Homestead Creek. The Howard River Bridge, consisting of one 100 ft. truss span in hardwood on mass concrete abutments, has been completed; also a similar bridge of one 81 ft. truss span at Harley Rock.

Blenheim – Hope Junction (Waimea County Section).—Formation and culverting of deviation 2 m. 52 ch. was completed. A 6 ft. by 6 ft. reinforced-concrete culvert 70 ft. long at Cedar Creek was completed and numerous smaller culverts placed.

Clarence Valley Track (Awatere County).—3 m. 8 ch. of 4 ft. track completed.

Little Wanganui to Kongahu (Buller County).—6 m. 24 ch. of formation 14 ft. wide was constructed and 63 ch. metalled 12 ft. wide.

Little Wanganui to Wangapeka (Buller County).—64 ch. of track was widened to dray-road width and 1 m. metalled as a relief work. Plans for an 80-ft. span truss bridge have been prepared, and when this is erected the access required by settlers will be completed. This road is a section of the ultimate Little Wanganui – Tadmore Road.

Oparara River to Simpson's (Buller County).—1 m. 5 ch. of road 14 ft. wide has been formed and 40 ch. metalled. This road connects with a probable future coast road to Heaphy.

Westport to Greymouth Coast Road (Buller County).—During the year 2 m. 50 ch. of road 14 ft. wide was constructed, 3 m. metalled, 673 lin. ft. of culverts placed, and one 18 ft. platform bridge erected. 40 ch. of light formation and widening and 1 m. of metal still requires to be done. This practically completes the formation of the Westport–Greymouth coast road, with the exception of the bridges at Punakaiki, Pororari, and Fox's Rivers. Materials for the first two bridges have been delivered on the site and contracts for erection (labour only) have been let. Plans for the last-mentioned bridge have been completed and materials will be ordered in the near future.

Brunner to Blackball Road (Grey County).—This road forms a section of the Grey Valley Road, and was put in hand as a relief work. 74 ch. of formation and 31 ch. of metalling was done during the year, together with the erection of one 27 ft. platform bridge and the placing of 427 lin. ft. of culverts.

Crooked River Bridge (Grey County).—This bridge, on the Grey Valley – Taramakau Road, has been completed. Four traffic-bridges are still required on this road.

Moonlight Creek Bridge (Grey County).—The construction of this bridge, 302 ft. long, has been completed, and spans the previous bad crossing on the Grey Valley Road.

Matakitaki – Springlands Junction Road (Inangahua County).—1 m. 6 ch. of road was formed and 2 m. 38 ch. metalled.

Creighton's Bridge (Maruia), (Inangahua County).—A suspension bridge 340 ft. long for foot traffic was erected.

Springlands Junction to Hot Springs Road (Inangahua County).—7 m. 15 ch. of road was formed, 2 m. 29 ch. metalled, and culverts placed. Two bridges, totalling 54 lin. ft., have been completed during the year. This work is being pushed through to completion. Two small bridges are still required to enable traffic to cross the creeks when in flood.

Waiau to Maruia via Lewis Saddle (Inangahua County).—This road is a continuation of the Springlands Junction to Hot Springs Road via Glenwye and Culverden to Canterbury District. The work has been commenced at the Hot Springs as a relief work. 40 ch. have been formed and 10 ch. metalled during the period.

Dorothy Falls Track (Westland County).—This work is being carried out as a relief work, and will give access, when completed, to Dorothy Falls, Lake Kanieri, via Lake Kanieri Road. 60 ch. were formed and metalled.

Main South Road (Waiho to Cook's), (Westland County).—32 ch. of 9 ft. road were widened to 16 ft. and metalled. This section has been improved, and when the Docherty and Omoeroa Rivers are bridged tourist traffic will have ready access as far as the Cook's River. Materials are coming to hand for both these bridges, and construction work will be put in hand shortly. The former bridge will consist of four rolled-steel-joist spans on ironbark piles.

Waikukupa River Bridge (Westland County).—The portion of bridge damaged by flood has been restored by the construction of three 42 ft. rolled-steel-joist spans and one 25 ft. ironbark span on pile piers.

Summit Road (Halswell County).—3 m. of this road have been formed 16 ft. wide. The work was done by co-operative contracts as a relief work.

Conway River Bridge to Claverly (Kaikoura County).—3 m. of access road have been formed and metalled.

Ram-paddock Road (Kowai County).—Plans have been approved for forming two deviations for a total length of 100 ch. to improve grades and alignment. This was also a relief work.

Tengawai River Bridge (Cave), (Levels County).—A light-traffic bridge 310 ft. long has been erected and approaches formed.

Pareora Bush Road (Mackenzie County).—During the period 54 ch. of heavy side-cutting have been completed by the unemployed. A road has been formed to a width of 22 ft. for 36 ch., and 18 ft. for 18 ch. The formation has now been completed, and tenders are being called for metalling.

Lake Sumner Pastoral Runs (Waipara County).—1¼ m. formed and 3¾ m. metalling have been completed.

Parnassus – Waiau Road (Amuri County).—8 m. of road-deviation and widening existing road has been completed. The metalling is in progress.

Pareora Bush Road (Levels County).—75 ch. of road-deviation has been formed to 16 ft. wide on heavy side-cutting, partly rock formation.

Upper Rangitata Road Deviation (Geraldine County).—65 ch. of road have been widened, and grades improved by making deviations, lowering cuttings, and making up banks.

Catlin's Valley to Table Hill (Clutha County).—1 m. 68 ch. formed and 41 ch. metalled.

Karoro Creek Road (Clutha County).—The Department has completed 1 m. 30 ch. formation and 37 ch. of metalling.

Papatowai to Long Beach Creek (Clutha County).—2 m. 44 ch. road formed and 68 ch. metalled.

Pembroke to Mount Aspiring (Lake County).—1 m. 58 ch. of road has been formed and 3 m. 54½ ch. metalled.

Kingston–Queenstown Road (Lake County).—The Department has surveyed 18 m., formed 7 m. 12 ch. of dray-road, and gravelled 25 ch. One culvert, 40 ft. long, has been placed.

Hagen Road (Southland County).—3 m. 24 ch. of road has been formed, and twenty-five culverts placed, totalling 758 lin. ft.

Tokanui–Haldane (Southland County).—1 m. formation completed and 100 lin. ft. culverts placed.

Traill Road (Wallace County).—2 m. formation completed, one 30 ft.-span bridge erected, and twenty-six pipe culverts, aggregating 728 lin. ft., placed.

Pahia Loan Block Road (Wallace County).—Relief work. Culverts totalling 540 ft. placed.

HYDRO-ELECTRIC WORKS.

Arapuni Power Development.

During the year under review Messrs. Sir W. G. Armstrong, Whitworth, and Co.'s sole connection with the works was the concluding of the maintenance period of twelve months in respect to works carried out on No. 1 section of contract, which period expired on the 31st December, 1928. The firm's connection with the works ceased from that date.

The whole construction work for the year was carried out by the Department, and was generally run on shifts, with practically no interruptions, and progress has been good. At the beginning of the period the position at the power-house was that the coffer-dam has been successfully sealed, the foundations for the four turbine and generator units poured, and parts of No. 3 turbine transported to site. At the end of the period the power-house structure was sufficiently advanced as to provide cover for No. 3 unit, which was completely erected and put into service, supplying power in the first instance on the 3rd June, 1929.

Power-house.—Details of work carried out are as follows: The excavation for the foundations of the switch-gear annexe was finished early in the period. The quantity excavated was 1,851 cub. yd., making a total of 9,918 cub. yd. since the Department commenced operations.

Good progress was made with the concreting of the power-house structure, which work was carried out continuously on three shifts. Early in the period the foundations of Nos. 1 and 2 units were poured to such a level as would permit the erection of the turbine-casings. As the casings were erected and aligned the concreting of the foundations was completed, but preference was given to the south end of the structure, so as to provide for putting of No 3. unit in service at the earliest possible date. With this in view, the steel frame of the generator-room was commenced from the same end, and subsequent to its completion the walls and roof were concreted over and around No. 3 unit. Later on in the period the walls and roof were extended over No. 2 unit. Foundations for No. 1 machine are well advanced, the turbine and lower machine floors being poured.

Subsequent to the completion of the excavation under the switch-gear annexe and air ventilating-shafts, concreting was commenced there, and has been completed, with the exception of the roof of the upper switch-gear room. The remaining concreting-work to be completed comprises the roof of the switch-gear annexe, the generator-room floor, walls, and roof around No. 1 unit, and the workshop and unloading-bay, together with the low annexe structure. 8,083 cub. yd. of concrete and 114·6 tons of reinforcing-steel were placed in the structure during the period.

The erection of the steel frame of the generator-room was commenced early in the period, and has been completed for some months. A contract was let for the laying of the ruberoid roofing, a section over Nos. 3 and 4 units having been completed. Towards the end of the period a start was made with the cleaning-down and painting of that portion of the structure completed.

Penstocks.—The erection, riveting, and caulking of the penstocks between the tunnels and the Johnson-Larner valve casings were commenced and completed for the three units, with the exception of the jointer-ring of No. 1. The bituminous painting and enamelling of these sections, together with the completion of that in the tunnels, has been finished for Nos. 2 and 3 units.

Turbine and Valves.—The erection of No. 3 turbine and valve, which was commenced early in the period, was completed, and the unit later put into service. Difficulty was experienced with the aligning of the outlet casing of the valve, and before the cover could be got into position concrete had to be cut from around the lower portion of the outlet section and flanges eased by cutting out rivets. No. 3 valve was put into service with hand-control apparatus, pending a thorough trial and test of the automatic equipment fitted. Difficulties are being experienced with the governor of this unit, which is apparently sluggish, the speed of the unit due to suddenly throwing off load being in excess of the makers' guarantees.

The casing of No. 2 turbine has been erected, aligned, and grouted in, the runner and guide vanes erected, and the main valve completed except for the control gear. The erection of the governor, which is on site, and turbine details, comprising the lubricating, compressed-air and oil-pressure system, have yet to be done.

No. 1 turbine casing and outside casing of the valve have been erected, aligned, and grouted.

Tail-race.—At the beginning of the period the work of clearing the tail-race of spoil dumped by the late contractors into the river from the power-house excavation and of enlarging and straightening the channel itself was put on three shifts. A sand-bar across the old river-bed, at a point approximately

one mile below the power-house site, had been formed on the diversion of the Waikato River over the Waiteti Flat. Pumps were installed at this spot and were successful in reducing the water-level in the old river-bed from level 146 ft. to level 135 ft. This level was further gradually reduced till November last, when water-level 129 was reached, which permitted excavation in the dry.

The greater portion of the excavation was in the first 20 ch. down-stream from the power-house, from which length a total of 63,000 cub. yd. was removed, over 10,000 cub. yd. being handled in one month. Owing to the awkward location in the gorge, all material had to be handled by the use of three cranes, loaded into trucks, and hauled to near-by dumping-grounds.

All material in the bed of the river above the 129·0 level was removed; this, together with the widening, should have the effect, neglecting the backing-up of the river below the sand-bar, of providing a maximum tail-water level of 145·0 for full-load conditions of eight turbines.

The whole of the tail-race work was completed by the end of April last, and the tail-race was at once brought into use for the drying-out period of No. 3 unit on short circuit. The total tail-race excavation was 70,300 cub. yd., all except 4,000 cub. yd. being done during the period under review.

To provide against possible erosion of the floor of the tail-race immediately in front of the draught-tubes, a 30-ft.-wide protecting slab consisting of 12 in. of concrete was laid down for the full length of the power-house structure.

Coffer-dam.—To provide for the future dewatering of the gorge above the existing portion of the power-house, on account of future extensions to the power-house and tail-race, piers for a coffer-dam were constructed in concrete across the gorge just up-stream of No. 4 draught-tube; this work was completed just prior to the coming into use of the tail-race at beginning of May. The completion of the dam, which comprises the placing of steel joists and sheeting, has been left over until it is required.

100-ton Crane.—Subsequent to the completion of the erection of the first section of the generator-room steel frame the 100-ton crane was erected and put into service on the erection of turbines, valves, generators, &c.

Outdoor Station.—Miscellaneous work has been carried out and completed at the outdoor station. This includes alterations to the top of the cable-tunnel, further work on the oil- and water-circulating systems, including the installation and connecting-up of the transformer water-supply pumps, the construction of steel towers, and the erection of cables to the water-rheostat, together with other miscellaneous works.

Penstock Intakes.—Trimming and grassing of the batter above the intakes, together with the permanent fencing, has been finished. The completion of the concrete slab near the pump-house is at present in hand.

Overflow-channel.—The investigation, by the use of boring plant, into the nature of the tuff near the waterfall, which was in hand at the end of last period, was completed, five holes in all being put down. A certain amount of erosion has taken place at the overfall from the overflow-channel at the Waiteti Flat. A survey of locality has been made, and measures for dealing with the situation are under consideration.

Erection of Equipment.—The erection of the equipment has been carried out under the control of the construction staff. The work done is detailed in the Chief Electrical Engineer's report.

Waikaremoana Power Development.

During the year practically all construction work has been completed.

Headworks.—In the intake-race a temporary timber dam was shifted into the by-pass channel. Should the necessity arise this dam can be removed quickly, and the top 5 ft. of Lake Kaitawa drawn off.

The permanent diversion weir was completed in April, 1928, but owing to a serious leakage under the foundation it was necessary to construct a concrete mat between the weir and this wall. Excavation here amounted to 252 cub. yd., and concrete poured to 276 cub. yd. Pumping operations involved a good deal of work, one 10 in., one 8 in., and three 4 in. centrifugal pumps being operated. On completion of the cut-off wall and mat the foundations above and below the weir were grouted under pressure. Tests showed that there is now no appreciable leakage. The spoil-dump below the weir was sluiced away when the stream was turned over the weir. The bed of the stream below the weir was then paved with stone, connected in place, and the banks stone-pitched, 283 sq. yd. being placed. Clay was sluiced into the river-bed up-stream to seal bottom. The temporary spillway in the earth dam was back-filled, 902 cub. yd. being placed. Total filling in the dam amounted to 16,806 cub. yd., and 1,680 sq. yd., of stone pitching was placed in position. In the approach canal the temporary dam was removed when the tunnel-portal was completed, and all stone pitching finished. Excavation totalled 14,498 cub. yd., and stone pitching 1,448 sq. yd.

The construction of the main-tunnel portal was completed in July, 1928, 177 cub. yd. of concrete being required. Stop-logs were placed temporarily in position. Back-filling behind the portal and over the additional 70 lineal feet of tunnel constructed in cut was completed, 3,328 cub. yd. being placed. The tunnel was filled for testing in November, 1928, and tests revealed that there was a large leakage through the tunnel-lining. Grouting was commenced and the lining was grouted throughout the whole length of the tunnel, and the arch plastered with a cement-gun. Final tests showed that the leakage is now of small proportions.

In the spillway-channel to the surge-chamber 530 cub. yd. were excavated and 213 sq. yd. were stone-pitched. Wing walls to the surge-chamber, facing the pipe-line bench, were formed of stone pitching, 82 sq. yd. being placed.

All banks of ramps and nigger-head in Lake Kaitawa were removed; also all floating timber.

The pipe-line was completed by the contractors in October, 1928, the total length for two pipes being 7,176 lin. ft. Venturi meters were installed and the exciter bus-pipe connected. Connection

was made between the No. 3 anchor-block and the Larner-Johnson valves. All pedestals were grouted after the filling of the pipe. Between No. 3 anchor-block and the power-house the area was concreted, and retaining-wall built for drainage purposes: 106 cub. yd. of concrete were poured here. Surface drains were cut across the pipe-line bench to pick up storm-water and prevent scouring.

The power-house was completed during the period. The following were the main items of construction: Completion of the shell of the building; concreting of Nos. 1 and 2 machine foundations; Larner-Johnson valves; workshop and unloading-bay floors; construction of concrete-block partition walls; plastering walls; completing of roofing; all plumbing; glazing; joinery; drains; test tank, &c. Under the annexe and at the southern end of the power-house 6,363 cub. yd. of filling was placed, and the tail-race side of the filling has been protected with stone. Total concrete placed, 8,298 cub. yd.; steel, 160 cub. yd.; and excavation, 12,403 cub. yd.

At the outdoor station all traverser tracks and turntables (three) were completed. All concrete pads for the steelwork were completed, 665 cub. yd. being poured. An oil-filter house in concrete was erected. The following earthenware pipes were laid: 12-in.-diameter cable-ducts, 12 in. by 6 in. diameter cooling water drains, and 9-in.-diameter storm-water drain fed by 6 in. tile and concrete surface drains. A 12 in. tile and concrete drain was laid along the western side of the site for surface drainage.

Several slips were cleared away from the western side of the site. The whole site has been trimmed, metalled, and fenced. The cable-tunnel from the power-house to the station has been completed. The length of this tunnel is 557 lin. ft., and concrete required amounted to 570 cub. yd., and excavation to 2,080 cub. yd. The total excavation for the site amounted to 16,165 cub. yd.

As conditions now existing are favourable, a culvert and small dam have been constructed across the Kahutangaroa Stream in connection with the lower development. The culvert has a waterway of 150 sq. ft. and a length of 114 ft. Concrete required amounted to 325 cub. yd. A small clay-fill dam of 3,442 cub. yd. was constructed to divert the stream through the culvert. Stone pitchings amounted to 719 sq. yd.

Waitaki River Power Development.

This scheme provides for the construction of headworks, power-house, outdoor switch-gear, and transmission-lines for an ultimate development of 100,000 h.p. The work involves a dam 1,800 ft. long, containing 170,000 cub. yd. of concrete, 40,000 cub. yd. of which have to be placed below water-level of the Waitaki River. The power-house will be constructed on the down-stream face of the dam, at the Otago end, and will ultimately house five units, each consisting of a 23,000 h.p. turbine coupled to a 16,666 kv.a. generator.

At the beginning of this period a commencement had just been made with the setting-up of the construction camp and of getting plant on to the ground, so that the twelve-months period covered by this report practically includes all work done to the 30th June last. Test borings and similar investigation work were continued till September, 1928, by which time sufficient information was available to enable the exact location of the dam to be finalized.

The first essential for construction purposes was the provision of power and light, facilities for transport, and the provision of housing for staff and workmen.

Power and light were provided by the construction of an 11,000-volt transmission-line 4 m. long from the terminus at Kurow of the Lake Coleridge system to the works, and the erection of the necessary substation and reticulation. Regarding transport, an investigation showed that requirements would be best served by an extension of railway facilities from the railway terminus at Kurow right on to the site of the works. Accordingly the necessary four miles of service railway were built, and opened for goods service in December last and for passengers in the following February. The formation was generally light, including some rock-cuttings and two bridges. The railway has already proved to be of great value for transport of heavy plant, and when regular consignments of cement have to be handled will prove a great asset to construction operations.

The provision of living-accommodation is a big and expensive feature of the work. At the end of the period under review, 100 married workmen's houses and 145 single men's huts had been built, and building is being continued. Other features now provided include a fully equipped Y.M.C.A. social hall, cookhouses, bathhouses, &c. Cottages for staff, workshops, offices, and stores have been built.

Regarding the works proper, although the Waitaki River is a powerful stream, subject to seasonal floods, it is considered imperative that not only shall the utmost possible use be made of the low-river stages, but that construction work on the river itself be carried on irrespective of the flood season. The layout of the coffer-dams has been fixed having this need in view, and work is being planned and done to the following programme: Firstly, to construct, under the protection of a central coffer-dam, a section of dam 25 ft. long in mid-stream, carrying concrete to a suitable safe level; secondly, to extend the coffer-dam from the central section of dam on to the Canterbury bank, and build the dam therein to a level above the temporary sluices that must be provided for passing the river while the section of dam on the Otago side is being built; thirdly, to construct the coffer-dam from central section of dam on to the Otago bank of river and continue with that portion of the dam. The remainder of the work will follow in routine order. At the same time the excavation for and concreting of the power-house section of the dam is to be pushed ahead to make room for power-house construction and erection of machinery.

The river has been bridged with a strong steel trestle located on the line of the up-stream end of the coffer-dam. This trestle is 540 ft. long and carries two rail-tracks, and is built to withstand the fierce floods that the river is subject to. The steel-sheet piling, 45 ft. long, for the coffer-dam for the central section of dam is all driven, enclosing an area 243 ft. long up and down stream, and 33 ft. wide. The next operation is to dewater and excavate for this section of the concrete dam, the coffer-dam

being secured by heavy strutting as the work proceeds. This central coffer-dam, secured by its enclosed section of the permanent work, will in turn furnish the starting-point for both the Canterbury and Otago coffer-dams.

Excavation for the power-house section of the dam has been begun, as also has excavation for the abutment of the dam against the hills on the Canterbury side. A deviation of the main road, 1½ m. long, has been completed and put into use.

A complete construction plant is already installed or is arranged for. The plant in use includes steam-locomotives, several pile-driving plants, derricks, cranes, air-compressing plants, &c. Plant for concrete-mixing purposes, including bins, is under erection.

Three shifts are employed on the river work, and two shifts on some of the other excavation. At the end of June 332 men were employed on the works.

RIVER IMPROVEMENT AND PROTECTIVE WORKS.

Wairoa River.

Tokatoka Stop-banks.—The work of protecting the foreshore of the Wairoa River against tidal and wave erosion, with consequent destruction of the stop-banks, made some small progress this year, 1,373 cub. yd. of rock spalls being placed on the foreshore, including a length of 25 ch. of the Awaroa Stream. 87 ch. of drain were cut between Wallace Road and Creamery Road, and a culvert, 36 ft. long, of 4-ft.-diameter pipes was laid under Creamery Road.

Waihou and Ohinemuri Rivers Improvement.

During the past year almost the whole work done was on the Lower Waihou River, and that lower end of the scheme is now substantially completed. A summary of the work done there is as follows: Stop-banks constructed by suction dredges, 2 m. 60 ch.; lighter sections of stop-banks constructed by co-operative contract, 2 m. 70 ch.; soiling stop-banks by use of Ruston drag-line excavators, 6 m. 71 ch.; filling borrow-pits and clearing beams by use of Ruston drag-line excavators, 3 m. 48 ch. Ten culverts, with flood-gates, sizes ranging from 12 in. to 4 ft. diameter, have been built. Road-reconstruction over a length of 80 ch., necessitated by construction of stop-bank, has been done.

On various major drains 5 m. 40 ch. of widening, deepening, and making batters has been done by drag-line specially bought for this class of work. 2 m. 40 ch. of drain has been enlarged by hand. Willow-clearing and willow-ringbarking have been carried out on a considerable scale. Other miscellaneous jobs have been carried out on various parts of the stop-bank system.

As a result of the major flood in July of last year, the stop-bank was breached at Rotokohu. The flood indicated that considerable seepage is liable to take place through the sand-core bank on the Upper Waihou. Arrangements are in hand for strengthening the Upper Waihou stop-banks against this risk by building a banquette on to the existing bank. This work will be undertaken during this year by using the Ruston drag-lines.

Generally the works have been adequately maintained, and the considerable plant in use has been kept in good condition.

Taieri River.

With the exception of work required to improve the operation of the contour channel, the construction work on the Taieri River flood-protection scheme is in its final stages. The main stop-bank is completed, except for raising and strengthening its continuation along the left bank of the contour channel, this latter work being in hand.

The pumping-station located in the main stop-bank alongside Waipori Lake has been completed. During construction some trouble with foundations was experienced. This was overcome, and extra sheet piling was driven across the line of the building, and concrete rafts laid down in inlet and outlet canals to stop water-seepage under or around the building. The equipment, consisting of three low-lift motor-driven pumps with necessary accessories, capable of handling approximately 80 cub. ft. of water per second each, has been erected, and on test satisfactorily stood up to makers' guarantee. The pumping-station is now in service, and, with the necessary system of feeding drains, constitutes a most valuable portion of the scheme, and will greatly enhance the value of the lower portion of the Taieri Plain.

Of the drainage system, 3 m. 61 ch. of the main drain is complete, save for bars or breaks left till the pumping-station and feeding-canal is complete, 80,000 cub. yd. being excavated from this during the year by Ruston drag-line, the remaining length of 60 ch. through Maori Lake being now in hand. Wain's drain, involving 32,000 cub. yd. of excavation, has also been dug with the Ruston drag-line. Wain's drain culvert-box under main stop-bank is in hand. Two road-bridges and four private bridges were built over main drain, bridges being single-span steel-joist structures of about 35 ft. length.

The contour-channel road-bridge (length, 200 ft.), a hardwood-timber structure on piled piers, has been completed. The Otokia Railway-bridge has been lengthened 400 ft. to provide additional waterway, the extension being in 40-ft.-span steel-plate girders, through type, on ironbark-pile piers. The removing of the old railway-bank under the bridge-extension is in hand.

The contour channel has always been unsatisfactory, in that it is impossible at cost within reason to give it sufficient capacity to carry all waters that flow to it. In the past the overflowing waters have breached the contour-channel banks in innumerable places, thus causing uncontrolled and expensive flooding. A scheme has been got out to provide definite spillways to give relief to the channel and prevent it breaching its banks, the spillway of flood-waters thus being restricted to short periods during the peak of floods. This scheme is now being submitted to the Taieri River Trust for its concurrence before steps are taken to put it in hand.

MARINE.

Lighthouses.

North Cape Lighthouse.—This light, which consists of an automatic flashing outfit mounted on a concrete base, was erected during the period. The flasher is of the open-flame type, and is contained in a 800 mm. catadioptic lens, the whole being enclosed in a lantern-house and fitted with sun-valve. This light is visible for about seventeen miles in clear weather, and marks the turning-point in the courses of vessels proceeding round the northern portion of the North Island.

Manukau South Head.—This light was converted from a watched oil-burning light to an automatic acetylene outfit. The original lens and lantern-house has been retained, but the range has been reduced to about sixteen miles.

Kahu Rocks.—The erection of this light, which is of the Dalen automatic type, was completed during the year. Its main purpose is to mark the position of the group of offshore rocks in this locality. Owing to the great construction difficulty of building on the rocks themselves, the lighthouse has been erected on a prominent point on the foreshore and the exact position of the rocks defined by a red sector. The light itself consists of a 300 mm. catadioptic-lens drum fitted with a Dalen incandescent burner with automatic mantle-exchanger and sun-valve. The apparatus is lodged in a lantern-house with cast-iron murette for the storage of the gas-accumulators, and is built on a concrete base on the top of what is locally known as the Honeycomb Rock, at a height of approximately 80 ft.

Cape Egmont.—The existing watched light at this station is one of the older fixed type, being one of the earliest provided by the service. The growth of motor traffic on the adjacent roads and the increasing number of electric lights in the locality make it difficult for shipmasters to quickly and surely pick up the fixed light at this station. It was therefore decided to provide a completely new and up-to-date revolving light giving a triple flash. The apparatus has now been received, and it is anticipated that the installation will shortly be completed.

Baring Head Lighthouse.—At present the entrance to Wellington Harbour is marked by two lights—one a second-order oil-burning watched light at an elevation of 322 ft., maintained by the Department, and the other a low-level Wigham light, maintained by the Wellington Harbour Board. For some time past it has been felt that it would be much better if the existing Harbour Board light was strengthened and the Department's light shifted to Baring Head. As a situation for a coastal light Baring Head has a distinct advantage over Pencarrow, and arrangements are in hand to give effect to this policy, provision being made on this year's estimates accordingly.

Godley Head.—A new lightkeeper's cottage has been built at this station, and plans are in hand for the conversion of the light itself to automatic operation. The present light is a fixed one, and in these days of universal electric lighting for households and the use of powerful headlights on motor-cars it is necessary to provide a light which has a distinct flashing characteristic, so as to avoid any chance of confusing it with other lights in the vicinity. It is mainly for this reason that the conversion is being made.

Tory Channel Leading-lights.—An order has been placed for the necessary apparatus to convert these lights, which are at present oil-burning, to automatic acetylene operation.

Tory Channel Light on West Head.—Specifications have been prepared and an order placed for the supply of a 300 mm. lens with open-flame burner, sun-valves, &c. for erection on the West Head at the entrance of Tory Channel. At the present time difficulty is sometimes experienced in picking up the entrance in thick weather, owing to the leading-lights being visible over a small arc only. It is anticipated that the provision of this additional light will be of considerable assistance in picking up the leading-lights and in coastal navigation generally.

Jack's Point.—It is proposed to install a new lens at this station and install an automatic open-flame flashing burner with sun-valve, and orders have been placed for the necessary apparatus.

Harbours.

Westport Harbour.—The past year has been a somewhat critical time for this harbour. In the earlier portion of the year the entrance was far from satisfactory, and the two suction dredges, "Eileen Ward" and "Rubi Seddon," have been kept steadily at work, and for the latter portion of the period the position materially improved. In view of the necessity for thoroughly investigating the underlying causes for the shoaling of the bar, a Resident Harbour Engineer was appointed and has been very fully employed in such investigations. The information obtained indicates that the main cause of the shoaling on the bar is due to the gradual accretion which has been taking place adjacent to the breakwaters. To cope with this effectually it will be necessary to extend the breakwater another 250 ft., when it is anticipated better results will be obtained with less dredging. During the period 690,230 cub. yd. have been dredged from the bar by the "Eileen Ward" and the "Rubi Seddon." The bucket dredge "Maui" was employed for the whole year in the berthage area, and removed 184,597 cub. yd. of material. The depths at the Crane Wharf berthages were maintained to approximately 25 ft. at L.W.O.S.T., and a large quantity of material was dredged from the shoaling opposite the old Staiths Wharf and the Merchandise Wharf. A great deal of siltation takes place in these areas owing to the large amount of material brought down by freshes, but a reasonable depth has been maintained throughout the year. The Priestman grab has been employed removing snags in the upper river, and also in the Western Lagoon, where it is hoped to increase the tidal compactment. The protection work at Organ's Island was carried to completion during the year. The whole of the western side of the island, 55 ch. in length, has been faced with rock, and a retaining-wall 8½ ch. in length constructed on the down-stream end of the rock facing. A total of 27,665 tons of rock was used in this

work, of which 21,765 tons were placed for the twelve months. The willow-plantations at Hannah's erosion have been fenced off and additional willows planted as required. The Cape Foulwind quarry has been in operation for the greater part of the year, a total of 26,765 tons having been quarried and transported to the protection works at Organ's Island, the western breakwater, Railway Department, &c. During the year the plant and buildings have been well maintained. The "Eileen Ward" and the "Maui" were sent to Wellington for annual overhaul, and the stream-tug "Mana" and the launch "Erlin" were slipped and painted.

Karamea Harbour.—During the past year the preliminary work in connection with the reconstruction of the breakwater has been practically completed and a start made to place stone along the line of the training-wall. The laying of the tramway from the quarry to the outer end of the retaining-wall was completed. This included the ballasting of the track for a distance of 1 m. 50 ch., the erection of 280 ft. of trestle from the end of the tram-line to the beginning of the retaining-wall, cutting down and recapping the old training-wall, and laying throughout with stringers and rails a total distance of 15 ch. The plant, consisting of petrol-locomotive, portable engine, and compressor, with 5-ton crane, came to hand early in the year, and a locomotive-shed and two extra workers' cottages were erected. The further opening-up at the quarry has been carried out, the work involved being increased by slips from above the high rock-face. It was found necessary to pass round a blunt spur of comparatively soft rock before tapping the outcrop of harder material farther up the Oparara River, and quarrying operations to the end of the year were confined thereto. The recent disastrous earthquake caused very considerable damage to the existing training-wall. Full details as to the additional work required are not yet available, but it is anticipated that there will be considerable additional work on the staging and a probable increase in the amount of stone required. The existing wall has practically collapsed in places, and the work will have to be modified accordingly.

Waikokopu Harbour.—The existing works at Waikokopu have been adequately maintained. The hulk "Talune," which was sunk as an experiment to prove the value of a short breakwater, has now broken up entirely, and a contract has been let for the construction of a rock breakwater 5 ch. long. A 2½-mile tramway has been constructed up the Tahaenui Valley, off the Waikokopu Railway, for the purpose of obtaining limestone for the breakwater. Twenty ton trucks have been built for carrying the stone, and are now in operation. The contractor has erected a staging at the breakwater and has commenced the depositing of stone. The installation of a crane, air-compressor, and other plant has been completed at the quarry, and work should now proceed expeditiously. The wiring of the Harbour Board's shed and wharf for electric light for future use with standard voltage has been carried out, and is now in use in conjunction with a small lighting plant.

Karaka Point Wharf.—During the year all the timber and materials were landed on the site, and a contract let for erection. The work is now practically complete.

Raupo Ferry Slip Extension.—This work was completed early in the year, and this has enabled it to be ready to work in conjunction with the Tikinui ferry slip across the river.

Rawene Launch-landing and Motor-landing.—A contract for the construction of the pontoon landing and steps, together with ramp landing for cars, was let early in the year. The bulk of the work is now done and should be completed very shortly.

Tinopai Wharf.—A contract has been let for the erection of this wharf.

Totara Wharf.—A contract was let for the erection of this wharf in New Zealand timbers, and was completed, together with approaches, early in the year.

Whangaroa Wharf.—This reinforced-concrete wharf has been completed during the period, with the necessary shed and cold store. The approaches were faced with rock.

Opunake Harbour.—Funds were provided for the Government for the removal of rocks in the fairway and in the vicinity of the wharf, and this work has been carried out, with the result that there is now a depth of 9 ft. 6 in. L.W.S.T., and shipping is beginning to use the port.

Half-moon Bay Wharf, Stewart Island.—During the year an extension of 51 ft. long by 31 ft. wide was completed. The approach to the wharf was also widened and strengthened by fitting additional bracing.

Miranda Wharf.—This structure, consisting of a wharf and jetty of a total length of 105 ft. 6 in., a galvanized-iron shed, and three retaining-walls, was completed during the period.

Matakana Wharf.—This wharf, which is of reinforced concrete, 1,440 sq. ft. in area, and carrying a shed with a floor area of 720 sq. ft., was erected during the year.

Whangamata Wharf.—All the timber has been delivered for this wharf, and arrangements are in hand for its erection.

Howick Wharf.—Extensive repairs were carried out at this wharf.

General.

A large number of applications have been received from local bodies and private individuals for the approval of works involving marine interests. Among the various applications were the following:—

Wharves.—Totara North, Whangaroa Harbour; Dargaville Wharf; Holmes Wharf, Oamaru; oil jetty, Wanganui; Kaiti Basin, Gisborne; Onakaka, Golden Bay; Lansfords, Tauranga Harbour; Mateotawa, Kaipara Harbour; Whangamata Harbour; Howard Point, Wellington Harbour; Taranaki Street Wharf, Wellington Harbour; cattle wharf, Napier Harbour Board.

Boat Sheds and Landings.—Horeke, Waihou River; Freeman's Bay, Auckland Harbour; Mechanics Bay, Auckland Harbour; Rawene Wharf, Hokianga Harbour; Pipitea Wharf, Wellington.

Transmission-lines.—Wairoa River, Tamaki Strait.

Boat Slips and Sheds.—Ferry slip, Raupo, Northern Wairoa; Devonport, Auckland Harbour; Surfdale, Waiheke Island; Balena Bay, Wellington Harbour; Paremata, Porirua Harbour.

Club-houses.—Mako Shark, Bay of Islands.

Foreshore Licenses and Buildings.—Rangiriri, Waikato River; Whangamarino Falls, Whangamarino River; Jackson's Bay, Oreti River, Foveaux Strait; Motueka Harbour; Whangape Harbour, St. Mary's Bay, Auckland; Tauranga Harbour; Whangapoua, Waiawa River; Waiaro, Coromandel Peninsula, Ruakaka River, Whangara, Hokianga Harbour; Rawene, Hokianga Harbour; Ferrymead, Heathcote River; Putiki Bay, Waiheke Island; Fitzroy Bay, Cook Strait.

Harbour-works.—Gisborne Harbour; Wanganui Harbour; Wellington Harbour; Auckland.

Reclamations.—Evans Bay, Wellington Harbour, Karaka Bay, Manukau Harbour; Wairau Creek Estuary; Bluff; Ngataringa Bay, Devonport.

Bridges, &c.—Onepoto Stream, Shoal Bay, Auckland; Te Piro Stream, Clevedon; Avon River, New Brighton; Oreti River; Waitiri Creek, Horeke; Ferrymead, Heathcote River; Wolf's Creek, Kaipara Harbour.

Outfall Sewers.—Milford Beach, Takapuna; Waikato River, Hamilton; Tokatoka, Kaipara Harbour.

Retaining-walls.—Taylorville, Wanganui River; Marine Parade, Napier; Kaipara River, Helensville.

DEFENCE WORKS.

New Zealand Air Force Base, Auckland.

Construction of the combined aeroplane and seaplane base at Hobsonville has been put in hand, and both the landing-field and the land hangar are now in use. Extensive clearing and levelling for landing-runways, involving 17,000 cub. yd. of excavation, have been completed, and the whole field sown down in permanent grass. 90 ch. of fencing and 56 ch. of metalled access roads have been completed. The apron for seaplane-hangars has been formed by combined excavation and reclamation on the shore-line, and 17,000 cub. yd. was excavated and placed in reclamation, protected by heavy stone retaining-wall. A hardwood-timber jetty, 286 ft. long, has been built, and the construction of a slipway in reinforced concrete for landing seaplanes is in hand. All concrete piles have been driven, and six piers are complete. The deck-slabs are being precast and are 50 per cent. complete. Residence for Officer Commanding, central office, control hut, boat-shed, and three cottages for airmen are complete. Three additional cottages are 90 per cent. finished. One land hangar, floor-space 5,671 sq. ft., with workshop and offices attached, is complete. Transport-shed, with accommodation for crash-tender, ambulance, tractor, huck starter, and car, is also complete. This latter building and the hangar are in reinforced concrete. Water-supply has been installed, and connections made to the various buildings; the water is obtained from well bores, is filtered, and pumped into a 12,500-gallon water-tower 30 ft. high. A sewerage and storm-water system is being installed and is 80 per cent. complete. A transformer and switch-hut has been built, and underground cables laid for reticulation of power and light to the various buildings. Telephone cables have been laid underground, and a central exchange with connections to the various buildings installed. A commencement has been made on the seaplane-hangars.

Waikato Camp, Ngaruawahia.

Work has steadily progressed on the Waikato Camp during the year, and the establishment is now practically completed. Magazines Nos. 8 and 10, a S.A.A. store, Ordnance workshops, butcher's shop and cool store, permanent shower-baths, Ordnance workshop, fencing, motor-garages at quarters, and permanent coal-enclosure have been completed. The magazine laboratory and the camp hospital are under construction. The preparation of the battalion areas has been finished, and a considerable amount of draining, tree-planting, and fencing has been attended to. Sixteen acres of the magazine area have been cleared and burnt. Maintenance of all completed works, including roads, has been attended to, and many new fittings put into the Ordnance stores, including tables, cupboards, trucks, and trollies.

IRRIGATION—CENTRAL OTAGO.

Operation of Completed Schemes.

During the past year the several completed schemes have been maintained in good condition, and all lands requiring water have been supplied. Of the schemes in operation, the following nine were operated during the year on a trading basis: Ida Valley, Galloway, Teviot, Bengerburn, Ardgour, Tarras, Earnscleugh, Manuherikia, and Last Chance; as against four for the preceding year. The financial results of the year's operations were: Revenue, £13,726; working-expenses, £11,089; profit on working, £2,637—the profit representing a decrease of £1,473 as compared with last year. The reasons for this decrease are, firstly, the inclusion in the trading accounts of the five additional schemes, in which irrigators are as yet paying only on the lower scale of the graduated rates; and, secondly, the general reduction in rates following on the adoption of the Irrigation Committee's recommendations.

The number of irrigators and the total area irrigated on all Government schemes for the past year is as follows :—

Scheme.	Number of Irrigators.	Acres under Irrigation.	Remarks.
		Acres.	
Ida Valley ..	49	11,441	..
Galloway ..	21	2,403	..
Manuherikia ..	73	5,627	Maintenance work continues heavy. Principal items, new 30-in.-diameter siphon across Chatto Creek and new length of iron fluming in Manuherikia Gorge.
Earnscleugh ..	51	1,843	..
Ardgour ..	12	1,494	..
Tarras	17	4,373	..
Last Chance ..	27	2,960	..
Teviot River ..	41	2,850	..
Teviot River Extension	6	647	Construction work completed during the year.
Bengerburn ..	14	144	This scheme operates under a Board of control.
Hawkdun ..	24	4,473	..
Totals ..	335	38,255	

The totals as above compare with figures for the previous year of 306 irrigators and 32,949 acres under irrigation.

New Schemes under Construction.

Hawkdun Scheme.—This scheme is, for all practical purposes, completed, and a full service can be given next season. The work for the year comprised construction of distributory races, of bridge crossings, gates, measuring-boxes, measuring-weir, and similar details.

Arrow River Scheme.—All pipes for the gorge pipe-line and the numerous siphons on the distributory races have now been delivered on the site, and the erection of these is making good progress, the work of erection including construction of pile bridges across the Arrow River in the gorge, of concrete saddles and anchorages, &c. Detail finishing-work on the races is in hand. It is anticipated that a partial supply early in the irrigation season will be available, and that a full supply to the whole area will be available about the New Year.

Ida Valley Scheme.—Owing to the very heavy demands on the Manorburn reservoir for the supply to Ida Valley and Galloway, the quantity of stored water has been very seriously depleted. It has become evident that the construction of the Poolburn dam, which was part of the original scheme, should be undertaken without loss of time. Necessary surveys and plans have been made with a view to the early commencement of construction. As an emergency measure a temporary low-lift pumping installation is being put in alongside the Manuherikia River, capable of pumping 16 heads of water to the Galloway races for supply at the Galloway area. This will reduce the demand on the Manorburn dam.

Surveys and Investigations.

Investigations and reports on several small proposed schemes have been made. River-gaugings and meteorological records have been fully kept up. The several demonstration plots that have been laid down on the border-dyke method have been maintained and kept in operation to demonstrate the results and economy in use of water that are obtained by that method.

TRAMWAYS.

Auckland.—14 ch. of new track was laid and inspected in Halsey Street. No new cars were inspected, but sixteen cars were inspected following accidents.

Napier.—One car, converted to one-man operation, has been passed and is now in operation.

Wellington.—56 ch. of new track was inspected during the year, comprising 19 ch. of Chaytor Street duplication, Karori, and 37 ch. of the Northland extension.

Wanganui.—Two one-man cars have been inspected and passed for traffic.

Christchurch.—During the year two small sections of new line were constructed, the first being a curve connecting lines in Moorhouse Avenue and Colombo Street, the second an extension of 4 ch. of the Quarry Road at McCormick's Bay. The following lines were relaid : (1) Addington line, Lincoln Road, 61 ch. of single and 6 ch. of double track ; (2) on the New Brighton line, 53 ch. of single track ; (3) Colombo Street, between Moorhouse Avenue and Hereford Street, 40 ch. of double track. All of these works were duly inspected and passed. The North Beach line between Burwood and North Beach was reopened for traffic after having been closed for some considerable time.

Invercargill.—During the year four of the regular two-man cars were converted to one-man operation and inspected accordingly. All cars on this system are now under one-man operation.

PUBLIC BUILDINGS.—MAINTENANCE.

The maintenance of public buildings has been carried out by the District Engineers and their staffs in accordance with proposals and reports prepared in District Offices. Maintenance work is, for more ready reference, included with public-building work reported on by the Government Architect.

PUBLIC-BUILDING WORKS AND ELECTRICAL OPERATIONS.

For details of the public-building works and of the operations of hydro-electric enterprises please see separate reports by the Government Architect and the Chief Electrical Engineer.

F. W. FURKERT, C.M.G.,
M.Inst.C.E., A.M.I.Mech.E.,
Engineer-in-Chief.

ANNEXURE I TO APPENDIX B.

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1929.

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, 1904–24.

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line.									
							Surveyed.	Under Formation.	Under Plate-laying.	Opened.						
										Date.	1924–25.	1925–26.	1926–27.	1927–28.	1928–29.	Total.
	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	..	..	..	..	..	27 2
			Hukerenui-Kamo ..	16 0	3 29	19 29	..	..	..	..	..	..	..	..	..	
	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	48 38	Otiria-Kaikohe ..	16 25	1 45	17 70	..	..	..	1 May, 1914	..	..	..	..	..	16 25
			Kaikohe-Okaihau ..	8 20	0 34	8 54	..	..	..	29 Oct., 1923	..	..	..	..	..	8 20
			Okaihau-Hokianga ..	23 73	2 06	25 79	11 73	4 73	8 0	..	..	..	..	..	..	..
Kaihu Valley	Kaihu Valley ..	24 32	Dargaville-Booms ..	17 21	0 75	18 16	..	..	..	..	..	..	..	..	..	19 58
			Booms-Tarawhati ..	2 37	0 25	2 62	..	..	..	1 June, 1914	..	..	..	..	..	
			Tarawhati-Donnelly's Crossing	4 54	0 38	5 12	..	..	..	5 Feb., 1923	..	..	..	..	..	4 54
North Auckland Main Trunk Railway	Dargaville–N.A.M.T. Railway	17 28	Kirikopuni–Dargaville	17 28	..	17 28	2 28	11 60	3 20	..	..	..	..	..	..	..
	Kaipara Northwards	83 39	Kirikopuni–Waiotira	13 56	1 44	15 20	..	..	..	15 May, 1928	..	..	..	..	13 56	13 56
			Waiotira–Mareretu ..	9 44	1 20	10 64	..	..	..	29 Nov., 1925	..	9 44	..	..	..	9 44
			Mareretu–Paparoa ..	4 16	0 25	4 41	..	..	..	29 Nov., 1925	..	4 16	..	..	..	4 16
			Paparoa-Huarau .	1 56	0 36	2 12	..	..	..	29 Nov., 1925	..	1 56	..	..	..	1 56
			Huarau-Maungaturoto	2 5	0 38	2 43	..	..	..	1 April, 1920	..	..	..	..	..	2 5
			Maungaturoto-Ranganui	4 25	0 61	5 6	..	..	..	1 April, 1920	..	..	..	..	..	4 25
			Ranganui-Kaiwaka ..	2 35	0 62	3 17	..	..	..	1 Aug., 1914	..	.	..	..	..	2 35
			Kaiwaka - Te Hana ..	8 65	1 3	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, 1929—*continued*.

NORTH ISLAND—*continued*.

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line.									
							Surveyed.	Under Formation.	Under Plate-laying.	Opened.						
										Date.	1924–25.	1925–26.	1926–27.	1927–28.	1928–29.	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
			Portland-Waiotira ..	14 56	1 39	16 15	..	..	..	29 Nov., 1925	..	14 56	..	..	..	14 56
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-Westfield	9 68	Deviation via Orakei	9 68*	1 45	11 33	..	..	9 68	..	..	..	..	..	..	..
	Auckland City Branch—Kingsland Station to Auckland Station via Western Park and Freeman's Bay	2 60	Auckland City Branch	2 60	..	2 60	..	..	..	..	..	..	..	..	..	..
Waiuku Branch	Waiuku Branch Railway	12 69	Paerata-Patumahoe	5 4	0 78	6 2	..	..	..	10 Dec., 1917	..	..	..	..	..	5 4
			Patumahoe-Waiuku	7 65	1 3	8 68	..	..	..	10 May, 1922	..	..	..	..	..	7 65
Huntly-Awaroa	Huntly-Awaroa ..	8 75	Huntly-Awaroa ..	8 75	1 18	10 13	..	..	..	16 June, 1924	1 55	..	..	..	..	8 75
Survey, new lines	Waikokowai Branch Railway	8 25	Waikokowai ..	8 25	..	8 25	8 25	..	..	..	..	..	..	..	..	..
Surveys, new lines	Paeroa-Pokeno ..	42 15	Paeroa-Pokeno ..	42 15	..	42 15	42 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	139 53	Waihi-Tahawai ..	14 0	4 42	42 75	..	..	..	1 May, 1927	..	..	..	14 0	..	14 0
			Tahawai-Tauranga ..	24 33						18 June, 1928	..	..	..	..	24 33	24 33
			Tauranga-Taneatua	59 9	9 41	68 50	..	..	..	3 Sept., 1928	..	..	..	..	59 9	59 9
			Taneatua-Opotiki ..	26 23	..	26 26	26 26	..	..	..	..	..	..	..	..	..

* Double track.

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1929—*continued*

NORTH ISLAND—*continued*

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line.									
							Surveyed.	Under Formation.	Under Platelaying.	Opened.						
										Date.	1924–25.	1925–26.	1926–27.	1927–28.	1928–29.	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.*	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†	..	..	..	..	..	..	..	..	..
			Whakatane Ballast Siding §	0 33	..	0 33	..	..	0 33	..	..	..	..	..	..	..
Thames Valley-Rotorua	Thames Valley-Rotorua	69 33	Morrinsville-Rotorua	69 33	5 27	74 60	..	..	..	..	..	..	..	..	..	69 33
New survey	Rotorua-Taupo ..	53 30	Rotorua-Taupo ..	53 30	..	53 30	53 30*	..	..	..	..	..	..	..	..	..
Gisborne-Rotorua	Gisborne-Opotiki ..	92 44	Gisborne Wharf-Kaiteratahi	13 10	2 45	15 55	..	..	..	..	..	..	..	..	..	
			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	..	..	..	..	..	49 32
			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	..	..	..	..	..	
			Motuhora-Motu ..	2 10	..	2 10	2 10	..	..	..	..	..	..	..	..	..
			Motu-Opotiki ..	41 2	..	41 2	41 2	Estim.	..	..	..	..	..	..	..	..
Gisborne-Napier	Napier-Wairoa ..	72 14	Napier-Eskdale ..	11 73	1 31	13 24	..	..	..	23 July, 1923	..	..	..	..	..	11 73
			Eskdale-Putorino ..	26 69	1 46	28 35	..	0 65	26 04	..	..	..	..	..	..	..
			Putorino-Wairoa ..	33 32	3 4	36 36	..	31 60	1 52	..	..	..	..	..	..	..
	Gisborne-Wairoa .. (Inland Route)	72 42	Gisborne Station-Makaraka	3 5	..	3 5	..	..	..	..	..	..	..	..	..	..
			Makaraka-Ngatapa ..	11 51	1 29	13 0	..	..	..	15 Dec., 1924	11 51	..	..	..	..	11 51
			Ngatapa-Wharekopae	4 69	..	4 69	0 19	3 0	1 50§	..	..	..	..	..	..	..
			Wharekopae-Waikura	5 40	..	5 40	5 40	..	..	..	..	..	..	..	..	..
			Waikura-Waterfall ..	6 66	..	6 66	5 6	Perm.	..	..	..	..	..	..	..	..
							1 60	Prelim.	..	..	..	..	..	..	..	..
			Waterfall-Hangaroa	4 0	..	4 0	4 0	"	..	..	..	..	..	..	..	..

* Trial survey. † Preliminary survey. ‡ Permanent survey. § Rails taken up.

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1929 —*continued.*

NORTH ISLAND—*continued.*

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line.									
							Surveyed.	Under Formation.	Under Platelaying.	Opened.						
										Date.	1924–25.	1925–26.	1926–27.	1927–28.	1928–29.	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.
Gisborne-Napier	Gisborne-Wairoa—*continued.*		Hangaroa-Te Reinga	17 11	..	17 11	17 11	"	..	..	..	..	..	..	..	..
			Te Reinga-Marumaru	9 40	..	9 40	9 40	"	..	..	..	..	..	..	..	..
			Marumaru-Wairoa ..	10 0	..	10 0	4 0	Perm.	..	..	..	..	..	..	..	..
							6 0	Prelim.	..	..	..	..	..	..	..	..
	Wairoa-Gisborne (Waikokopu Route)	63 12	Wairoa-Nuhaka ..	18 24	1 18	19 42	..	..	18 24	..	..	..	..	..	..	..
			Nuhaka-Waikokopu	6 11	0 49	6 60	..	..	6 11	..	..	..	..	..	..	..
			Waikokopu-Patutahi	32 0	..	32 0	26 40	..	..	..	..	..	..	..	..	..
							5 40	Trial	..	..	..	..	..	..	..	..
			Patutahi Gisborne ..	6 57	..	6 57	..	..	..	..	..	..	..	..	..	..
			Wairoa-Freezing-works Siding	..	0 34	0 34	..	..	0 34	..	..	..	..	..	..	..
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	Trial	..	..	..	..	..	..	..	..
	Lower Hutt–Silverstream	9 34	Lower Hutt-Waterloo Road	9 34	1 62	11 16	6 50	..	..	25 May, 1927	..	..	..	2 64†	..	2 64†
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-New Plymouth	Wellington-Manawatu	83 37	Wellington-Longburn	83 37	15 76	99 33	..	..	..	7 Dec., 1908*	..	..	..	..	..	83 37
		7 2†	Tawa Flat Deviation	7 2†	..	..	..	7 02†	..	..	..	..	..	..	..	..
		6 78†	Palmerston North Deviation	6 78†	16 11	23 9	..	6 78†	..	..	..	..	..	..	..	..

* Date of purchase. † Double track.

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1929—*continued*.

NORTH ISLAND—*continued*.

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line.									
							Surveyed.	Under Formation.	Under Platelaying.	Opened.						
										Date.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	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	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.	..	..	..	..	..	..	..	..
	Patea Waitara and New Plymouth	72 29	Patea-New Plymouth Breakwater	..	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	89 0	Stratford-Toko ..	6 26	0 40	6 66	..	..	..	..	..	..	..	..	..	
			Toko-Oruru ..	4 72	0 36	5 28	..	..	..	1 Mar., 1905	..	..	..	..	..	
			Oruru-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	..	..	..	..	..	
			Pohokura-Whangamomona	6 13	0 45	6 58	..	..	..	1 July, 1914	..	..	..	..	..	47 40
			Whangamomona-Kohuratahi	4 53	0 29	5 2	..	..	..	7 Jan., 1918	..	..	..	..	..	
			Kohuratahi-Tahora	5 14	0 37	5 51	..	..	..	21 Nov., 1924	5 14	..	..	..	..	
			Tahora-Raekohua ..	3 20	..	3 20	..	2 47	0 53	..	..	..	..	..	..	..
			Raekohua-Heao ..	8 30	..	8 30	4 10† ..	4 20	..	..	..	..	..	..	..	..
			Heao-Ohura ..	10 60	..	10 60	1 10†	9 0	0 50	..	..	..	..	..	..	..
			Ohura-Matiere ..	8 67	1 21	10 8	..	..	8 67	..	..	..	..	..	..	..
			Matiere-Okahukura ..	10 23	1 10	11 33	..	..	10 23	..	..	..	..	..	..	..
	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 ..	56 18	Te Roti-Opunake ..	22 63	3 2	25 65	..	..	..	12 July, 1926	..	..	22 63	..	..	22 63
			Opunake-Stony River	18 70	..	18 70	18 70	..	..	..	..	..	..	..	..	..
			Stony River-Moturoa	14 45	..	14 45	14 45	..	..	..	..	..	..	..	..	..

† Permanent survey. § Rails taken up

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1929—*continued.*

NORTH ISLAND—*continued.*

Appropriation.	Division.	Milleage.	Section.	Main Line.	Sidings.	Total.	State of Line.									
							Surveyed.	Under Formation.	Under Platelaying.	Opened.						
										Date.	1924–25.	1925–26.	1926–27.	1927–28.	1928–29.	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.		ch.	M. ch.	M. ch.	M. ch.	M. c	M. ch.
Stratford-Main Trunk—*contd.*	Te Roti-Moturoa Deviation ..	..	Oakura Breakwater ..	..	..	..	2 30	..	..	..	..	..	..	..	..	..
	Manaia Branch ..	5 50	Manaia-Kapuni ..	5 50	0 78	6 48	..	4 25	1 25§	..	..	..	..	..	..	..
	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	..	..	..	..	..	..	..
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
	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 ..	2795 41	..	2795 41	250 71	3046 32	1075 16	88 08	106 06	..	18 40	30 12	22 63	16 64	97 18	1508 72

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, 1929—*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, 1904-24.

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line.										
							Surveyed.	Under Formation.	Under Platelaying.	Opened.							
										Date.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	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)	146 75	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-Murchison	23 53	..	23 53	7 0	Trial	..	..	..	..	..	..	..	..
							16 53	Prelim.	..	..	..	..	..	..	..	..
			Murchison-Kawatiri	22 70	0 38	23 28	13 79	6 28	2 43	..	..	..	..	..	..	..
			Kawatiri-Glenhope ..	3 73	0 15	4 8	..	..	..	21 June, 1926	..	..	3 73	..	..	..
			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	..	..	..	..	..	41 54
			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	..	..	..	..	..	..	..	..	..	
			Otira-Arthur's Pass	8 14	5 38	13 52	..	..	..	26 May, 1924	8 14	..	..	..	..	
			Arthur's Pass-Cass	14 67	0 20	15 7	..	..	..	1 July, 1914	..	..	..	..	..	
			Cass-Broken River ..	15 22	1 29	16 51	..	..	..	10 Dec., 1910	..	..	..	..	..	92 68
			Broken River-Otarama	7 40	0 30	7 70	..	..	..	29 Oct., 1906	..	..	..	..	..	
			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-Cape Foulwind	Westport-Cape Foulwind	7 0	Westport Cape Foulwind	7 0	0 60	7 60	..	..	..	..	..	..	..	..	..	7 0
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	0 39	20 45	11 6	5 0	4 0	..	..	..	..	..	..	..

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1929—*continued.*

SOUTH ISLAND—*continued.*

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line.									
							Surveyed.	Under Formation.	Under Platelaying.	Opened.						
										Date.	1924–25.	1925–26.	1926–27.	1927–28.	1928–29.	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	1 40	4 4	..	..	..	3 Sept., 1923	..	..	..	..	..	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	..	..	..	..	..	56 6
			Kaparu-Ward ..	8 15	1 20	9 35	..	..	..		..	..	..	..	..	
			Ward-Mirza ..	3 38	0 30	3 68	..	..	..	4 Dec., 1915	..	..	..	..	..	
			Mirza-Wharanui ..	4 38	0 34	4 72	..	..	..		..	..	..	..	..	
			Wharanui-Kekerangu	7 0	..	7 0	2 42	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	7 0	Prelim.	..	..	..	..	..	..	..	..
			Conway River - Mendip Hills	10 50	..	10 50	10 50	Prelim.	..	..	..	..	..	..	..	..
	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
			Rotherham-Waiau ..	5 62	1 3	6 65	..	..	..							

TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1929—*continued*

SOUTH ISLAND—*continued.*

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line.									
							Surveyed.	Under Formation.	Under Platelaying.	Opened.						
										Date.	1924–25.	1925–26.	1926–27.	1927–28.	1928–29.	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	..	..	..	..	..	..	..	..
			Serpentine-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.	..	..	..	..	..	..	..	..
	Orari–Rangitata, via Geraldine	10 25	Orari-Geraldine ..	4 17	..	4 17	4 17	..	..	..	..	..	..	..	..	..
			Geraldine-Rangitata	6 8	..	6 8	6 8	..	..	..	..	..	..	..	..	..
Waitaki-Bluff and Branches	Main Line ..	246 69	South Waitaki-Bluff	246 69	59 13	306 2	..	..	..	..	..	..	..	..	..	246 69
	Branches,—															
	Duntroon - Hakataramea	37 33	Pukeuri-Duntroon ..	21 75	1 35	23 30	..	..	..	..	..	..	..	..	..	21 75
			Duntroon - Hakataramea	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, 1929—*continued.*

SOUTH ISLAND—*continued.*

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line.										
							Surveyed.	Under Formation.	Under Platelaying.	Opened.							
										Date.	1924–25.	1925–26.	1926–27.	1927–28.	1928–29.	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.
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	..	..	..	..	..	..	..	..	..	
	Lawrence - Roxburgh	36 71	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 - Miller's Flat	14 70	0 38	15 28	..	..	..	16 Dec., 1925	..	14 70	..	..	..	58 67
			Miller's Flat - Roxburgh	9 12	0 68	10 0	..	..	..	19 Apr., 1928	..	..	..	..	9 12	
	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	..	..	..	..	..	..	..	..	..
	Stirling - Hill End (via Stoney Creek)	11 43	Trial Survey ..	11 43	..	11 43	11 43	..	..	..	..	..	..	..	..	..
	Balclutha - Appleby Junction or Catlin's - Seaward Bush	105 49	Balclutha-Owaka ..	19 20	1 63	21 3	..		..	..	..	..	..	..	..	
			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	..	..	..	..	..	42 67
			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	..	..	..	..	..	
			Waimahaka-Appleby	24 52	1 50	26 22	..	..	..	..	..	..	..	..	..	32 79
	Waipahi - Heriot Burn	26 23	Waipahi-Heriot ..	20 3	2 3	22 6	..	..	..	..	..	..	..	..	..	
			Heriot-Edievale ..	6 20	0 45	6 65	..	..	..	15 Feb., 1905	..	..	..	..	..	26 23
	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.	..	..	..	..	..	..	..	..

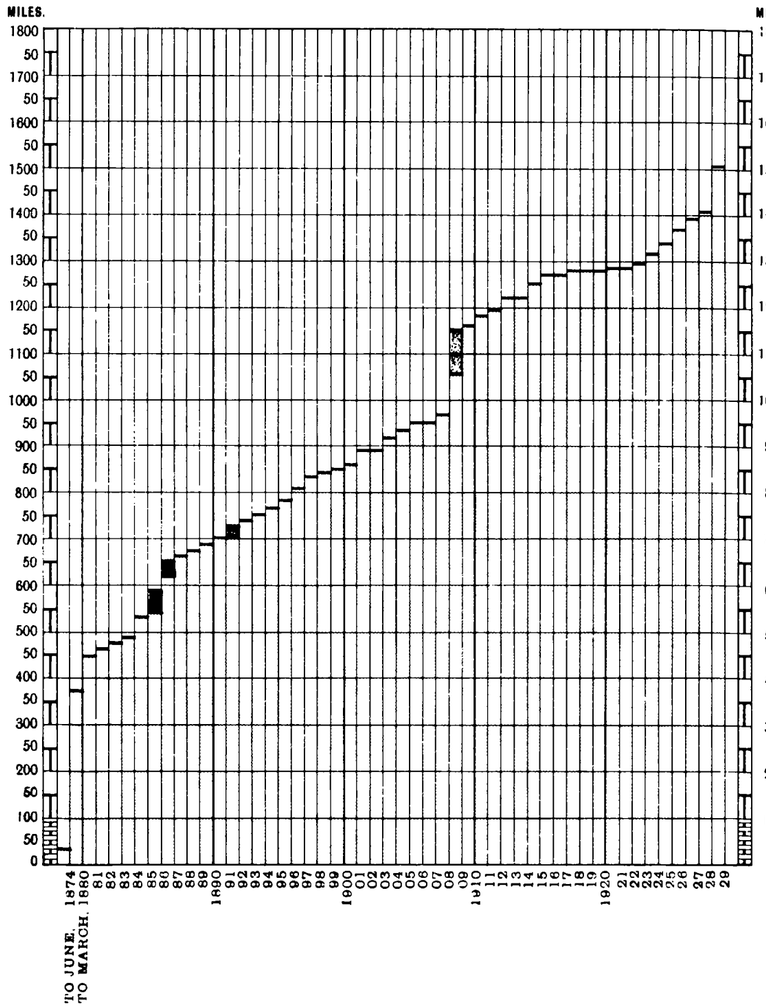
TABLE OF LENGTHS OF GOVERNMENT LINES AUTHORIZED, CONSTRUCTED, AND SURVEYED UP TO 31ST MARCH, 1929—*continued*.

SOUTH ISLAND—*continued*.

Appropriation.	Division.	Mileage.	Section.	Main Line.	Sidings.	Total.	State of Line.									
							Surveyed.	Under Formation.	Under Platelaying.	Opened.						
										Date.	1924–25.	1925–26.	1926–27.	1927–28.	1928–29.	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.
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	..	..	..	..	..	..	..	..	..	147 27
			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	..	..	..	10 July, 1921	..	..	..	..	..	
			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 74	Makarewa-Orepuki ..	35 41	6 37	41 78	..	..	..	..	..	..	..	..	..	56 34
			Orepuki-Waihoaka ..	4 48	0 58	5 26	..	..	..	..	..	..	..	..	..	
			Waihoaka-Tuatapere	8 7	1 10	9 17	..	..	..	1 Oct., 1909	..	..	..	..	..	
			Tuatapere-Orawia ..	8 18	..	8 18	..	..	..	20 Oct., 1925	..	8 18	..	..	..	
			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 ..	2368 07	..	2368 07	267 57	2635 64	478 51	21 12	9 63	..	8 14	25 58	3 73	..	9 12	1793 77

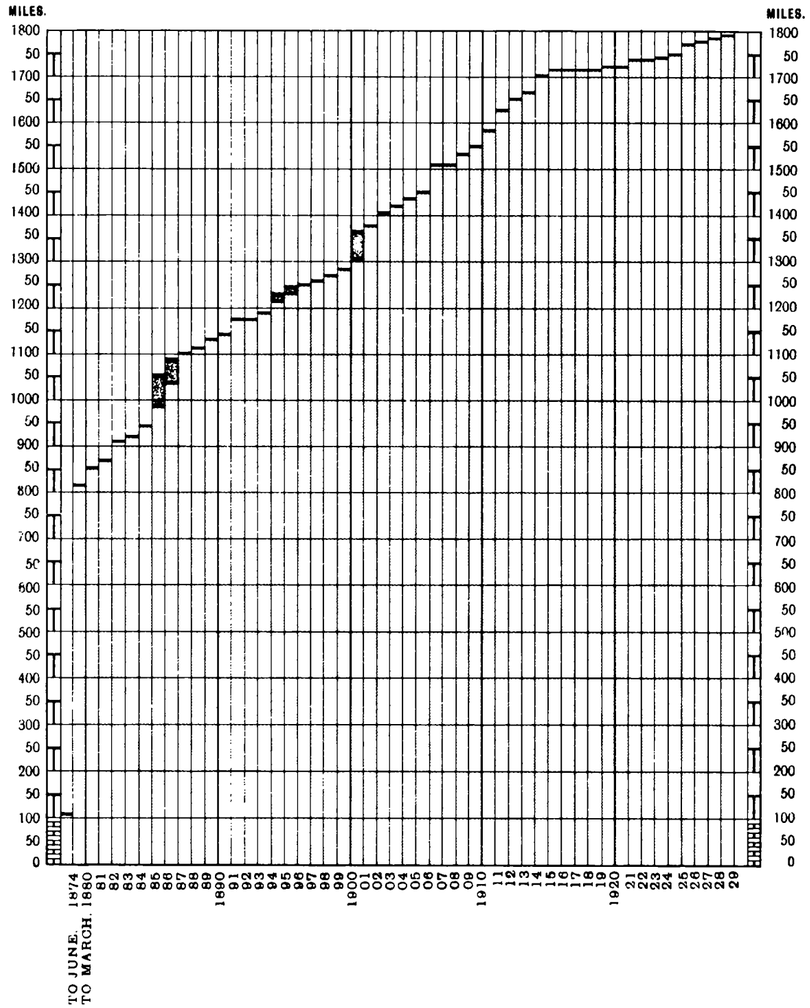
NUMBER OF MILES OPEN
OF
GOVERNMENT LINES.

NORTH ISLAND.



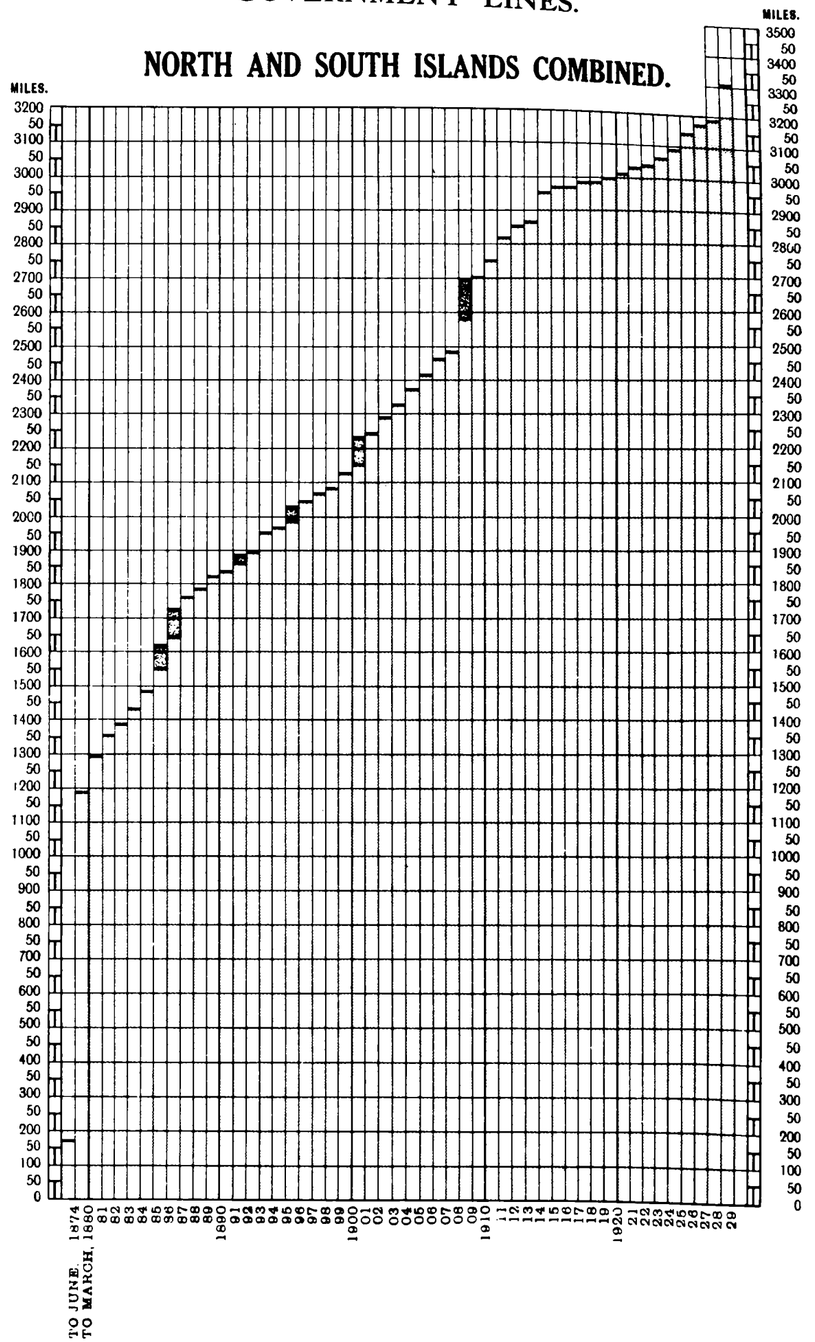
NUMBER OF MILES OPEN
OF
GOVERNMENT LINES.

SOUTH ISLAND.



NUMBER OF MILES OPEN
OF
GOVERNMENT LINES.

NORTH AND SOUTH ISLANDS COMBINED.



Private railways acquired by the Government shown thus: ▬

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
1929

— Scale of Miles —

10 0 10 20 30 40 50 60 70 80

— REFERENCE —

GOVERNMENT RAILWAYS.

Opened
Under construction
Proposed
Explored

PRIVATE RAILWAYS.

Opened

168° 169° 170° 171° 172° 173° 174°

40° 41° 42° 43° 44° 45° 46° 47° 48°

TASMAN SEA

PACIFIC OCEAN

C. Farewell
GOLDEN BAY
D'Urville Id
French Pass
COOK STRAIT
TASMAN BAY
Karamea R.
KARAMEA BIGHT
Mokikinui R.
C. Foulwind
C. Campbell
CLOUDY BAY
WELLINGTON
Buller River
Clarence R.
Kaikoura Peninsula
Conway R.
Waiau-ua R.
Hurunui R.
Ashley R.
PEGASUS BAY
Waimakariri R.
Banks Peninsula
Rakaia R.
Ashburton R.
Rangitata R.
CANTERBURY BIGHT
Waitaki R.
Clutha R.
Taieri R.
C. Saunders
Shag Point
Abut Hd
Mt Cook
12349ft
Mt Sefton
10950ft
Mt Harper
L. Tekapo
Pukaki L.
L. Ohau
L. Wanaka
L. Hawea
L. Te Anau
L. Wakatipu
Manapouri L.
Monowai L.
Hauroto L.
Milford Sound
JACKSON'S BAY
Haast R.
FOVEAUX STRAIT
SOLANDER Id
RUAPUKE Id
The Blunt
STEWART Id
Port William
East Head
Port Pegasus
S.W. Cape
MASON BAY

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 Orawia		64
Invercargill to Tokanui		34
Balclutha to Tahakopa		43
Dunedin to Cromwell		155
Dunedin to Port Chalmers		8
Gore to Lumsden		37
Gore to Waikaka		16
Waipahi to Edievale		26
Milton to Roxburgh		61
Dunedin to Oamaru	78	
Oamaru to Timaru	53	
Timaru to Ashburton	47	
Ashburton to Rolleston	36	
Rolleston to Christchurch	14	
Dunedin to Christchurch		230
Christchurch to Lyttelton		7
Oamaru to Hakataramea		43
Timaru to Fairlie Creek		39
Christchurch to Greymouth		147
Christchurch to Little River		36
Christchurch to Waiau		82
Christchurch to Parnassus		85
Picton to Wharanui		56
Nelson to Glenhope		59
Greymouth to Reefton		47
Reefton to Inangahua		19
Greymouth to Ross		39
Westport to Mokihinui Colliery		31

BY AUTHORITY: W. A. G. SKINNER, GOVERNMENT PRINTER, WELLINGTON.

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
1929

— 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
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 to Woodville	115	
Woodville to Napier (Spit)	97	
Wellington to Napier via Wairarapa		212
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 Taneatua		227
Auckland to Rotorua		171
Auckland to Whangarei		133
Dargaville to Donnelly's Crossing		24
Whangarei to Opua		53
Kawakawa to Okaihau		29
Gisborne to Motuhora		49
Thames to Waihi		33
Stratford to Tahora		48

G. H. LOVELOCK, GOVERNMENT PRINTER, WELLINGTON.

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 activities of the Architectural Branch of the Department for the year ended 30th June, 1929 :—

During the period plans were prepared for seventy new works, of a total estimated value of £571,525, of which thirty-five contracts, to the amount of £132,755, have been let. In addition, twenty-seven contracts, to the amount of £191,327, for buildings designed prior to the 30th June, 1928, have also been let, making the total of works completed or under construction £324,082.

The latter total includes £57,839 for secondary-school buildings, and £6,970 for hospitals, &c., designed for Hospital Boards.

In addition to the above totals for buildings designed in Head Office, a large amount of minor additions, alterations, and repairs, and general maintenance of public buildings has been carried out by District Engineers, and a considerable quantity of furniture and fittings has been manufactured in the Public Works workshops for various Government Departments.

New Zealand materials and manufactures have been used, except where the use of imported material was unavoidable, with generally satisfactory results. Competition for Government contracts has been keen, with prices generally showing a downward tendency, and the standard of workmanship has been satisfactory.

The recent disastrous earthquake put building-construction methods to a severe test, and it is gratifying to report that Government buildings generally suffered little serious damage. Where such occurred the buildings were erected before the use of steel in combination with concrete became known as a building method. The serious damage to the post-offices at Westport and Greymouth is directly traceable to the towers, in combination with bad ground for a satisfactory foundation. In no case has other than minor damage been reported to modern buildings or additions in which reinforcement against earthquakes is provided in accordance with departmental practice, and it may therefore be claimed that reasonable protection is afforded the occupants.

The following is a schedule of the works carried out during the year :—

Viceregal Residences.

Auckland District.—General maintenance-work has been carried out, and electric bells and heaters installed.

Wellington District.—General maintenance-work has been carried out to the main building and various residences, and glazing, &c., of the glasshouse has been completed.

Post-offices.

Whangarei District.—A new post-office has been erected at Herekino and fittings installed. Alterations and renovations have been carried out as required to fourteen offices and residences.

Auckland District.—Contracts have been let for new brick post-offices at New Lynn, Northcote, and Mercer, and the buildings are in course of erection. A new office in wood has been completed at Te Akau. Alterations and renovations have been carried out to sixteen offices and residences; a petrol tank and pump have been erected at Pukekohe, and extensive alterations effected at Hamilton Automatic Exchange.

Taumarunui District.—Renovations, &c., have been carried out to eleven offices.

Tauranga District.—Extensive alterations and additions were made to Rotorua Post-office, and renovations, &c., have been carried out to eight other offices.

Gisborne District.—A garage and storeroom were erected at Tokomaru Bay Post-office, and renovations, &c., carried out to eight offices.

Stratford District.—At Waverley the new post-office in brick and concrete, commenced last year, was completed, and a garage and lineman's store in wood and iron were erected. Very extensive additions in brick and concrete were carried out at Hawera Post-office. At Ohakune a new carrier-equipment building in brick and concrete is in course of erection. Extensive renovations were carried out to six offices, and general maintenance work attended to.

Napier District.—Work on the new Napier Post-office was commenced in October last. The new building is of three stories, steel-frame construction, encased in concrete, with brick panels, the street frontages being faced with Coromandel granite up to first-floor level and Oamaru stone above. Excellent progress has been made, and it is anticipated that the building will be ready for occupation before the time specified for completion—viz., 8th June, 1930. Additions to Waipukurau Post-office in brick and concrete have been completed, and repairs and renovations carried out to seventeen offices.

Wellington District.—A new garage, petrol-tank, and pump have been erected at Featherston Post-office, and a petrol tank and bowser installed at Otaki. Alterations and renovations have been carried out as required to thirty-one offices, &c.

Nelson District.—A contract has been let for very extensive additions and alterations to Nelson Post-office, and work has just commenced. A petrol-tank has been installed. At Murchison a store and garage has been erected, while at Blenheim land has been acquired for a similar purpose.

Christchurch District.—A new post-office and telephone exchange have been erected and fitted up at Hinds. New post-offices are in course of erection at Shirley and Cust, the former being almost completed. Extensive alterations are being effected to Ashburton Post-office, and renovations, &c., were carried out to nine other offices.

Dunedin District.—A large garage and store has been erected at the telegraph-office, Dunedin. In connection with the proposed new chief post-office, extensive testing of the site has been made for foundation purposes, and the site has been enclosed by a hoarding. Portion of the very extensive excavation work was carried out by contract, and the balance is being done by day-labour. An order has been placed for approximately 1,500 wooden piles, which will be driven to consolidate the ground. Extensive alterations and additions have been made at Pembroke, and renovations, &c., carried out to forty-six offices.

Greymouth District.—Extensive additions in brick and concrete are being made to Greymouth Post-office. Repairs and renovations have been carried out to twelve post-offices.

Courthouses.

Whangarei District.—A building has been acquired in Whangarei, altered and fitted up as a Courthouse, and furniture and fittings installed. Renovations, &c. have been carried out to three other buildings.

Auckland District.—Renovations and repairs have been carried out as required.

Gisborne District.—Fittings, &c., were provided and fixed at Gisborne Courthouse, and the electrical installation reconditioned.

Stratford District.—Repairs and renovations were carried out to a number of Courthouses.

Napier District.—Extensive alterations and additions have been made to Hastings Courthouse, and repairs and renovations carried out to other Courthouses as required.

Wellington District.—At Foxton a new Courthouse in brick and concrete has been erected and the old building removed. Renovations were carried out to a number of other buildings.

Christchurch District.—Repairs and renovations were carried out to three Courthouses.

Dunedin District.—Repairs and renovations have been carried out to eleven buildings.

Greymouth District.—Repairs have been carried out to five Courthouses.

Police-stations and Gaols.

Whangarei District.—Repairs and renovations have been carried out to nine police-stations.

Auckland District.—At Auckland Central Station a contract was let for an additional story, together with structural alterations and a new lift, and the works are well advanced. A new building in wood has been erected at Mount Albert, and repairs and renovations carried out to ten police-stations. At Waikeria Borstal Institute additional accommodation at No. 1 camp has been provided and the Waikeria Stream bridge redecked. A new drainage system, with septic tank, is under construction.

Taumarunui District.—Renovations, &c., have been carried out at Te Kuiti and Ongarue.

Tauranga District.—Renovations, &c., have been carried out to five buildings.

Gisborne District.—Renovations, &c., were carried out to ten buildings.

Stratford District.—At Stratford and Normanby new buildings in wood were erected. Maintenance work was attended to as required.

Napier District.—A new police-station in brick has been erected at Hastings, and renovations carried out to eight buildings.

Wellington District.—Repairs and renovations have been carried out to fourteen stations. At Mount Crawford Prison all work in connection with the erection of the administration block was completed; a new workshop providing ample accommodation for the industrial activities of the prison, and also large store accommodation, were erected; four warder's cottages were erected and a fifth is in course of erection; the formation of the new access road has been practically completed and metalling commenced. At Wi Tako Prison, Trentham, water is being laid on from the Upper Hutt supply. Renovations, &c. have been carried out to the Women's Reformatory, Point Halswell.

Christchurch District.—A new police-station was completed at Sumner, and additions made to the station at Addington. Maintenance-work, &c., has been carried out as required to eight stations.

Dunedin District.—A new police-station was erected at Lumsden. Renovations have been carried out to eighteen stations. At the Invercargill Borstal Institution an additional story was completed on the south wing, a garage was built at the farm, and various maintenance-works attended to.

Greymouth District.—Renovations have been carried out to thirteen police-stations and six residences. A new stable was erected at Greymouth Station.

Mental Hospitals.

Avondale.—Extensive alterations and additions have been made to various buildings during the year, and renovations carried out as required.

Wolf Home.—The buildings have been repainted and a washhouse erected.

Puhitahi.—The following buildings in wood and concrete have been erected: Kitchen block, with dining-rooms, &c.; lavatories; dormitory for men's quarters; artisans' quarters; calf-pens and piggeries. In addition, brick and concrete stables, implement-shed, and boiler-house have been built. A temporary water-supply has been provided, with high stand and tanks, and motor-pump. For the permanent supply a contract was let for carrying water from Patumohoe Springs; the

reservoir, with necessary 6 in. and 8 in. pipe-lines, has been completed. Electric supply has been laid on from the Franklin Power Board's reticulation.

Tokanui.—Artisans' quarters in wood have been completed during the year, and three brick villas for women are in course of erection and nearing completion.

Porirua.—The new Nurses' Home, containing over one hundred rooms was completed, furniture and furnishings installed, and the laying-out of the grounds commenced. An incinerator and two garages were erected, additions have been made to a number of buildings, and renovations carried out as required. A new system of ventilation has been installed in the women's portion of the main building similar to that recently installed in the men's portion. The water-supply has been improved by raising the level of the lower dam, and all fire-hydrants have been overhauled and put in good order.

Nelson and Stoke.—Three large villas in brick and concrete are in course of erection; also a new bakery, meat-shop, &c.

Sunnyside.—Extensive additions to the boiler-house are under construction, new boilers, &c., being provided, together with new chimney-stack, &c. New sewer drainage was laid.

Templeton.—Villa No. 2, on the same lines as Villa No. 1, is in course of erection, very satisfactory progress having been made, and a large elevated concrete water-supply tank was erected.

Seacliff.—A new laundry and kitchen block has been erected, and is ready for the installation of machinery and equipment. Additions to the Nurses' Home and a new Assistant Medical Officer's house are nearing completion. New piggeries have been erected, and extensive alterations, additions, and renovations have been carried out.

Hokitika.—A new laundry and boiler-house have been erected, and the machinery will be transferred from Seacliff. An elevated, reinforced-concrete water-tank of 40,000 gallons capacity is in course of erection, and pipes have been driven for a water-supply.

Education Department.

Whangarei District.—Additions were completed to the Native school at Matangirau, and renovations and repairs carried out to four other schools and residences.

Auckland District.—At the Seddon Memorial Technical College, Auckland, a new assembly-hall, gymnasium, class-rooms, lavatories, &c., were completed during the year, and the heating contract is in hand. At Hamilton a new technical school in brick and concrete, and comprising five class-rooms and lavatory accommodation, has been completed during the year, and alterations and additions were carried out to the existing portion, including a new hot-water service. Additions have been made in wood to the Hamilton Receiving-home, and a new electric-lighting system installed at Pukekohe Technical College.

Taumarunui District.—Additions have been made to the Native school and residence at Otukou, and maintenance-works carried out to other schools as required.

Tauranga District.—Renovations and repairs were carried out to eight Native schools and residences.

Gisborne District.—Extensive works were carried out to the Gisborne High School, and renovations, &c., to the Boys' Rectory and Girls' Hostel; furniture and fittings were provided for the Child Welfare Office. At Te Araroa a new residence was erected, and additions and repairs made to the school. A new class-room was built at Tikitiki, and sundry repairs and renovations carried out at four other schools.

Stratford District.—At Wanganui Technical College new class-rooms in brick and concrete were erected, existing class-rooms were altered, and electric light installed. A new residence in wood was erected at Otoko Pa Native School, and the school removed and renovated. A new Native school was erected at Parinui.

Napier District.—Extensive additions in brick and concrete were made to the Dannevirke High School and Hastings High School. Repairs and renovations were carried out to the Green Meadows Receiving-home and five Native schools.

Wellington District.—At Palmerston North Technical School new workshops were erected, the old workshops being converted into class-rooms. Renovations, &c., were carried out to several institutions in Wellington.

Nelson District.—At Blenheim the Marlborough High School workshops were completed and a heating service installed.

Christchurch District.—A new high school in wood is nearing completion at Waimate, and at Timaru extensive additions in brick and concrete are being made to Timaru Boys' and Girls' High Schools. At the Girls' Home, Burwood, extensive alterations are being made to No. 2 building. Fire-alarm installations are being provided at the Christchurch Receiving-home and Boys' Probation Home, and maintenance-work has been attended to as required.

Dunedin District.—New dormitories have been erected at Otekaike Special School, and maintenance work, &c., carried out to other buildings.

Greymouth District.—Repairs and renovations have been carried out to the Technical School and School of Mines at Westport.

Health Department.

Auckland District.—At St. Helens Hospital, Auckland, additions to the store have been made and a new boiler installed. Extensive renovations have been carried out to Thames Hospital.

Gisborne District.—Alterations and renovations were carried out to Cook Hospital, Gisborne; additions and furniture provided at St. Helens Hospital; and office accommodation and furniture, &c., provided for the District Health Office.

Stratford District.—A new ante-natal clinic and additions to the Nurses' Home are in course of erection at St. Helens Hospital, Wanganui.

Napier District.—New offices were provided for the District Health Office.

Wellington District.—Additions and alterations were made to Otaki Hospital; renovations were carried out to Otaki Sanatorium, dental clinic and St. Helens Hospital, Wellington, and to Quarantine station, Somes Island.

Christchurch District.—At Hanmer Springs a Nurses' Home in brick, concrete, and wood, and containing sixty bedrooms, is in course of erection, and is nearing completion. A boiler-house, with new boilers and machinery, has been erected; a contract was let for extensive steam-heating and hot-water supply, and this work is practically completed. Various minor works have been carried out at this institution. A contract has been let for a new bath and massage building; the old buildings have been removed, and the site is being prepared. General maintenance-work was carried out at St. Helens Hospital, Christchurch.

Dunedin District.—Renovations were carried out to St. Helens Hospitals, Dunedin and Invercargill.

HOSPITAL BOARDS.

Whangarei District.—An extension was made to the children's ward during the year.

Auckland District.—A contract was let for a maternity hospital at Paeroa, and the work is well advanced.

Taumarunui District.—An iron fire-escape was fitted to the Nurses' Home at the Taumarunui Hospital.

Gisborne District.—A new hospital was erected in concrete at Te Araroa.

Napier District.—Very extensive additions were made to the Napier Hospital, consisting of the Coleman Ward and special-service Block, while the bacteriological section and the upper story of the Nurses' Home were completed. At Hastings Memorial Hospital a bronze memorial tablet with marble surround was erected.

Dunedin District.—At Gore, extensive additions were made to the main hospital block, consisting of kitchen, staff dining-room, &c. A cottage for the porters was also erected. These works were carried out for the Southland Hospital Board.

Greymouth District.—Extensive additions and alterations were made to Grey River Hospital, consisting of a new administration block, additions and alterations to the operating block, diet-kitchens, massage-rooms, &c.

DEFENCE DEPARTMENT.

Auckland District.—The following buildings have been completed at Hobsonville Aerodrome: Residence for O.C. Air Base; central office; control hut; boat-shed; three cottages for airmen (and three almost completed); large hangar for planes, with workshops and offices; transport-shed in reinforced concrete, with accommodation for crash-tender, ambulance, tractor, cars, &c. A timber jetty, 286 ft. long, has been built, and a slipway for planes is well advanced. A sewerage and storm-water drainage system is almost completed; an elevated concrete water-tank, with bores, pumps, &c., has been erected, and pipe-lines laid. Electric supply has been provided and telephone-cables laid. A seaplane-building block is in course of erection. At Narrow Neck two buildings, removed from Mount Eden Ordnance Department, have been altered and re-erected on concrete foundations. General renovations have been carried out to the camp buildings, and additional drainage and fencing provided. At North Head new lavatories have been provided and a tank-stand with tank, pumps, &c., was installed. A building is being dismantled, altered, and re-erected at Ponsonby Drill-hall. This work is almost completed. At Waikato Camp, Ngaruawahia, the following works, commenced last year, have been completed: Magazines Nos. 8 to 10; roading from railway-gates; S.A.A. magazines; Ordnance workshops; butcher's shop, and cool-store; battalion area. New works authorized and completed during the year are: Permanent showers; battalion areas; Ordnance-workshops fences; motor-garages; permanent coal-store; No. 2 area cleared, cultivated, and grassed. The following are under construction: Laboratory, camp hospital, magazine-drains, &c. Extensive repairs, renovations, earthworks, &c., have also been carried out as required. New office accommodation has been provided in Wellesley Street Post-office for Auckland Headquarters. Renovations, &c., have been carried out at Auckland Drill-hall and at Cambridge. At Freeman's Bay a building, consisting of drill-hall, gun-room, Officers' room, &c., has been erected for the R.N.V.R. Training-base.

Stratford District.—Alterations and additions, including a miniature rifle range, racks, &c., were made at New Plymouth Coronation Hall. At Rewarewa Rifle Range, a new concrete trench and new target-frames, &c., were provided. At Wanganui additions to cottage, &c., were carried out.

Napier District.—Extensive repairs and renovations were carried out to the Artillery Barracks, Owen Street, and to the Coote Road Drill-hall.

Wellington District.—At Fort Ballance a new laboratory was erected. Renovations and general maintenance works were carried out to Trentham Military Camp; Headquarters, Buckle Street; cottage, Fort Kelburn; and to Defence Headquarters, Palmerston North. At Fort Dorset search-lights have been installed.

Christchurch District.—A contract was let and completed for re-covering of the hangar-roofs at Sockburn Aerodrome, and electric light and power were installed. The fitting up of a drill-hall for Naval defence was completed. A considerable amount of maintenance-work was carried out to King Edward Barracks and Artillery stables, Christchurch, and to the caretaker's cottage, Temuka Drill-hall. At Burnham Military Camp, new Ordnance workshops, &c., have been completed.

Dunedin District.—At Waianakarua Camp a water-supply has been installed, and sundry works have been carried out to drill-halls, &c., as required. At Invercargill Drill-hall and Artillery Barracks new administrative offices and storerooms were erected, the building generally renovated, and an addition was made to the main building.

Greymouth District.—Repairs and alterations were carried out at Westport Drill-hall, and maintenance-works to three other drill-halls.

Tourist Department.

Taumarunui District.—The large addition to the hostel at Waitomo was completed during the year, and the existing wooden portion altered and renovated. The additions comprise seven staff bedrooms, twenty-one bedrooms, nineteen single rooms, bathroom, and lavatory. In addition, a main hall, lounge, sitting-room, smoke-room, boot-room, and kitchen have been provided. The basement has been fitted up as coal-stores and heating-chambers. Very extensive works were carried out to the grounds, and roads formed. A pumping plant was installed.

Napier District.—Improvements and renovations have been carried out to bathhouses at Morere Springs, and at Napier offices have been fitted up and furnished for the Department.

Nelson District.—Hut-construction at Mount Balloon was completed.

Christchurch District.—At Pukaki Hotel a new drainage system, with septic tank, was installed, and new conveniences provided.

Dunedin District.—The contract for the new Milford Sound Accommodation-house was completed in December, 1928, and was in use during the tourist season. The main building comprises two accommodation wings, and a central kitchen and dining block. The buildings, which accommodate sixty guests, were electrically lighted throughout, and every modern convenience provided. Two bridges were erected on the Milford Track. At Queenstown Tourist Park a new glasshouse, complete with boiler, propagating-frames, &c., was completed, and the tennis-courts renovated.

Greymouth District.—A new office was provided and furnished for the Department at Greymouth. The Almer Accommodation-hut was rebuilt and enlarged at Franz Josef Glacier, at an altitude of 5,500 ft.; also the Burke Hut on the Haast Pass track.

Department of Agriculture.

Auckland District.—At Motuihi new piggeries were erected in concrete and wood. At Ruakura Farm the electrical system was changed over to the 230 voltage, and at Te Kauwhata Farm electric light and power was installed.

Taumarunui District.—Furniture and fittings were supplied and installed at the Department's offices at Taumarunui and Te Kuiti.

Tauranga District.—Renovations were carried out to the Rotorua office, and fittings and furniture supplied.

Gisborne District.—Office accommodation was arranged at Tolaga Bay, and fittings and furniture supplied. Stalls were erected at the Gisborne Winter Show.

Stratford District.—Repairs and renovations were carried out to a number of buildings, and an office, with furniture, &c., provided at Opunake.

Napier District.—Repairs, &c., were carried out to the Department's building at Hastings, and electric light installed at Woodville. At Wairoa, chemicals have been packed, crated, and carted from the Te Uhi blackberry experimental section. A shelter-shed was erected on the wharf at Waikokopu.

Wellington District.—At Palmerston North office accommodation was arranged, and an implement-shed and hothouses were erected for the Plant Research and Seed-testing Branches. Electric light and power was installed at Wallaceville Laboratory; steel shelving, &c., provided at the Department's offices, Dominion Farmers' Building, Wellington; and renovations, &c., were carried out to the laboratories at Fairlie Terrace and Sydney Street, Wellington.

Christchurch District.—At Fairlie Stock Inspector's house electric light was installed and various improvements effected. At Timaru new offices were provided and fitted up.

Dunedin District.—Renovations, &c., were carried out to a number of residences and offices.

Greymouth District.—Office accommodation was provided for the Apiary Instructor at Greymouth, and maintenance-works carried out to Waimaunga Experimental Farm buildings.

Soldiers' Graves.

A large number of soldiers' graves have been attended to, headstones and concrete surrounds being fixed as required.

General.

Renovations and repairs have been carried out to various departmental buildings, and furniture and fittings were made and supplied as required.

In conclusion, I desire to place on record my appreciation of the co-operation of the district offices, and the efficient and loyal manner in which the members of the architectural staff carried out their duties.

John T. Mair, A.R.I.B.A., Government Architect.

APPENDIX D.

ANNUAL REPORT OF THE CHIEF ELECTRICAL ENGINEER.

The Chief Electrical Engineer to the Hon. the Minister of Public Works.

Sir,—

I beg to report on the position of the development of electric power in the Dominion for the past year as follows:—

GOVERNMENT SCHEMES IN OPERATION.

LAKE COLERIDGE ELECTRIC-POWER SUPPLY.

The year ending 31st March, 1929, represents the fourteenth year of operation of the Lake Coleridge scheme, and the year's working shows very satisfactory results.

The attached tables (I, III, and V) give the analysis of results obtained for the year's operation, connected load details being given in Table IV.

Financial Results.

The capital outlay at the end of the year was £1,581,262, as against £1,561,081 for the previous year, showing an increase of £20,181, and is analysed in Table II. The total revenue for the year was £186,963, as compared with £171,127 for the year ending 31st March, 1928, and after payment of all charges, including interest and depreciation, but not sinking fund, a surplus of £50,374 was shown. This amount has been credited to the Sinking Fund Account, bringing that fund to a total of £112,839, to which must be added accrued interest earned of £2,931, bringing the total amount to the credit of the sinking fund to £115,770. The arrears of sinking fund contributions as at the 31st March, 1929, are now reduced to £7,561, and all arrears should be wiped out next year. Table I shows particulars of financial results and load records.

The total cost per unit generated was 0·303d., being a decrease of 0·069d., due to increased output with a decrease in operating-costs. Total operating-costs have decreased by £9,924, due to decreased management and generating costs and decreased Harper diversion maintenance. Particulars of working-costs are shown in Table III.

Connected Load.

The total connected load at the end of the year was 157,399 kw., being an increase of approximately 15·4 per cent. on that of the previous year. Details of connected load are given in Table IV.

Power-house Load and Operation.

The maximum output from the power-house for the year was 24,370 kw., representing an increase of 15·9 per cent. over the previous year's maximum. This increase is a normal one, and the addition of the Lyttelton–Christchurch Railway electrification demand has not materially affected this figure. Units output from the power-house totalled 108,011,955, as against 93,853,759 for the previous year, an increase of 15 per cent. The maximum units generated for the year in any one day was 368,500, on 28th March. The annual load-factor was 50·7 per cent., or 0·3 per cent. lower than that of the previous year.

There was no overload experienced on the full capacity of the plant (27,000 kw.), and no calls were made on the tramway stand-by plant for this reason or due to any interruption to supply. During the period from 31st March to 30th June, 1929, the maximum demand on the power-house reached 27,540 kw.—viz., on 19th June.

Transmission-lines.

The Glenroy–Glentunnel section of the north line was converted from 7/·135″ aluminium to 19/13 copper at the end of June, 1928, and there remains now only one section of main transmission-line to be converted to copper—viz., twenty-four miles of north line between Hororata and Christchurch. This work was not put in hand during the year owing to the high cost of copper, but will be carried out when the copper-market becomes more favourable.

Progress in live-line insulator-testing and line-work has been maintained, and interruption to service reduced by changing insulators and poles without shut-down. No extensive routine insulator-testing, however, was carried out during the year, as the available staff was employed on extra work in new-line construction and the overhaul of wiring systems.

66 KV. SUBSTATIONS.

The following table shows the installed capacity of each substation, together with the maximum demand and units output:—

Substation.	Installed Capacity.	Maximum Demand.	Units supplied.
	Kw.	Kw.	
Addington	17,000	17,610	78,427,359
Timaru	5,000	2,247	9,235,173
Ashburton	5,000	1,402	5,451,510
Oamaru	1,050*	869	3,677,587
Hororata	295	264	900,149

* 300 kv.a. bank added 4th November, 1928.

Addington Substation.

After a period of twelve months' shut-down, during which new field coils were obtained and fitted, the 6,000 kv.a. condenser was placed again in regular service on the 31st July, 1928, and has since operated satisfactorily.

On the 18th September, 1928, a second new bank of 12,000 kv.a. transformers arrived, and the old north bank of transformers (5,000 kv.a.) was dismantled in November, the station operating with a transformer capacity of 17,000 kv.a. pending the completion of the installation of the new 12,000 kv.a. bank. This bank is now completed and ready for service, and the bank being replaced is being converted to outdoor self-cooling type for use at Oamaru Substation. The capacity of the transformers at Addington Substation has now been brought to 29,000 kv.a.

Further trouble, due to low insulation readings on the bushings of the ironclad switch-gear, was experienced, and more replacement of bushings has been found necessary.

INTERRUPTIONS TO SUPPLY.

(*a*) *Christchurch Supply.*

The total number of interruptions to Christchurch supply exceeding 1 minute was nine, and the total time of same was 1 hour 47¼ minutes. The longest period, of 1 hour 15 minutes, occurred on the 22nd February. The trouble was due to a period of dry dusty conditions, followed by heavy early-morning fog, causing a flash-over and damage to several insulators on all lines between Hororata and Christchurch. The interruption occurred at 5.30 a.m., and fortunately caused a minimum of inconvenience to consumers. Steps were immediately taken to have all insulators wiped down on the sections of lines affected, and no trouble has since been experienced. Of the remaining eight interruptions, totalling 32¼ minutes, three were due to failures of insulators on transmission-lines, two to trees blowing over on the lines, one to failure of O.C.B. bushing, and two to troubles at the power-house.

(*b*) *Ashburton Substation.*

The total number of interruptions to supply at Ashburton, apart from those prearranged, was sixteen, and the time of same 1 hour 42½ minutes. Of this number, five of the interruptions affecting Christchurch also affected Ashburton, the total time of same being 24½ minutes. Of the remaining twelve, four were due to broken wires on the transmission-line between Hororata and Ashburton, one to insulator-failure on transmission-line between power-house and Hororata, two to trouble at Hororata Substation, three to trouble at Ashburton Substation, and one unknown.

(*c*) *Timaru Substation.*

The total number of interruptions to this supply, apart from those prearranged, was twenty, and the time of same 2 hours 15½ minutes. Of this number, thirteen of the interruptions affecting Ashburton also affected Timaru, of a total time of 1 hour 5½ minutes. Of the remaining seven interruptions, six were due to transmission-line troubles (causes not ascertained), and one due to failure of insulator on air-break switch at Timaru Substation.

(*d*) *Oamaru Substation.*

The total number of interruptions to this supply, apart from those prearranged, was twenty-one, totalling 1 hour 33½ minutes. Of this number, twenty of the interruptions affecting Timaru also affected Oamaru. The remaining interruptions, therefore, were caused by faults on the transmission-line between Timaru and Oamaru.

DESIGN WORK.

The design and layout of No. 1 unit (8,830 kv.a.) involved considerable work, owing to space-restrictions in the existing building, which had been originally built to accommodate machines of smaller capacity, and for architectural reasons the extension was built to the same width as the original.

Special provision had to be made to accommodate the turbine relief valve which is of the jet dispersing type, a feature which is not incorporated in the other turbines in this station. To provide for the heavy hydraulic thrusts developed, particular care was called for in designing anchorages for the valve and hood, and adequate steel reinforcement had to be provided to withstand the stresses imposed.

For the Lyttelton–Christchurch electrification the design office prepared layout drawings covering the electrical equipment for the guidance of the electrical staff, and drawings in connection with the new arrangement of the 11,000-volt switch-gear in Woolston Substation were also prepared.

General.

In connection with the electrification of the Lyttelton–Christchurch line, a contract was let in August, 1927, for supply of two 1,350 kw. rotary converters, together with all switch-gear for conversion of 11,000 volts A.C. to 1,500 volts D.C. A contract for the substation building at Woolston to house this equipment was let in April, 1928. Considerable delay was experienced in delivery of equipment and in completion of the building. The machinery commenced to arrive about the middle of October, 1928, and despite difficulties due to unfinished state of building and non-arrival of certain apparatus the full equipment was installed, dried out, and tested at the end of January, 1929. Actual supply for electrification purposes was available at the beginning of February, and the formal opening of the line took place on the 14th February, 1929.

During the year the construction work for the Lyttelton–Christchurch Railway electrification supply at Woolston Substation was completed, a special duplicate circuit 11 kv. line being constructed for this purpose. This line was completed and tested on the 12th January, 1929.

An annexe to the above substation has been used to accommodate 11 kv. switch-gear for the supply of local consumers by the Department, and the low-tension supply to all wholesale consumers supplied by the Department has been converted to 11,000 volts, and on the removal of the old substation these consumers will be supplied through the new 11 kv. switch-gear.

During the year two areas of supply have been sold to local supply authorities: (1) The Department's consumers north of the Waimakariri River, to the North Canterbury Electric-power Board; (2) the Department's wholesale consumers in the Hornby-Islington area, to the Springs-Ellesmere Power Board. The North Canterbury Power Board took over all the Department's reticulation north of the Waimakariri River on 1st July, 1928.

In February, 1929, several main-line interruptions were caused by a continued period of fogs coupled with dust where the lines parallel roads, and it was necessary to employ gangs of men to wipe down insulators between Addington and Aylesbury on the south and middle lines, and between Addington and Bealey on the north line.

The construction of the North Canterbury duplicate circuit 33 kv. line was completed and put into service at 11 kv. on the 15th March, 1929. This supply will be changed to 33 kv. on the installation of the new outdoor transformer-banks at Addington.

The new outlet weir at the lake was completed in April, 1929, thus bringing the normal level of the lake to 1,672 ft.

Installation of No. 1 Generating-unit.

During July, 1928, the work of installing the third 7,500 kw. (8,830 kv.a.) generating-unit was commenced. The weir-basin has been completed and the tail-race widened. At the 31st March last 1,340 ft. of pipe-line had been fitted and riveted up. To date (30th June, 1929) the pipe-line has been completed with the exception of the closing-piece at the power-house, and the generating-set bed-plate has been grouted in and part of the turbine and generator lined up in position.

Rainfall.

The rainfall at the power-house for the year was 36·28 in., and the number of rainy days was 132—a record.

MANGAHAO ELECTRIC-POWER SYSTEM.

Financial Results.

The capital outlay at the close of the year was £2,416,713, as against £2,373,921 for the previous year, an increase of £42,792, which is analysed in Table X. The net revenue for the year was £114,148 5s. 6d., as against £44,111 15s. 2d. for the previous year, an increase of £70,036 10s. 4d., or 158·8 per cent.; and the gross revenue for the year £186,712 12s., as against £155,856 10s. 1d., an increase of £30,856 1s. 11d., or 19·8 per cent. The increase in net revenue is largely due to a reduction in the amount of power purchased from outside sources. During the year power purchased cost £72,563 6s. 6d., as against £111,744 14s. 11d. for the previous year, or a decrease of 54 per cent. Included in power purchased during the year is £15,038 9s. 4d. from Waikaremoana hydro-electric power scheme, which is a credit to that scheme and a debit to Mangahao. Working-expenses were £34,344, as analysed in Table XI. The gross financial results of the system are analysed in Table XIII.

Operation and Maintenance.

Headworks and Power-house.

Storage was available in the upper Mangahao dam from the beginning of the year, heavy rainfall in April filling the dam and causing the automatic gates to tip. Several minor troubles were thus brought to light, but these have been rectified and the gates have since functioned satisfactorily. For several short periods during the year the storage was insufficient to meet the demands on the station, and it was necessary to call on stand-by plants to give relief. Since generation was commenced by the Waikaremoana Station the number of such calls has been reduced considerably, and it has been possible to maintain ample storage in the Mangahao dams. A water-level indicator has been installed at the upper Mangahao dam, and is operating satisfactorily, as are those at the two other dams and at the surge-chamber. Painting has been carried out on the pipe-lines, and the surge-chamber-gate

operating equipment has been cleaned and overhauled. The turbines and generators have operated very satisfactorily during the year, practically all trouble being due to broken turbine buckets. In order to cope with the increased demand on the station a new set of nozzles, slightly larger than the originals, has been purchased. These are now to hand, and will be fitted when the Waikaremoana Station is able to take over the bulk of the load on the system, thus releasing the local machines when required.

Transmission-lines.—110,000-volt Lines.

Mangaore–Khandallah Line.—During the year there have been nine complete interruptions on this line, totalling 22 hours 17 minutes. Of these, five interruptions, totalling 22 hours 2 minutes, were due to trouble caused by salt spray on insulators; two, totalling 9 minutes, were due to unknown causes; one, of 4 minutes, was traced to a flash-over; while one, of 2 minutes, was due to a switching error at the power-house. In the light of subsequent experience it is reasonable to assume that the interruptions on this line due to unknown causes were actually caused by salt spray on the insulators. This line has been thoroughly overhauled, and is now in good order.

Mangaore–Bunnythorpe Section—West Line.—This line has been in service through the year, supplying power to the Manawatu-Oroua and Wanganui-Rangitikei Power Boards. Other than prearranged shut-downs, totalling 6 hours 10 minutes, there have been nine interruptions to service, totalling 5 hours 18 minutes, and these were all caused by salt deposits on the insulators on the Bunnythorpe–Wanganui section of the line. The lengthening of jumpers and hanging of weights on the Bunnythorpe–Wanganui section have been completed, and this line is now in good condition.

Mangaore–Bunnythorpe Section—East Line.—This line has been in service during the year for the supply of power to Hawke's Bay and Wairarapa, and since the end of January, 1929, for the supply of power from the Waikaremoana Power-station to the Mangahao system. Other than prearranged shut-downs, totalling 2 hours 16 minutes, there have been nine interruptions to service, totalling 2 hours 13 minutes. Two interruptions, totalling 42 minutes, were due to the failure of rotating insulators on the air-break switch at Woodville Switching-station, while another interruption, of 3 minutes, was possibly due to a fault in one of these insulators which later failed completely; one interruption, of 8 minutes, was traced to a flash-over at an air-break switch at Waipukurau Substation which brought the line out at the power-house. Four, of a total duration of 54 minutes, were due to flash-overs caused by salt deposits on insulators; and one, of 26 minutes, was due to some cause unknown. The lengthening of jumpers and hanging of weights to the revised schedule have been completed, and this line is now in good condition.

The groyne at the Manawatu River crossing has been cleared of debris and a few more willows planted to fill gaps.

Bunnythorpe–Wanganui Line.—Service to the Wanganui-Rangitikei Power Board has been given on this line during the year. Interruptions recorded total forty-four, of 127 hours 16 minutes duration. Of these, twenty, totalling 15 minutes, were traced to faults on the Power Board system, which tripped the O.C.B. at Bunnythorpe; two, totalling 4 hours 40 minutes, were due to a lightning-stroke which set fire to a transmission-line pole; twelve interruptions, totalling 33 hours 55 minutes, were due to line troubles caused by salt deposits on insulators; one, of 12 minutes, was occasioned by switching operations, during the transfer of load to the Waikaremoana Power-station, whilst another, of 10 minutes, was due to the failure of supply from that station; two interruptions, totalling 3 hours 47 minutes, were necessitated by troubles which developed in parts of the equipment at Wanganui Substation; while for the remaining one, of 18 minutes, no cause has been found.

During the period that trouble was experienced due to salt deposits on insulators this length of line suffered rather severely. Investigation showed that one make of insulator gave somewhat low value of leakage resistance, and it was therefore decided to remove those of that make from this section of line, substituting insulators of higher leakage resistance. The line has been patrolled regularly throughout the year and trees cut where necessary.

Bunnythorpe–Woodville Section.—Other than prearranged shut-downs, totalling 5 hours 42 minutes, there were thirty interruptions to service, totalling 4 hours 36 minutes. Three interruptions, of 1 hour 7 minutes total duration, were due to the failure of rotating insulators on an air-break switch at Woodville Switching-station, while three others, totalling 10 minutes, were probably due to the same insulators before they failed completely; five interruptions, totalling 21 minutes, were caused by surges when tests were being carried out on the synchronous condenser at Napier Substation; one interruption, of 8 minutes, was due to a flash-over on an air-break switch at Waipukurau Substation which brought out the line at the power-house; one, of 10 minutes, was due to trouble at the Waikaremoana Station; and two, of 7 minutes total duration, were occasioned by switching operations when changing the load from the Mangahao to the Waikaremoana Station; one interruption, of 8 minutes, was probably due to a jumper on the Mangamaire–Masterton line being blown into contact with a cross-arm during a gale, and one, of 5 minutes, was due to lightning; three interruptions, totalling 57 minutes, were caused by salt deposits on insulators; ten, totalling 1 hour 13 minutes, were due to causes which could not be ascertained.

A close watch has been kept on the Bunnythorpe–Ashhurst section of this line for cable-strands broken by vibration, but during the year no trouble of this nature has been encountered. At pole No. 177, near Ashhurst, a parallel-groove clamp was tightened under live-line conditions. The line has been patrolled regularly throughout the year and trees cut and tracks cleared where necessary. Generally this line has given good service, and at the present time is in good condition.

Woodville–Mangamaire Section.—Other than prearranged shut-downs, totalling 37 hours 49 minutes, there have been forty-two interruptions to service, totalling 10 hours 16 minutes, on this line during the year. Of the remainder, thirty-one were due to the same causes as on the Bunnythorpe–Woodville

section, except for the longer time delays necessitated by switching operations at Woodville; these interruptions totalled 5 hours 9 minutes. One, of 50 minutes, was due to a faulty rotating insulator on an air-break switch at Mangamaire Substation, while another, of 4 minutes duration, was due to a flash-over at a jumper on pole 1269 during a gale, which swung the jumper sufficiently close to the pole to cause arcing. Six interruptions, totalling 3 hours 42 minutes, were occasioned by switching operations when transferring load from the Mangahao Station to Waikaremoana; one, of 24 minutes, was due to transformer trouble at the Mangamaire Substation, when the conductor through a L.T. bushing broke at the insulator and allowed the cable to come in contact with the transformer-tank; two interruptions, of 7 minutes total duration, were due to causes which could not be ascertained, although it is suspected that one was due to trouble on the Tararua Power Board's system, which tripped the O.C.B. at Woodville.

The H Pole at the corner of Woodlands and Broomfield Roads has been replaced by a new structure, the one originally erected having decayed and was considered unsafe. Earth-strip has now been removed from all poles on the sections from which the earth-wire had previously been removed, and guy-wires have been tightened where necessary. Preparations are now in hand for "stubbing" weak poles on this section.

Mangamaire–Masterton Section.—Other than prearranged shut-downs, totalling 46 hours 33 minutes, there have been forty-five interruptions to service, totalling 11 hours 6 minutes. Of the remainder, forty-two were from the same causes as on the Woodville–Mangamaire section, and accounted for 10 hours 53 minutes, leaving three interruptions, of 13 minutes duration, which were traced to troubles on the Power Board's system. These had opened the O.C.B. at Mangamaire.

Woodville–Dannevirke Section.—Other than prearranged shut-downs, totalling 12 hours 27 minutes, interruptions on this line during the year totalled forty-eight, of 7 hours 42 minutes duration. Twenty-seven, of a total duration of 5 hours 5 minutes, were due to same causes as on the Bunnythorpe–Woodville section; three interruptions, totalling 10 minutes, were traced to weighted insulators on the Dannevirke–Waipukurau section being blown in towards the pole during a gale and arcing over; four, totalling 9 minutes, were caused by a cable on the Dannevirke–Waipukurau section working out of its clamp and making intermittent contact with the pole; six interruptions, totalling 1 hour 31 minutes, were entailed by switching operations when transferring load from Mangahao to Waikaremoana Station; while one, of 10 minutes duration, was due to the resulting surge when an O.C.B. at Woodville was closed on to a fault at Mangamaire. The causes of the remaining seven interruptions, totalling 37 minutes, could not be ascertained.

Dannevirke–Waipukurau Section.—Other than prearranged shut-downs, totalling 9 hours 56 minutes, there were forty-six interruptions recorded on this section during the year, totalling 18 hours 48 minutes. Forty-one were due to the same causes as on the Woodville–Dannevirke section, and totalled 18 hours 27 minutes. The extra time was taken in patrolling the line and holding this section out of service when a cable came out of its clamp. This fault occurred at night, and could not be located until daybreak. Two interruptions, totalling 6 minutes, were caused by lightning, and one, of 4 minutes, was due to a fault on a Power Board's line, which caused the O.C.B. at Dannevirke to trip; two, of 11 minutes total duration, were due to causes which could not be traced.

Protection work at the foot of towers on the Tukituki River crossing has been continued, and periodical inspections of all river-crossings have been made. H poles have been tightened up and earth-strips removed from poles of the section from which earth-wire had been removed. A cotter-pin was replaced in a tie-down clamp under live-line conditions.

Waipukurau–Napier Section.—Other than prearranged shut-downs, totalling 19 hours 38 minutes, there were fifty-five interruptions on this section during the year, of 19 hours 47 minutes total duration. Forty-nine, totalling 19 hours 28 minutes, were due to same causes as on the Dannevirke–Waipukurau section; two interruptions, totalling 7 minutes, were caused by faults on the Power Board's 11,000-volt lines, while one of 6 minutes was due to lightning; three, of 6 minutes total duration, were due to unknown causes.

River-crossings have been inspecte dregularly, and pole No. 1005 near Raukawa has been straightened and concreted.

Transmission-lines.—11,000-volt Lines.

Mangaore–Shannon Section.—Other than prearranged shut-downs, totalling 2 hours 26 minutes, four interruptions to service, totalling 17 minutes, were recorded on this section during the year. Of the remainder, one, of 3 minutes, was occasioned by the manual operation of the switches in the power-house, to relieve the station of overload, which was lowering the frequency. Leakage relays have recently been installed on these feeders.

Khandallah–Hutt Power Board Section.—Forty-nine interruptions to service, lasting 13 hours 26 minutes, were recorded on the Hutt feeders during the year. Of these, twenty-five, totalling 5 hours 48 minutes, were due to troubles on the Power Board's lines; one, of 5 minutes, was due to the failure of supply on the main transmission-line, due to a flash-over at pole 629, while two, totalling 12 minutes, were due to insulator trouble on the main line; one interruption, of 4 minutes, was due to the operation of the overload relays on No. 1 feeder when the load was transferred from No. 2 feeder during trouble on the latter; two interruptions, of 2 minutes total duration, were caused by lightning; one, of 6 hours 28 minutes, was caused by the Ngahauranga line fouling the Hutt line when the former was damaged during a heavy gale—the Hutt feeder was kept out of service to minimize danger when repairing the Ngahauranga feeder; one, of 2 minutes, was due to the breaking of a jumper at an air-break switch on No. 2 feeder, while one, of 20 minutes, was caused by a fire at pole 78; one, of 5 minutes duration, was occasioned by switching operations at Khandallah Substation. The remaining thirteen interruptions, totalling 15 minutes, were due to causes which could not be ascertained.

Khandallah–Petone Railway Section.—Other than prearranged shut-downs, totalling 104 hours, there were thirteen interruptions to supply, totalling 12 hours 4 minutes, recorded during the year. One, of 7 hours 53 minutes, was due to the breakdown of a transformer supplying solenoids on remote-controlled air-break switches in the railway-yard; one, of 5 minutes, was due to the failure of supply from power-house owing to a flash-over at pole 629 on the main transmission-line, while two others, totalling 12 minutes, were due to insulator troubles on the main line; three interruptions, totalling 2 hours 37 minutes, were occasioned by fires on poles on the Hutt line. Six interruptions, totalling 1 hour 17 minutes, occurred on a Sunday when the Railway Department's feeder was being used by the Power Board to supply Hutt Valley. Of these, two, lasting 2 minutes, were due to overload, and one, of 1 minute, was to enable the overload-relay settings to be altered. Two interruptions, lasting 1 hour 12 minutes, were due to troubles on the Power Board's lines, and one of 1 minute was due to some unknown cause.

Khandallah–Wellington Meat Export Co. Section.—Other than prearranged shut-downs, totalling 28 hours 3 minutes, there have been six interruptions, totalling 12 hours 35 minutes, on this section during the year. One, of 4 hours 37 minutes, was due to water getting into current-transformers at the Ngahauranga Works, and one, of 7 hours 38 minutes, was caused by a break in the line where chafing had taken place at a binder; one interruption, of 5 minutes, was caused by a flash-over at pole 629 on the power-house–Khandallah transmission-line, and two, lasting 12 minutes, were due to insulator trouble on the main line. The remaining one, of 3 minutes, was due to switching operations at Khandallah Substation.

Transmission-lines.—General.

The third series of tests on insulators by the buzz-stick method is now nearing completion, only a portion of the Bunnythorpe–Wanganui section requiring retests on insulators reported as defective after the initial test. All units reported as defective have been replaced with tested units and forwarded to Khandallah for testing on the oscillator. This latter test is a gauge of the efficiency of the buzz-stick method, and generally the results of the latter are confirmed.

Generally, all lines have operated satisfactorily throughout the year. A large percentage of interruptions recorded on the main transmission-line was due to salt deposits, which gave trouble in February and March last, after a long spell of dry weather. Such conditions will have to be guarded against in the future, and it is clear that all insulators must be cleaned periodically. It seems not improbable that some means will be devised whereby this can be done under live-line conditions, thus reducing considerably the number of interruptions required for work on the lines.

With the commencement of operation of the Waikaremoana Station the existing protective equipments at substations between the two generating-stations became inadequate to cope with the altered conditions of power being fed from either end of the system, and a complete new system of protective gear has been ordered. This will be coming to hand and will be installed during the current year. In addition, a high-tension synchronizing equipment is being installed at the Mangahao Station to enable the two power-houses to be paralleled on the 110 kv. side of the main transformers. At present paralleling can only be done on the 11 kv. bus-bars, necessitating a short interruption on the Bunnythorpe east line every time the two stations are paralleled.

Sap-testing has been continued on the poles of the whole system, and experiments have been carried out with a view to arriving at the best means of strengthening poles which show an undue proportion of sap. Several poles have been replaced on the Woodville–Masterton section, and at the present time others are being strengthened by "stubbing."

A check has been kept on lightning-storms occurring in the area traversed by Mangahao lines, seventeen being recorded during the year. Only one storm did appreciable damage to the system, pole 432 on the Bunnythorpe–Wanganui line being damaged by fire after the line had been struck by lightning. Two strings of insulators were shattered, and the lightning-arrester fuses at Wanganui Substation were blown. At the same time one of the Wanganui Power Board's feeders was struck and a potential transformer on their switch-gear at the substation damaged. Another lightning-discharge struck the Bunnythorpe–Wanganui telephone-line, burning through the wire.

Substations.

The apparatus at all substations has operated satisfactorily throughout the year.

Synchronous condensers have been erected at Khandallah, Dannevirke, and Mangamaire Substations, and have been run as required for voltage regulation.

Two rotating insulators on air-break switches at Woodville Switching-station and one at Mangamaire Substation failed during the year and were replaced. All the damaged insulators were of the hollow type, with which trouble has been experienced previously.

New metering equipments have been installed at Khandallah, Bunnythorpe, Mangamaire, Masterton, Dannevirke, and Waipukurau Substations, and the metering-apparatus at other stations has been checked during the year.

A new substation is in course of erection at Marton, to provide a second point of supply to the Wanganui-Rangitikei Power Board.

At Napier Substation a battery-room has been erected and a 110-volt battery installed for O.C.B. controls. Similar batteries have been installed at other substations in place of the 30-volt primary batteries originally used for O.C.B. controls.

A fire did considerable damage to the garage at Woodville Switching-station, and destroyed a truck housed therein. The garage has since been reconstructed.

A considerable amount of work has been done at all substations in improvement of grounds, and at Khandallah a large amount of testing-work has been carried out for the whole system.

General.

The operation of the whole system throughout the year has been satisfactory, many of the difficulties of the earlier years of operation having been overcome. With the growth of load on the system, particularly since the inception of operation of the Waikaremoana Station, the purchase of additional equipment at substations becomes necessary, and at the present time additional oil circuit-breakers are being installed at Napier, Waipukurau, Dannevirke, Woodville, and Bunnythorpe Substations.

Again good results have been obtained with the buzz-stick method of testing insulators on live lines, and the third series of tests is now nearing completion. Linesmen have been brought to the power-house for a "refresher" course in this work immediately prior to the commencement of the annual tests on the lines. The results of tests this year confirm those obtained in previous years, two makes of insulator standing out as much better than other makes at present in use.

Apart from the testing of insulators, on only two occasions has it been necessary to work on transmission-lines under live-line conditions. At pole 177, near Ashhurst, a parallel-groove clamp was tightened, and on the Dannevirke–Waipukurau section a cotter-pin was replaced in a tie-down clamp while the line was still in service.

Trouble is still occasionally experienced with A.C.S.R. cable, broken strands resulting from vibration. Between power-house and Bunnythorpe eight broken strands have been detected, all being in the spans adjacent to the Manawatu River crossing. Repairs have been effected and investigation made as to means of overcoming this trouble. Similar trouble has been experienced in other parts of the world, and various types of damping-devices have been tried, some with marked success. Similar devices will be tried on our lines during the coming year.

Tail-race.—Additional groynes have been built in the tail-race, existing groynes extended, and fascining carried out at many places. The tail-race is now in good order, and protective works are standing up well.

Design Work.

During the year the electrical design office prepared plans and issued drawings for the staff dining-room and for the single men's quarters in connection with Mangaore Village Settlement. With the advent of power from Waikaremoana it became necessary to prepare fresh layout plans and drawings in connection with Napier, Waipukurau, Dannevirke, Woodville, and Bunnythorpe Substations, to provide for the additional steelwork and switch-gear.

Construction.

Khandallah Substation.—During the year erection of the 10,000 kv.a. synchronous condenser and its control equipment was completed, and this plant is now operating satisfactorily as required.

A current-limiting resistance has been installed in connection with the 250 kv. testing transformer.

Earth-leakage and definite time-limit relays have been fitted to the Petone Railway and the Wellington Meat Export Co.'s feeder panels, and put into service.

New printometers have been installed and tested, and are now operating satisfactorily.

New ironclad switch-gear has been erected for the control of additional feeders to Wellington City and put into service.

Bunnythorpe Substation.—The 110 kv. oil circuit-breaker used as a tie-switch has been re-erected on a steel framework, which permits switch-tanks to be lowered for inspection of contacts when required.

New O.C.B.s have been purchased for this station, and have recently come to hand. Their erection will be put in hand during the coming year. Meantime the necessary concrete foundations have been put down.

Wanganui Substation.—A well has been sunk in the substation grounds for a permanent water-supply for the station and cottages.

New leakage-relays have been installed on the main 11 kv. switch.

Marton Substation.—Erection of this station is now proceeding to give a second point of supply to the Wanganui-Rangitikei Power Board. This Board closed down its steam plant as from the 31st March, 1929, and now takes the whole of its supply from the Department.

A 1,500 kv.a. transformer has been transferred from Dannevirke and installed at Marton on a concrete foundation. A four-pole structure has been erected and an air-break switch assembled thereon. The necessary 11 kv. switch-gear and metering equipment is on order, but until it comes to hand a temporary supply will be given without metering equipment.

Woodville Switching-station.—The garage and workshop, which were destroyed by fire, have been rebuilt, and a shelter-fence has been erected round the cottages.

A new O.C.B. has been purchased for this station, and has recently come to hand. Erection of same will be put in hand at an early date.

Mangamaire Substation.—A 1,500 kv.a. synchronous condenser and the necessary control gear have been erected at this station, and are operating satisfactorily as required.

A battery-house has been erected and 110-volt battery installed for supply to condenser and O.C.B. controls. The solenoid coils on the O.C.B.s have been changed for 110-volt supply. A battery-charging motor-generator set has been installed in conjunction with the new battery.

A spare 1,500 kv.a. transformer has been purchased for this station, and has been dried out ready for service when required.

Owing to the high voltage at Mangamaire when Waikaremoana is supplying power to the system, it has been necessary to install an auto-transformer to reduce the L.T. voltage to a normal value.

A 2,200-gallon outdoor oil-storage tank has been installed and oil-piping connected thereto.

Masterton Substation.—An auto-transformer has been installed to reduce the L.T. voltage to normal when Waikaremoana is supplying power to the system.

Dannevirke Substation.—The 1,500 kv.a. synchronous condenser and its control equipment have been erected and put into service.

A spare 1,000 kv.a. transformer has been purchased for this station, and after drying out has been put into service. The original 1,500 kv.a. transformer has been removed to Marton Substation, and will be replaced by the one ordered for that station when same comes to hand.

The new O.C.B. has been received on site, and erection will be put in hand at an early date.

Waipukurau Substation.—The 110-volt battery and charging-set for this station have been erected, a battery-house being erected separate from the main substation building.

The new O.C.B. has come to hand, and will be erected as soon as staff for this work is available.

Napier Substation.—New switch-gear has been purchased for this station, and is now in course of erection. The O.C.B. for the Mangahao transmission-line is ready for service, while erection of the two O.C.B. air-break switches and steelwork for the Waikaremoana lines is nearing completion. For the latter lines two oxide-film lightning-arresters have been erected.

Erection of the 4,500 kv.a. synchronous condenser has been completed, and this machine is operating satisfactorily when required.

A battery-room has been erected and a 110-volt battery and charging-set installed.

A well has been sunk in the station-grounds and a pumping plant installed to give a permanent water-supply.

Wanganui–Stratford Transmission-line.—A survey party is at present engaged on the location of this line, and approximately seventeen miles have been pegged.

Stratford – New Plymouth Line (50 kv.).—The survey of this line has been completed, and construction will be put in hand as soon as poles come to hand from Australia. Delivery of these poles has been held up owing to the timber strike in that country.

This line, which will ultimately be an extension of the Wanganui–Stratford line, and part of the Main North Island transmission system, will be leased to and operated by the New Plymouth Borough Council for power-supply from the Tariki Station until such time as the Department is able to give supply from the Mangahao-Waikaremoana system.

Load.

The rainfall during November, December, and January was insufficient to meet the demands on the station, and it became necessary to call on auxiliary plants for relief.

At the end of January, 1929, the Waikaremoana Station commenced supplying power to the Mangahao system with one 20,000 kv.a. generator. During the early stages of operation at that station many minor troubles were encountered, which made it inadvisable to dispense with the services of the auxiliary plants immediately. These troubles have now been overcome, and with the approaching completion of erection of the second unit at Waikaremoana it is anticipated that ample power will be available to meet all demands for some time to come.

The maximum load on the station for the year was 20,960 kw., and the maximum number of units generated per week 2,505,380. Both these figures occurred early in the year, before the Waikaremoana Station was in operation, and indicate that the Mangahao Station was overloaded both on plant capacity and on units generated. In the latter case the overload was 55 per cent. The maximum load on the combined Mangahao-Waikaremoana system is now in the neighbourhood of 36,000 kw.

Since Waikaremoana Station has come into operation Mangahao has fulfilled its duties as a peak-load station, Waikaremoana being operated on as near a 100-per-cent. load-factor as possible, and Mangahao supplying the extra power required at times of peak load. The high load-factors obtaining up to the beginning of the year will therefore not be reached again except under emergency conditions. This condition of operation will enable the most use to be made of the available water in the Mangahao dams.

The results of operation are given in Table IX, and the connected load in Table XII. The connected load is now 211,303 kw., against 170,068 kw. for the previous year, an increase of 24 per cent.

WAIKATO ELECTRIC-POWER SUPPLY.

Capital Outlay.

The total capital outlay at the end of the year on assets provided under the Horahora scheme, together with assets provided under the Arapuni scheme and operated to supply power from Horahora and auxiliary plants, was £1,128,036, not including stocks of £14,310. This is an increase during the year of £154,863.

As is shown in Table XXII herewith, the principal items making up the increase are the Diesel plant at Penrose, and the 50,000-volt transmission-line from Ngongotaha to Opotiki, together with increases in the items "Interest during construction" and "Cost of raising loans," which increases represent the proportion of these costs chargeable against the Arapuni assets in operation.

The increases in these items have been incurred over a period of some years, and are now for the first time included in the assets on which interest has to be charged against operating revenue.

Financial Results of Operation and Future Prospects.

The year ended with a loss, after allowing for all working-costs, interest, and depreciation, of £15,291, as compared with a profit last year of £6,176. Annual revenue increased from £125,312 to £135,511; working-costs increased from £46,568 to £76,231; gross profit decreased from £78,744 to £59,280; capital charges increased from £72,568 to £74,571. No payment to sinking fund is being made this year.

The increase of £29,663 in working-costs is accounted for principally by the increase of £27,531 in the items "Operation and maintenance of auxiliary plants" (Diesel plant and Grand Junction plant) and "Power purchased in bulk."

The purchase of power from the Auckland Power Board, on account of the fire at Horahora, cost the Department about £4,750, and, while the total units generated by all plants increased by about 4,900,000, the condition of the river at Horahora caused a reduction in units generated there of about 9,400,000. The deficiency in supply from Horahora, as well as the increase in the total supply, had to be made up by increased output from the auxiliary plants, at much greater operating-cost.

While the loss this year has been greater than was anticipated, the delay in completion of Arapuni, combined with the growth of load, made inevitable either some loss or some restriction in the use and extension of electric supply. The purchase of the auxiliary plants was the only means of avoiding such restriction, and it has enabled both the Department and Power Boards to proceed with their extensions to new consumers. There is little doubt that the future advantages resulting from this course will more than compensate for the cost incurred.

The table given below is an analysis of the sources and amounts of revenue:—

Revenue from—	1926. £	1927. £	1928. £	1929. £
Large mining companies	16,476	16,150	16,091	15,767
Four original Power Boards (Cambridge, Central, Te Awamutu, and Thames Valley)	42,226	50,616	52,487	60,553
Additional Power Boards other than Auckland (Waitomo, Franklin, Waitemata, and Bay of Plenty) ..	504	6,173	18,198	28,303
Auckland Power Board	10,850	15,139	16,132	10,556
Hamilton Borough	6,205	6,888	7,452	7,821
Tourist Department, Rotorua ..	276	2,202	2,440	2,515
Other wholesale consumers ..	7,432	8,988	9,871	7,133
Miscellaneous	1,861	2,532	2,641	2,863
Total	85,380	108,748	125,312	135,511

This shows considerable increases from both the older and the newer Power Boards, and a drop in revenue from the Auckland Power Board, which Board has been buying any surplus power that has been available.

Future Prospects.

With the first unit at Arapuni coming into service in June, 1929, and the second in September, 1929, an ample supply of power is assured for the whole District. The first unit will enable the expensive auxiliary plants to be shut down, and, in addition, will supply a considerable part of the Auckland Power Board's load. The second unit will supply the remainder of the Auckland load. The revenue for the coming year will thus be much increased; but, as against this, almost the whole of the capital charges on expenditure incurred at Arapuni and on the transmission-lines and 110 kv. substations will be chargeable against revenue from the date the first unit starts. Thus it is to be expected that in the first year of partial operation there will be a considerable loss, which is estimated at £29,000, without provision for sinking fund. In the following year it is estimated that revenue will be sufficient to pay all charges, including sinking fund.

Design Work.

Designs and layout drawings were prepared by the electrical design office in connection with extensions at Penrose Substation; also drawings and specifications for substations at Waiotahi, Matamata, Huntly, Kerepeehi, and Edgecumbe.

Consequent upon the advent of power from Arapuni, a complete recast of the layout at Hamilton No. 1 Substation was decided on, and complete drawings for a new building, including switch-rooms, battery-room, office accommodation, oil-filtering equipment, and blacksmith's shop were prepared and issued.

Specifications and design data were prepared in connection with the special towers required on the Hamilton–Huntly line.

Extensions during the Year, and Future Extensions.

General, Additional Consumers, and Connected Load.

During the year supply has been given at the following additional points: Consumer—Bay of Plenty Power Board; point of supply—Edgecumbe; date—30th June, 1928.

Supply was given on this date at 11,000 volts over the section of 50 kv. line Edgecumbe–Waiotahi, and thence over the Power Board lines to Opotiki.

The connected load, not including Auckland, has increased from 64,580 kw. to 77,121 kw.

The number of milking-machines supplied has increased from 3,559 to 4,398, electric ranges from 1,287 to 2,025, and electric water-heaters from 4,163 to 5,431.

The maximum load last year and this year has been as follows: Horahora—Last year, 12,400; this year, 10,300. System—Last year, 15,700; this year, 15,900.

The " system total " of units generated and purchased increased from 100,075,668 to 104,992,762.

The diversity factor, exclusive of power supplied to Auckland and of connected load in Auckland, is 4·85, as compared with 4·1 last year.

Horahora.

There were no extensions at Horahora during the year.

Additional Transmission-lines.

Ngongotaha – Edgecumbe – Waiotahi 50 kv. Line.—This line was completed and placed in service in June, 1928.

Hamilton–Huntly 50 kv. Line.—Except for short gaps at the two ends, this line was completed during the year. Special narrow-base towers have been ordered for the Hamilton end, provision being made for these to carry more than one circuit, so as to minimize interference with property.

Arrangements are being made to build a new 50 kv. line from Half-way, on the Horahora–Waikino line, to Waihou and thence to Paeroa (total length about twenty-four miles), to improve supply to Waihou, Waikino, and Kerepeehi Substations.

Arapuni–Penrose 110 kv. Steel-tower Line. — This line was completed last year, but examination of the foundations this year showed that a number of them in the heavy clay country had water or wet clay in the bottoms of the holes. In a number of cases the holes were dug out and refilled, and in others holes were bored down to the bottom and broken rock rammed around the grillage.

Substations.

Penrose (110/22 and 22/50 kv.).—General construction work which had been almost at a standstill during the erection of the Diesel plant was resumed. Outside, the 110 kv. steel structure was extended, and was nearing completion at the end of the year. The runways were extended and pads installed for the new 30,000 kv.a. bank of transformers. Cable-ducts were constructed for control cables and all rockwork and concreting completed. All 22 kv. cables were laid and connected up and a start made on running the control cables to the various O.C.B.s. The main 110/22 kv. and 22/50 kv. transformers were completed and tested out under voltage. The synchronous condenser-transformers were completed and connected up, but have not yet been used. The 110 kv. O.C.B.s were completed, and the erection of the remaining O.C.B.s nearly completed. A protective fence was erected round the whole of the outdoor apparatus, with a special fence round the lightning-arresters. Inside the building the switch-gear was completed, and was livened up on the 21st February, the Power Board making use of the gear subsequently. The synchronous condenser (10,000 kv.a.) was erected, but has not yet been dried out. A control board was erected for the control of the 110 kv. outdoor equipment. Practically the whole of the equipment has since been tested out and put into service.

Bombay (110/50 kv. and 50/11 kv.).—Work on the permanent equipment was continued throughout the year. The outdoor steelwork was completed in April, and all apparatus, insulators, and bus-bars erected and connected up. Four 1667 kv.a. 110/50 kv. transformers were transported by road from Auckland, dried out, and assembled in position. Four 500 kv.a. 50/11 kv. transformers were also installed, and have been carrying the Franklin Power Board load since the 16th December. Five 110 kv. and two 50 kv. O.C.B.s were erected, lined up, dried out, and filled with oil ready for service. The whole of the permanent 50 kv. gear, including the oxide-film arresters on the Waikino line, has been in service since the 16th December. Inside the building five 11 kv. cubicles have been erected complete with isolators and metering for the supply of the Franklin Power Board. A control board with mimic bus diagram for the control of all the outdoor gear is complete, and batteries for operating trip circuits and the motor-operated O.C.B.s are installed. A 10-ton electric crane was erected in the workshop. The old temporary substation has been partly dismantled, but the 50 kv. air-break switches are being retained until the 110 kv. wood-pole line is required for use at 110 kv. The three 250 kv.a. transformers from the temporary substation are being moved to Te Awamutu.

Hamilton No. 2 (110 kv.).—The extra steelwork for the incoming O.C.B.s arrived in May and was erected. The four 110 kv. O.C.B.s arrived in July, and have been erected and dried out. A thorough overhaul of all the apparatus was made, and the substation left ready for service. A protective fence round the structure has still to be completed.

Hamilton No. 1 (50/11 kv.).—The new workshop was completed, and has been of great use. It consists of a covered gantry portion extending over the railway-siding, with a pit for handling transformers. The old crane from Horahora was shortened and erected in the gantry. The building was further extended by a wing similar in size to the original workshop, and has provided much-needed room for storing heavy cases and transformers, and also provides accommodation for the transmission-line repair equipment. A new concrete test-room building has been completed, taken over from the contractors, and equipped.

Waikino (50/11 kv.).—Construction work at Waikino continued with the arrival of the seven new 1,000 kv.a. 50/11 kv. transformers. These were dried out and installed, the first bank being put into service on the 24th June, and the second on the 5th August. The old arresters on the Bombay line were dismantled and a new oxide-film arrester erected in their place. Improvements were made in the control-room lighting and in keeping dust out of the condenser-room. The old transformers were railed to Hamilton No. 1 to be overhauled and one bank converted for outdoor use at Gisborne.

Waihou (50/11 kv.).—Four new 750 kv.a. transformers were installed in place of seven 250 kv.a. transformers. The work was commenced at the end of May, and completed on the 12th June. The new bank is connected delta-star and on the 11 kv. side will parallel with Waikino and Kerepeehi over the Thames Valley 11 kv. lines. The old transformers which were connected delta-delta were

overhauled and transferred to Edgecumbe and Waiotahi Substations. Preparations are in hand for the extension of the building at Waihou to include a workshop and crane. A new steel structure is on order, and the substation will ultimately be remodelled on the lines of Kerepeehi and Matamata Substations.

Kerepeehi (50/11 kv.).—The erection of the permanent substation equipment was commenced in April, but work was delayed owing to bad deliveries of materials. The transformers (four 750 kv.a.) were transported by rail to Thames, and by punt and launch across the Gulf and up the Piako River to Kerepeehi on the 3rd October. As supply was already being given to the Power Board through the temporary substation, the whole of the new gear was completed before changing over on the 17th December. The temporary substation was dismantled and final cleaning-up completed in January.

Grand Junction (11 kv.).—Two new 625 kv.a. 400/11,000-volt transformers were installed to complete two three-phase banks. These, together with two new 11 kv. O.C.B.s, enable both generators to supply their full-rated kilovolt-amperes into the system. The older turbine was fitted with a new rotor, and the station was made ready to take full load during July. Improvements were made to the station-lighting and various electrical overhaul work was done, the construction gang finally leaving in the middle of August.

Ngongotaha (50/11 kv.).—The outdoor 50 kv. wood-pole structure was altered and extended to provide an air-break switch and terminal structure for the extension of the 50 kv. transmission-line to Edgecumbe and Waiotahi.

Edgecumbe (50/11 kv.).— A temporary wood-pole substation structure was commenced on the 11th May with transformer and outgoing line, 50 kv. A.B.S., 750 kv.a. transformer-bank on temporary foundations, and oxide-film lightning-arrester. This was put into service on the 29th June, and supplied the local load as well as some Waiotahi load, which was fed at 11,000 volts over the 50 kv. line. To improve voltage conditions a temporary building was put up and an induction voltage-regulator installed to boost the voltage over the 50 kv. line. This was put into service in October. The construction of the permanent substation started in September, and the indoor switch-gear was put into service on the 12th December. The outdoor 50 kv. switchgear was not completed until early in June, when the transformers were moved to their permanent position and the substation finally put into operation all on permanent equipment. A graded resistance lightning-arrester from Waikino was installed, and the oxide-film arrester moved to its permanent position at Waiotahi. The transformers at this substation are from Waihou, and are connected delta-delta with a neutral earthing reactor.

Waiotahi (50/11 kv.).—Construction work was started in November. The substation is similar to Edgecumbe, but the steel structure is simpler, and has only one air-break switch mounted on it. The transformers which had been in service at Waihou were thoroughly overhauled at Hamilton No. 1, and were railed to Auckland and shipped to Opotiki, from whence they were transported nine miles by road to the substation. The substation was finally completed and put into service at 50 kv. on the 9th May, 1929.

Matamata (50/11 kv.).—This substation is required by the Thames Valley Power Board to improve voltage conditions in the Matamata area, where the load had grown too heavy to be efficiently handled from Horahora and Waihou at 11,000 volts. The old 50 kv. steel-tower line has been diverted on two new galvanized-steel angle towers, fitted with wooden top cross-arms with double-pin insulators and connected through the top of a steel structure. Construction work started in October, and was practically complete by the end of May, 1929. The substation will not be put into service until the new transformers are installed at Horahora to replace those damaged in the fire in September last.

Huntly (50/11 kv.).—This substation is being provided to give a second point of supply to the Central Power Board, whose lines, at present fed at 11,000 volts from Hamilton No. 1 Substation, are too long to serve the northern areas adequately. A start on construction was made in March, and the substation is expected to be complete by the end of July, 1929.

Henderson (50/11 kv.).—The 1,000 kv.a. three-phase transformer that was in service at Kerepeehi was overhauled and transported to Henderson, where it will be installed as soon as a new air-break switch which is now on order arrives and can be erected.

Operation and Maintenance.

Headworks and Power-station, Horahora.

Inspection after emptying the race on the 20th May showed practically no more sand had accumulated in it in two months. The amount of sand and debris in the river caused a fair amount of trouble during the year, but it interfered very little with power-supply. Fifteen new runners (out of twenty-four total) and fourteen new guide-wheel castings (out of twenty-four) require replacement, and new ones have been ordered.

The roller-train of the non-automatic gate in the weir had several rollers broken on it, probably as a result of its being blocked up with rubbish, and the gate could be operated only with a lot of difficulty for most of the year.

Screen-scraping has been necessary continuously throughout the year, as many as three men per shift being required at times.

Two failures of condenser-bushings on the Waikino line oil circuit-breaker in February and the breakdown of the local service transformer in March were the only failures of electrical apparatus during the year.

A small motor-driven pump was installed near the Pokaiwhenua Stream to enable water-supply for the transformers to be taken from that source when necessary.

Fire at Horahora.

On Saturday, the 1st September, 1928, at 7.55 p.m., fire broke out in the workshop and old oil-boiling-plant building. The exact cause of the fire is not known. When first noticed it was confined to the woodwork enclosing an induction-regulator which had been drying out, but had been cut off about noon. The usual inspections of the transformer-house and apparatus had been made, and it is difficult to see how any smouldering action could have been caused in the first place, or could have continued unnoticed for eight hours. The chemical fire-extinguishers were brought into use almost at once, and almost succeeded in getting the fire under, but they gave out in probably less than ten minutes, and the fire spread to some oil that was stored in drums near by, and very soon involved most of that portion of the building. The wooden floor of this building had been replaced with concrete some time before as a safety measure, but the wooden lining of the walls had not been removed. The fire travelled along this wood lining to the wood lining of the roof of the new transformer-bay, and thence to the roof of the main transformer and switch-gear building. The Hamilton Fire Brigade were communicated with, and arrived at about 10.30 p.m., and soon got the fire under control, though it took them several hours playing water on the transformer-tanks to put it out completely. This work was done at considerable risk to members of the Brigade.

The damage done was as follows :—

To Buildings.—Workshop and oil store : completely destroyed. New 50 kv. transformer bay : Roof completely destroyed. Main building : Roof destroyed on two and a half bays out of four.

To Apparatus.—Transformers : Two main transformers (single-phase 5/50 kv.) out of ten total were destroyed ; the others all sustained slight damage to bushings, joints, &c. The new 50 kv. bank of three single-phase transformers without conservators, owing to the air-space above the oil, was practically undamaged. The three 5/11 kv. three-phase transformers in service were practically undamaged.

50 kv. switch-gear : Practically undamaged.

5 kv. switch-gear : The O.C.B.s in the new 5/50 kv. transformer-bay were little damaged. Those in the original building, where they were exposed to fire from oil from the transformers and reactances, were destroyed. Those in the 11 kv. bay were badly damaged, but capable of repair.

All overhead wiring and practically all control wiring in the building was completely destroyed.

The damage done amounted approximately to £12,500.

The following statement covers the work of giving emergency supply and restoring the main supply :—

1st September—8.10 p.m. : All power-supply from Horahora cut off, leaving McLaren's Falls supplying about 2,000 kw. to Waikino Substation. 9 p.m. : Diesel plant supplying Henderson, Takapuna, Bombay, and Hamilton (partial supply). 10.40 p.m. : Auckland Power Board supply came on, and supply was given to Te Awamutu and Hangatiki. 11.28 p.m. : Grand Junction plant on. 11.45 p.m. : The Penrose and Waikino supplies were paralleled, and partial supply was given at all points except Arapuni, Ngongotaha, and the Bay of Plenty Substations.

2nd September.—On Sunday morning a connection was made, avoiding the damaged part of Horahora, to give supply over the Horahora – Arapuni – Ngongotaha – Bay of Plenty line. Thereafter, except for occasional interruptions due to overload in the emergency conditions, consumers were not subjected to any great inconvenience, except for low voltage at the more remote points. 6.45 a.m. : Load supplied was 7,600 kw.

3rd September—6 a.m. : Load supplied was 8,500 kw. 6.35 p.m. : Temporary connections at Horahora enabled it to take over the Cambridge load of 500 kw.

4th September—3.4 p.m. : Horahora supplied an additional 1,000 kw. to Thames Valley – Matamata area. 5.30 p.m. : Total load supplied was 11,370 kw., and apart from the fact that the Waihi Company were cut off, and the Auckland Power Board were supplying 5,000 instead of taking 2,000 kw., supply conditions were almost normal.

9th September—3.44 p.m. : No. 3 transformer-bank put into service, increased load on Horahora by 4,000 kw.

30th September—1.8 p.m. : No. 1 transformer-bank, which had been reconditioned and dried out, was placed in service. This has enabled Horahora to carry up to 10,000 kw. total load, the maximum that hydraulic conditions have allowed since.

New transformers have been ordered to replace the two destroyed by the fire, but they have not yet arrived.

The work of getting the station into service again in stages, and at the same time giving supply from such portions of it as could be used, would have been difficult under any conditions, and was made more so by the very bad weather in September.

The Arapuni office took charge of the new building-work, and carried it out very expeditiously under these adverse conditions, combined with the risk of proximity to live wires and bus-bars. Some of the best of our men from other districts were sent to assist, and an offer from the Auckland Power Board to send six of their men was accepted, and under the Station Superintendent and First Operator, Horahora, and the Assistant Distribution Engineer, Hamilton, the work of restoration was carried out practically without a hitch.

Transmission-lines.—50 kv.

With the exception of the Horahora–Waikino line and two cases of breakdown due to lightning on the Horahora–Arapuni–Ngongotaha–Edgecumbe–Waiotahi line, there have been few line troubles during the year.

The alteration of the Horahora–Waikino line—mounting the top insulator on a short wooden extension of the tower, and the two side insulators on wooden cross-arms instead of steel—has been tried out on a number of towers, and promises to be effective in preventing trouble caused by birds. As soon as practicable the whole of the line from Horahora to Half-way will be changed in this manner. From Half-way a new section of line will be constructed to Waihou and on to join the Bombay–Waikino line at Paeroa.

Live-line testing has been carried out on all lines throughout the year, and a considerable number of defective insulators have been discovered.

Six poles which had been weakened by decay were replaced on the Mystery Creek–Te Awamutu section.

On the 29th June pole 256 on the wood-pole line near Huntly West was blown over at about 45° without interruption to service, and had to be straightened up.

At the same time steel tower No. 254, alongside this pole, was blown over and had to be rebuilt, about one-quarter new members being required for this purpose.

A fair amount of tree-cutting has been done during the year, principally on the Mystery Creek–Te Awamutu, Arapuni–Ngongotaha, and Horahora–Waiorongomai sections of line.

Fences and gates were erected to prevent danger to stock on bridges on Waiorongomai–Waikino section.

On the Te Awamutu–Hangatiki section a pole was found with the top burnt, but with no insulators damaged, the cause of this being presumably a flash-over due to lightning.

Substations.

Penrose.—The temporary 50/6·6 kv. substation remained in service throughout the year. After the fire at Horahora, cables of greater capacity were put in to enable supply back up to 5,600 kw. to be given by the Auckland Power Board. The necessary connections were made to enable the Diesel plant to supply.

Bombay.—The temporary gear supplying the Franklin Power Board remained in service until the 16th December, when the permanent equipment was put into service.

Hamilton No. 1.—An additional bank of transformers, 1,500 kv.a. was installed, making the total substation capacity 3,000 kv.a. A flash-over on two pin-insulators on the 11,000-volt structure occurred in bad weather in April.

Waikino.—The existing two banks of 3,615 kv.a. each of water-cooled transformers were replaced with two banks of 3,000 kv.a. each, self-cooled, and delta-star connected instead of star-star. A new lighting installation was put in. A rat caused a short circuit in the condenser switch-gear. New metering equipment was installed on Thames Valley supply. One of the 50 kv. wall entrance bushings broke down during the year. Two hydrants for fire protection were put up.

Waihou.—The existing two banks of 750 kv.a. each were replaced with one of 2,250 kv.a., delta-star connected instead of delta-delta.

Arapuni.—Nothing to report.

Mamaku.—The 150 kv.a. transformer broke down on the 29th October, the failure being between H.T. and L.T. windings on one phase. It was replaced with a spare transformer from Hamilton after two and a half days' interruption.

Ngongotaha.—Nothing to report.

Edgecumbe (Rangitaiki).—A temporary substation was erected, and supply given to the Bay of Plenty Power Board by it on the 30th June, 1928, and the change-over to the permanent substation gear was made in stages. On the 2nd February a failure in a trifurcating-box caused earth-leakage relays to operate incorrectly, and made service intermittent at intervals for two days until the fault was repaired. Supply was given to the whole Bay of Plenty area from this substation. The Department's line from Edgecumbe to Waiotahi was used as an 11,000-volt feeder, with an induction-regulator to regulate voltage. On the 15th February a lightning-discharge damaged the arrester slightly.

Te Awamutu.—Nothing to report.

Hangatiki.—On the 17th January a current-transformer broke down and blew out the back of the incoming panel, setting fire to the compound and causing a short circuit on the incoming cable. This fused the transformer-leads under the oil. Repairs were effected on two transformers, and, using the spare transformer, service was restored after 18 hours 3 minutes. The third transformer was later repaired. The switchboard being out of service, supply was given through temporary connections to the Board's lines.

Henderson.—A rat caused a short circuit on P.T. fuses on the 15th April. The spare transformer which had been in use at Kerepeehi was returned to Henderson.

Takapuna.—Nothing to report.

Grand Junction Plant and 11,000-volt Substation.

This plant has been in regular operation throughout the year, running usually from 6 a.m. to 10 p.m. daily.

A considerable amount of work has had to be done to the brickwork, grates, and mechanical stokers, to keep them in order, and the boiler-drums have been treated with zinc-white to arrest pitting action.

A new rotor for one of the turbines was installed early in the year, and this turbine was again placed in service.

Additional 11 kv. switch-gear and transformers, to bring the total capacity up to 3,750 kv.a. (two banks of three 625 kv.a. each), were installed. One of the older transformers, which had broken down on the previous December, was repaired, and another, which broke down in much the same way on the 19th January, was repaired and placed in service again on the 15th March.

The lighting and wiring of the plant were overhauled.

On the 23rd January broken cross-head bolts on the air-pump of one turbine set resulted in considerable damage to the pump, and the set was out of service for repairs until the 8th March.

The Junction plant was not called upon to deliver its maximum capacity until the present winter, and its maximum supply to date was 3,400 kw. in June, 1929.

Diesel Plant, Penrose.

The erection of the Diesel plant was completed in May, 1928. (See last annual report.) Trouble very soon after operation started, mainly in pitting and corrosion of the exhaust-valves, owing to unsuitability of the atomizers for use with the fuel oil supplied. A large number of trials were run with different adjustments of the engines, but without much improvement, and finally the makers were asked if they could supply new atomizers suitable for the oil available. In the meantime arrangements were made to get a sufficient supply of another oil from the Admiralty fuel-tanks at Devonport, and from October to the end of January this oil was used, with satisfactory results. Tests were made early in February, using the original oil with the new atomizers on No. 3 set, with good results after a number of adjustments had been tried, and arrangements were therefore made to change over completely to this oil, which has been used exclusively from the 21st April, 1929.

Operating troubles with the engines have been principally due to carbonization of oil, both the cooling-oil in the piston-heads and the lubricating-oil in the air-compressor. On a number of occasions carbonization of the cooling-oil has resulted in blockage of the supply of oil, and on one occasion deposit of carbon inside the piston-head has reduced the cooling effect, this resulting in burning of patches on the piston-head, followed by slight cracking at the burnt patch. Carbonization of lubricating-oil in the air-compressor results in blockage in the intercooler, requiring the set to be shut down until the blockage is removed.

In June, 1928, shortly after starting up, a bolted joint in the piston cooling-oil system of No. 1 set came adrift, causing failure of oil-supply and slight seizing of the piston on the cylinder-liner, scoring the latter so that it had to be replaced.

In addition to the foregoing, there have been a number of minor troubles on smaller parts, requiring frequent attention and occasional replacement, but on the whole the plant has worked satisfactorily. It has been in regular operation since September, 1928, two units running nearly all the time on full load on six days a week from 5 a.m. to 10 p.m., and three units running occasionally when required. The maximum load carried to date was 4,240 kw., on the 24th April, 1929.

11,000-volt Lines and Substations.

There has been little trouble with these during the year. Eight decayed poles were replaced in August on the Horahora–Leamington section.

Power purchased and generated by Stand-by Plants.

Power purchased during the year amounted to 12,776,370 units, including 10,514,730 units from McLaren's Falls and 1,762,070 units from the Auckland Power Board, the latter being mostly obtained in September, 1928, following the fire at Horahora. In addition to this, the Grand Junction plant supplied 5,046,740 units and the Diesel plant 7,070,912 units, a total of 12,917,652. The total units from all these plants was thus 25,694,022, or approximately one-quarter of the total output, as compared with one-eighth for the previous year.

Interruptions.

Due to 50 kv. Transmission-lines.—Athough interruptions to supply have been more numerous than usual for the year, this has been due rather to the extraordinary conditions of operation than to actual defects in the lines.

No insulator breakdowns have occurred on any of the following line sections: Waiorongomai–Waihou, Waikino–Kerepeehi, Waikino–Aongatete, Horahora–Arapuni, Horahora–Mystery Creek–Te Awamutu–Hangatiki, Mystery Creek–Hamilton, Horahora–Hamilton–Bombay–Penrose (110 kv. construction), Penrose–Henderson–Takapuna.

The Horahora–Waiorongomai section was responsible for seven interruptions due to insulator failure, one due to a turkey flying into the line, one to trees falling across it, and one to binders and mechanical clips broken in a storm.

The Waiorongomai–Waikino section was responsible for four interruptions due to insulator failure.

On the Bombay–Kerepeehi section one insulator failed during the year, punctured by lightning. There were no other faults on this section.

On the Arapuni–Ngongotaha section there was one flash-over at the time of a severe lightning-storm, and later on pole 77 was discovered to have the top burnt off, with no insulators damaged, but with the telephone and power wires in contact, this being responsible for an interruption of 12 hours 28 minutes.

On the Ngongotaha–Edgecumbe section lightning shattered one insulator at pole 320, burning about 2 ft. of the pole-top, and causing an interruption of 17 hours 38 minutes.

In addition to the foregoing, there were nine interruptions due to unknown causes, in most cases more than one line being affected.

Due to the following Causes.—Horahora: Fire in transformer-house, 1st September. Failure of condenser-bushings on Waikino line O.C.B., 17th and 21st February.

Waihou: Blowing of 50 kv. transformer-fuses on 3rd, 4th, and 5th February, for no apparent reason, interrupted supply at this substation.

Waikino: Breakdown of wall-entrance bushing. Three short-circuits of 11 kv. gear were caused by rats.

Kerepeehi: Breakdown of bushing in a transformer 11 kv. trifurcating-box.

Bombay: Failure of 50 kv. insulator on an air-break switch.

Penrose: Flash-over on an 11 kv. fuse. Damage to a trifurcating-box caused by rain through a broken window. A 6,600-volt bushing on the main transformers failed and was replaced.

Henderson: A rat caused a short-circuit on an 11 kv. potential-transformer.

Hamilton: Flash-over on 11 kv. insulators on the take-off structure during a storm.

Hangatiki: Breakdown of current-transformer in the ironclad switch-gear, and damage to leads in main transformers.

Mamaku: Breakdown of 150 kv.a., 50 kv. transformer.

Edgecumbe: Flash-over on 50 kv. lightning-arresters. Flash-over between 11 kv. fuses on earthing-reactor. Failure of bushing on 11 kv. trifurcating-box.

No trouble occurred at Takapuna, Te Awamutu, Arapuni, and Ngongotaha Substations.

General.

The Okere plant has been run regularly throughout the year from 6 a.m. to 10 p.m. on six days per week, by arrangement with the Tourist Department.

While generally successful, the operation of four plants—Horahora, McLaren's, Grand Junction, and the Diesel plant—in parallel over fairly long lengths of line with each other and with King's Wharf has proved fairly difficult.

The 50 kv. system consists of over 400 miles of line, and under the present temporary means of supplying it all from Horahora it has not been practicable to install the gear necessary to cut out a defective section without interruption to the rest of the system. It is probable, too, that on such an extensive system, supplied by comparatively small stations, a fault that is of little importance in itself may cause disturbance in voltage sufficient to cause trouble on some part of the system. Some of the interruptions during the year may be due to that reason. Further, with all plants fully loaded, an interruption which cut off one of them would generally lead to an interruption on all of them, though not in all cases, and the time required to restore service has been increased by the necessity for telephoning instructions *re* synchronizing, &c., before load could be put on. The bulk of this work has fallen on the operating staff at Horahora, who are entitled to credit for the way in which they have carried it out, as are also the operating staff at Penrose, Waikino, the Grand Junction plant, and Hamilton.

Operation of Arapuni (June and July, 1929).—No. 3 unit at Arapuni was first started on 4th May, 1929. Drying-out on short circuit was completed on 31st May, and after relay tests and preliminary governor tests it was run in parallel with King's Wharf for short periods on the 2nd and 3rd June, and regularly from the 4th June—at first from about 3 p.m. to 9 a.m., and then continuously, carrying occasionally up to full load.

On the 7th July Arapuni took over the following load—Penrose Area and southern area of Auckland Power Board, Takapuna Substation, Henderson Substation, Bombay Substation, Hamilton Substation, Kerepeehi Substation—and gave supply to it continuously. The Arapuni maximum load was then little over 15,000 kw., with daily output about 250,000 units.

Horahora, with the occasional aid of McLaren's and the Junction plant, then supplied the rest of the Waikato system—total load, about 9,500 kw.—and the two plants were not in parallel with each other or with King's Wharf.

I regret to have to record the death on the 4th May of Mr. J. W. Swaney, Power-station Superintendent in charge of Arapuni and Horahora. Mr. Swaney had been in charge of Horahora since 1925, and it is due mainly to his energy and ability that the power-station has been satisfactorily maintained during this difficult period. His place at Arapuni has been filled by Mr. W. H. G. Watson, First Operator at Lake Coleridge.

Arapuni.

Construction.

In connection with the civil construction work during the year see Engineer-in-Chief's report.

Design Work.

Consequent upon the Department taking over from Messrs. Armstrong, Whitworth, and Co., the preparation of new designs for the power-house foundations to take up the ground-stresses as found was undertaken by the electrical design office, and detail constructional drawings issued for same. Numerous structural drawings were also prepared for modifications found necessary in connection with other features in the contractor's original designs.

Generators.

During the year the assembly and erection of No. 3 generator, 17,650 kv.a. (15,000 kw.), was put in hand as soon as the power-house building was sufficiently advanced to provide cover, and by the 4th June, 1929, this machine was completed and placed in service. Good progress is being made with

No. 2 generator, the rotor and thrust-bearing being assembled and the stator-windings placed in position. It is expected that it will be ready for service by September, 1929. During the year a contract was let for the supply of the fourth generator of 15,000 kw. capacity.

Transformers.

The assembling and drying-out of the main transformers was completed, and an extra set of service transformers installed in connection with No. 3 generator. The assembly and drying-out of the testing-transformer was also completed during the year.

Switch-gear.

The 110-000-volt switch-gear was completely checked for connections prior to placing in service. The 11,000-volt isolating-switches and supporting steelwork were erected in the cable-room, and a start made with the steelwork for the 11,000-volt switches. As the building was not sufficiently advanced to permit of the installation of these 11,000-volt oil switches, temporary arrangements were made in connection with the operation of No. 3 generator. The foundations, steelwork, and switches for the 50,000-volt structure for the Horahora tie-line were completed. In the control-room the steel and marble work in connection with the operating-bench was assembled and erected, also the low-tension and watt-hour meter boards completed. Three panels of the control benchboard, the low-tension and the signal board were connected up and placed in service.

Motor-generators.

The motor-generator set was removed from the temporary shed to its permanent position in the power-house and placed in service.

Cables and Wiring.

A large amount of this work has been completed, the whole of the system at the outdoor substation, including interlocking, signal, power, and miscellaneous cables being laid and connected up. The main transformer-cables for Nos. 1, 2, and 3 generators have been completed and boxed, and generator, auxiliary, and pilot cables have also been completed for Nos. 2 and 3.

Heating and Lighting.

The lighting installations at the main dam, outdoor substation, 110,000-volt structure, penstock-intakes, and pump-house have been completed, while similar work at the power-house is being completed in the control-room, transformer and cable rooms, and also below No. 3 generator.

WAIKAREMOANA ELECTRIC-POWER SUPPLY.

During the year practically all civil construction work has been completed under the direction of the Engineer-in-Chief.

Design Work.

The design and drawing work to cover the layout of the generating plant and switch-gear was completed. The work included the design of the foundations for two 20,000 kv.a. units and the necessary piping for the forced-lubrication system and water-cooling system in connection with the plant. The design of an artificial loading-tank for testing the main generating units was prepared for tendering purposes, and drawings issued for erection of same in the field.

The necessary layout drawings for Gisborne and Wairoa Substations were prepared in the design office and issued for the erecting staff.

Power-station.

With the completion of the power-station building, the erection of the 80-ton crane was pushed ahead, so as to facilitate the erection of No. 2 unit.

Work on the installation of the 11 kv. switch-gear, control boards, control and main cables, &c., was pushed on at the same time as the erection of No. 2 unit, so as to have all the apparatus ready when it was ready for service.

On the 6th December, 1928, water was admitted into No. 2 pipe-line, but, due to water leaking through the bolt-holes at the Larner-Johnson valve, the pipe-line had to be emptied and welding of bolt-heads done to prevent leaking.

On the 21st December, 1928, the pipe-line was again filled, and No. 2 unit turned over for the first time at 11.23 a.m., on the above date and run for a short while, and again later in the afternoon, when it was again found necessary to shut down, due to the seating of the Larner-Johnson valve giving trouble. The Larner-Johnson valve was dismantled and all the holding-bolt holes in the seating-ring filled with spelter, redrilled, and tapped.

This unit was again ready for running on the 5th January, and after several hours' running, trouble was experienced with the governor. Trouble was experienced off and on with the governor for some days, but by the latter end of January this unit started to carry commercial load, Napier being the first station to receive power from this station. It is also worthy of note that this unit was placed urgently into service without any preliminary testing, and, except for small troubles, the generator has been in constant service since the above date.

Work on No. 1 unit was held up pending the arrival of the turbine, which did not arrive until the second week in February. On arrival of the turbine, erection of No. 1 unit was pushed rapidly ahead, and by the 26th May, 1929, the generator was ready for drying out.

This unit went into commercial operation on the 12th July, 1929. Some trouble is being experienced in the operation of the pressure-relief valves on both these machines as supplied, and modifications are under consideration.

Outdoor Station.

The erection of the 110 kv. and 50 kv. gear, reported nearly complete in last year's report, was completed, and final connections made. The 110 kv. O.C.B.s, together with the isolating-switches, were then connected to their respective control cables and all connections checked. The seven 6,666 kv.a. 110 kv. transformers and 1,500 kv.a. 50 kv. transformers were dried out and placed in position on their foundations, oil and water connections being made to each tank. The station oil-purifying system, together with the fire storage tanks, were connected up, and the oil for the transformers and O.C.B.s filtered ready for service.

The 110 kv. equipment was energized on the 28th January, 1929, and the 50 kv. equipment on the 18th February, when the supply of power was given to Napier and Gisborne Substations respectively.

Trouble was experienced with the 110 kv. isolating and air-break switch insulators breaking, and these insulators are now being replaced with insulators of another material. Provision has also been made to flood-light the outdoor structure, so as to facilitate inspection work at night.

Several large slips on to the outdoor-station site destroyed portions of the station draining system. This has now been repaired, but it is quite probable that during the rainy season other slips will occur.

The temporary power-station was finally taken out of service at the end of May, 1929, though prior to this a start was made to dismantle and re-erect the equipment in the main power-station. No. 5 unit was erected in the main power-station, and put into operation early in June, to supply current to the staff village and power-station.

Work on the erection of the L.T. panels and No. 4 unit is being pushed on, and should be completed very shortly.

General.

Practically all the cable-work is now completed, and, excepting for the water-level indicators and controls for the gates at the surge-chamber, the installation of the power-station equipment is complete.

General cleaning-up of the power-station and outdoor station yet remains to be done, also the grassing of the main-pipe-line slope.

Wairoa Loading-shed.

All equipment has been removed from this shed, and the building is being left for the storing of equipment for the next development.

Waikokopu Wharf Crane.

This crane, now that the heavy lifts are over for the present scheme, has been painted, and all exposed parts covered with grease to prevent corrosion by rust.

Transmission-lines.

110 kv. Transmission-lines.

Tuai–Napier Section.—The work of constructing the main 110 kv. double-circuit line from Tuai to Napier, which was reported nearly complete at the end of June last year, was completed and ready for service in November, 1928, the first circuit being energized on the 28th January, 1929, when load was carried over same for the Napier district. Each circuit can be isolated for testing at three different points, a linesman being stationed at each switch and directly in touch with the power-station by telephone. A considerable amount of work is yet to be done in connection with getting patrol tracks in order, as the recent heavy rains in May last did a considerable amount of damage to same. One cage and two bridges have been erected to facilitate patrol.

50 kv. Transmission-lines.

Tuai-Gisborne Section.—Work on this line was pushed ahead well, and by the end of December, 1928, this line was completed except for the erection of the isolating-switch at Tinoroto. When the construction of this line had only just started severe gales were experienced at the Tuai end of the line. As the result of this experience steps were taken to ensure that the line would withstand similar gales in the future.

This line was placed into service on the 18th February, 1929, at 9 p.m., and since that date has given no trouble.

Near the Gisborne end of the line it may be necessary to divert the line for about half a mile, as during the heavy rains in May last a considerable amount of the country moved. Work on the patrol tracks was also completed; also the installation of cages across the Ruatikuri and Hangaroa Rivers. This line can be isolated for testing at three different points, a linesman being stationed at each switch and directly in touch with the power-station by telephone.

Tuai–Wairoa Line.—When this line was taken over by the Department power was being supplied from the temporary power-station to the Wairoa Power Board at 11,000 volts, and, as this line was to be changed over to 50,000-volt service, this had to be done during the week-ends, so that the Power Board's service would be disturbed as little as possible. By the end of December this line had been converted, and ready for service at 50,000 volts. In case of trouble the line can be isolated at Mitchell's turn-off.

This line was placed into operation at 50,000 volts on the 8th April, 1929.

It was necessary to cut away quite a number of trees from the line, and to fix up cages across the Waikaretaheke River. So as to facilitate patrol, three telephone-huts were installed alongside the Tuai–Wairoa Road and the telephones connected on to the main P. and T. line between the power-station and Wairoa Exchange.

Substations.

Gisborne Substation (Patutahi).

Work on this station was rapidly pushed ahead, the outdoor steelwork, lightning-arresters, 50 kv. switch-gear erected, and a 1,205 kv.a. bank of transformers from the Hamilton district being placed in position, and connected up ready for service. The 11 kv. switch-gear and regulator, together with the earthing-reactor, were installed and connected up ready for service. The oil-tanks and oil-purifying system were installed in the building provided for same, and connections run out to the 50 kv. transformers and O.C.B., also into the main station.

Two wells were sunk to provide water for the cooling of the transformers, also a water-tank erected to give two hours reserve supply of water in case of trouble with the water-pump.

Two linesmen's cottages were erected on the substation-site and are connected directly with the power-station by telephone during the night. The substation building also houses the switching-cubicles of the Poverty Bay Power Board, besides being equipped with a 15-ton crane and workshop for repairing the station-transformer and equipment.

This station was placed into service on the 18th February, 1929, and, except for minor troubles, the equipment has functioned satisfactorily.

Wairoa Substation.

This station consists of one bank of three 500 kv.a. transformers, total capacity 1,500 kv.a., stepping down from 50 kv. to 11 kv., together with a suitable air-break switch and 50 kv. lightning-arresters, the control of this station being from Tuai. The 11 kv. side of the transformers feed directly through the Department's metering equipment to the Wairoa Power Board's substation.

Work on the erection of this station was commenced in October, 1928, and by the end of February, 1929, was ready for service, though at this time the Power Board was not ready for the change-over, the station finally going into service on the 6th April, 1929.

Interruptions.

The following were the interruptions for the period 29th January to 30th June, 1929 :—

Section.	Total.		Prearranged.	
	Number.	Duration.	Number.	Duration.
		Hrs. min.		Hrs. min.
On 110,000-volt lines—				
Power-house, Napier West	14	128 24	1	0 33
On 50,000-volt lines—				
Power-house, Gisborne	34	93 10	4	20 20
Power-house, Wairoa	3	4 27½	2	3 21
Stations—				
Power-house—				
Whole load	13	127 51	..	..
Only 110 kv. load	1	3 10	1	3 10
Gisborne—Whole load	26	96 37	4	20 37
Wairoa—Whole load	3	4 35	2	3 21

Waitaki Development.—Design Work.

Drawings showing the general arrangement of the power-station building have been prepared by the electrical design office, and the detail drawings for this building are being prepared as required. The design and layout of the high-tension outdoor switching equipment have been finalized. Layout drawings for the main generating-machines, together with detail constructional plans, are to be prepared as soon as the necessary certified particulars are received from the manufacturers. Details of the design of the dam and the method of construction have been prepared.

Drawings and specifications covering the supply and delivery of two 600 h.p. auxiliary hydro sets have been prepared and tenders invited for same.

The arrangement of the village layout has been fixed, and specifications and drawings for the permanent-staff cottages, single men's quarters, and the hostel are now being prepared.

Interconnected Transmission-Lines.

A large amount of investigation into the electrical and mechanical characteristics of the interconnected Waitaki-Coleridge transmission-lines has been carried out, and arrangements made for suitable equipment to meet the position. To carry out this and similar investigation work a short-circuit calculating-table has been procured. This apparatus forms a very useful adjunct to the electrical design office, and enables electrical problems of the field to be reproduced in miniature in the office and results obtained which could only be otherwise obtained by long and laborious calculations.

Stability of Transmission-lines.

During the past year a technical investigation has been undertaken in connection with the electrical stability of transmission-lines. This trouble, which has made its appearance in older countries, has not yet been experienced in this country, but with the rapid growth of load which is now taking place it has become imperative for the Department to examine its own transmission-lines with a view to forestalling the trouble, and it is hoped that as a result of the investigations now being made it will be able to predict the maximum load over any portion of the lines with fair accuracy and take steps accordingly.

Line Surveys.

Line-survey methods have been given further attention, and instructions drawn up for the information of district officers, indicating a different basis of procedure in order to obtain the most economical location and layout of transmission-lines without definitely fixing the size of conductors and height of supports.

Investigations have been made in connection with longitudinal movement of suspension insulators when excessive spans vary in length, and consideration has also been given to the problems of line-vibration and spacing of conductors in very long spans.

BROKEN WIRES AND POLES.

During the year there were reported by electric supply authorities 1,547 cases of broken wires and 128 broken poles.

From incomplete returns the approximate number of miles of each size and material of conductor is scheduled below, together with a summary of the number of breaks reported in the respective sizes of wires in use. The scheduled mileage of conductors erected totals 85,613, and the average number of miles of line per broken conductor reported is 55. Taken on a route-mile basis of 17,759 miles, the number of breaks per route-mile of line erected is very low—viz., 0·087. Falling trees are the principal destructive agent in the case of broken wires, 531 cases, or 34·32 per cent., being due to this cause.

There is an increase in the number of broken poles—viz., 128, as against 65 last year—and this is attributed principally to the number of locally-grown bluegum poles erected six or seven years ago and which are now failing due to decay.

Actual Mileages and Sizes of Overhead Conductors in Use at 31st March, 1929.

Size of Conductors (S.W.G.).	Copper.	Failures.	Aluminium.	Failures.	Galvanized Steel.	Failures.	Galvanized Iron.	Failures.	Copper-weld.	Failures.	Steel-cored Aluminium.	Failures.	Bronze.	Failures.	Total Failures.
	Miles.		Miles.		Miles.		Miles.		Miles.		Miles.		Miles.		
7/20	5,486	310	..	..	..	..	..	..	..	..	..	..	..	..	310
7/18	8,592	301	..	..	1	..	..	..	..	..	..	..	..	..	301
7/17	1,956	23	..	..	..	..	..	..	..	..	..	..	..	..	23
7/16	12,964	129	96	3	16	..	..	..	..	..	..	..	..	..	132
7/15	2,108	..	..	..	..	..	..	..	..	..	..	..	..	..	..
7/14	9,032	..	114	3	240	..	..	..	..	..	..	..	..	..	3
7/13	1,061	..	..	..	..	..	..	..	..	..	..	..	..	..	..
7/12	309	..	260	3	..	..	..	..	8	..	..	..	..	..	3
7/10	12	6	24	4	..	..	..	..	..	..	..	..	..	..	10
7/9	63	..	4	..	..	..	..	..	..	..	..	..	..	..	..
19/18	271	..	..	..	..	..	..	..	..	..	..	..	..	..	..
19/17	404	1	..	..	..	..	..	..	..	..	..	..	..	..	1
19/16	1,284	1	..	..	..	..	..	..	..	..	..	..	..	..	1
19/15	101	..	1	..	..	..	..	..	..	..	..	..	..	..	..
19/14	504	2	..	..	..	..	..	..	..	..	..	..	..	..	2
19/13	1,467	..	..	..	..	..	..	..	..	..	..	..	..	..	..
19/12	5	1	..	..	1	..	..	..	..	..	..	..	..	..	1
37/16	32	..	..	..	..	..	..	..	..	..	..	..	..	..	..
37/15	399	..	..	..	..	..	..	..	..	..	..	..	..	..	..
37/14	30	..	..	..	..	..	..	..	..	..	..	..	..	..	..
37/13	22	..	..	..	..	..	..	..	..	..	..	..	..	..	..
37/12	3	1	..	..	..	..	..	..	..	..	..	..	..	..	1
12	2,981	139	..	..	..	..	96	..	..	..	..	..	30	..	139
10	10,445	311	..	..	137	..	269	..	502	..	..	..	..	..	311
8	12,211	172	..	..	2,699	34	5,375	59	903	12	..	..	..	..	277
7	778	..	..	..	5	..	..	..	91	..	..	..	..	..	..
6	255	..	..	..	..	..	16	..	169	14	..	..	..	..	14
4	609	..	..	..	..	..	..	..	58	..	..	..	..	..	..
2	84	..	..	..	..	..	..	..	..	..	59	..	..	..	..
0	116	..	..	..	..	..	..	..	..	..	..	..	..	..	..
7/·062	..	..	..	..	..	..	..	..	..	..	107	..	..	..	..
7/·0743	..	..	..	..	..	..	..	..	..	..	25	..	..	..	..
7/·0834	..	..	..	..	..	..	..	..	..	..	20	..	..	..	..
6/·144	..	..	..	..	..	..	..	..	..	..	19	..	..	..	..
2/0	..	..	11	..	..	..	..	..	..	..	59	..	..	..	..
3/0	..	..	..	..	..	..	..	..	..	..	138	..	..	..	..
Miscellaneous Sizes.															
7/8	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
7/11	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..
7/·122	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..
6/·144	..	..	..	..	..	..	..	..	..	..	19	..	..	..	..
6/·186	..	..	44	..	..	..	..	..	..	..	..	..	..	..	..
5/15	..	..	..	..	115	..	..	..	..	..	..	..	..	..	..
4/14	..	..	..	..	..	..	287	..	..	..	..	..	..	..	..
19/10	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..
14/12	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Odd failures	..	18	..	..	..	..	..	..	..	..	..	..	..	..	18
Totals	73,586	1,415	561	13	3,214	34	6,043	59	1,731	26	448	..	30	..	1,547

Grand total miles, 85,613.

ELECTRICAL ACCIDENTS.

The following is a list of various electrical accidents reported to the Department for twelve months from the 30th June, 1928, to the 30th June, 1929 :—

3/7/28 Substation attendant received burns to face and arms through opening starting-switch of 2,000 kw. rotary converter in error. (Auckland Power Board.)

18/7/28 Maori boy, aged ten years, electrocuted through climbing transmission-line pole and coming in contact with air-break switch, Ngongotaha–Opotiki 50,000-volt line. (Public Works Department.)

22/7/28 Man received severe burns through wilfully climbing on to substation platform and contacting with live wires. (Thames Valley Power Board.)

13/8/28 Linesman electrocuted while erecting low-tension line under 6,600-volt line. (Hutt Valley Power Board.)

22/8/28 Assistant linesman received shock and slight burn through slipping while working on pole and coming in contact with 2,000-volt mains and stay wire. (Wellington City Council.)

22/8/28 Assistant linesman electrocuted by contact with live 6,600-volt lines. This man exceeded his instructions and had no right to climb pole. (Poverty Bay Power Board.)

9/9/28 Consumer received severe shock while trying to repair radiator attached to three-pin plug. (Wellington.)

15/9/28 Consumer received shock through broken plug on iron and making accidental contact with oven. (Christchurch.)

23/9/28 A mine electrical engineer received shock and burns while working near 11,000-volt cubicle. (Grey Power Board.)

7/10/28 Boy electrocuted by contact with high-tension telephone-line which had become detached from supporting bracket. (Dunedin City Council.)

8/11/28 Four cattle electrocuted by contact with low-tension line brought down by cattle milling around pole. (Wanganui-Rangitikei Power Board.)

23/11/28 Linesman electrocuted while working on live low-tension lines through not taking proper precautions. (Waitaki Power Board.)

21/12/28 Engineer at hospital electrocuted through using a portable hand-lamp that did not comply with the regulation requirements. (Central Hawke's Bay Power Board.)

27/12/28 Boy received shock and burns from a defective vacuum-cleaner flexible. (Wairarapa Power Board.)

14/1/29 Wireman received shock and slight burns while working near high-tension transformer in cramped space. (Raetihi Borough Council.)

23/1/29 Child received shock and slight burns through climbing on to roof of outhouse and making contact with live wires. (Wanganui Power Board.)

25/1/29 Man received severe shock and cow electrocuted through high-tension line falling and contacting with low-tension line, which in turn livened up wire fence. This further livened up cow-shed through some scrap iron in contact with both. (Wanganui-Rangitikei Power Board.)

12/4/29 Wireman received shock from consumer's main while working on switchboard. (Napier Borough Council.)

20/6/29 Workman received burns through dropping a spanner on live terminals in underground-cable box. (Auckland Power Board.)

21/6/29 A carpenter miraculously escaped severe injuries or death when he allowed a piece of metal downpipe to foul 11 kv. line. (Manawatu-Oroua Power Board.)

ELECTRIC-POWER BOARDS.

Amendments to the original (1918) Act, based on the results of experience, were passed in 1919, 1920, 1921, 1922, and 1923. The legislation was consolidated and amended in the Electric-power Boards Act, 1925, with subsequent amendments in 1927 and 1928.

The development of the reticulated areas of Electric-power Boards has continued to make substantial progress during the year. There are now forty-three districts constituted, and thirty-eight actually carrying out the distribution and sale of electrical energy (August, 1929). The total area covered is 66,869 square miles, or 63 per cent. of the total area of the Dominion; the total population concerned is 922,464, or 63 per cent. of the total population of the Dominion; and unimproved value of the land included in the electric-power districts and outer areas is £254,032,991, or 74·5 per cent. of the total unimproved value of the Dominion.

The attached coloured map shows the location of the various Boards already constituted and the proposed Boards. The areas in which Electric-power Boards have not been set up are, on the whole, comparatively sparsely populated, but there is one locality where it would appear that such a Board could with advantage be formed—viz., the suggested Waimarino Electric-power District, which includes Ohakune, Raetihi, and surrounding district. Since the 31st March, 1929, the Waimea Electric-power District has been constituted, including Richmond, Motueka, Tahunanui, and portion of Waimea County. Nelson City is included in the outer area of this district. The proposed Hurunui Electric-power District is also well on its way towards being constituted. Hobson Electric-power District is extending its area to include Otamatea and Whangarei Counties.

So far only one of the four main cities—viz., Auckland—has been included in the inner area of a power district, but of the secondary centres the boroughs of Wanganui, Palmerston North, Invercargill, Timaru, Napier, Hastings, Blenheim, Greymouth, Gisborne, and Oamaru are included. The advantages of Power Board organization are more obvious to rural than to urban ratepayers, and yet the above position indicates that some of the more important centres are realizing that it is to their advantage generally to be associated with the country in undertaking the work of reticulation of electric power on a comprehensive scale.

The Boards already formed are working energetically in carrying out their functions. Twenty-four Boards—viz., Waitemata, Thames Valley, Bay of Plenty, Cambridge, Central, Franklin, Waitomo, Te Awamutu, Hutt Valley, Horowhenua, Manawatu-Oroua, Wanganui-Rangitikei, Central Hawke's Bay, Hawke's Bay, Dannevirke, Tararua, Wairarapa, Malvern, Banks Peninsula, Springs-Ellesmere, Ashburton, North Canterbury, South Canterbury, and Waitaki—have carried out fairly complete reticulation of their areas, and are distributing power taken in bulk from the plants at Horahora, Mangahao, Waikaremoana, and Lake Coleridge. The Auckland Board has taken over the city electric-power station, and has provided large extensions of both plant and mains. It has also entered into a contract to take the whole of its power, with a minimum of 15,000 kw., from the Government when the Arapuni Station is completed, the first unit of which went into commercial operation in June, 1929. Taranaki is now giving a supply from its own generating-station at Tariki. Wairoa and Poverty Bay are taking power in bulk from the Department's station at Lake Waikaremoana, Wairoa Board supplying the Borough of Wairoa and a large portion of Wairoa County, and Poverty Bay Board supplying Gisborne and surrounding area. Six—viz., Opunake, Taranaki, Southland, Wairere, Marlborough, and Teviot—have local water-power stations in operation, and the Golden Bay Power Board is expected to be operating by September, 1929. The Westland Power Board has delegated its license to Westland Power, Ltd., for a term of years. The Grey Power Board has erected a steam station of its own, and has made arrangements for constructing a hydro station on the Arnold River near Kaimata. The Tauranga, Otago, and Otago Central Boards have arranged to purchase power in bulk from other authorities. The other four—viz., Hobson, South Taranaki, Buller, and Reefton—are making arrangements which have not yet been finalized.

Table XXX gives details of the date of constitution, the area, population, and rateable value of each of forty-three power districts already formed, also the amounts of the loans already authorized and the voting of each poll taken. The total amount of the loans authorized by the thirty-eight districts which have taken their polls is £12,309,116. The population of the districts concerned is 884,676, so that the loans authorized amount to £13·9 per head of population, as compared with £12·1 last year. The unimproved valuation of the districts is £247,977,236, the loans authorized amounting to 4·98 per cent. of the unimproved rateable value of the lands pledged as security for the loans. The voting at the polls totalled 55,058 to 9,189—*i.e.*, a majority of 83·5 per cent.

Table XXXI shows the capital expenditure incurred by each Board up to the end of the financial year 1928–29, the revenue and expenditure, and the amount of rates struck and collected.

The total capital outlay by the thirty-nine Boards which have started construction is £12,009,891, and a small proportion of this is on works not yet in service. The gross revenue from the sale of electricity by the thirty-eight Boards which had commenced supply was £1,850,453, of which 32·8 per cent. was received by the Auckland Board. The general result is a profit over the whole business of the Power Boards of £100,462 for appropriation to Depreciation and Reserve Funds, &c.

During last year six of the Boards struck a general rate, which was collected in three cases, and five of the Boards struck special rates for the security for loans, which were collected in two cases.

Several of the Boards have been passing through a critical stage owing to the high cost and high interest rates ruling in 1921, when they started construction work, and to the fact that they have undertaken the construction of many lines without requiring the guarantees from consumers authorized by clause 7 (*d*) of the 1922 regulations, and since amplified in the 1927 regulations. But costs and rates of interest are now substantially lower, and other Boards have profited by such experiences, and much better results will be attained by the Power Boards generally in future as the result of the experience of these earlier districts.

LOCAL ELECTRIC-SUPPLY SYSTEMS.

Including the Government plants, there are now (31st March, 1929) thirty-eight public electric-power stations in the Dominion, as compared with forty-one last year. One new hydro station (Westland) came into operation, and one water-power station (Inglewood), and one gas (Opotiki) station were shut down from regular operation when bulk supply became available. Mataura, hitherto scheduled under hydro, is now included with the distributing authorities, as the power is generated by the Southland Frozen Meat Co. The total installed capacity has increased during the year by 17,099 kw., or 11·6 per cent. (from 146,360 kw. to 163,459 kw.), while the sum of the maximum loads has increased by 26,781 kw., or 22·7 per cent. (from 117,445 kw. to 144,226 kw.).

The proportion of installed plant is now as follows:—

	Stations.	Kilowatts.	Proportion per Cent.
Water-power	30	135,007	82·60
Steam-power, excluding hydro stand-by plants at Wellington (10,000), Invercargill (2,450), Waihi (2,500)	3	27,324	16·70
Gas-power	2	112	0·09
Oil-power	3	1,016	0·61
	38	163,459	100·00

The number of consumers supplied has increased from 243,795 to 266,306, an increase of 22,511, or 9·2 per cent., for the year.

The total pupulation included in the various areas of electric-power supply is 1,360,976, or 91 per cent. of the total population of the Dominion, so that the ideal of a supply being available to every home in the Dominion is well on the way to realization.

The maximum demand per head of population in the area supplied is 0·105 kw., 70 per cent. of the allocation of 0·15 kw., or 0·2 h.p. per head of population, which is the basis of the design of the Government schemes. The units sold per head of population supplied were 398, as compared with 320 last year.

The total length of distribution-line is 17,759 route-miles, as compared with 17,063 last year, an increase of 696 miles, or 4·1 per cent. The number of consumers per route-mile is 15, as compared with 14·3 last year, the increase being due to the extra mileage of new lines erected during the year and to the increased generating-capacity made available.

The maximum power-demand per route-mile is now 8·15 kw., the sales 30,600 units, and the revenue £211. The units are better than last year (26,800), and there is a slight increase in revenue as against £198 last year, and there is an increase in the maximum demand of 6·9 kw., last year.

The revenue per kilowatt of maximum load of all stations was £26, as compared with £28·4 last year. The water-power stations show a revenue of £27 per kilowatt, steam stations of £21·97 per kilowatt, oil stations of £37·01 per kilowatt, and gas stations of £44·28 per kilowatt. These are valuable figures for use in forecasting the revenue from systems of various descriptions. The water-power systems include the greatest proportion of large consumers, and the gas-engine stations the greatest proportion of small consumers.

Out of the ninety-six scheduled supply authorities, sixty-nine showed a profit for the year amounting to £673,256, and twenty-seven showed a loss amounting to £159,441. The general result is a net profit for the whole Dominion of £513,815 after paying working-costs (£1,814,633) and capital (interest and sinking fund) charges (£1,425,793) at the rate of 5·99 per cent. on the total capital outlay of £23,813,228. This shows a net profit of 2·16 per cent. as compared with 2·13 per cent. last year. The business, on the whole, is thus a thoroughly sound and remunerative one, as well as supplying a public necessity to 91 per cent. of the population of the Dominion.

The following table summarizes the results of the year's operations in connection with electric supply throughout the Dominion :—

Results for Electric-power Supply of New Zealand for the Year ended 31st March, 1929.

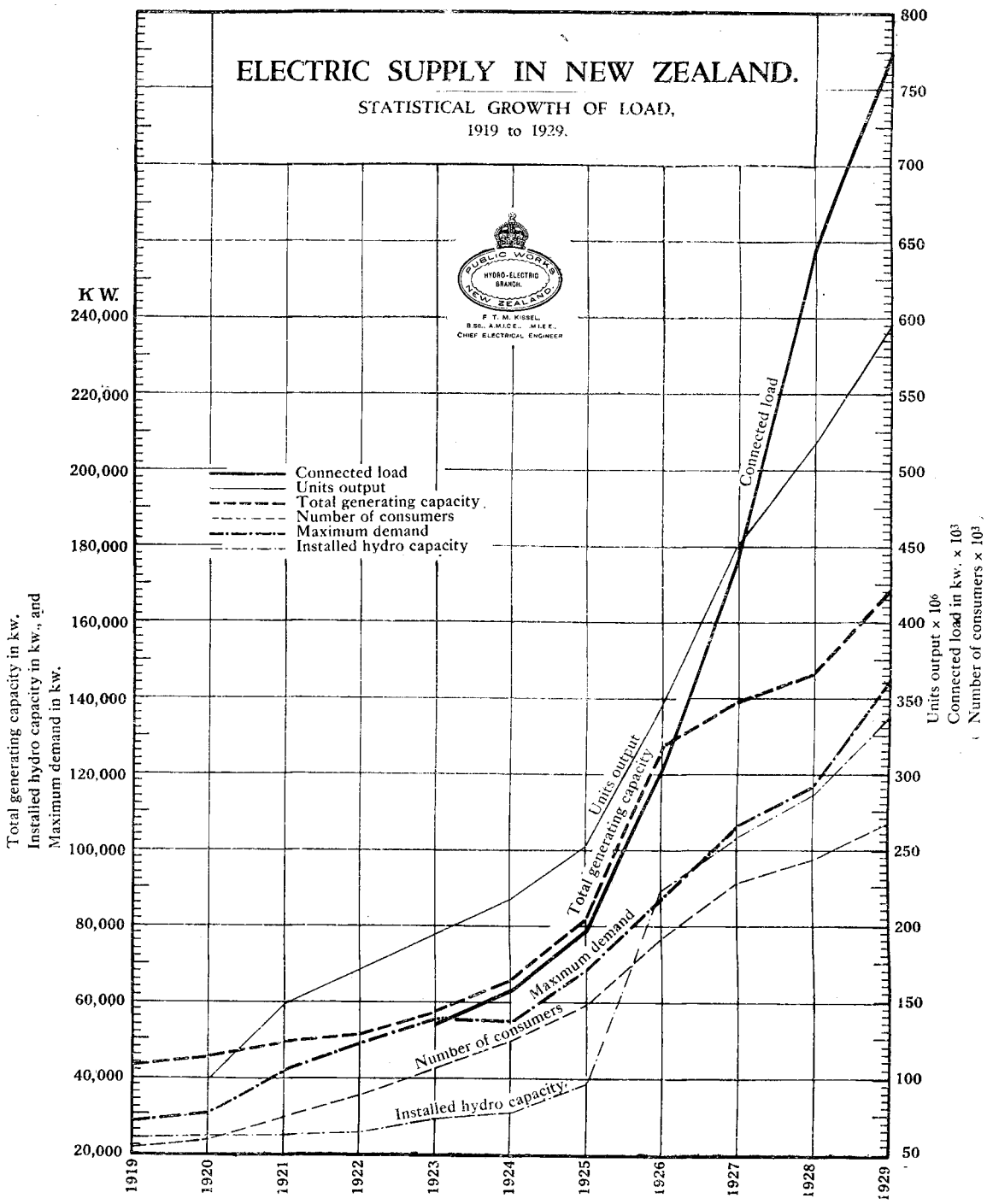
—	Water.	Steam.	Gas.	Oil.	Total.
Number of electric-supply authorities ..	88	3	2	3	96
Installed capacity (main plant only), (kilowatts)	146,512	27,324	112	1,016	174,964
Average installed generating capacity (kilowatts)	1,665	9,108	56	339	1,822
Maximum load (kilowatts)	113,360	29,650	87	1,129	144,226
Units generated	483,795,760	107,851,325	102,554	3,158,222	594,907,861
Units sold	441,182,465	97,471,660	80,623	2,519,316	541,254,064
Annual load factor (per cent.)	48·8	45·43	13·46	34·45	47·1
Number of consumers	216,811	44,659	448	4,388	266,306
Capital outlay	£20,584,109	£2,980,555	£22,672	£225,892	£23,813,228
Capital outlay per kilowatt installed (including reticulation)	£140·49	£109·08	£202·43	£222·33	£136·10
Total working-costs	£1,447,644	£330,555	£3,408	£33,026	£1,814,633
Working-costs per unit sold	0·79d.	0·81d.	10·14d.	3·15d.	0·81d.
Working-costs per kilowatt (maximum) ..	£12·8	£11·15	£39·17	£29·25	£12·5
Total capital charges	£1,213,066	£199,664	£1,708	£11,355	£1,425,793
Capital charges per unit sold	0·66d.	0·49d.	5·08d.	1·08d.	0·63d.
Capital charges per kilowatt (maximum) ..	£10·66	£6·73	£19·63	£10·06	£9·88
Capital charges as percentage of capital outlay	5·89	6·70	7·53	5·03	5·99
Total annual costs	£2,660,710	£530,219	£5,116	£44,381	£3,240,426
Total costs per unit sold	1·45d.	1·30d.	15·22d.	4·23d.	1·44d.
Total costs per kilowatt (maximum).. ..	£23·46	£17·88	£58·80	£39·31	£22·38
Revenue (not including rates)	£3,057,335	£651,273	£3,852	£41,781	£3,754,241
Revenue per unit sold	1·66d.	1·60d.	11·47d.	4·00d.	1·66d.
Revenue per kilowatt (maximum)	£27·0	£21·97	£44·28	£37·01	£26·0
Net profit..	£396,625	£121,054	−£1,264	−£2,600	£513,815
Ratio of working-costs to revenue (per cent.)	47·35	50·76	88·47	79·05	48·34

GROWTH OF LOAD.

In the early days of electric supply electricity was used almost exclusively for lighting purposes, but with the advent of electric motors and the application of electricity for heating purposes the power and heating load increased, until at the present time the energy used for lighting is small compared with that used for other purposes. The benefits of electric drive in factories and workshops have to a large extent been taken advantage of, and the use of electricity for commercial heating and domestic heating and cooking is rapidly increasing. The use of electric ranges, water-heaters, and portable domestic appliances, such as radiators, toasters, percolators, vacuum cleaners, and kettles, during the past few years confirms the opinion that the use of electricity for domestic purposes will soon exceed the demand for industrial and commercial uses.

An interesting graph has been prepared showing the growth of load from 1919 to 1929, and is published with this report. This graph shows the annual increments in the installed generating-capacity, aggregate maximum demand on the generating-stations, the number of consumers supplied, number of units generated, and total connected load. The figure for the installed capacity of hydro

stations does not yet include the units at Arapuni, nor the second unit at Waikaremoana or the ninth unit at Lake Coleridge, and by the 31st March, 1930, the installed-generating-capacity figures will be increased by approximately 75,000 kilowatts.



Returns have again been obtained of electric ranges and water-heaters in use throughout the Dominion, and the figures obtained continue to show satisfactory increases over those of the previous twelve months, and the statistics obtained for the year ending 31st March, 1929, have been scheduled in Table XXXV. Of the ninety-six electric-supply authorities engaged in retail distribution of electrical energy, eighty-six have an aggregate total of 20,254 electric ranges connected to their systems, and the number now installed represents an increase of 28·4 per cent. for the year. The return shows the percentage of consumers using electric cooking to the total number of consumers being supplied in each area respectively, and an examination of this column shows where the field for electric cooking still remains to be developed.

The number of consumers using electric water-heaters has increased from 21,513 to 29,257, an increase of 36 per cent.

When electric-supply authorities actively canvass their areas for the above class of load the response is generally favourable, and it is only reasonable to anticipate that in the near future the demand on the available stations will be such as to warrant further extensions to keep up with the requirements. This development of load is particularly noticeable in rural and country areas, where fuel is scarce and where the facilities for more congenial living-conditions are being brought into line with those already existing in the metropolitan areas.

As regards electrically-driven milking-machines, the figures this year show a steady advance over those of previous years—viz., 1925, 3,581; 1926, 4,856; 1927, 6,738; 1928, 8,514; 1929, 10,161. The collection of these statistics was inaugurated in 1923, when the total number of electrically-driven machines was only 1,310. The increase in six years is thus 675 per cent., and, as there are still about 8,000 machines which are fuel- or water-driven, the work of conversion is a long way from completion, and the electric-supply authorities have still this additional load of approximately 10,000 h.p. in prospect and ready for canvassing as the reticulation extends farther into the outlying districts.

ELECTRICAL SUPPLY AND WIRING REGULATIONS.

The Electric Supply and Wiring Regulations, which were gazetted in 1927 with the intention of revising same after two years' trial, are now about to be revised, and all electric-supply authorities have been circularized for an expression of opinion and suggestions for the improvement of same as a result of their experience.

The Advisory Committee has continued to meet regularly during the year to consider various questions submitted by the supply authorities in connection with interpretations of certain regulations. During the period from 1st April, 1928, to 30th June, 1929, the Committee was convened sixteen times, and gave answers to 26 questions in connection with the Electrical Supply Regulations and 211 questions in connection with the Electrical Wiring Regulations, in addition to adjudicating on numerous electrical accessories and appliances sent in for an expression of opinion. The proceedings of all these meetings have been carefully indexed for future reference when the work of revision commences, and will be made available to members of the Committee to aid them in redrafting any regulations which are at present considered to be ambiguous. The electric-supply authorities continue to evince a keen interest in seeing that the regulations are given effect to, and the work of administration of the regulations has been materially assisted by this co-operation of the electric-supply authorities.

Amendments or additions to the following regulations were gazetted on 4th July, 1929:—

Electrical Supply: 46, 94, 106, 116, 189, and 205.

Electrical Wiring: 66, 71, 76, 86, 90, 100, 133, 164, 179, 192, 200, 204, 223, 224, 225, 227, 228, 252, 281, Second Schedule Part III, class (S) and class (T).

INSPECTION OF ELECTRIC LINES.

The periodic inspection of the electric lines throughout the Dominion has been maintained in conjunction with the inspections necessitated by the addition of new lines erected during the year.

The following fifty-five supply authorities have made extensions to their electric lines during the year ending 31st March, 1929:—

Ashburton Power Board
Auckland Power Board
Banks Peninsula Power Board
Bluff Borough Council
Cambridge Power Board
Central Hawke's Bay Power Board
Central Power Board
Christchurch City Council
Dannevirke Power Board
Dunedin City Council
Franklin Power Board
Grey Power Board
Hamilton Borough Council
Hastings Borough Council
Hawke's Bay Power Board
Horowhenua Power Board
Hutt Valley Power Board
Invercargill Borough Council
Malvern Power Board
Manawatu-Oroua Power Board
Marlborough Power Board
Napier Borough Council
North Canterbury Power Board
Nelson City Council
New Plymouth Borough Council
Otago Central Power Board
Palmerston North Borough Council
Patea Borough Council
Poverty Bay Power Board
Riccarton Borough Council
Rotorua (Tourist Department)
South Canterbury Power Board
Southland Power Board
Springs-Ellesmere Power Board
Stratford Borough Council
Taihape Borough Council
Taranaki Power Board
Tararua Power Board
Taumarunui Borough Council
Tauranga Borough Council
Te Aroha Borough Council
Te Awamutu Power Board
Te Puke Town Board
Thames Valley Power Board
Timaru Borough Council
Waimairi County Council
Wairarapa Power Board
Wairoa Borough Council
Wairoa Power Board
Waitaki Power Board
Waitemata Power Board
Waitomo Power Board
Wanganui-Rangitikei Power Board
Wellington City Council
Whangarei Borough Council.

The following is a list of the various electric-supply authorities and companies whose lines have been inspected during the past year:—

Power Boards (31).

Ashburton
Banks Peninsula
Central
Central Hawke's Bay
Dannevirke
Grey
Hawke's Bay
Horowhenua
Hutt Valley
Malvern
Manawatu-Oroua
Marlborough
North Canterbury
Opunake
Otago
Otago Central
Poverty Bay
South Canterbury
Springs-Ellesmere
Taranaki
Tararua
Tauranga
Te Awamutu
Teviot
Thames Valley
Wairarapa
Wairoa
Waitaki
Waitemata
Waitomo
Wanganui-Rangitikei.

Cities (4).

Wellington	Christchurch	Dunedin	Nelson.

Boroughs (25).

Hastings	Ohakune	Rangiora	Tauranga
Invercargill	Picton	Riccarton	Te Aroha
Kaiapoi	Palmerston North	Stratford	Thames
Lyttelton	Patea	Sumner	Wairoa
Motueka	Queenstown	Timaru	Waitara
Napier	Raetihi	Taihape	Westport.
New Plymouth			

Town Districts (4).

Havelock North	Kaponga	Mangaweka	Te Puke.

County Councils (4).

Halswell	Murchison	Uawa	Waimairi.

Companies (15).

J. D. Barry, Tokomaru	Kanieri	Waimea
Blackball Coal Co.	J. F. Pettie, Waipiro	Westport Coal Co.
Blackwater Mines	Reefton	Wairakei, Ltd.
Farmers' Co-operative Co., Tokomaru	Tai Tapu	Waipiro Trading Co.
Hawera	Union Steamship Co., Port Chalmers	Westland Power, Ltd.

It is satisfactory to be able to say that the electric-supply authorities facilitate inspections, and almost without exception give prompt attention to the rectifying of any defects discovered as a result of these inspections. It is intended to arrange for more attention to be directed towards the inspection of wiring installations in public buildings and private residences, and to combine this with the periodic inspection of overhead lines.

LICENSES ISSUED.

The following water-power and electric-line licenses have been issued during the period from July, 1928, to July, 1929: Waimea Electric Supply Co. (amendment), Bay of Islands Harbour Board, Uawa County Council (amendment), Hikurangi Town Board (2), Sullivan Bros. (Weheka), Westland Power Board (amendment), Manunui Town Board (2), Waipiro Trading Co. (Waipiro Bay), Golden Terrace Extended Gold-dredging Co., Lyttelton Borough Council (amendment), Ohakune Borough Council (amendment), Raetihi Borough Council (amendment), Westport Coal Co. (Granity).

ELECTRICAL APPLIANCES BOARD.

Pressure from the electric-supply authorities continues to be brought to bear on the Department for the setting-up of some authority with constitutional powers to prohibit the sale and use of unsafe electrical appliances to the public, but up to the present there is no legislative enactment to permit of this being done.

ELECTRICAL FIRES.

During the year 21 fires attributed to electrical causes were reported to the Department by electric-supply authorities.

It is suspected that a good number of fires reported in the newspapers as originating from the use of electricity are wrongly classified as "electrical," and the various electric-supply authorities' engineers in New Zealand have been communicated with to make every endeavour to see that electricity is not blamed as the destructive agent unless it is definitely known to be the case. In this respect it has been suggested that supply authorities' electrical engineers should co-operate with local superintendents of the fire brigades by supplying the superintendent with E.S.R. 4 Forms, and the particulars furnished could then be verified by the local electrical engineer before signing same.

WORK FOR OTHER DEPARTMENTS.

This Department during the year has again been called upon to co-operate with other Government Departments—namely, the Mental Hospitals Department, in connection with electrifying the institutions at Seacliff, Porirua, Stoke, Avondale, and Tokanui; Health Department, Hanmer Sanatorium, extension of existing installation; Tourist Department, in connection with electric supply for the new hostel at Milford Sound; for the Cook Islands Department, work in connection with new generating plant for Niue Island; and for the Department of External Affairs an inspection of the hydro-electric installation recently installed at Apia.

REGISTRATION OF ELECTRICAL WIREMEN.

The Electrical Wiremen's Registration Act is now entering on its fourth year of operation, and has proved to be a very useful measure in protecting the public from dangerous work. It has also proved to be of assistance to the electrical-supply authorities in seeing that satisfactory work is being done, and has assisted them in their endeavours to prevent work being done by unskilled persons. The ease with which electrical wiring and apparatus can be extended, altered, or repaired has always proved a temptation to unskilled persons, consequently much unsatisfactory and sometimes positively dangerous work has been carried out in the past and still continues to a limited extent. That consumers will continue to tamper with their installations there is little doubt, and there appears to be no means of protecting such people from risk of the danger to life and property caused by work which is carried out contrary to the Electrical Wiring Regulations.

The Act is designed to protect the person who is prepared to have the work done by skilled workmen, and the annual cost of administering it is little more than the cost of property destroyed in an average fire. The gain to the community so far as the elimination of destruction of property is concerned is obvious, while the immunity from danger to life is beyond estimation. The Act also has the effect of protecting the skilled wireman from unfair competition by men with little or no experience, and thus proves an incentive to the man who is prepared to devote his time to study in order to qualify.

The Act is also designed to raise the standard of electrical-wiring work by providing that fully qualified men who have passed an examination of a standard not lower than that set by the City and Guilds of London Institute shall carry out the work. Provision had, however, to be made to register the wiremen who were working when the Act came into force, and, while probably the majority of these had passed an examination, the fact remains that work in the past was in a number of cases not done as well as could be desired nor as required by the regulations then in force. The power under the Act to endorse a wireman's registration certificate or remove his name from the register for bad workmanship is having its effect, and there is no doubt that the standard of work is improving. An amendment to the Act has given the Board power to remove an endorsement, and this will allow more freedom in making endorsements, as it was considered in a number of cases that an endorsement for life was too drastic a punishment, whereas one for a few years would meet the case.

The Act and regulations were amended during the year to provide for several matters not included in the principal Act, and to make for better working in other directions.

The members of the Registration Board are appointed for a term of three years, and as the term for the first Board expired on the 31st March, 1929, a new Board has, in accordance with section 3 of the principal Act, been appointed. The Board is now composed of three members of the previous Board and two new members.

Provision was made in the regulations issued under the Act for the registers to be purged every three years, and notices were forwarded on the 31st March, 1929, to every registered electrical wireman informing him that if he wished to have his name retained on the register, application to that effect had to be made not later than the 30th June.

To the end of June, 1929, there have been registered 317 Inspectors of Electrical Wiring, 2,779 electrical wiremen with full registration, and 60 electrical wiremen with limited registration, an increase of 53 Inspectors, 181 electrical wiremen with full registration, and 39 electrical wiremen with limited registration since July, 1928. In addition to the above registrations, 62 provisional licenses were issued during the year ended 30th June, 1929. Of the 2,779 electrical wiremen with full registration, 528 have been registered after passing the Board's examination.

Nineteen prosecutions for working contrary to the Act have been taken during the year ended 30th June, 1929, and others are pending. Of the above prosecutions, one was taken against a wireman who had neglected to become registered; nine cases were against unregistered persons; four cases were against persons employing unregistered men; one against a contractor for employing an apprentice without supervision; one against an apprentice for working without supervision; one against a wireman for failing to produce his registration certificate for inspection; one against a contractor for failure to notify intention to commence wiring-work; and one against a wireman for connecting wiring with the source of supply before such wiring had been inspected, tested, and approved. Fines and costs totalling £69 were imposed in the above cases.

Up to the 30th June, 1929, 181 reports of breaches of the Act were received from the time the Act came into force. Figures for the yearly periods since the Act came into force are as follows: Year ended 31st March, 1927, fifty-two; year ended 31st March, 1928, sixty-three; year ended 31st March, 1929, fifty-four. A number of cases were not taken, as the evidence was insufficient to secure a conviction.

Up to the 30th June, 1929, there have been 100 reports of bad workmanship from the time the Act came into force. The figures for the yearly periods are as follows: Year ended 31st March, 1927, seventeen; year ended 31st March, 1928, forty-six; year ended 31st March, 1929, twenty-seven. Of the cases reported during the year ended 30th June, 1929, the following action has been taken: One name was removed from the register, one provisional license was withdrawn, the certificates of sixteen wiremen were endorsed for bad workmanship, four wiremen were censured, five wiremen were cautioned, in one case the offence occurred before the Act came into force and no action could be taken, and in two cases the work was carried out by wiremen other than those first reported. Four Inspectors were reported to the Board for unsatisfactory inspections; of these, two were censured, one was referred to the supply authority concerned, and action in the other case is under review.

Examinations were held during the year in September, 1928, and March, 1929. The results of the examinations are very unsatisfactory, and the indications are that the apprentices are not availing themselves fully of the facilities for technical instruction. Details of the examinations held will be found in the following tables.

Electrical Wiremen's Examination Results.

—	October, 1926.			April, 1927.			October, 1927.			March, 1928.			September, 1928.			March, 1929.		
	Entered.	Passed.	Percentage.	Entered.	Passed.	Percentage.	Entered.	Passed.	Percentage.	Entered.	Passed.	Percentage.	Entered.	Passed.	Percentage.	Entered.	Passed.	Percentage.
Written Part.																		
Auckland	29	20	69	41	22	54	55	28	51	53	37	70	65	22	34	62	18	29
Christchurch	22	10	45	35	21	60	29	17	59	31	20	65	31	10	32	23	2	9
Dunedin	8	6	75	22	17	78	26	10	38	24	14	58	23	5	22	22	4	18
Gisborne	..	..	..	7	2	29	11	5	45	10	7	70	5	1	20	7	4	57
Greymouth	6	4	67	5	3	60	6	2	33	3	Nil	..	9	Nil	..	10	2	20
Hamilton	18	13	72	28	13	46	20	11	55	14	8	57	16	6	37	17	2	12
Havelock South ..	..	..	..	..	..	..	..	..	..	1	1	100	..	..	..	..	..	..
Hawera	..	..	..	..	..	..	2	Nil	..	5	2	40	..	..	..	5	Nil	..
Invercargill	4	4	100	1	Nil	..	8	3	37	10	7	70	4	2	50	8	2	25
Kaikoura	2	Nil	..	2	2	100	..	..	..	..	..	..	..	..	..	..	..	..
Masterton	5	4	80	8	5	63	7	3	43	9	3	33	8	2	25	8	2	25
Napier	8	7	87	7	2	29	15	6	40	14	11	79	7	1	14	10	3	30
Nelson	5	2	40	6	3	50	6	1	17	4	2	50	3	Nil	..	4	1	25
New Plymouth ..	..	..	..	..	..	..	11	7	64	7	3	43	8	1	12	9	3	33
Palmerston North ..	13	10	77	20	13	65	15	9	60	16	10	63	11	1	9	13	2	15
Stratford	7	4	57	13	4	31	..	..	..	1	Nil	..	..	..	..	..	..	..
Tauranga	..	..	..	..	..	..	..	..	..	..	..	..	2	1	50	4	1	25
Timaru	..	..	..	5	4	80	4	1	25	7	6	86	4	2	50	2	Nil	..
Wanganui	6	5	83	..	..	..	9	1	11	12	2	17	13	1	7	12	1	8
Wellington	29	16	55	34	22	65	38	26	68	44	34	77	63	22	35	59	7	12
Westport	..	..	..	2	1	50	2	Nil	..	2	1	50	4	Nil	..	4	2	50
Whangarei	5	4	80	3	2	67	1	1	100	1	1	100	..	..	..	4	3	75
Total	167	109	65	239	136	57	265	131	49	268	169	63	276	77	28	283	59	21
Highest marks obtained		91			86			80			89			79			84	
Practical Part.																		
Auckland	23	19	83	37	31	84	44	39	89	35	23	66	68	29	43	58	20	34
Christchurch	21	15	71	32	23	72	22	17	77	27	9	33	30	11	37	25	3	12
Dunedin	9	8	89	23	17	74	25	17	68	19	6	32	24	15	62	14	5	36
Gisborne	..	..	..	6	4	67	5	4	80	6	1	17	6	3	50	5	Nil	..
Greymouth	6	4	67	6	3	50	5	5	100	2	Nil	..	5	1	20	7	Nil	..
Hamilton	20	18	90	28	14	50	20	5	25	13	6	46	19	8	42	17	1	6
Havelock South ..	..	..	..	..	..	..	..	..	..	1	1	100	..	..	..	..	..	..
Hawera	..	..	..	..	..	..	5	5	100	3	2	67	..	..	..	2	Nil	..
Invercargill	6	6	100	1	Nil	..	8	7	87	6	3	50	4	4	100	6	3	50
Kaikoura	2	2	100	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Masterton	5	5	100	8	8	100	6	5	83	5	Nil	..	6	3	50	4	Nil	..
Napier	8	7	87	8	7	87	12	9	75	11	10	91	6	3	50	9	4	44
Nelson	6	5	83	5	4	80	4	4	100	..	..	..	2	Nil	..	2	1	50
New Plymouth ..	..	..	..	..	..	..	9	7	78	6	6	100	6	1	17	3	1	33
Palmerston North ..	14	12	86	19	17	90	12	11	92	10	5	50	11	7	66	7	2	28
Stratford	7	4	57	15	9	60	..	..	..	..	..	..	..	..	..	..	..	..
Tauranga	..	..	..	..	..	..	..	..	..	..	..	..	2	1	50	4	Nil	..
Timaru	..	..	..	5	5	100	4	3	75	6	5	83	3	2	67	4	Nil	..
Wanganui	6	4	67	..	..	..	7	6	86	6	6	100	6	4	67	3	2	66
Wellington	33	23	70	31	18	58	37	28	76	39	26	67	68	36	53	51	20	39
Westport	..	..	..	2	1	50	2	2	100	2	1	50	4	3	75	2	Nil	..
Whangarei	5	2	40	5	3	60	1	1	100	1	1	100	..	..	..	5	Nil	..
Total	171	134	78	231	164	71	228	175	77	198	111	56	270	131	49	228	62	27
Highest marks obtained		94			91			91			96			93			86	

F. T. M. KISSEL, B.Sc., M.I.E.E., A.M.I.C.E.,

Chief Electrical Engineer.

TABLE I.—LAKE COLERIDGE ELECTRIC-POWER SUPPLY.—RESULTS OF OPERATION.

Results of Operation.	Eleventh Year, 1926.	Twelfth Year, 1927.	Thirteenth Year, 1928.	Fourteenth Year, 1929.
	£	£	£	£
Capital outlay..	1,366,951	1,538,569	1,561,081	1,581,262
Costs—				
Working-costs	27,035	30,728	40,054	30,130
Interest	50,324	65,094	75,630	76,612
Depreciation, 2 per cent.	19,350	28,168	29,863	29,847
Total costs	96,709	123,990	145,547	136,589
Accumulated Depreciation Fund	111,526	142,594	173,231	192,359
Accumulated deficiency	..	..	..	..
Sinking Fund Account	8,907	35,443	62,465	112,334
Revenue—				
City Council	50,377	64,322*	68,000*	70,344*
Tramways	10,122	16,094	16,863	16,215
Wholesale consumers	60,250	67,378	83,722	97,817
Retail consumers	264	269	164	145
Miscellaneous	2,342	2,177	2,378	2 442
Total revenue	123,355	150,240	171,127	186,963
Maximum load (kilowatts)—				
Power-house	14,430	16,880	21,020	24,370
Substations—				
Addington	11,670	12,872	16,088	17,610
Timaru	1,043	1,133	1,616	2,247
Ashburton	806	1,040	1,306	1,402
Oamaru	..	269	581	869
Hororata	63	177	239	264
Point	19	21	19	21
Total substations (66 kv.)	13,601	15,512	19,313	21,772
City Council	7,244	7,978	10,102*	11,624*
Tramways	2,880	2,860	2,720	2,810
Average load (kilowatts)—				
Power-house	7,916	9,000	10,710	12,370
Substations (66 kv.)	6,303	8,200	9,780	11,120
City Council	3,357	3,760	4,480*	5,140*
Tramways	972	980	1,020	986
Units output—				
Power-house	68,860,614	78,342,797	93,853,759	108,011,955
Fed to village, tunnel, and intake	1,664,917	741,462	757,678	1,422,898
Fed to transmission-lines	65,491,130	76,941,870	93,096,081	106,589,057
Substations (66 kv.)	61,167,881	71,791,696	85,969,069	97,765,686
Units distributed—				
City Council (sold)	29,126,211	32,935,247	39,390,350*	45,058,656*
Tramways (sold)	8,511,530	8,583,270	8,993,650	8,648,400
Wholesale consumers and local bodies (sold) ..	22,988,931	27,829,050	34,912,744	42,195,004
Retail consumers (sold)	41,453	23,699	20,844	24,147
Substations and power-house local consumption unsold	284,764	1,516,395	1,453,130	2,118,757
Total units distributed	60,952,889	70,887,661	84,770,718	98,044,964
Losses—				
Transmission-line losses	4,323,249	5,150,174	7,127,012	8,823,371
Percentage	6·270	6·7	7·65	8·28
Distribution losses	1,342,454	1,645,497	1,956,029	1,143,620
Percentage	2·20	2·2	2·3	1·15
Average load-factor (per cent.)—				
Power-house	54·8	53·4	51·0	50·7
Substations (66 kv.)	54·0	52·9	50·6	51·2
City	46·3	47·2	44·4*	44·3*
Working-costs—				
Per kilowatt (power-house maximum) ..	£1·874	£1·820	£1·905	£1·236
Per kilowatt (substations maximum) ..	£1·99	£1·981	£2·074	£1·383
Per unit generated	0·094d.	0·094d.	0·102d.	0·067d.
Per unit distributed	0·106d.	0·104d.	0·113d.	0·074d.
Capital charges—				
Per kilowatt (power-house maximum) ..	£4·828	£5·525	£5·019	£4·368
Per kilowatt (substation maximum)	£5·129	£6·012	£5·462	£4·889
Per unit generated	0·243d.	0·286d.	0·027d.	0·236d.
Per unit distributed	0·274d.	0·323d.	0·299d.	0·261d.
Total cost—				
Per kilowatt (power-house maximum) ..	£6·702	£7·345	£6·924	£5·605
Per kilowatt (substation maximum)	£7·119	£7·993	£7·536	£6·273
Per unit generated	£0·337d.	0·379d.	0·372d.	0·303d.
Per unit distributed	0·381d.	0·419d.	0·412d.	0·334d.
Revenue (total revenue)—				
Per kilowatt (power-house maximum) ..	£8·548	£8·900	£8·141	£7·672
Per kilowatt (substation maximum)	£9·081	£9·685	£8·860	£8·587
Per unit generated	0·430d.	0·460d.	0·437d.	0·416d.
Per unit distributed	0·486d.	0·509d.	0·484d.	0·457d.
Per unit sold (city)	0·415d.	0·469d.	0·414d.	0·375d.
Per unit sold (trams)	0·285d.	0·450d.	0·450d.	0·449d.
Per unit sold (wholesale consumers)	0·629d.	0·581d.	0·575d.	0·556d.
Per unit sold (retail consumers)	1·528d.	2·724d.	1·889d.	1·441d.

* Excludes Woolston.

TABLE II.—LAKE COLERIDGE ELECTRIC-POWER SUPPLY.—ANALYSIS OF CAPITAL OUTLAY.

Item.	Total Expenditure to 31st March,		Difference in Expenditure during Year 1928–29.
	1928.	1929.	
	£	£	£
Land, roading, and fencing	24,125	24,320	+195
Harper diversion	23,007	23,133	+126
Headworks No. 1	211,346	235,702	+24,356
Headworks No. 2	237,311	223,263	−14,048
Power-house machinery	205,658	208,210	+2,552
Staff village	24,571	24,611	+40
Transmission-lines	365,748	381,188	+15,440
Addington Substation	80,021	84,619	+4,598
Primary distribution	67,859	49,977	−17,882
Secondary distribution	106,733	106,792	+59
Service transformers and meters	8,008	6,869	−1,139
Vehicles and loose tools	28,476	27,849	−627
Telephone-lines	1,903	1,903	..
Office furniture	255	261	+6
Surveys, preliminary expenses, &c.	114,627	119,804	+5,177
Interest during construction	61,433	62,761	+1,328
Total	1,561,081	1,581,262	+20,181

TABLE III.—LAKE COLERIDGE ELECTRIC-POWER SUPPLY.—OPERATING OR WORKING COSTS.

Item.	1928.		1929.	
	Cost.	Cost per Unit Distributed.	Cost.	Cost per Unit Distributed.
	£	d.	£	d.
Harper diversion	2,813	0·008	1,201	0·003
Generating	12,336	0·035	10,170	0·025
Transmission-line	4,184	0·012	3,375	0·008
Main distribution	3,356	0·009	3,255	0·008
H.T. distribution	3,565	0·010	1,500	0·004
L.T. distribution	4,442	0·013	4,564	0·011
Stand-by	..	..	..	..
Management	9,358	0·026	6,066	0·015
	40,054	0·113	30,131	0·074

Units distributed—1928, 84,770,718; 1929, 98,044,964.

TABLE IV.—LAKE COLERIDGE ELECTRIC-POWER SUPPLY.—TOTAL CONNECTED LOAD, TOTAL UNITS, AND REVENUE FOR YEAR ENDED 31ST MARCH, 1929.

Consumer.	Connected Load.			Total Connected Load.	Maximum Kilowatts.	Maximum Kilovolt-amperes.
	Light.	Heat.	Power.			
Distributing authorities—	Kw.	Kw.	Kw.	Kw.		
Christchurch City Council	..	..	..	83,284·000*	11,624·00	..
Woolston Borough Council	..	..	..	..	226·80	..
Christchurch Tramway Board.. ..	85·000	..	2,900·000	2,985·000	2,860·00	..
Ashburton Power Board	1,466·552	7,099·276	1,697·795	10,263·623	1,392·00	1,437·60
Banks Peninsula Power Board ..	385·455	2,042·260	316·963	2,744·678	280·00	..
Eyre County Council†	..	..	..	..	..	117·90
Halswell County Council	76·175	216·840	51·371	344·386	..	129·21
Heathcote County Council	451·783	2,646·020	125·017	3,222·820	483·88	..
Kaiapoi Borough Council†	..	..	..	..	102·05	..
Kowai County Council†	..	..	..	..	..	66·00
Lyttelton Borough Council	327·625	643·359	663·405	1,634·389	202·00	..
Lyttelton Pumping-station	0·400	3·000	113·630	117·030	107·00	..
Malvern Power Board	276·646	1,397·880	219·578	1,894·104	249·50	263·25
North Canterbury Power Board ..	812·172	2,215·273	1,388·062	4,415·507	900·00	1,032·00
Rangiora County Council	..	..	..	..	321·50	..
Riccarton Borough Council	625·090	2,596·166	441·925	3,663·181	370·56	374·40
South Canterbury Power Board ..	3,345·850	9,535·890	2,845·144	15,726·884	..	2,486·66
Springs-Ellesmere Power Board ..	842·450	2,840·904	2,238·619	5,921·973	1,060·80	..
Sumner Borough Council	327·375	895·850	189·199	1,412·424	211·20	..
Tai Tapu Dairy Co.	109·210	269·000	71·981	450·191	197·62	..
Waimairi County Council	96·430	146·600	23·104	266·134	..	..
Waitaki Power Board	1,479·202	4,637·005	1,195·980	7,312·187	864·00	979·20
	10,707·415	37,185·323	14,481·773	62,374·511	..	..
Direct consumers (29)	533·670	1,797·220	8,811·971	11,142·861	..	..
Total wholesale	11,241·085	38,982·543	23,293·744	156,801·372	..	..
Retail	3·170	6·600	2·611	12·381	..	..
	11,244·255	38,989·143	23,296·355	73,529·753	..	..
Substations—						
Addington	19·000	58·000	52·220	129·220	..	..
Point	1·020	11·320	..	12·340	..	..
Hororata	1·200	7·200	..	8·400	..	..
Ashburton	1·080	9·500	2·238	12·818	..	..
Timaru	2·500	17·000	1·860	21·360	..	..
Oamaru	1·500	10·000	1·492	12·992	..	..
Woolston (Public Works Department) ..	0·300	2·000	..	2·300	..	..
Power-house	..	..	..	388·000	..	..
Grand total	11,270·855	39,104·163	23,354·165	157,401·183	..	..

* Includes Woolston Borough Council. † Handed over to control of Power Boards during year.

Cost per unit distributed, 0·334d.

Connected loads: 1926, 90,926 kw.; 1927, 112,424 kw.; 1928, 136,364 kw.

TABLE V.—LAKE COLERIDGE ELECTRIC-POWER SUPPLY: GROSS FINANCIAL RESULTS OF DISTRIBUTION OF ENERGY FOR YEAR ENDED 31ST MARCH, 1929.

Distributing Authority.	Number of Consumers.	Revenue.						Expenditure.							Balance.	
		Capital Outlay.	From Sale of Electrical Energy.	Rates.	Trading Account.	Other Sources.	Total.	Paid for Electrical Energy.	Working-costs and Management.	Interest.	Depreciation.	Sinking Fund, Reserve Fund, &c.	Other Expenditure.	Total.	Profit.	Loss.
		£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Public Works Department	81	1,581,262	48,304*	..	285	2,157	186,964	..	30,079	76,612	29,847	50,426	..	186,964	..	..
Ashburton Power Board	3,250	318,360	38,499	..	..	449	38,948	10,903	9,829	17,797	3,424	3,069	183	45,205	..	6,257
Banks Peninsula Power Board	931	99,546	11,791	..	201	267	12,259	2,445	4,502	6,161	..	1,062	1,154	15,324	..	3,065
Christchurch City Council	26,689	630,843	203,993*	..	3,940	19,615	234,110	70,343	50,582	26,638	30,351	23,656	..	201,570	32,540	..
Eyre County Council†	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Halswell County Council	235	6,830	1,730	..	42	11	1,783	749	536	263	..	50	..	1,598	185	..
Heathcote County Council	1,121	26,458	8,176	..	102	68	8,346	3,962	2,201	636	..	496	..	7,295	1,051	..
Kaiapoi Borough Council†	460	11,530	2,589	..	104	..	3,062	1,033	860	641	..	253	..	2,787	275	..
Kowai County Council†	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Lyttelton Borough Council	603	6,930	4,618	..	77	64	4,759	1,824	2,222	172	..	100	..	4,318	441	..
Malvern Power Board	590	51,564	5,902	..	345	691	6,938	2,308	1,847	3,157	..	545	133	7,990	..	1,052
Rangiora County Council†	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Riccarton Borough Council	1,256	18,343	8,264	..	894	21	9,179	3,286	3,697	551	680	40	..	8,254	925	..
South Canterbury Power Board	3,000	296,901	44,400	..	171	257	44,828	18,107	8,053	15,193	1,161	5,764	145	48,423	..	3,595
Springs-Ellesmere Power Board	1,849	117,348	19,089	..	180	174	19,443	5,934	3,242	6,749	1,435	1,121	1,826	20,307	..	864
Sumner Borough Council	930	12,259	5,933	..	62	..	5,995	2,035	1,490	430	286	81	71	4,393	1,602	..
Tai Tapu Dairy Co.	237	10,298	3,710	..	130	..	3,840	1,664	1,093	410	357	..	48	3,572	268	..
Waimairi County Council	2,888	71,081	19,251*	63	..	2	19,427	6,851	5,235	2,491	..	563	..	15,140	4,287	..
Waitaki Electric-power Board	2,891	152,299	31,466	..	978	141	32,585	7,234	6,342	8,811	2,100	3,077	..	27,564	5,021	..
North Canterbury Electric-power Board ..	1,042	85,155	10,091*	..	88	83	10,280	5,564	1,090	573	1,317	89	..	8,633	1,647	..
Totals	48,053	3,497,007	467,806	63	7,599	24,000	642,746	144,242	132,900	167,285	70,958	90,392	3,560	609,337	48,242	14,833

*After deducting sales to other distributing bodies, totalling—Public Works Department, £136,218; Christchurch City Council, £6,562; Waimairi County Council, £111; North Canterbury Power Board, £18. † Taken over by North Canterbury Electric-power Board.

	£
Gross profit	33,409
Raised by rates	63
Net profit	£33,346

TABLE VI.—LAKE COLERIDGE ELECTRIC-POWER SUPPLY.—MILKING-MACHINES CONNECTED AT 31ST MARCH, 1929.

Electric-power Board.	½ Horse-power.		1 Horse-power.		1½ Horse-power.		2 Horse-power.		3 Horse-power.		Total Number.	Total Horse-power.
	No.	H.P.	No.	H.P.	No.	H.P.	No.	H.P.	No.	H.P.		
Ashburton Power Board ..	..	..	5	5	17	25·5	16	32	..	..	38	62·5
Banks Peninsula Power Board	5	2½	38	38	3	4·5	75	150	3	9	124	204
Christchurch City Council*	..	..	..	..	..	..	..	..	..	..	..	..
Halswell County Council ..	..	..	..	..	..	..	5	10	9	27	14	37
Heathcote County Council ..	..	..	1	1	..	..	2	4	2	6	5	11
Kaiapoi Borough Council ..	..	..	..	..	1	1·5	1	2	1	3	3	6·5
Lyttelton Borough Council	..	..	..	..	..	..	..	..	1	3	1	3
Malvern Power Board ..	..	..	..	..	..	..	5	10	..	..	5	10
North Canterbury Power Board	1	½	2	2	2	3	19	38	18	54	42	97·5
Rangiora Borough Council*	..	..	..	..	..	..	..	..	..	..	..	..
Riccarton Borough Council*	..	..	..	..	..	..	..	..	..	..	..	..
South Canterbury Power Board	..	..	..	..	25	37·5	40	80	6	18	71	135·5
Sumner Borough Council ..	..	..	..	..	..	..	..	..	1	3	1	3
Tai Tapu Dairy Co. ..	..	..	1	1	..	..	26	52	13	39	40	92
Timaru Borough*	..	..	..	..	..	..	..	..	..	..	..	..
Waitaki Power Board ..	..	..	1	1	6	9	9	18	..	..	16	28
Waimairi County Council ..	..	..	..	..	..	..	10	20	3	9	13	29
Totals	6	3	48	48	54	81	208	416	57	171	359	719

* None installed.

TABLE VII.—LAKE COLERIDGE ELECTRIC-POWER SUPPLY.—ROUTE-MILES OF POWER BOARD'S LINES AT 31ST MARCH, 1929.

	11,000 Volts.				6,600 Volts.		3,300 Volts.		400 Volts.		Total Route-miles.
Number of Circuits	1	2	3	4	1	2	1	2	1	2	
Ashburton Power Board	54·5	19	0·7	0·62	614	2·1	..	..	86·08	..	827 (*a*)
Banks Peninsula Power Board ..	..	..	..	..	..	..	111	..	63	..	174 (*b*)
Christchurch City	7·65	..	..	..	..	..	3·12	..	238·57	..	281 07 (*c*)
Halswell County Council	..	..	..	..	..	..	6·5	..	15·5	..	22
Heathcote County	..	..	..	..	..	..	7	..	24	..	31 (*d*)
Kaiapoi Borough	..	..	..	..	..	..	0·8	..	11·25	..	12·05
Lyttelton Harbour Board ..	..	..	..	..	..	..	..	..	2·05	..	2·05
Lyttelton Borough	..	..	..	..	..	..	..	..	..	9·2	9·2
Malvern Power Board	..	..	..	..	152	..	..	..	11·0	..	163 (*e*)
North Canterbury Power Board* ..	..	..	..	..	..	..	..	..	..	..	..
Rangiora Borough	..	..	..	..	..	..	1·85	..	9·23	..	11·08
Riccarton Borough	..	..	..	..	..	..	2	..	18·50	..	20·50
South Canterbury Power Board ..	83	28	..	..	497	3	1·6	..	70·5	..	683·1 (*f*)
Sumner Borough	2	..	..	..	..	..	3	..	11	..	16 (*g*)
Tai Tapu Dairy Co.	..	..	..	..	..	..	16	..	14	..	30 (*h*)
Timaru Borough	1	..	..	..	..	..	5·58	3·12	42·425	..	52·125
Waitaki Power Board	94·8	..	..	..	176	..	3·25	..	81	..	355 (*i*)
Waimairi County	..	..	..	..	1·25	..	1·5	..	115·5	..	118·25 (*j*)
Totals	242·95	47	0·7	0·62	1,440·25	5·1	163·2	3·12	813·605	9·2	2,785·425

* Return not received.

(*a*) Also 0·82 miles of 6,600 volts and 18 miles of 400 volts under 11,000-volt lines, double circuit; 40·03 miles of 6,600 volts and 66·03 miles of 400 volts under 11,000-volt lines, single circuit.
(*b*) Also 22 miles of 33,000 volts and 12 miles of 3,300 volts under 33,000 volts, and 40 miles of 400 volts under 3,300 volts.
(*c*) Also 31·736 miles 11,000-volt underground cable.
(*d*) Also 1·5 miles of 400 volts under 3,300-volt lines.
(*e*) Also 28 miles of 400 volts under 6,600-volt lines.
(*f*) Also 68 miles of 6,600 volts and 3 miles of 400 volts under 11,000-volt lines, 18 miles of 400 volts under 11,000/6,600-volt lines, and 200 miles of 400 volts under 6,600-volt lines.
(*g*) Also 18·5 miles of 400 volts under 11,000-volt lines.
(*h*) Also 10 miles of 400 volts under 3,300-volt lines.
(*i*) Also 11·25 miles of 6,600 volts and 20 miles of 400 volts under 11,000-volt lines, 0·4 miles of 3,300 volts and 43 miles of 400 volts under 6,600-volt lines, and 3·75 miles of 400 volts under 3,300-volt lines.
(*j*) Also 21 miles of 400 volts under 6,600-volt lines and 18 miles of 400 volts under 3,300-volt lines.

TABLE VIII.—LAKE COLERIDGE POWER SUPPLY.—ROUTE-MILEAGE OF DEPARTMENT'S LINES IN OPERATION AT 31ST MARCH, 1929.

	Size of Wire (S.W.G.)	Miles.
66 kv. Lines (Single Circuit)—		
Christchurch north line	19/13 Cu	39·0
	7/10 Cu	4·4
	7/·135 Al	24·1
Christchurch middle line	19/13 Cu	61·5
Christchurch south line	19/13 Cu	61·5
Point to Timaru	19/13 Cu	4·6
	7/14 Cu	79·8
Hororata to Timaru	19/13 Cu	2·6
	3/0 A.S.C.R.	76·4
Timaru to Oamaru	3/0 A.S.C.R.	60·2
		414·1
33 kv. Lines—		
Stoddart's Corner to Motukarara	7/16 Cu	8·5
North Canterbury line (double circuit)—Under 11 kv. pressure temporarily	7/·135 Al	22·4
		30·9
11 kv. Lines (Double Circuit)—		
Northern feeder	Mostly 7/14 Cu; some 7/·135 Al	13·5
Southern and western feeder	7/14 and 7/16 Cu; some 7/·135 Al	21·0
Lyttelton feeder	7/·104 Al 7/·064 Cu 7/·080 Cu No. 8 Cu weld 7/·135 Al No. 10 Cu 7/12 Al 7/14 Cu 7/16 Cu	13·6
Montreal (double circuit)	7/12 Al	0·8
Point to Phillips's farm (single circuit)	No. 8 Fe	1·7
Point to Snowdon	No. 6 B. & S. copper-weld	4·3
		54·9

TABLE IX.—MANGAHAO ELECTRIC-POWER SUPPLY.—RESULTS OF OPERATIONS.

—	1927. (Second Year.)	1928. (Third Year.)	1929. (Fourth Year.)
	£	£	£
Capital outlay	2,242,871	2,373,921	2,416,713
Costs—			
Working-costs*	26,921	33,914	34,344
Interest	98,881	106,441	135,358
Depreciation	32,997	35,301	42,714
Fire insurance	..	..	99
Total costs	158,799	175,656	212,515
Revenue	101,897	44,112	114,148†
Loss	56,902	131,544	98,367
Depreciation Fund	32,997	35,301	42,714
Fire Insurance Fund	..	..	99
Maximum load (kilowatts)—			
Power-house	18,100	20,040	20,960
Khandallah Substation	12,720	12,120	13,820
Wellington City	11,078	10,496	10,176
Hutt Valley Electric-power Board	1,700	2,120	3,000
Wellington Meat Export Co.	397·6	455	480
Railway Department	360	480	580
Horowhenua Electric-power Board	1,688	1,968	1,978
Manawatu-Oroua Electric-power Board	1,632	2,094	2,901
Dannevirke Electric-power Board	381	420	574
Tararua Electric-power Board	382	442	547
Wairarapa Electric-power Board	820	930	1,060
Wanganui-Rangitikei Electric-power Board	1,848	2,016	2,484
Central Hawke's Bay Electric-power Board	300	440	510
Hawke's Bay Electric-power Board	..	2,072	2,616
Units output—			
Generated—			
Power-house total	72,133,890	74,726,880	98,327,690
Purchased—			
Waikaremoana power scheme	..	..	14,437,890
Wellington City Council	5,720,463	22,539,685	11,788,599
Wanganui-Rangitikei Electric-power Board	549,620	2,307,964	1,063,010
Palmerston North Borough Council	143,911	1,176,556	560,879
Napier Borough Council	..	1,257,120	889,435
Hastings Borough Council	..	841,095	568,838
Other sources	..	1,118,809	260,739
Total units generated and purchased	78,547,884	103,968,109	127,897,080
Units sold—			
Wellington City Council	36,140,668	40,024,449	42,236,872
Wellington Meat Export Co.	1,292,500	1,574,550	1,793,670
Horowhenua Electric-power Board	5,986,110	7,090,301	7,282,266
Hutt Valley Electric-power Board	6,334,156	9,193,558	13,802,446
Wairarapa Electric-power Board	1,676,550	2,246,344	3,727,654
Tararua Electric-power Board	1,556,650	2,105,967	2,678,400
Dannevirke Electric-power Board	1,337,202	1,612,296	2,461,797
Central Hawke's Bay Electric-power Board	1,188,238	1,945,807	2,497,522
Hawke's Bay Electric-power Board	..	6,035,193	12,049,125
Manawatu-Oroua Electric-power Board	9,068,259	11,442,722	16,231,606
Wanganui-Rangitikei Electric-power Board	6,959,957	11,865,489	13,335,003
New Zealand Railways	704,456	965,175	1,054,580
Headworks and village	1,346,880	1,309,635	650,765
Testing, &c. (includes supply to substations)	250,391	375,086	360,307
Total units sold	73,842,017	97,786,572	120,162,013
Losses—			
Total losses (units)	4,705,867	6,181,537	7,735,067
Percentage	6·0	5·9	6·0
Load-factor (per cent.)—			
Power-house (annual)	45·3	42·4	53·6‡
Power-house (average weekly)	55·3	53·1	57·6
Working-costs (less power purchased)—			
Per kilowatt (power-house maximum)	£1·49	£1·7	£1·64
Per unit generated	0·0895d.	0·109d.	0·084d.
Per unit sold	0·087d.	0·084d.	0·069d.
Capital charges—			
Per kilowatt (power-house annual maximum)	£7·28	£7·066	£8·5
Per unit generated	0·44d.	0·46d.	0·43d.
Per unit sold	0·43d.	0·35d.	0·36d.
Total costs—			
Per kilowatt (power-house annual maximum)	£8·62	£8·76	£10·14
Per unit generated	0·53d.	0·56d.	0·52d.
Per unit sold	0·517d.	0·43d.	0·43d.
Revenue—			
Per kilowatt (power-house maximum)	£5·64	£2·2	£5·45
Per unit generated	0·339d.	0·142d.	0·229d.
Per unit sold	0·331d.	0·108d.	0·190d.

* Does not include £72,563 for power purchased. † Gross revenue, £186,712. ‡ On units generated; 69·7 per cent. on total units.

TABLE X.—MANGAHAO ELECTRIC-POWER SUPPLY.—ANALYSIS OF CAPITAL OUTLAY.

	Expenditure to 31st March,		
	1927.	1928.	1929.
	£	£	£
Land, roading, tram-lines, and fencing	80,012	83,055	83,214
Headworks	664,154	764,461	803,169
Generating-station and machinery	294,911	301,207	303,358
Transmission-lines	447,847	442,961	449,367
Main substations	229,700	258,430	282,385
Service buildings and workmen's accommodation	74,700	73,166	72,155
Vehicles and loose construction tools	7,946	7,262	5,780
Office furniture	961	964	923
Surveys, expenses, and salaries	117,516	130,307	131,997
Construction plant and equipment	72,464	52,781	19,397
Interest during construction	217,069	236,993	239,587
Cost and expenses of raising loans	35,591	22,334	25,381
Totals	2,242,871	2,373,921	2,416,713

TABLE XI.—MANGAHAO ELECTRIC-POWER SUPPLY.—OPERATING OR WORKING COSTS.

	1927.		1928.		1929.	
	Cost.	Per Unit sold.	Cost.	Per Unit sold.	Cost.	Per Unit sold.
	£	d.	£	d.	£	d.
Generating	6,037	0·019	6,789	0·016	8,187	0·0165
Transmission	12,468	0·041	16,211	0·038	12,768	0·026
Substations	3,692	0·012	5,112	0·012	5,467	0·0115
Management and general	4,724	0·015	5,802	0·014	7,922	0·015
Totals	26,921	0·087	33,914	0·080	34,344	0·069

TABLE XII.—MANGAHAO ELECTRIC-POWER SUPPLY.—CONNECTED LOAD IN KILOWATTS AT 31ST MARCH, 1929.

	Street-lighting.	General Lighting, Heating, and cooking.	Power.	Total.
Public Works Department	2	450	198	650
Wellington City Council	350	59,450	26,800	86,600
Wellington Meat Export Co.	..	64	959	1,023
Railway Department	..	125	2,500	2,625
Hutt Valley Electric-power Board	98	20,480	4,574	25,152
Horowhenua Electric-power Board	32	5,894	2,578	8,504
Manawatu-Oroua Electric-power Board	136	19,817	4,562	24,515
Dannevirke Electric-power Board	18	4,205	905	5,128
Tararua Electric-power Board	12	3,009	848	3,869
Wairarapa Electric-power Board	27	7,933	1,626	9,586
Wanganui-Rangitikei Electric-power Board	110	17,000	4,878	21,988
Central Hawke's Bay Electric-power Board	21	3,100	560	3,681
Hawke's Bay Electric-power Board	10	5,497	12,475	17,982
Totals	816	147,024	63,463	211,303

1926, 49,020 kw.; 1927, 111,082 kw.; 1928, 170,068 kw.

TABLE XIII.—MANGAHAO ELECTRIC-POWER SUPPLY: GROSS FINANCIAL RESULTS OF DISTRIBUTION OF ENERGY FOR THE YEAR ENDED 31ST MARCH, 1929.

Distributing Authority.	Number of Consumers.	Capital Outlay.	Revenue.					Expenditure.							Balance.	
			From Sale of Electrical Energy.	Rates.	Trading Account.	Other Sources.	Total.	Paid for Electrical Energy.	Working-costs and Management.	Interest.	Depreciation.	Sinking Fund, Reserve Fund, &c.	Other Expenditure.	Total.	Profit.	Loss.
		£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Public Works Department ..	71	2,416,489	8,881*	..	..	1,886	186,712	72,563	32,061	135,458	42,714	99	2,396	285,291	..	98,579
Horowhenua Electric-power Board	2,991	186,793	38,934	..	292	1,171	40,397	15,263	8,365	10,868	3,171	1,895	230	39,792	605	..
Dannevirke Electric-power Board	2,011	188,811	22,930	..	434	666	24,030	5,073	5,762	9,944	1,713	1,973	753	25,218	..	1,188
Central Hawke's Bay Electric-power Board	1,369	117,569	17,473	..	..	1,242	18,715	4,583	2,656	7,726	2,194	935	665	18,759	..	44
Hawke's Bay Electric-power Board	1,990	221,433	20,435*	..	1,718	1,213	39,758	20,224	3,006	11,724	2,250	2,000	475	39,679	79	..
Hutt Valley Electric-power Board	8,181	341,558	74,543	..	876	1,029	76,448	24,209	16,649	18,481	10,152	3,884	703	74,078	2,370	..
Manawatu-Oroua Electric-power Board	4,117	461,565	51,556*	..	688	715	61,713	21,881	8,174	24,313	2,489	4,417	439	61,713	..	..
Tararua Electric-power Board	1,302	147,500	19,382	..	199	922	20,503	4,783	4,043	7,803	2,941	1,463	957	21,990	..	1,487
Wairarapa Electric-power Board	3,410	333,048	41,855	..	1,214	2,284	45,353	4,762	12,864	20,421	2,007	3,511	1,139	44,704	649	..
Wellington City Council ..	25,000	1,055,804	366,066†	..	..	3,217	369,283	56,647	112,858	29,722	..	44,349	10,363	253,939	115,344	..
Wanganui-Rangitikei Electric-power Board	8,185	511,863	98,289*†	..	..	4,428	103,086	18,520	29,948	30,338	16,250	5,146	1,077	101,279	1,807	..
Mangaweka Town Board ..	100	4,784	917	..	212	71	1,200	369	525	193	..	130	208	1,425	..	225
Hastings Borough Council ..	3,119	106,155	24,743†	..	..	72	24,815	7,092	9,276	3,873	..	1,512	..	21,753	3,062	..
Napier Borough Council ..	3,782	150,612	44,022†	..	..	624	44,646	9,300	17,971	6,937	..	3,471	76	37,755	6,891	..
Palmerston North Borough Council	4,631	202,902	51,504†	..	..	1,127	52,631	8,754	11,376	10,891	..	3,997	927	35,945	16,686	..
Totals	70,259	6,446,886	881,530	..	5,633	20,667	1,109,290	274,023	275,534	328,692	85,881	78,782	20,408	1,063,320	147,493	101,523

* After deducting sales to other distributing bodies, totalling — Public Works Department, £175,945; Wanganui-Rangitikei Electric-power Board, £369; Hawke's Bay Electric-power Board, £16,392; Manawatu-Oroua Electric-power Board, £8,754. † Includes amounts received from Public Works Department for power generated; Wellington City Council, £42.979; Wanganui-Rangitikei Electric-power Board, £12,552; Hastings Borough Council, £2,106; Napier Borough Council, £4,120; Palmerston North Borough Council, £2,337.

Net profit, £45,970.

TABLE XIV.—MANGAHAO ELECTRIC-POWER SUPPLY.—MILKING-MACHINES CONNECTED AT 31ST MARCH, 1929.

Power Board.	½ Horse-power.		1 Horse-power.		1½ Horse-power.		2 Horse-power.		3 Horse-power.		5 Horse-power.		Total Number.	Total Horse-power.
	No.	H.P.	No.	H.P.	No.	H.P.	No.	H.P.	No.	H.P.	No.	H.P.		
Horowhenua	77	38·5	28	28	91	136·5	225	450	1	3	..	..	422	656
Manawatu-Oroua ..	..	..	30	30	..	..	678	1,356	..	..	..	..	708	1,386
Wanganui-Rangitikei ..	..	..	..	..	220	330	97	194	14	42	13	65	344	631
Hawke's Bay	..	..	1	1	31	46·5	30	60	1	3	..	..	63	110·5
Central Hawke's Bay ..	..	..	..	..	1	1·5	57	114	..	..	..	..	58	115·5
Dannevirke	1	0·5	20	20	118	177	104	208	..	..	..	..	243	405·5
Tararua	1	0·5	75	75	43	64·5	103	206	3	9	..	..	225	355
Wairarapa	2	1	14	14	..	..	248	496	5	15	..	..	269	526
Hutt Valley	..	..	5	5	11	16·5	31	62	2	6	..	..	49	89·5
Totals	81	40·5	173	173	515	772·5	1,573	3,146	26	78	13	65	2,381	4,275

TABLE XV.—MANGAHAO ELECTRIC-POWER SUPPLY.—ROUTE-MILEAGE, POWER BOARD LINES, AT 31ST MARCH, 1929.

——	11,000 Volts.			6,600 Volts.		3,000 Volts.		400 Volts.	Total Route-miles.
Number of Circuits	3	2	1	2	1	2	1	1	
Horowhenua	0·63	2·88	147·2	..	..	..	..	127·14	277·85 (*a*)
Manawatu-Oroua	..	24	258	..	..	..	160	118	561·5 (*b*)
Wanganui-Rangitikei ..	..	35	205	..	175	1	5	150	571 (*c*)
Hawke's Bay	..	20	147	..	..	..	6	60	233
Central Hawke's Bay ..	..	1·5	109	..	25·75	..	1	38·5	175·75 (*d*)
Dannevirke	..	4·5	22·75	0·5	191·5	..	..	70·13	289·38 (*e*)
Tararua	..	12·25	26·0	..	..	..	93·0	38·0	169·25 (*f*)
Wairarapa	1·25	27·25	203	..	..	..	7·25	51·75	290·5 (*g*)
Hutt Valley	..	16·25	1·25	16·0	69·0	..	..	163·0	265·5 (*h*)
Total	1·88	143·63	1,219·2	16·5	461·25	1	272·25	816·52	2,833·73

(*a*) Also 87·11 miles of 400 volts on 11,000-volt lines.
(*b*) Also 18 miles of 3,300-volt lines under 11,000-volt lines and 279 miles of 400-volt lines under 11,000 and 3,300-volt lines.
(*c*) Also 35 miles of 6,600 volts and 2·5 miles of 3,000 volts on 11,000-volt poles, and 205 miles of 400 volts on same poles as higher-voltage lines.
(*d*) Also 27 miles of 400-volt lines on same poles as 11,000 volts, 4·25 miles of 400 volts on same poles as 6,600 volts, and 2·25 miles of 400 volts on same poles as 3,000 volts.
(*e*) Also 0·63 miles of 11,000-volt underground cable, and 19·33 miles of 6,600-volt lines on 11,000-volt poles; 12·8 miles of 400-volt lines on 11,000-volt poles, and 77·8 miles of 400-volt lines on 6,600-volt poles.
(*f*) Also 33 miles of 3,000 volts on 11,000-volt poles and 83 miles of 400 volts on 11,000-volt and 3,000-volt poles.
(*g*) Also 1·75 miles of 11,000-volt underground cable, and 147 miles of 400 volts on same poles as higher-voltage lines.
(*h*) Also 10 miles of 6,600 volts on 11,000-volt poles, 7 miles of 400 volts on 11,000-volt poles, and 39 miles of 400 volts on 6,600-volt poles.

TABLE XVI.—MANGAHAO ELECTRIC-POWER SUPPLY.—ROUTE-MILEAGE OF DEPARTMENT'S LINES IN OPERATION AT 31ST MARCH, 1929.

——	Size of Wire (S.W.G.).	Miles.
110,000-volt Lines (Double Circuit)—		
Mangahao–Khandallah	19/13 Cu	61·10
Mangahao–Bunnythorpe	3/0 A.C.S.R.	25·44
110,000-volt Lines (Single Circuit)—		
Bunnythorpe–Wanganui	3/0 A.C.S.R.	39·34
Bunnythorpe–Woodville	3/0 A.C.S.R.	12·44
Woodville–Masterton	3/0 A.C.S.R.	51·50
Woodville–Taradale	3/0 A.C.S.R.	76·00
		265·82

——	No. of Circuits.	Size of Wire (S.W.G.).	Miles.
11,000-volt Lines—			
Khandallah–Petone	4	19/16 Cu	3·81
Khandallah–Wellington Meat Export Co...	1	19/16 Cu	0·63
Mangaore–Shannon	2	19/16 Cu	3·00
			7·44
Total route-miles in operation ..	..	..	273·26

TABLE XVII.—WAIKAREMOANA ELECTRIC-POWER SUPPLY.—RESULTS OF OPERATION, 1928-29: TEMPORARY DEVELOPMENT.

	£
Capital outlay	969,616
Costs—	
Working-costs	1,752
Interest	6,978
Depreciation	2,587
Fire insurance	57
Total costs	11,374
Revenue	6,941
Loss	4,433
Depreciation Fund	2,587
Fire Insurance Fund	57
Maximum load (kilowatts)—	
Power-house	1,174
Wairoa Electric-power Board	764
Units output—	
Temporary power-house	3,900,000
Units sold—	
Wairoa Electric-power Board	2,825,000
Lake House, Waikaremoana	99,163
Dunedin Engineering and Steel Co.	44,973
Staff village and works	666,471
	3,635,607
Losses—	
Total losses (units)	264,393
Percentage	6·78
Load-factor (per cent.)—	
Temporary power-house (annual)	38·0
Temporary power-house (average weekly)	46·0
Working-costs—	
Per kilowatt (power-house maximum)	£1·492
Per unit generated	0·108d.
Per unit sold	0·116d.
Capital charges—	
Per kilowatt (power-house annual maximum)	£8·196
Per unit generated	0·590d.
Per unit sold	0·635d.
Total costs—	
Per kilowatt (power-house annual maximum)	£9·688
Per unit generated	0·699d.
Per unit sold	0·750d.
Revenue—	
Per kilowatt (power-house annual maximum)	£5·912
Per unit generated	0·427d.
Per unit sold	0·458d.

TABLE XVIII.—WAIKAREMOANA ELECTRIC-POWER SUPPLY.—ANALYSIS OF CAPITAL OUTLAY.

	£
Land, roading, and fencing	65,206
Headworks	171,248
Generating-station	280,564
Transmission-lines	210,493
Substations	17,781
Staff village	26,768
Workers' accommodation, temporary buildings, &c.	31,774
Harbour facilities, Waikokopu	3,768
Electric and telephone lines, &c.	6,218
Construction plant	7,220
Supervision, surveys, &c.	62,484
Interest during construction	45,899
Cost of raising loans	40,193
	£969,616

TABLE XIX.—WAIKAREMOANA ELECTRIC-POWER SUPPLY.—OPERATING-COSTS, 1928-29.

	Cost. £	Per Unit sold. d.
Generating	1,501	0·099
Transmission	83	0·006
Management and general	168	0·011
	£1,752	0·116

TABLE XX.—WAIKAREMOANA ELECTRIC-POWER SUPPLY.—GROSS FINANCIAL RESULTS OF DISTRIBUTION OF ENERGY FOR THE YEAR ENDING 31ST MARCH, 1929.

Distributing Authority.	Revenue.							Expenditure.							Balance.	
	Number of Consumers.	Capital Outlay.	From Sale of Electrical Energy.	Rates.	Trading Account.	Other Sources.	Total.	Paid for Electrical Energy.	Working-costs and Management.	Interest.	Depreciation.	Sinking Fund, Reserve Fund, &c.	Other Expenditure.	Total.	Profit.	Loss.
		£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Public Works Department ..	7	969,616	357*	..	..	862	1,219	..	1,752	6,978	2,587	57	..	11,374	..	10,155
Wairoa Electric-power Board ..	317	53,415	9,904	2,023	544	121	12,592	6,022	2,273	3,592	768	400	120	13,175	..	583
Totals	324	1,023,031	10,261	2,023	544	983	13,811	6,022	4,025	10,570	3,355	457	120	24,549	..	10,738

* After deducting amount of sales to Wairoa Power Board.

TABLE XXI.—WAIKATO ELECTRIC-POWER SUPPLY.—RESULTS OF OPERATIONS.

—	Sixth Year. March, 1926.	Seventh Year. March, 1927.	Eighth Year. March, 1928.	Ninth Year. March, 1929.
Capital outlay—	£	£	£	£
Horahora—Total expenditure	561,065	576,841	609,228	617,725
Less assets not in operation	33,734	..	..	..
Horahora—Assets in operation	527,331	576,841	609,228	617,725
Arapuni—Assets in operation	174,026	268,107	363,945	524,621
Total assets in operation	701,357	844,948	973,173	1,142,346
Costs—				
Working-costs	19,612	28,713	46,568	76,231
Capital costs—Interest	31,269	37,989	44,190	53,044
Capital costs—Depreciation	13,601	16,481	18,646	21,527
Sinking Fund	11,342	8,448	9,732	..
Total costs	75,824	91,631	119,136	150,802
Revenue	85,830	108,748	125,312	135,511
Profit	10,006	17,116	6,176	*Dr.* 15,291
Accumulated surplus	30,554	47,670	53,845	32,415
Accumulated Depreciation Fund	46,444	63,782	84,272	103,187
Accumulated Sinking Fund	28,939	38,515	49,847	52,164
Maximum load (kilowatts)—				
System for year (includes Grand Junction, Diesel plant, and McLaren's Falls)	11,860	14,760	15,700	15,900
Horahora Power-station for year	11,400	12,400	12,400	10,300
Horahora Power-station, average weekly	9,665	11,090	11,370	9,702
Units output—				
Horahora Power-station, total generated	65,435,630	79,253,160	88,703,370	79,298,740
Grand Junction	..	..	..	5,846,740
Diesel plant	..	..	..	7,070,912
Units purchased (McLaren's Falls, Auckland Power Board, and dairy factories)	1,590,511	7,398,942	11,372,298	12,776,370
Total units generated and purchased	67,026,141	86,652,102	100,075,668	104,992,762
Horahora exciter sets	1,210,230	1,850,000	1,720,690	1,010,540
Horahora local service	..	..	424,600	337,635
Units available for outgoing lines	65,815,911	84,802,102	97,930,378	103,644,587
Units sold	60,261,326	75,844,229	87,852,067	92,707,271
Units unaccounted for	5,554,585	8,957,873	10,078,311	10,937,316
Percentage of units available	8·44	10·55	10·29	10·58
Total units fed to 11 kv. lines at Horahora	7,626,020	8,458,230	10,463,059	11,495,860
Input to 50 kv. lines	56,321,700	68,204,125	76,318,205	78,458,710
Input to 50 kv. substations	51,919,046	60,467,232	69,036,223	70,597,039
50 kv. transmission and transmission losses (units)	4,402,654	7,736,893	6,281,982	7,861,671
Percentage of units to 50 kv. lines	7·82	11·35	9·1	11·1
Distribution losses, 11 kv. (units)	874,251	350,588	215,995	469,659
Discrepancy in metering	277,680	..	..	..
Load-factor, annual (per cent.)—				
System	64·5	67·7	72·8	75·5
Power-house	65·5	72·9	81·7	87·8
Load-factor, average weekly—				
Power-house	77·5	81·6	88·2	93·2
Working-costs	£19,612	£28,713	£46,568	£76,231
Per kilowatt (system annual maximum)	£1·65	£1·95	£2·96	£4·79
Per unit generated and purchased	0·070d.	0·079d.	0·112d.	0·174d.
Per unit sold	0·078d.	0·091d.	0·127d.	0·197d.
*Capital costs	£44,870	£54,470	£62,836	£74,571
Per kilowatt (system annual maximum)	£3·78	£3·69	£4·00	£4·70
Per unit generated and purchased	0·161d.	0 151d.	0·151d.	0·171d.
Per unit sold	0·179d.	0·172d.	0·172d.	0·194d.
*Total costs on system	£64,482	£83,183	£109,404	£150,802
Per kilowatt (system annual maximum)	£5·43	£5·64	£6·96	£9·49
Per unit generated and purchased	0·231d.	0·230d.	0·263d.	0·345d.
Per unit sold	0·257d.	0·263d.	0·299d.	0·391d.
Revenue	£85,830	£108,484	£125,312	£135,511
Per kilowatt (system annual maximum)	£7·24	£7·72	£7·98	£8·53
Per kilowatt (power-house annual maximum)	£7·52	£8·75	£10·1	£13·15
Per kilowatt (power-house average weekly maximum)	£8·88	£9·79	£11·1	£13·97
Per unit generated and purchased	0·307d.	0·301d.	0·305d.	0·31d.
Per unit sold	0·342d.	0·343d.	0·342d.	0·351d.

* Sinking fund not included for 1929.

TABLE XXII.—WAIKATO ELECTRIC-POWER SUPPLY.—ANALYSIS OF CAPITAL OUTLAY.

—	At 31st March, 1928.	At 31st March, 1929.	Expenditure during Year.	
			Dr.	*Cr.*
Horahora—	£	£	£	£
Land, roading, and fencing	3,208	3,208	..	..
Headworks	177,934	178,012	78	..
Generating-station, transformers, and machinery	116,016	113,612	..	2,404
Staff village	11,492	11,822	330	..
Arapuni—				
Electric lines, &c.	675	675	..	..
Auxiliary plants—				
Waihi Grand Junction steam	10,299	9,202	..	1,097
Diesel engines	..	63,657	63,657	..
110,000-volt transmission-lines	135,561	135,578	17	..
50,000-volt transmission-lines	199,587	229,691	30,104	..
11,000-volt transmission-lines	43,601	43,601	..	..
110,000-volt substations	39,224	50,990	11,766	..
50,000-volt substations	106,009	103,105	..	2,904
11,000-volt substations	8,729	10,913	2,184	..
General—				
Land, stores, and railway-siding, Claudelands	12,125	13,776	1,651	..
Staff residences, Claudelands	4,380	4,397	17	..
Office furniture, Hamilton	1,151	924	..	227
Vehicles, loose tools, and equipment	7,781	8,428	647	..
Engineering—Office and general expenses on surveys and on construction	45,832	50,566	4,734	..
Interest during construction	49,569	66,014	16,445	..
Cost of raising loans	..	29,865	29,865	..
Stocks of materials	..	14,310	14,310	..
Totals	973,173	1,142,346	169,173	..

TABLE XXIII.—OPERATING OR WORKING COSTS.

—	1925–26.		1926–27.		1927–28.		1928–29.	
	Cost.	Per Unit sold.	Cost.	Per Unit sold.	Cost.	Per Unit sold.	Cost.	Per Unit sold.
	£	d.	£	d.	£	d.	£	d.
Generating	5,511	0·022	5,313	0·0168	16,446	0·0449	39,219	0·1015
Transmission-lines	3,403	0·0139	5,226	0·0165	7,757	0·0212	7,995	0·0207
Main substations	3,621	0·0144	4,434	0·014	5,466	0·0149	6,165	0·0159
H.T. distribution	21	0·000084	..	..	..	..	..	..
Management and general	4,494	0·0179	4,954	0·017	5,631	0·0154	6,210	0·0161
Purchase of power	2,562	0·0102	8,787	0·0278	11,268	0·0308	16,642	0·0431
	19,612	0·078	28,714	0·0922	46,568	0·1272	76,231	0·1973

Units sold: 1925–26, 60,261,326; 1926–27, 75,844,229; 1927–28, 87,852,067; 1928–29, 92,707,271.

POWER PURCHASED.

—	1925–26.		1926–27.		1927–28.		1928–29.	
	Units.	Cost.	Units.	Cost.	Units.	Cost.	Units.	Cost.
		£ s. d.		£ s. d.		£ s. d.		£ s. d.
Grand Junction Co. (total generated and purchased)	143,400	503 0 9	162,700	1,250 13 5	3,612,720	13,300 9 11	..	..
McLaren's Falls	1,425,660	1,983 1 11	7,217,830	7,489 1 6	7,379,095	7,690 7 2	10,514,730	11,022 18 9
Auckland Power Bd.	9,400	19 11 7	14,281	29,15 0	333,110	693 19 7	1,762,070	4,896 8 8
Waitoa Factory	5,760	19 14 2	2,357	17 15 10	5,760	24 0 0	4,580	19 1 8
Frankton Factory	3,771	21 14 10	..		15,303	47 16 5	6,208	19 8 0
Te Awamutu Factory	1,920	14 11 3	1,774		14,550	60 12 6	1,420	5 18 4
Hautapu Factory	600	..	..	..	11,760	49 0 0	..	..
Waitomo Electric-power Board	..	..	..	..	..	11 2 6	..	..
	1,590,511	2,561 14 6	7,398,942	8,787 5 9	11,372,298	21,877 8 1	12,289,008	15,963 15 5
Grand Junction Co. (generated)	..	..	..	..	2,768,220	10,608 19 6		
Net total purchased	..	..	..	..	8,604,078	11,268 8 7		
Tourist Department*	..	..	..	..	..	..	..	240 4 0
Dairy factories†	..	..	..	..	..	..	487,362	437 15 3
							12,776,370	16,641 14 8

* Payment for extra labour in running Okere plant in taking up part of own load. † Payment for taking up part of own load.

NOTE.—Included in the 1927–28 figure of the Grand Junction Co. are 2,768,220 units, generated at a cost of £10,608 19s. 6d. thereat since 17th October, 1927, when the Department took over plant.

TABLE XXIV.—WAIKATO ELECTRIC-POWER SUPPLY.—CONNECTED LOAD IN KILOWATTS AT 31ST MARCH, 1929.

(Does not include Auckland Power Board.)

	1928.	1929.
Waihi Gold-mining Co.	4,545	4,545
Waihi Grand Junction Gold Co.	2,528	2,528
Cambridge Co-operative Dairy Co.	411	411
New Zealand Dairy Co., Frankton	828	828
State Farm, Ruakura	16	16
New Zealand Railways, Frankton	1,906	936
Hamilton Borough Council	6,153	6,843
Tourist Department, Rotorua	3,390	3,194
Cambridge Electric-power Board	2,211	2,461
Central Electric-power Board	6,354	7,992
Te Awamutu Electric-power Board	3,520	4,117
Thames Valley Electric-power Board	16,493	18,192
Waitomo Electric-power Board	1,428	1,790
Franklin Electric-power Board	4,085	5,808
Waitemata Electric-power Board	10,075	13,159
Public Works Department, Horahora	151	151
Public Works Department, Arapuni	110	303
Public Works Department, Hamilton	56	56
Public Works Department, Penrose	127	127
Bay of Plenty Power Board	..	3,664
Total connected load	64,580	77,121

TABLE XXV.—WAIKATO ELECTRIC-POWER SUPPLY.—ROUTE-MILEAGE OF DEPARTMENT'S LINES IN OPERATION AT 31ST MARCH, 1929.

—	Size of Wire (S.W.G.).	Miles.
110,000-volt Lines (Single Circuit)—		
Horahora—Tap on Arapuni–Penrose line, Penrose (Arapuni scheme—in operation at 50,000 volts)	19/13	94
50,000-volt (Double Circuit)—		
Penrose–Takapuna (including 9·1 miles of duplicate pole-line)	7/14	28·6
50,000-volt (Single Circuit)—		
Horahora—Tap on Arapuni–Penrose line (temporary)	7/14	2·0
Horahora–Waikino	7/12 & No. 0	44·42
Waiorongomai–Waihou	7/12	5·22
Waikino–Aongatete (Department's part of McLaren's Falls line)	7/14	17·27
Horahora–Claudelands	7/12	27·5
Mystery Creek–Te Awamutu	7/14	9·5
Te Awamutu–Hangatiki	7/14	19·5
Horahora–Arapuni	7/12	6·8
Arapuni–Ngongotaha	7/14	32·25
Ngongotaha–Waiotahi	7/14	60·01
Bombay–Waikino	7/14	50·7
		397·77

—	Number of Circuits.	Size of Wire (S.W.G.).	Miles.
11,000-volt Lines—			
Waikino–Waihi	1	37/13	5·77
Waihi Grand Junction	1	7/12	0·75
Horahora–Leamington	2	7/14	12·54
Leamington–Hamilton	2	7/16	15·86
Hamilton–Frankton	4–3–2	7/16	3·8
Bombay–Pukekohe	2	7/14	5·0
			43·72
Total	..	..	441·49

TRANSMISSION-LINES ERECTED.

Route Miles.

110,000-volt steel-supported, double circuit	99·00
110,000-volt wood-pole, single circuit	99·00
50,000-volt steel-supported, single circuit	44·42
50,000-volt steel-supported, double circuit	19·50
50,000-volt wood-pole, single circuit	248·95
11,000-volt steel-supported, single circuit	5·77
11,000-volt wood-pole, single circuit	0·75
Two-, three-, and four-circuit	37·20
Total route-miles	554·59

Circuit Miles.

	7/16	7/14	7/12	19/16	19/13	No. 0.	37/13
Copper	45·42	232·81	46·21	50·7	297	38·48	5·77

Total circuit mileage (all three-phase), 716·39.

TABLE XXVI.—WAIKATO ELECTRIC-POWER SUPPLY.—ROUTE-MILEAGE, POWER BOARD LINES, AT 31ST MARCH, 1929.

	11,000 Volts.		3,000 Volts.		400 Volts.	Total Route-miles.	
Number of circuits	2	1	2	1	1		
Cambridge Electric-power Board	..	..	..	101	70·5	171·5	(*a*)
Central Electric-power Board	7·25	147	..	93·75	167·5	415·5	(*b*)
Te Awamutu Electric-power Board ..	12	37	5	168	70	292	(*c*)
Thames Valley Electric-power Board ..	83	353·6	..	105	149·4	691	(*d*)
Waitomo Electric-power Board*	..	..	..	..	..	..	(*f*)
Franklin Electric-power Board	1	262	..	..	96	358	(*g*)
Waitemata Electric-power Board	5·45	135·23	..	0·4	216·65	357·73	(*e*)
Hamilton Borough Council	2	1·9†	0·5	4·25	45	53·65	(*h*)
Bay of Plenty	..	187	..	..	25·25	212·25	(*i*)

* No returns available. † 11 kv. cable.

(*a*) Also 45·5 miles of 400 volts on 3,000-volt lines.
(*b*) Also 2½ miles of 3,000 volts on 11,000-volt poles; 66 miles of 400 volts on 11,000-volt poles; and 48 miles of 400 volts on 3,000-volt poles.
(*c*) Also 21 miles of 3,000 volts on 11,000-volt lines; 18 miles of 400 volts on 11,000-volt lines; and 117 miles of 400 volts on 3,000-volt lines.
(*d*) Also 269 miles of 400 volts on 11,000-volt lines, and 99 miles of 400 volts on 3,000-volt lines.
(*g*) Also 146 miles of 400 volts on 11,000-volt lines.
(*h*) Also 4 miles of 400 volts on 3,000-volt lines.
(*e*) Also ·3 miles of 400 volts on 3,000-volt lines.
(*e*) Also 98·5 miles of 400 volts on 11,000-volt lines.
(*i*) Also 49·75 miles of 400 volts on 11,000-volt lines.

TABLE XXVII.—WAIKATO ELECTRIC-POWER SUPPLY.—MILKING-MACHINES CONNECTED AT 31ST MARCH, 1929.

Electric-power Board.	½ Horse-power.		1 Horse-power.		1½ Horse-power.		2 Horse-power.		3 Horse-power.		5 Horse-power.		Total Number.	Total Horse-power.
	No.	H.P.	No.	H.P.	No.	H.P.	No.	H.P.	No.	H.P.	No.	H.P.		
Cambridge Board	1	0·5	14	14	121	181·5	127	254	8	24	..	..	271	474·0
Central Board	..	..	51	51	97	145·5	669	1,338	12	36	..	..	829	1,570·5
Te Awamutu Board ..	6	3	23	23	132	198·0	271	542	..	..	..	..	445*	769·25*
Thames Valley Board ..	1	0·5	18	18	12	18·0	1,700	3,400	60	180	2	10	1,793	3,626·75
Waitomo Board	..	..	..	..	..	..	106	212	..	..	..	..	106	212·0
Franklin Board	62	31	25	25	256	384·0	142	284					532†	737·25
Waitemata Board ..	5	2·5	4	4	..	..	74	148	1	3	..	..	84	157·5
Tourist Department ..	..	..	..	..	2	3·0	10	20	8	24	..	..	20	47·0
Bay of Plenty Board ..	..	..	..	..	73	109·5	233	466	12	36	..	..	318	611·5
Total	75	37·5	135	135	693	1,039·5	3,332	6,664	101	303	2	10	4,398	8,205·75

* Includes thirteen ¼ h.p. motors. † Includes forty-four ¼ h.p. motors and three ¾ h.p. motors.

ELECTRIC RANGES.

2 kw. and not over 5 kw., 139; 5 kw. and over, 1,886: total number, 2,025.

ELECTRIC WATER-HEATERS.

Total number, 5,431; total kilowatts, 3,608.

TABLE XXVIII.—WAIKATO ELECTRIC-POWER SUPPLY.—GROSS FINANCIAL RESULTS OF DISTRIBUTION OF ENERGY FOR THE YEAR ENDED 31ST MARCH, 1929.

Distributing Authority.	Number of Consumers.	Capital Outlay.	Revenue.*				Expenditure.							Balance.	
			From Sales of Electrical Energy.	Trading Account.	Other Sources.	Total.	Paid for Electrical Energy.	Working-costs and Management.	Interest.	Depreciation.	Sinking Fund and Reserve Fund Account.	Other Expenditure.	Total.	Profit.	Loss.
		£	£	£	£	£	£	£	£	£	£	£	£	£	£
Public Works Department	18	1,142,346	37,105*	..	2,863	39,968	16,642	59,589	53,044	21,527	..	..	150,802	..	15,291
Cambridge Electric-power Board ..	1,203	104,349	16,957	407	977	18,341	4,907	5,057	6,300	400	1,184	..	17,848	493	..
Central Electric-power Board	3,336	279,440	45,016	220	916	46,152	10,354	9,135	15,789	2,460	2,807	1,901	42,446	3,706	..
Te Awamutu Electric-power Board ..	1,437	165,471	25,656	78	549	26,283	6,335	4,435	9,224	500	1,536	897	22,927	3,356	..
Thames Valley Electric-power Board ..	5,221	758,839	116,255*	1,259	2,964	120,478	39,197	22,909	42,807	1,738	9,231	9,226	127,457	..	1,665
Franklin Electric-power Board	2,716	221,835	28,870	2,309	3,225	34,404	8,346	6,185	11,396	2,000	3,211	176	31,314	3,090	..
Waitomo Electric-power Board ..	1,178	103,396	14,379	171	421	14,971	3,010	5,492	5,322	1,738	845	..	16,407	..	1,436
Waitemata Electric-power Board ..	6,618	336,507	57,644	1,047	2,340	61,031	13,298	16,268	15,617	1,000	7,410	514	54,107	6,924	..
Tourist Department	1,557	65,319	14,944	445	70	15,459	2,522	4,211	3,266	1,306	4,154	..	15,459	..	..
Hamilton Borough Council	3,552	72,570	33,448	..	104	33,552	7,821	6,144	3,254	..	5,775	4,703	27,697	5,855	..
Te Aroha Borough Council	658	19,600	6,436*	..	410	6,846	1,614	2,412	548	337	95	238	5,244	1,842	..
Thames Borough Council	1,091	31,705	9,120	17	92	9,229	3,700	3,540	1,059	210	209	16	8,734	495	..
Totals	28,585	3,301,377	405,830	5,953	14,931	426,714	117,746	145,377	167,626	35,565	36,457	17,671	520,442	25,761	18,392

* After deducting amount of sales to other distributing authorities—Public Works Department, £95,543; Thames Valley Electric-power Board, £5,314; Te Aroha Borough Council, £240: total, £101,097.

TABLE XXIX.—RETURN SHOWING AVERAGE REVENUE PER CONSUMER AND PER CAPITA FOR THE YEAR ENDING 31ST MARCH, 1929.

Licensee.	Ratio of Consumers to Population.	Average Revenue per Consumer.	Average Revenue per Capita.	Capital Outlay per Capita.
	Per Cent.	£	£	£
Ashburton Power Board	18·57	11·98	2·23	18·59
Auckland Power Board	23·21	14·91	3·46	15·82
Banks Peninsula Power Board	22·99	13·17	3·03	24·58
Bluff Borough Council	23·31	8·69	2·03	5·98
Bay of Plenty Power Board	10·64	10·36	1·10	18·16
Cambridge Power Board	20·05	15·25	3·06	17·39
Central Hawke's Bay Power Board	12·45	13·67	1·70	10·69
Central Power Board	18·49	13·83	2·56	15·49
Christchurch City Council	29·17	8·77	2·56	7·48
Coleridge (Public Works Department)	Figures not applicable.			
Dannevirke Power Board	15·94	11·95	1·91	14·97
Dunedin City Council	26·93	9·06	2·44	16·26
Franklin Power Board	16·60	12·67	2·10	13·56
Grey Power Board	14·23	11·52	1·64	9·14
Halswell County Council	12·70	7·59	0·96	3·69
Hamilton Borough Council	24·50	9·45	2·31	5·00
Hastings Borough Council	30·73	7·96	2·44	10·46
Havelock North Town Board	23·82	12·02	2·86	21·91
Hawera County Electric Co.	19·64	11·30	2·22	8·79
Hawke's Bay Power Board	12·81	20·03	2·56	14·29
Heathcote County Council	18·68	7·45	1·39	4·41
Horahora (Public Works Department)	Figures not applicable.			
Horowhenua Power Board	18·42	13·51	2·49	11·50
Hutt Valley Power Board	21·22	9·34	1·98	8·86
Inglewood Borough Council	31·92	8·81	2·81	9·73
Invercargill Borough Council	21·36	10·83	2·31	7·69
Kaikoura County Council	23·17	10·88	2·52	15·60
Kaiapoi Borough Council	25·56	6·66	1·70	6·41
Kamo Town Board	16·33	9·00	1·47	5·26
Kanieri Electric Light, Ltd.	20·92	14·11	2·95	16·15
Kaponga Town Board	30·75	11·54	3·55	20·42
Lyttelton Borough Council	16·08	7·89	1·27	18·48
Malvern Power Board	11·68	11·76	1·37	11·19
Manawatu-Oroua Power Board	10·55	14·99	1·58	11·83
Mangahao (Public Works Department)	Figures not applicable.			
Mangaweka Town Board	28·57	12·00	3·43	13·67
Marlborough Power Board	13·50	10·82	1·46	21·04
Mataura Borough Council	23·62	4·71	1·11	3·52
Motueka Borough Council	18·88	7·50	1·42	8·03
Murchison County Council	24·89	16·96	4·22	3·38
Napier Borough Council	20·25	11·80	2·39	8·06
Nelson City Council	19·43	11·04	2·15	8·32
New Plymouth Borough Council	26·76	11·51	3·08	19·02
North Canterbury Power Board	7·95	9·88	0·79	7·42
Ohakune Borough Council	19·92	7·93	1·58	7·02
Opunake Power Board	17·14	9·64	1·65	14·35
Otago Central Power Board	34·27	9·60	3·29	35·57
Otago Power Board	25·50	8·71	2·22	20·35
Palmerston North Borough Council	23·45	11·36	2·66	10·27
Patea Borough Council	18·06	11·68	2·11	7·07
Picton Borough Council	25·93	8·93	2·32	13·05
Poverty Bay Power Board	16·66	9·50	1·58	8·54
Queenstown Borough Council	26·52	5·76	1·53	15·01
Raetihi Borough Council	8·60	9·99	0·86	8·03
Rangiora Borough Council	25·33	7·57	1·92	5·38
Reefton Electric Light and Power Co.	25·58	10·81	2·77	7·50
Riccarton Borough Council	25·12	7·31	1·84	3·67
Rotorua. (See under Tourist Department.)				
South Canterbury Power Board	7·18	14·95	1·07	7·24
South Taranaki Power Board	Not yet functioning.			
Southland Power Board	12·37	13·24	1·64	24·65
Springs-Ellesmere Power Board	16·26	10·52	1·71	10·49
Stratford Borough Council	27·76	11·94	3·31	8·33
Sumner Borough Council	26·57	6·45	1·71	4·10
Taihape Borough Council	24·04	9·68	2·33	7·55
Tai Tapu Dairy Co., Ltd.	4·16	16·20	0·67	1·81
Taranaki Electric-power Board	14·62	19·36	2·83	38·45
Tararua Power Board	13·37	14·95	2·00	14·38
Taumarunui Borough Council	19·10	11·90	2·27	15·15
Tauranga Borough Council	35·48	31·42	11·15	53·99
Tauranga Power Board	9·84	27·06	2·66	14·00
Te Aroha Borough Council	28·00	10·77	3·02	8·37
Te Awamutu Power Board	18·82	18·33	3·45	21·72
Te Puke Town Board	26·63	11·00	2·93	11·10
Teviot Power Board	23·33	14·00	3·27	34·80
Thames Borough Council	21·82	8·46	1·85	6·34
Thames Valley Power Board	12·79	24·11	3·08	18·60
Timaru Borough Council	16·99	10·54	1·79	6·24
Tourist Department (Rotorua)	28·31	9·93	2·81	11·88
Uawa County Council	23·75	12·57	2·99	15·62

TABLE XXIX.—RETURN SHOWING AVERAGE REVENUE PER CONSUMER AND PER CAPITA FOR THE YEAR ENDING 31ST MARCH, 1929—*continued.*

Licensee.	Ratio of Consumers to Population.	Average Revenue per Consumer.	Average Revenue per Capita.	Capital Outlay per Capita.
	Per Cent.	£	£	£
Waikaremoana (Public Works Department)	Figures not	applicable.		
Waimairi County Council	22·22	6·70	1·49	5·71
Waimea Electric Supply Co.	16·30	7·46	1·22	4·99
Wairarapa Power Board	17·49	13·30	2·33	17·08
Wairere Power Board	12·55	1·39	1·75	17·10
Wairoa Borough Council	27·00	10·93	2·95	8·25
Wairoa Power Board	5·88	33·66	1·98	10·00
Wairua (Wilson's)	Figures not	applicable.		
Waitaki Power Board	16·22	11·27	1·83	8·90
Waitara Borough Council	24·17	8·38	2·03	6·39
Waitemata Power Board	17·25	9·22	1·59	8·77
Waitomo Power Board	14·73	12·71	1·87	12·92
Wanganui-Rangitikei	15·74	12·59	1·98	9·80
Wellington City Council	22·73	13·05	2·97	9·60
*Westland Power Board	7·62	20·16	0·15	12·88
Westport Borough Council	13·20	10·19	1·34	7·34
Whakatane Borough Council	24·00	12·78	3·07	30·30
Whangarei Borough Council	27·40	10·88	2·98	8·00
Average for reticulated areas in New Zealand ..	19·33	14·10	2·73	17·27
Average for 1928	20·40	11·50	2·36	14·80

* License delegated to and operated by "Westland Power, Ltd."

Table XXX.—Electric-power Boards of New Zealand as constituted at 31st March, 1929.

Name of Board.	Proclamation constituting Power Board Area gazetted.	Number of Members on Board.	Approximate Area (Square Miles).		Population.		Value of Rateable Property.			Valuation Basis.	Amount of Loan authorized.	Voting for Loan Poll.	
							Used as Rating Basis.	Unimproved.					
			District.	Outer Area.	District.	Outer Area.	District.	District.	Outer Area.			For.	Against.
							£	£	£		£		
Ashburton	17/11/21	12	1,193	1,349	17,500	533	11,500,000	9,346,863	700,181	Capital	326,150	1,590	96
Auckland	1/4/22	12	300	..	175,000	..	50,491,865	50,491,865	..	Capital	2,318,000	11,004	1,367
Banks Peninsula	8/1/20	7	387	..	4,050	..	4,659,610	3,766,638	..	Capital	114,680	327	90
Bay of Plenty	20/8/25	8	460	2,615	8,525	3,100	1,769,657	1,769,657	450,000	Unimproved	184,000	436	137
Buller	11/5/22	5	1,987	..	9,197	..	696,374	696,374	..	Unimproved	Poll not yet taken		
Cambridge	8/1/20	8	137	..	6,000	..	2,559,567	1,550,262	..	Capital	113,236	474	71
Central	8/7/20	8	817	..	18,039	..	8,091,272	4,554,703	..	Capital	307,000	1,059	78
Central Hawke's Bay	19/10/22	9	1,300	..	11,000	..	6,839,951	6,839,951	..	Unimproved	150,000	543	41
Dannevirke	11/8/21	10	578	118	12,188	426	4,275,674	4,275,674	487,019	Unimproved	175,000	646	95
Franklin	29/6/25	9	628	..	16,359	..	7,761,397	4,926,883	..	Capital	254,820	1,127	154
Golden Bay	16/6/25	5	51	..	1,200	..	455,000	240,717	..	Capital	25,000	236	96
Grey	26/10/22	9	640	810	12,100	600	1,545,502	515,700	107,000	Capital	138,000	1,368	298
Hawke's Bay	19/6/24	11	1,682	2	41,090	1,120	18,127,637	11,416,761	136,641	Capital	304,000	681	68
Hobson	29/3/23	8	778	..	7,180	..	1,424,942	1,424,942	..	Unimproved	Poll not yet taken.		
Horowhenua	1/12/21	9	630	..	16,240	..	4,984,359	3,403,255	..	Capital	260,000	973	26
Hutt Valley	6/7/22 11/12/24	11	530	..	38,560	..	3,119,920	3,119,920	..	Unimproved	390,000	2,303	343
Malvern	28/6/23	6	308	1,833	3,550	1,500	3,037,533	2,433,080	1,458,588	Capital	65,000	508	33
Manawatu-Oroua	1/12/21	12	1,301	..	39,011	..	13,846,231	13,846,231	..	Unimproved	500,000	1,144	96
Marlborough	25/10/23	8	3,218*	..	14,530*	..	8,658,285	5,879,884*	..	Capital	327,500	1,334	300
North Canterbury	26/2/27	8	746	312	9,340	3,745	6,052,918	5,051,124†	1,903,803†	Capital	160,300	430	86
Opunake	9/8/21 11/3/22	7	197	5	7,000	300	1,728,168	916,111	..	Capital	101,200	61	9
Otago	18/10/23 31/12/26 1/11/28	7	825	1,456	13,301	10,881	3,793,509	2,198,991	2,497,457	Capital	256,500	1,358	196
Otago Central	26/10/22	9	232	2,452	3,085	2,085	538,838	160,008	863,819	Capital	87,000	430	31
Poverty Bay	12/6/24	11	1,747	..	23,670	..	16,536,848	9,356,443	..	Capital	280,000	1,203	244
Reefton	30/6/21	4	24	..	1,639	..	178,055	38,504	..	Capital	Poll not yet taken.		

* Includes outer area. † 1928 figures.

TABLE XXX.—ELECTRIC-POWER BOARDS OF NEW ZEALAND AS CONSTITUTED AT 31ST MARCH, 1929—*continued*.

Name of Board.	Proclamation constituting Power Board Area gazetted.	Number of Members on Board.	Approximate Area (Square Miles).		Population.		Value of Rateable Property.			Valuation Basis.	Amount of Loan authorized.	Voting for Loan Poll.	
							Used as Rating Basis.	Unimproved.					
			District.	Outer Area.	District.	Outer Area.	District.	District.	Outer Area.			For.	Against.
							£	£	£		£		
South Canterbury	3/7/24	12	1,673	3,451	35,618	6,125	12,946,839	12,946,839	2,640,530	Unimproved ..	329,000	1,861	584
Southland	13/11/19 19/11/19	12	7,918	3,035	67,090	22	15,200,658	15,200,658	137,513	Unimproved ..	1,650,000	6,516	415
South Taranaki	24/4/25	8	162	700	12,000	4,500	6,271,271	3,699,667	..	Capital	187,500	1,062	206
Springs-Ellesmere	1/7/20	5	412	..	11,370	..	6,994,004	6,994,004	..	Unimproved ..	140,000	959	56
Taranaki	18/5/22 6/5/26 20/5/26	8	355	1,333	13,985	8,015	6,141,672	2,865,396*	3,109,336*	Capital	435,000	1,026	252
Tararua	23/3/22	10	700	565	8,485	1,770	2,833,944	2,833,944	1,149,113	Unimproved ..	164,480	714	83
Tauranga	14/6/23	7	636	3	8,280	3,600	1,022,713	1,022,713	491,947	Unimproved ..	114,500	421	277
Te Awamutu	8/1/20	8	270	..	7,620	..	3,699,132	2,353,948	..	Capital	178,000	757	146
Teviot	22/7/22	7	320	..	1,500	..	195,431	255,661	..	Unimproved ..	50,500	191	27
Thames Valley	8/1/19	12	2,295	6	38,000	4,000	14,444,808	7,369,058	34,152†	Capital	850,000	1,236	806
Wairarapa	25/3/20	9	516	1,480	19,500	4,500	9,183,537	5,161,438	3,057,562	Capital	327,250	2,284	312
Wairere	9/10/24 4/11/26 21/3/29	7	382	25	2,500	200	696,621	696,621	163,379	Unimproved ..	38,500	82	8
Wairoa	29/7/20	10	1,354	..	7,678	..	3,941,141	2,569,189	..	Capital	100,000	504	31
Waitaki	9/8/23	9	520	1,853	17,029	791	6,855,282	4,406,970	358,805	Capital	135,000	1,286	124
Waitemata	18/10/23 27/11/24 26/8/26 7/3/29	12	627	..	38,370	..	11,977,760	5,950,120	..	Capital	280,000	5,052	1,603
Waitomo	6/3/24	7	160	1,100	5,000	3,000	1,066,361	1,066,361	2,500,000‡	Unimproved ..	117,000	557	90
Wanganui-Rangitikei ..	1/12/21	12	1,648	972	52,000	3,000	22,099,617	6,568,540	1,408,210	Capital	375,000	1,315	214
Westland§	28/10/20	9	750	..	3,272	..	196,268	196,268	..	Unimproved ..	Poll not yet taken.		
Totals, 1928–29 ..	..	377	41,394	25,475	858,651	63,813	308,440,171	230,377,936	23,655,055	..	12,309,116	55,058	9,189
Totals, 1927–28 ..	..	378	41,397	25,506	866,148	63,614	303,759,825	230,884,781	25,021,555	..	11,272,726	49,228	7,940

* 1924 figures. † 1928 figures. ‡ 1926 figures. § License delegated to Westland Power, Ltd.

Table XXXI.—Electric-power Boards.—Financial Statistics for the Year ended 31st March, 1929.

Name of Board.	Main Supply commenced.	Capital Outlay.	Revenue.					Expenditure.				Profit.	Loss.	Rates.					
			Sale of Electricity.		Sale of Materials (Profit).	General.	Total (not including Rates).	Power and Operating-costs.	General.	Capital Charges.*	Total Annual Costs.			General Rate.		Availability Rate.		Special Rates.	
			Bulk.	Retail.										Levied.	Collected.	Levied.	Collected.	Levied.	Collected.
		£	£	£	£	£	£	£	£	£	£	£	£	d.	£	d.	£	d.	£
Ashburton	1923	325,250	..	38,499	..	449	38,948	16,988	3,927	20,866	41,781	..	2,833	..	..	..	..	..	..
Auckland	1908	2,768,798	..	603,635	..	2,153	605,788	259,628	45,608	186,037	491,273	114,515	..	..	..	..	..	$\frac{1}{80}$ and $\frac{1}{6}$	..
Banks Peninsula ..	1921	99,546	..	11,791	201	267	12,259	5,326	2,775	7,223	15,324	..	3,065	$\frac{1}{13}$	..	..	..	$\frac{1}{7}$	4,094†
Bay of Plenty.. ..	1928	154,785	313	8,655	..	433	9,401	5,004	2,579	7,589	15,172	..	5,771	..	..	..	..	$1\frac{1}{2}$ and $\frac{1}{4}$	..
Buller‡	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cambridge	1920	104,349	..	16,957	407	977	18,341	7,683	2,281	7,484	17,448	893	..	..	..	..	..	..	..
Central	1921	279,440	..	45,016	220	916	46,152	16,385	5,005	18,596	39,986	6,166	..	..	..	..	..	..	..
Central Hawke's Bay ..	1925	117,569	506	16,967	..	1,242	18,715	5,954	1,950	7,961	15,865	2,850	..	..	..	..	..	..	..
Dannevirke	1925	188,811	..	22,930	434	666	24,030	7,875	3,051	11,817	22,743	1,287	..	..	..	..	..	..	..
Franklin	1925	221,835	..	28,870	2,309	3,225	34,404	9,844	4,863	13,607	28,314	6,090	..	..	..	..	..	$\frac{5}{8}$ and $\frac{9}{160}$	..
Golden Bay‡	..	5,280	..	..	..	..	..	..	921	..	921	..	921	$\frac{3}{8}$	687	..	..	..	..
Grey	1926	116,070	..	20,264	133	412	20,809	8,544	3,779	8,727	21,050	..	241	..	..	..	..	..	..
Hawke's Bay	1927	221,433	22,237	14,590	1,718	1,213	39,758	21,364	2,141	13,724	37,229	2,529	..	..	..	..	..	..	..
Hobson‡	..	..	..	..	..	31	31	..	170	..	170	..	139	..	..	..	..	..	..
Horowhenua	1924	186,793	..	38,934	292	1,171	40,397	19,146	4,712	12,763	36,621	3,776	..	..	..	..	..	..	..
Hutt Valley	1925	341,558	..	74,543	876	1,029	76,448	34,925	6,636	22,115	63,676	12,772	..	..	..	..	..	..	..
Malvern	1925	56,532	..	5,902	345	691	6,938	3,213	1,075	3,702	7,990	..	1,052	$\frac{1}{4}$ and $\frac{1}{6}$	..	..	..	..	..
Manawatu-Oroua ..	1924	461,565	8,755	51,555	688	715	61,713	25,988	4,506	28,730	59,224	2,489	..	..	..	..	..	..	..
Marlborough	1927	305,664	1,661	18,357	95	1,108	21,221	3,004	2,036	21,185	26,225	..	5,004	..	..	..	..	..	..
North Canterbury ..	1928	97,061	1,800	8,309	88	83	10,280	6,193	461	662	7,316	2,964	..	..	..	..	..	..	..
Opunake	1924	100,421	..	11,395	8	168	11,571	2,073	1,695	8,075	11,843	..	272	..	..	..	..	..	..
Otago	1926	270,672	591	28,638	..	308	29,537	14,284	5,215	17,769	37,268	..	7,731	..	..	..	..	..	..
Otago Central ..	1925	68,375	..	6,513	..	189	6,702	1,200	1,694	4,525	7,419	..	717	..	..	..	..	..	..
Poverty Bay	1912	202,034	..	36,571	100	790	37,461	26,072	4,440	9,471	39,983	..	2,522	..	..	..	..	..	..
Reefton‡	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
South Canterbury ..	1925	302,044	10,097	34,303	171	257	44,828	21,467	4,838	20,957	47,262	..	2,434	..	..	..	..	..	..
Southland	1925	1,653,767	19,167	80,447	260	10,018	109,892	28,025	24,930	115,500	168,455	..	58,563	$\frac{3}{4}$	43,476	..	..	$\frac{3}{8}$	8,568
South Taranaki‡ ..	..	..	..	..	..	..	..	..	801	..	801	..	801	..	767	..	..	..	..
Springs-Ellesmere ..	1922	119,280	..	19,089	180	174	19,443	7,762	3,240	7,870	18,872	571	..	..	..	..	..	..	..
Taranaki	1927	472,412	5,485	27,526	996	762	34,769	4,625	6,922	29,757	41,304	..	6,535	..	..	2	14,860	..	..

* Includes interest and sinking fund payments only. † Includes general rate. ‡ Not yet actively functioning.

TABLE XXXI.—ELECTRIC-POWER BOARDS.—FINANCIAL STATISTICS FOR THE YEAR ENDED 31ST MARCH, 1929—*continued.*

Name of Board.	Main Supply commenced.	Capital Outlay.	Revenue.					Expenditure.				Profit.	Loss.	Rates.					
			Sale of Electricity.		Sale of Materials (Profit).	General.	Total (not including Rates).	Power and Operating-costs.	General.	Capital Charges.*	Total Annual Costs.			General Rate.		Availability Rate.		Special Rate.	
			Bulk.	Retail.										Levied.	Collected.	Levied.	Collected.	Levied.	Collected.
		£	£	£	£	£	£	£	£	£	£	£	£	d.	£	d.	£	d.	£
Tararua	1925	147,500	..	19,382	199	922	20,503	6,944	2,663	9,266	18,873	1,630	..	..	..	..	..	..	..
Tauranga	1926	115,890	..	19,594	29	2,431	22,054	9,837	3,588	8,091	21,516	538	..	..	..	..	..	..	..
Te Awamutu	1921	165,471	1,156	24,500	78	549	26,283	9,134	2,533	10,760	22,427	3,856	..	..	564	..	..	..	..
Teviot	1924	52,197	778	3,525	258	338	4,899	749	872	3,535	5,156	..	257	½	355	..	..	..	..
Thames Valley ..	1921	758,839	6,238	115,331	1,259	2,964	125,792	52,546	18,786	52,038	123,370	2,422	..	..	..	..	..	..	..
Wairarapa	1924	333,048	1,370	40,485	1,214	2,284	45,353	9,467	9,308	23,932	42,707	2,646	..	..	..	..	..	..	..
Wairere	1925	34,193	..	3,441	..	50	3,491	400	1,063	2,313	3,776	..	285	..	..	..	..	..	..
Wairoa	1923	53,415	5,032	4,872	544	121	10,569	7,164	1,251	3,992	12,407	..	1,838	..	190	2	3,208	..	..
Waitaki	1926	158,522	334	31,132	978	141	32,585	11,241	2,335	11,888	25,464	7,121	..	⅜	..	..	..	..	..
Waitemata	1926	336,507	..	57,644	1,047	2,340	61,031	19,109	10,971	23,027	53,107	7,924	..	..	..	..	..	..	..
Waitomo	1926	103,396	..	14,379	171	421	14,971	5,490	3,012	6,167	14,669	302	..	..	..	..	..	1¼, 1/8¼, 3/8¼, and 3/8½	..
Wanganui-Rangitikei ..	1924	509,569	4,603	94,055	..	4,428	103,086	41,120	8,380	35,484	84,984	18,102	..	..	..	..	..	..	..
Westland†	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Totals, 1928–29 ..	..	12,009,891	90,123	1,698,596	15,298	46,436	1,850,453	735,773	217,013	797,205	1,749,991	201,443	100,981	..	46,039	..	18,068	..	12,662
Totals, 1927–28 ..	..	11,078,670	75,021	1,478,606	15,387	59,177	1,628,191	609,003	191,098	720,388	1,520,489	204,605	96,903	..	50,180	..	2,760	..	17,014

* Includes interest and sinking fund payments only. † License delegated to Westland Power, Ltd.

Table XXXII.—Summary of Returns of Operating Results for the Year ended 31st March, 1929.

Title.	Capital Outlay at 31st March, 1929. (Total Expenditure—Depreciation not deducted.)	Total Revenue (not including Rates),	Working-expenses.		Capital Charges, &c.		Total Annual Costs.	Net Results.		Comparative Figures—Revenue and Expenditure.								Retail Selling-rates.		
			Total.	Per Cent. of Revenue.	Total.	Per Cent. of Capital Outlay.		Profit.	Loss.	Average Revenue from Sale of Energy.		Working-costs.		Capital Charges.		Total Costs.		Lighting.	Heating.	Power.
										Per Unit sold.	Per Kw. of Max.	Per Unit sold.	Per Kw. of Max.	Per Unit sold.	Per Kw. of Max.	Per Unit sold.	Per Kw. of Max.			
GENERATING-STATIONS (classified according to Number of Units generated).																				
Steam Stations.																				
Over 1,000,000 Units.	£	£	£		£		£	£	£	d.	£	d.	£	d.	£	d.	£	d.	d.	d.
1. Auckland Power Board ..	2,768,798	605,788	305,236	50·39	186,037	6·72	491,273	114,515	..	1·55	21·48	0·78	10·86	0·48	6·62	1·26	17·48	5 and 2 / All less	4½ / 5 per cent.	2½ to ⅝
2. Grey Power Board ..	116,070	20,809	12,323	59·22	8,727	7·52	21,050	..	241	1·92	20·50	1·17	12·45	0·83	8·80	2·00	21·25	6	1½ to 3	2 to 1½
3. Nelson City Council ..	95,687	24,676	12,996	52·67	4,900	5·12	17,896	6,780	..	4·33	42·36	2·37	23·21	0·89	8·75	3·26	31·96	9	4 to 2	4 to 2
Totals, steam stations ..	2,980,555	651,273	330,555	50·76	199,664	6·70	530,219	121,295	241	1·59	21·84	0·81	11·15	0·49	6·73	1·30	17·88	..	..	..
Gas Stations.																				
Under 100,000 Units.																				
4. Kaikoura County Council ..	9,831	1,588	1,592	100·25	746	7·59	2,338	..	750	12·00	51·50	12·36	53·07	5·79	24·87	18·15	77·94	12	12	6
5. Motueka Borough Council ..	12,841	2,264	1,816	80·21	962	7·49	2,778	..	514	9·78	35·53	8·77	31·86	4·64	16·88	13·41	48·74	12	4	4
Totals, gas stations ..	22,672	3,852	3,408	88·47	1,708	7·53	5,116	..	1,264	10·63	41·03	10·14	39·17	5·08	19·63	15·22	58·80	..	..	..
Oil Stations.																				
Under 100,000 Units.																				
6. Uawa County Council ..	6,246	1,194	579	48·49	638	10·21	1,217	..	23	17·04	56·80	8·69	28·95	9·57	31·90	18·26	60·85	17	11	11
From 100,000 to 250,000 Units.																				
7. Picton Borough Council ..	17,612	3,126	1,935	61·90	1,246	7·07	3,181	..	55	7·83	47·73	4·85	29·54	3·12	19·02	7·97	48·56	10	4 to 2	4
Over 1,000,000 Units.																				
8. Poverty Bay Power Board ..	202,034	37,461	30,512	81·45	9,471	4·69	39,983	..	2,522	3·65	35·06	3·04	29·25	0·94	9·08	3·98	38·33	8 to 6	4	3 to 2½
Totals, oil stations ..	225,892	41,781	33,026	79·05	11,355	5·03	44,381	..	2,600	3·89	36·17	3·15	29·25	1·08	10·06	4·23	39·31	..	..	..
Hydro Stations.																				
Under 250,000 Units.																				
9. Ohakune Borough Council	16,846	3,790	1,899	50·11	999	5·93	2,898	892	..	5·52	37·30	2·87	19·38	1·51	10·19	4·38	29·57	9	3 to 1	4 to 2
10. Queenstown Borough Council	12,116	1,233	483	39·17	796	6·57	1,279	..	46	3·27	14·95	0·19	6·44	2·33	10·61	2·52	17·05	7 to 2	7 to 2	4 to 2
11. Reefton Electric Lighting and Power Co., Ltd.	9,004	3,318	2,821	85·02	..	..	2,821	497	..	10·61	48·24	9·40	42·74	..	..	9·40	42·74	Flat rate.		
12. Waimea Electric Supply and Manufacturing Co., Ltd.	19,958	4,863	3,224	66·30	440	2·20	3,664	1,199	..	8·57	44·30	6·00	31·00	0·82	4·23	6·82	35·23	11	4	4
13. Westland Power, Ltd. ..	54,093	645	1,461	226·51	..	..	1,461	..	816	1·25	4·96	2·83	11·24	..	..	2·83	11·24	8 to 6	1½	3
Totals, under 250,000 units	111,769	13,849	9,888	71·40	2,235	2·00	12,123	2,588	862	5·60	27·93	4·19	20·90	0·95	4·73	5·14	25·63	..	..	..

TABLE XXXII.—SUMMARY OF RETURNS OF OPERATING RESULTS FOR THE YEAR ENDED 31ST MARCH, 1929—*continued.*

Title.	Capital Outlay at 31st March, 1929. (Total Expenditure—Depreciation not deducted.)	Total Revenue (not including Rates).	Working-expenses.		Capital Charges, &c.		Total Annual Costs.	Net Results.		Comparative Figures—Revenue and Expenditure.								Retail Selling-rates.		
			Total.	Per Cent. of Revenue.	Total.	Per Cent. of Capital Outlay.		Profit.	Loss.	Average Revenue from Sale of Energy.		Working-costs.		Capital Charges.		Total Costs.		Lighting.	Heating.	Power.
										Per Unit sold.	Per Kw. of Max.	Per Unit sold.	Per Kw. of Max.	Per Unit sold.	Per Kw. of Max.	Per Unit sold.	Per Kw. of Max.			
GENERATING-STATIONS—(CLASSIFIED ACCORDING TO NUMBER OF UNITS GENERATED)—*continued.*																				
HYDRO STATIONS—*continued.*	£	£	£		£		£	£	£	d.	£	d.	£	d.	£	d.	£	d.	d.	d.
From 250,000 to 500,000 Units.																				
14. Havelock North Town Board	24,097	3,150	914	29·02	1,735	7·20	2,649	501	..	2·79	21·72	0·81	6·30	1·54	11·97	2·35	18·27	7	2	2
15. Kaponga Town Board ..	24,507	4,260	2,978	69·91	1,191	4·86	4,169	91	..	2·87	24·77	1·95	17·31	0·78	6·92	2·73	24·23	7	4 to ½	5 to 2
16. Murchison County Council	15,200	1,900	585	30·79	974	6·41	1,559	341	..	2·64	18·72	0·85	6·03	1·41	10·04	2·26	16·07	6	3	3
17. Patea Borough Council ..	12,729	3,796	2,270	59·80	600	4·71	2,870	926	..	3·22	40·11	1·98	24·67	0·52	6·52	2·50	31·19	8½ to 6½	4 to 2	3⅗ to 1
18. Raetihi Borough Council ..	36,146	3,867	1,794	46·39	1,912	5·29	3,706	161	..	2·71	24·53	1·34	12·12	1·43	12·92	2·77	25·04	10 to 3	1	3 to 1½
19. Westport Borough Council	29,373	5,378	2,099	39·03	2,304	7·84	4,403	975	..	4·63	35·28	1·85	13·25	2·03	14·55	3·88	27·80	9	3 to 1	3
Totals, 250,000 to 500,000 units	142,052	22,351	10,640	47·60	8,716	6·14	19,356	2,995	..	3·13	26·87	1·53	13·10	1·25	10·73	2·78	23·83	..	..	..
From 500,000 to 750,000 Units.																				
20. Taihape Borough Council ..	18,502	5,701	2,524	44·27	1,081	5·84	3,605	2,096	..	3·39	25·34	1·58	11·79	0·68	5·05	2·26	16·84	8	1½	2
21. Wairere Power Board ..	34,193	3,491	1,463	41·91	2,313	6·76	3,776	..	285	1·29	14·83	0·55	6·30	0·86	9·97	1·41	16·27	9	4⅓	1
Totals, 500,000 to 750,000 units	52,695	9,192	3,987	43·37	3,394	6·44	7,381	2,096	285	2·07	19·87	0·93	8·94	0·79	7·61	1·72	16·55	..	..	..
Over 1,000,000 Units.																				
22. Coleridge (Public Works Dept.)	1,645,223	186,964	30,131	16·12	126,986	7·72	157,117	29,847	..	0·46	7·57	0·08	1·24	0·32	5·21	0·40	6·45	..	..	..
23. Dunedin City Council ..	1,301,168	195,085	64,237	32·93	65,503	5·03	129,740	65,345	..	1·08	15·05	0·36	5·01	0·37	5·11	0·73	10·12	6 to 1	2 to ½	2 to ⅛
24. Hawera County Electric Light Co., Ltd.	109,666	27,665	10,402	37·60	1,481	1·35	11,883	15,782	..	4·01	41·24	1·63	16·75	0·23	2·38	1·86	19·13	8	1½	4
25. Horahora (Public Works Dept.)	1,142,346	135,511	76,231	56·25	53,044	4·64	129,275	6,236	..	0·34	8·34	0·20	4·79	0·14	3·34	0·34	8·13	..	..	..
26. Kanieri Electric Light, Ltd.	40,370	7,380	6,048	81·95	..	..	6,048	1,332	..	0·67	9·75	0·56	8·17	..	..	0·56	8·17	6	1½	4 to 2
27. Mangahao (Public Works Dept.)	2,416,489	186,711	106,907	57·26	135,358	5·60	242,265	..	55,554	0·37	8·82	0·21	5·10	0·27	6·46	0·48	11·56	..	..	..
28. Marlborough Power Board ..	305,664	21,221	5,040	23·75	21,185	6·93	26,225	..	5,004	2·21	26·34	0·56	6·63	2·34	27·88	2·90	34·51	9	2½ to 1½	3 to 1½
29. New Plymouth Borough Cl.	399,465	64,670	26,591	41·12	23,364	5·85	49,955	14,715	..	1·50	24·64	0·65	10·64	0·57	9·35	1·22	19·99	7 to 5	2 to 1	2 to 1
30. Opunake Power Board ..	100,421	11,571	3,768	32·56	8,075	8·04	11,843	..	272	2·21	29·99	0·73	9·92	1·57	21·25	2·30	31·17	4 to 2	2	3 to 2
31. Southland Power Board ..	1,653,767	109,892	52,955	48·19	115,500	6·98	168,455	..	58,563	1·50	18·97	0·80	10·09	1·73	22·00	2·53	32·09	7 to 1	7 to 1	7 to 1
32. Taranaki Power Board ..	472,412	34,769	11,547	33·21	29,757	6·30	41,304	..	6,535	1·19	13·89	0·42	4·86	1·08	12·53	1·50	17·39	6	3	3 to 1
33. Taumarunui Borough Council	60,592	9,094	2,401	26·40	4,121	6·80	6,522	2,572	..	2·59	18·32	0·72	5·11	1·24	8·77	1·96	13·88	9 to 7	3 to 1½	3 to 9/10
34. Tauranga Borough Council	134,966	27,873	7,950	28·52	10,393	7·70	18,343	9,530	..	0·42	7·48	0·12	2·20	0·16	2·88	0·28	5·08	7	1½	2 to 1
35. Teviot Power Board ..	52,197	4,899	1,621	33·09	3,535	6·77	5,156	..	257	0·56	7·42	0·21	2·79	0·46	6·10	0·67	8·89	3 to ½	3 to ½	3 to ½
36. Waikaremoana (Public Works Dept.)	981,517	22,993	3,889	16·91	20,893	2·13	24,782	..	1,789	0·29	1·25	0·05	0·22	0·28	1·18	0·32	1·40	..	..	..
37. Wilson's Cement Co. (Wairua)	90,993	15,338	4,950	32·27	..	..	4,950	10,388	..	0·35	6·54	0·12	2·17	..	..	0·12	2·17	5½ to 5	1½	3 to 2½
38. Whakatane Borough Council	54,532	5,523	2,446	44·29	3,355	6·15	5,801	..	278	2·68	20·14	1·20	9·06	1·65	12·43	2·85	21·49	9	1½	3 to 1
Totals, over 1,000,000 units	10,961,788	1,067,159	417,114	39·09	622,550	5·68	1,039,664	155,747	128,252	0·57	8·00	0·23	3·22	0·34	4·81	0·57	8·03	..	..	..
Totals, hydro stations ..	11,263,463	1,112,551	441,629	39·70	636,895	5·65	1,078,524	163,426	129,399	0·59	9·52	0·24	3·90	0·35	5·62	0·59	9·52	..	..	..
Grand totals, generating-stations	14,492,582	1,809,457	808,618	44·69	849,622	5·86	1,658,240	284,721	133,504	0·68	12·28	0·31	5·61	0·33	5·89	0·64	11·50	..	..	..

TABLE XXXII.—SUMMARY OF RETURNS OF OPERATING RESULTS FOR THE YEAR ENDED 31ST MARCH, 1929—*continued*.

Title.	Capital Outlay at 31st March, 1929. (Total Expenditure—Depreciation not deducted.)	Total Revenue (not including Rates).	Working-expenses.		Capital Charges, &c.		Total Annual Costs.	Net Results.		Comparative Figures—Revenue and Expenditure.								Retail Selling-rates.		
			Total.	Per Cent. of Revenue.	Total.	Per Cent. of Capital Outlay.		Profit.	Loss.	Average Revenue from Sale of Energy.		Working-costs.		Capital Charges.		Total Costs.		Lighting.	Heating.	Power.
										Per Unit sold.	Per Kw. of Max.	Per Unit sold.	Per Kw. of Max.	Per Unit sold.	Per Kw. of Max.	Per Unit sold.	Per Kw. of Max.			
POPULATION BASIS.	DISTRIBUTING-STATIONS (CLASSIFIED ACCORDING TO POPULATION IN AREA).																			
Under 1,000.	£	£	£		£		£	£	£	d.	£	d.	£	d.	£	d.	£	d.	d.	d.
39. Kamo Town Board ..	3,154	882	613	69·50	232	7·36	845	37	..	6·04	36·67	4·21	25·54	1·59	9·67	5·80	35·21	9	4	4
40. Mangaweka Town Board ..	4,784	1,200	1,102	91·83	323	6·75	1,425	..	225	3·30	17·14	3·97	20·60	1·16	6·04	5·13	26·64	12	3½	4½
41. Te Puke Town Board ..	10,879	2,871	1,385	48·24	562	5·17	1,947	924	..	2·29	32·25	1·12	15·74	0·45	6·39	1·57	22·13	8	2½ to 1½	2½ to 1½
Totals, under 1,000 ..	18,817	4,953	3,100	62·59	1,117	5·94	4,217	961	225	2·79	28·01	1·87	18·73	0·67	6·75	2·54	25·48	..	..	..
From 1,000 to 2,500.																				
42. Bluff Borough Council ..	10,112	3,423	2,469	72·13	658	6·51	3,127	296	..	2·62	16·36	2·00	12·53	0·53	3·34	2·53	15·87	7 to 6	2	3 to ⅞
43. Halswell County Council ..	6,830	1,783	1,285	72·07	313	4·58	1,598	185	..	1·36	13·39	1·01	9·90	0·25	2·43	1·26	12·32	Flat rate.		
44. Inglewood Borough Council	12,644	3,658	2,371	64·82	750	5·93	3,121	537	..	2·67	25·69	1·97	18·97	0·62	6·00	2·59	24·97	6	2	2 to 1¾
45. Kaiapoi Borough Council ..	11,530	3,062	1,893	61·82	894	7·75	2,787	275	..	3·26	28·99	2·08	18·55	0·98	8·76	3·06	27·31	6	1½ to 1	3 to 1½
46. Mataura Borough Council ..	4,580	1,446	1,483	102·56	234	5·11	1,717	..	271	4·23	18·43	4·86	21·19	0·77	3·34	5·63	24·53	6	2½	2½
47. Otago Central Power Board..	68,375	6,702	2,894	43·18	4,525	6·62	7,419	..	717	1·53	20·68	0·68	9·19	1·06	14·37	1·74	23·56	£10 per kw. per annum	£12 per kw. for continuous service	£2 per kw. per annum.
48. Rangiora Borough Council..	11,296	4,026	2,658	66·02	397	3·51	3,055	971	..	2·85	27·72	1·92	18·72	0·29	2·80	2·21	21·52	6 to 2	2½ to ½	3 to ½
49. Te Aroha Borough Council..	19,671	7,086	4,264	60·17	643	3·27	4,907	2,179	..	2·78	33·38	1·78	21·32	0·27	3·22	2·05	24·54	7 to 5	3 to ½	3 to ½
50. Wairoa Borough Council ..	19,272	6,894	4,903	71·12	1,416	7·35	6,319	575	..	1·40	29·49	1·04	21·99	0·30	6·35	1·34	28·34	6	3 to 1	3 to 1½
51. Waitara Borough Council ..	11,424	3,621	1,815	50·12	900	7·88	2,715	906	..	4·31	36·44	2·39	20·17	1·18	10·00	3·57	30·17	9	3 to 1	3 to 1
Totals, 1,000 to 2,500 ..	175,734	41,701	26,035	62·43	10,730	6·11	36,765	5,924	988	2·13	24·73	1·41	16·34	0·58	6·74	1·99	23·08	..	..	..
From 2,500 to 5,000.																				
52. Banks Peninsula Power Bd.	99,546	12,259	8,101	66·08	7,223	7·26	15,324	..	3,065	3·00	34·68	2·06	23·83	1·84	21·24	3·90	45·07	10	2 to ⅜	3 to 1½
53. Lyttelton Borough Council..	6,930	4,759	4,046	85·02	272	3·92	4,318	441	..	2·08	22·86	1·82	20·03	0·12	1·35	1·94	21·38	4½	1	3 to 1
54. Stratford Borough Council..	28,335	11,268	5,680	50·41	3,426	12·09	9,106	2,162	..	2·21	29·61	1·11	14·95	0·67	9·02	1·78	23·97	8	4 to 1½	4 to 1
55. Sumner Borough Council ..	14,354	5,995	3,596	59·98	511	3·56	4,107	1,888	..	2·35	28·09	1·42	17·03	0·20	2·42	1·62	19·45	5	1½	1½
Totals, 2,500 to 5,000 ..	149,165	34,281	21,423	62·49	11,432	7·66	32,855	4,491	3,065	2·44	29·65	1·56	18·91	0·83	10·09	2·39	29·06	..	..	..
From 5,000 to 10,000.																				
56. Bay of Plenty Power Board..	178,950	9,401	7,583	80·66	7,589	4·90	15,172	..	5,771	1·61	11·59	1·36	9·80	1·36	9·81	2·72	19·61	10	4	3
57. Cambridge Power Board ..	104,349	18,341	9,964	54·33	7,484	7·17	17,448	893	..	1·55	29·19	0·91	17·15	0·68	12·88	1·59	30·03	9	3 to ¾	3 to ¾
58. Heathcote County Council ..	26,458	8,346	6,163	73·84	1,132	4·28	7,295	1,051	..	1·39	16·89	1·05	12·73	0·19	2·34	1·24	15·07	5	1½ to 1	3 to 1
59. Malvern Power Board ..	56,532	6,938	4,288	61·80	3,702	6·55	7,990	..	1,052	2·80	22·44	2·04	16·30	1·76	14·08	3·80	30·38	9 to 1	..	3 to 1
60. Riccarton Borough Council	18,343	9,179	6,983	76·08	591	3·22	7,574	1,605	..	1·23	22·27	1·04	18·84	0·09	1·59	1·13	20·43	6 to 1	1	1½
61. Tai Tapu Co-operative Dairy Co., Ltd.	10,298	3,840	2,805	73·05	410	3·98	3,215	625	..	1·62	18·74	1·22	14·17	0·18	2·07	1·40	16·24	P.W.D. flat rate.		
62. Tauranga Power Board ..	115,890	22,054	13,425	60·87	8,091	6·98	21,516	538	..	1·64	30·14	1·12	20·65	0·68	12·45	1·80	33·10	10 to 1¼	5 to 1¼	3 to 1
63. Te Awamutu Power Board	165,471	26,283	11,667	44·39	10,760	6·50	22,427	3,856	..	1·65	32·72	0·75	14·88	0·69	13·72	1·44	28·60	8 to 7	2 to 1½	3 to 1½
64. Thames Borough Council ..	31,705	9,229	7,256	78·62	1,268	4·00	8,524	705	..	2·55	26·43	2·03	21·03	0·35	3·68	2·38	24·71	8	3 to 1½	3 to ½
65. Tourist Department (Rotorua)	65,319	15,459	6,733	43·55	4,572	7·00	11,305	4,154	..	2·69	29·19	1·21	13·15	0·82	8·93	2·03	22·08	7	3 to 1	3 to 1
66. Wairoa Power Board ..	53,415	10,569	8,415	79·62	3,992	7·47	12,407	..	1,838	1·06	15·97	0·90	13·57	0·43	6·44	1·33	20·01	10 to 1	10 to 1	10 to 1
67. Waitomo Power Board ..	103,396	14,971	8,502	56·79	6,167	5·96	14,669	302	..	2·48	42·79	1·47	25·30	1·07	18·35	2·54	43·65	10	3 to 1½	2 to 1½
68. Whangarei Borough Council	56,013	20,861	13,427	64·36	2,223	3·97	15,650	5,211	..	2·40	34·78	1·58	22·95	0·26	3·80	1·84	26·75	5½ to 5	1½	3 to 2
Totals, 5,000 to 10,000 ..	986,139	175,471	107,211	61·10	57,981	6·03	165,192	18,940	8,661	1·77	25·51	1·14	16·49	0·62	8·92	1·76	25·41	..	..	..

Table XXXII.—Summary of Returns of Operating Results for the Year ended 31st March, 1929—*continued.*

Title.	Capital Outlay at 31st March, 1929. (Total Expenditure—Depreciation not deducted.)	Total Revenue (not including Rates).	Working-expenses.		Capital Charges, &c.		Total Annual Costs.	Net Results.		Comparative Figures—Revenue and Expenditure.								Retail Selling-rates.		
			Total.	Per Cent. of Revenue.	Total.	Per Cent. of Capital Outlay.		Profit.	Loss.	Average Revenue from Sale of Energy.		Working-costs.		Capital Charges.		Total Costs.		Lighting.	Heating.	Power.
										Per Unit sold.	Per Kw. of Max.	Per Unit sold.	Per Kw. of Max.	Per Unit sold.	Per Kw. of Max.	Per Unit sold.	Per Kw. of Max.			
Population Basis—*continued.*										DISTRIBUTING-STATIONS (classified according to Population in Area)—*continued.*										
From 10,000 to 20,000.	£	£	£		£		£	£	£	d.	£	d.	£	d.	£	d.	£	d.	d.	d.
69. Ashburton Power Board ..	325,250	38,948	20,915	53·70	20,866	6·42	41,781	..	2,833	2·17	26·14	1·18	14·20	1·18	14·17	2·36	28·37	8 to 1	3 to 1	3 to $\frac{9}{10}$
70. Central Power Board ..	279,440	46,152	21,390	46·35	18,596	6·65	39,986	6,166	..	1·76	34·90	0·84	16·58	0·73	14·42	1·57	31·00	8½	1½	3
71. Central Hawke's Bay Power Board	117,569	18,715	7,904	42·23	7,961	6·77	15,865	2,850	..	2·08	34·26	0·94	15·50	0·95	15·61	1·89	31·11	10	3 to 1½	3 to 1½
72. Dannevirke Power Board ..	188,811	24,030	10,926	45·47	11,817	6·26	22,743	1,287	..	2·75	39·95	1·31	19·03	1·42	20·59	2·73	39·62	8	3 to 1½	3 to 1
73. Franklin Power Board ..	221,835	34,404	14,707	42·75	13,607	6·13	28,314	6,090	..	1·66	25·32	0·85	12·90	0·78	11·94	1·63	24·84	8	3 to 1½	3 to 2
74. Hamilton Borough Council	72,570	33,552	18,668	55·64	4,899	6·75	23,567	9,985	..	2·94	35·21	1·64	19·65	0·43	5·16	2·07	24·81	5½	2	2
75. Hastings Borough Council ..	106,155	24,815	16,368	65·96	5,385	5·07	21,753	3,062	..	2·34	32·64	1·55	21·59	0·51	7·10	2·06	28·69	8 to 1½	4 to 1½	3 to 1½
76. Hawke's Bay Power Board..	221,433	39,758	23,505	59·12	13,724	6·20	37,229	2,529	..	0 92	14·08	0·59	8·99	0·34	5·25	0·93	9·24	8 to 1½	8 to 1½	3 to 1½
77. Horowhenua Power Board..	186,793	40,397	23,858	59·06	12,763	6·83	36,621	3,776	..	1·53	19·68	0·94	12·06	0·50	6·45	1·44	18·51	8	4 to 1½	4 to 2
78. Napier Borough Council ..	150,612	44,646	27,347	61·25	7,836	5·20	35,183	9,463	..	2·53	34·10	1·57	21·18	0·45	6·07	2·02	27·25	6 to 1½	3 to 1½	3 to 1½
79. North Canterbury Power Bd.	97,061	10,280	6,654	64·73	662	0·68	7,316	2,964	..	1·61	9·80	1·06	6·45	0·11	0·64	1·17	7·09	8 to 3	2 to 1	3 to ½
80. Otago Power Board ..	264,336	29,537	19,499	66·02	17,769	6·56	37,268	..	7,731	1·64	19·75	1·10	13·18	1·00	12·01	2·10	25·19	8	1⅓	1
81. Palmerston N. Borough Cl.	202,902	52,631	21,057	40·01	12,888	6·35	33,945	18,686	..	2·05	28·46	0·83	11·63	0·51	7·12	1·34	18·75	6	4 to 1½	3 to 1¾
82. Springs-Ellesmere Power Bd.	119,280	19,443	11,002	56·59	7,870	6·60	18,872	571	..	1·69	17·99	0·98	10·37	0·70	7·42	1·68	17·79	8 to 7	3 to ½	3 to ½
83. Tararua Power Board ..	147,500	20,503	9,607	46·86	9,266	6·28	18,873	1,630	..	1·95	35·43	0·96	17·56	0·93	16·94	1·89	34·50	8	4 to 1	4½ to ½
84. Timaru Borough Council ..	109,121	31,352	16,585	52·90	9,161	8·40	25,746	5,606	..	2·10	23·52	1·18	13·18	0·65	7·28	1·83	20·46	7	3 to 1½	2½ to ¾
85. Waimairi County Council ..	74,253	19,364	12,086	62·41	3,054	4·11	15,140	4,224	..	1·30	21·66	0·81	13·52	0·20	3·42	1·01	16·94	5 to 1½	2 to 1	3 to ⅓
86. Wairarapa Power Board ..	333,048	45,353	18,775	41·40	23,932	7·19	42,707	2,646	..	2·21	39·49	0·99	17·71	1·26	22·58	2·25	40·29	7	3½ to 1¾	4½ to 2
87. Waitaki Power Board ..	158,522	32,585	13,576	41·66	11,888	7·50	25,464	7,121	..	2·40	32·11	1·03	13·85	0·91	12·13	1·94	25·98	8 to 3	3 to ⅛	3 to ½
Totals, 10,000 to 20,000 ..	3,376,491	606,465	314,429	51·85	213,944	6·32	528,373	88,656	10,564	1·86	25·65	1·00	13·85	0·68	9·42	1·68	23·27	..	..	..
From 20,000 to 30,000.																				
88. Invercargill Borough Council	161,418	48,601	26,726	54·99	11,171	6·92	37,897	10,704	..	2·24	26·16	1·30	15·15	0·54	6·33	1·84	21·48	$6\frac{7}{10}$ to 1⅔	..	$2\frac{7}{10}$ to 1
From 30,000 to 50,000.																				
89. Hutt Valley Power Board ..	341,558	76,448	41,561	54·37	22,115	6·47	63,676	12,772	..	1·66	24·85	0·93	13·85	0·49	7·37	1·42	21·22	6 to 5	3 to 1	3 to 1
90. Manawatu-Oroua Power Bd.	461,565	61,713	30,494	49·41	28,730	6·22	59,224	2,489	..	1·07	20·79	0·54	10·51	0·51	9·90	1·05	20·41	8	3½ to 1½	4½ to ½
91. South Canterbury Power Bd.	302,044	44,828	26,305	58·68	20,957	6·94	47,262	..	2,434	1·32	17·66	0·78	10·46	0·62	8·34	1·40	18·80	8 to 3	3 to 2	3 to 1
92. Thames Valley Power Board	758,839	125,792	71,332	56·71	52,038	6·86	123,370	2,422	..	1·47	28·46	0·86	16·70	0·63	12·18	1·49	28·88	8	3 to 1½	7 to 3
93. Waitemata Power Board ..	336,507	61,031	30,080	49·29	23,027	6·84	53,107	7,924	..	1·90	37·92	0·99	19·79	0·76	15·15	1·75	34·94	6⅛	3½ to 1¾	3½ to 1¾
Totals, 30,000 to 50,000 ..	2,200,513	369,812	199,772	54·02	146,867	6·67	346,639	25,607	2,434	1·45	25·23	0·81	14·06	0·59	10·34	1·40	24·40	..	..	..
50,000 and over.																				
94. Christchurch City Council ..	684,702	234,110	120,925	51·65	50,294	7·35	171,219	62,891	..	1·25	17·84	0·72	10·25	0·30	4·26	1·02	14·51	6 to 1	1½ to 1	1½ to ¾
95. Wanganui-Rangitikei Power Board	511,863	103,086	49,500	48·02	35,484	6·96	84,984	18,102	..	1·87	27·48	0·94	13·79	0·67	9·88	1·61	23·67	6 to 5	3 to 2½	..
96. Wellington City Council ..	1,055,804	326,304	136,894	41·95	37,151	3·52	174,045	152,259	..	2·09	23·61	0·89	10·01	0·24	2·72	1·13	12·73	6 to 3	2 to 1	2¾ to 1¼
Totals, 50,000 and over ..	2,252,369	663,500	307,319	46·32	122,929	5·46	430,248	233,252	..	1·68	21·75	0·82	10·57	0·33	4·23	1·15	14·80	..	..	..
Grand totals, distributing-stations	9,320,646	1,944,784	1,006,015	51·73	576,171	6·22	1,582,186	388,535	25,937	1·72	24·15	0·93	13·04	0·53	7·47	1·46	20·51	..	..	..
Dominion totals, all stations	23,813,228	3,754,241	1,814,633	48·34	1,425,793	5·99	3,240,426	673,256	159,441	..	..	..	..	..	..	..	..	..	..	..

TABLE XXXIII.—ELECTRIC-SUPPLY STATIONS OF NEW ZEALAND AT 31ST MARCH, 1929.

Title.	Supply commenced.	Population included in Area of Supply.	Number of Consumers.	Capacity. Main Plant.	Capacity. Stand-by Plant.	Capacity. Maximum Load.	Connected Load.	Demand Factor.	Units. Generated.	Units. Purchased.	Units. Total.	Units. Sold (including Sales in Bulk).	Units. Non-productive.	Units. Percentage Non-productive.	Annual Load Factor.	Average Units sold (excluding Sales in Bulk) per Consumer.	Average Units sold (excluding Sales in Bulk) per Capita of Population.	System of Supply.	Supply Voltage.	Route-miles of Lines.	Static Head.
									GENERATING-STATIONS (CLASSIFIED ACCORDING TO UNITS GENERATED).												
				Kv.a.	Kv.a.	Kw.	Kw.	Per Cent.							Per Cent.						Ft.
STEAM STATIONS. *Over 1,000,000 Units.*																					
1. Auckland Power Board	1908	175,000	40,617	25,450	..	28,100	168,000	16·7	103,047,035	10,108,461	113,155,496	93,634,531	19,520,965	17·3	46·0	2,305*	535	A.C./D.C.	230/400/460	933·5	..
2. Grey Power Board	1926	12,700	1,807	1,250	..	990	3,752	26·4	3,112,130	42,534	3,154,664	2,522,730	631,934	20·0	36·4	1,396*	199	A.C.	400/230	84	..
3. Nelson City Council	1923	11,500	2,235	624	937	560	4,437	12·6	1,692,160	..	1,692,160	1,314,399	377,761	22·3	34·5	556	108	A.C.	415/236	46·5	..
Totals, steam stations	..	199,200	44,659	27,324	937	29,650	176,189	16·8	107,851,325	10,150,995	118,002,320	97,471,660	20,530,660	17·4	45·4	2,181	489	..	..	1,064	..
GAS STATIONS. *Under 100,000 Units.*																					
4. Kaikoura County Council ..	1922	630	146	47	..	30	106	28·3	44,430	..	44,430	30,909	13,521	30·4	16·9	212	49	A.C.	400/230	5·0	..
5. Motueka Borough Council ..	1922	1,600	302	65	..	57	187	30·5	58,124	..	58,124	49,714	8,410	14·5	11·6	165	31	A.C.	400/230	11·7	..
Totals, gas stations.. ..	..	2,230	448	112	..	87	293	29·7	102,554	..	102,554	80,623	21,931	21·4	13·5	180	36	..	..	16·7	..
OIL STATIONS. *Under 100,000 Units.*																					
6. Uawa County Council	1925	400	95	30	..	20	63	31·8	21,803	..	21,803	15,996	5,807	26·6	12·4	168	40	D.C.	230	3	..
From 100,000 to 250,000 Units.																					
7. Picton Borough Council	1917	1,350	350	136	..	66	474	13·8	127,910	..	127,910	95,817	32,093	25·1	22·3	274	71	D.C.	230/460	10	279
Over 1,000,000 Units.																					
8. Poverty Bay Power Board ..	1912	23,670	3,943	850	300	1,043	6,981	14·9	3,008,509	249,000	3,257,509	2,407,503	850,006	26·1	35·7	611	102	A.C./D.C.	460/400/230	199·5	..
Totals, oil stations	..	25,420	4,388	1,016	300	1,129	7,518	15·0	3,158,222	249,000	3,407,222	2,519,316	887,906	26·1	34·5	574	99	..	..	212·5	..
HYDRO STATIONS. *Under 250,000 Units.*																					
9. Ohakune Borough Council ..	1914	2,400	478	120	141	98	566	17·3	184,294	..	184,294	159,023	25,271	13·7	21·5	333	66	A.C.	400/230	19	42
10. Queenstown Borough Council ..	1924	807	214	60	..	75	278	27·0	150,300	..	150,300	82,038	68,212	45·4	22·9	384	102	A.C.	230/400	25	510
11. Reefton	1887	1,200	307	86	..	66	264	25·0	96,000	..	96,000	72,000	24,000	25·0	16·6	235	60	D.C.	220	7·25	27
12. Waimea Electric Supply and Manufacturing Co., Ltd.	1912	4,000	652	100	40	104	862	12·1	100,836	61,184	162,020	128,995	33,025	20·4	17·8	198	32	A.C.	230/400	35	11
13. Westland Power, Ltd.	1928	4,200	32	620	200	130	525	24·8	154,800	..	154,800	123,840	30,960	20·0	27·2	3,870*	29	A.C.	400/230	35	355
Totals, under 250,000 units ..	..	12,607	1,683	986	381	473	2,495	19·0	686,230	61,184	747,414	565,946	181,468	24·3	18·0	336	45	..	..	121·25	..
From 250,000 to 500,000 Units.																					
14. Havelock North Town Board ..	1916	1,100	262	180	..	145	527	27·5	415,900	..	415,900	270,555	145,345	35·0	32·8	1,033*	246	A.C.	400/230	16·5	50
15. Kaponga Town Board	1916	1,200	369	165	..	172	585	29·4	326,859	129,048	455,907	366,659	89,248	19·6	30·3	994	306	A.C./D.C.	400/230/230	50	58/31
16. Murchison County Council ..	1922	450	112	100	..	97	261	37·2	250,200	..	250,200	165,391	84,809	33·9	29·4	1,477	368	A.C.	400/230	14	105
17. Patea Borough Council	1901	1,800	325	82	80	92	305	30·2	319,440	..	319,440	274,680	44,760	14·0	39·6	845	153	A.C.	110/220	13·8	78
18. Raetihi Borough Council ..	1917	4,500	387	350	120	148	700	21·1	428,300	..	428,300	321,225	107,075	25·0	33·0	830	71	A.C.	400/230	28	380
19. Westport Borough Council ..	1925	4,000	528	250	..	158	645	24·6	406,640	..	406,640	272,974	133,666	32·9	29·3	517	68	A.C.	400/230	21·5	430
Totals, 250,000 to 500,000 units	..	13,050	1,983	1,127	200	812	3,023	26·9	2,147,339	129,048	2,276,387	1,671,484	604,903	24·4	31·1	843	128	..	..	143·8	..

* Includes wholesale supply to tramways, boroughs, large industrial, mining, and pumping loads.

TABLE XXXIII.—ELECTRIC-SUPPLY STATIONS OF NEW ZEALAND AT 31ST MARCH, 1929—*continued.*

Title.	Supply commenced.	Population included in Area of Supply.	Number of Consumers.	Capacity.			Connected Load.	Demand Factor.	Units.						Annual Load Factor.	Average Units sold (excluding Sales in Bulk) per Consumer.	Average Units sold (excluding Sales in Bulk) per Capita of Population.	System of Supply.	Supply Voltage.	Route-miles of Lines.	Static. Head
				Main Plant.	Stand-by Plant.	Maximum Load.			Generated.	Purchased.	Total.	Sold (including Sales in Bulk).	Non-productive.	Percentage Non-productive.							
GENERATING-STATIONS (CLASSIFIED ACCORDING TO UNITS GENERATED)—*continued.*																					
HYDRO STATIONS—*continued.*								Per Cent.						Per Cent.							Ft.
From 500,000 to 750,000 Units.				Kv.a.	Kv.a.	Kw.	Kw.														
20. Taihape Borough Council ..	1913	2,450	589	150	75	214	957	22·4	507,620	..	507,620	383,738	123,882	24·4	27·1	652	157	D.C.	460/230	10·25	30
21. Wairere Power Board	1925	2,000	251	480	..	232	1,025	22·6	713,712	..	713,712	642,341	71,371	10·0	35·1	2,559	321	A.C.	400/230	87·25	65
Totals, 500,000 to 750,000 units ..	..	4,450	840	630	75	446	1,982	22·5	1,221,332	..	1,221,332	1,026,079	195,253	16·0	31·3	1,222	231	..	..	97·50	..
Over 1,000,000 Units.																					
22. Coleridge	1915	..	61	33,750	..	24,370	157,415	15·5	108,011,955	..	108,011,955	95,926,207	12,085,748	11·2	50·6	..	..	A.C.	400/230	519·5	480
23. **Dunedin City Council**	1907	80,000	21,540	16,250	860	12,810	59,950	21·4	54,393,220	..	54,393,220	42,774,183	11,619,037	21·4	48·8	1,735*	467	A.C.	400/230	496	700
24. Hawera County Electric Co., Ltd..	1903	12,470	2,449	634	607	621	3,990	15·6	1,649,510	..	1,649,510	1,534,549	114,961	7·0	30·3	627	123	A.C.	400/230	78	57
25. Horahora	1921	..	..	12,860	..	15,900	77,121	20·6	92,216,392	12,776,370	104,992,762	92,707,271	12,285,491	11·7	75·4	..	566	A.C.	..	441·5	27
26. Kanieri Electric Light, Ltd. ..	1921	2,500	523	700	150	710	1,177	62·9	3,269,900	..	3,269,900	2,572,570	697,330	21·3	50·4	4,919*	1,029	A.C.	400/230	17·8	250
27. Mangahao	1925	..	59	24,000	..	20,960	211,303	9·9	98,327,690	29,569,390	127,897,080	119,801,706	8,095,374	6·3	69·7	..	..	A.C.	400/230	358·4	896
28. Marlborough Power Board ..	1927	14,530	1,962	625	..	760	3,220	23·6	3,182,851	..	3,182,851	2,170,389	1,012,462	31·8	47·8	959	129	A.C.	230/400	268	100
29. New Plymouth Borough Council ..	1905	21,000	5,620	4,125	..	2,500	15,000	16·7	11,855,920	545,570	12,401,490	9,824,200	2,577,290	20·8	56·6	1,631*	436	A.C.	400/230	240	120/240
30. Opunake Power Board	1924	7,000	1,200	380	..	(380)	(1,791)	21·2	1,327,800	85,660	1,413,460	1,235,350	178,110	12·6	42·5	1,029	176	A.C.	400/230	146	53
31. Southland Power Board	1925	67,090	8,298	7,050	..	5,250	34,493	15·2	22,389,760	13,480	22,403,240	15,980,658	6,422,582	28·7	48·7	1,202*	149	A.C.	400/230	2,380	154
32. Taranaki Power Board	1927	12,285	1,796	3,600	..	2,376	6,640	35·8	7,353,900	9,300	7,363,200	6,633,200	730,000	9·9	35·4	2,555*	373	A.C.	400/230	266	300
33. Taumarunui Borough Council ..	1924	4,000	764	500	..	470	1,478	31·8	1,166,996	..	1,166,996	799,185	367,811	31·5	28·3	1,046	200	A.C.	415/230	15·5	25
34. Tauranga Borough Council ..	1915	2,500	887	4,800	..	3,612	4,796	76·5	18,162,714	..	18,162,714	15,331,361	2,831,353	15·6	57·4	1,896*	673	A.C.	400/230	64·20	110/86
35. Teviot Power Board	1924	1,500	350	750	..	580	2,135	24·5	2,322,937	..	2,322,937	1,858,350	464,587	20·0	45·6	4,165*	972	A.C.	240/400	66	380
36. Waikaremoana	1928	..	22	20,000	1,500	17,750	13,481	..	18,684,260	..	18,684,260	18,190,615	493,645	2·6	12·0	..	..	A.C.	230/400	127	645
37. Wairua Hydro Power Station ..	1916	..	44	2,500	..	2,280	8,781	26·0	11,415,660	..	11,415,660	10,091,966	1,323,694	11·6	57·2	2,077*	..	A.C.	400/230	36·8	130
38. Whakatane Borough Council ..	1922	1,800	432	240	..	270	667	40·5	1,005,888	..	1,005,888	487,196	518,692	51·6	42·5	1,128	271	A.C.	400/230	25	258
Totals, over 1,000,000 units..	..	226,675	46,007	132,264	3,117	111,629	603,438	18·5	456,737,353	42,999,770	499,737,123	437,918,956	61,818,167	12·4	51·1	2,003	407	..	..	5,545·7	..
Totals, hydro stations ..	..	256,782	50,513	135,007	3,773	113,360	610,938	18·6	460,792,254	43,190,002	503,982,256	441,182,465	62,799,791	12·4	50·7	1,889	371	..	..	5,908·25	..
Grand totals, generating stations	..	483,632	100,008	163,459	5,010	144,226	794,938	18·1	571,904,355	53,590,097	625,494,352	541,254,064	84,240,288	13·5	49·5	1,954	403	..	..	7,201·45	..
DISTRIBUTING-STATIONS (CLASSIFIED ACCORDING TO POPULATION IN AREA).																					
POPULATION BASIS.																					
Under 1,000.																					
39. Kamo Town Board	1923	600	98	..	..	(24)	147	16·3	..	34,946	34,946	34,946	..	..	16·6	357	58	A.C.	400/230	5·6	..
40. Mangaweka Town Board ..	1913	350	100	40	..	52·5	184	29·1	33,767	61,213	94,980	66,696	28,284	29·8	20·1	667	191	A.C.	230/400	8	37
41. Te Puke Town Board	1921	980	261	..	..	(88)	(544)	16·2	..	323,326	323,326	297,337	25,989	8·0	41·9	1,139*	303	A.C.	400/230	8·75	..
Totals, under 1,000.. ..	..	1,930	459	40	..	165·5	875	18·9	33,767	419,485	453,252	398,979	54,273	12·0	31·3	869	207	..	..	22·35	..
From 1,000 to 2,500.																					
42. Bluff Borough Council	1903	1,690	394	..	..	197	910	21·7	..	350,076	350,076	295,627	54,449	15·6	20·3	750	175	A.C.	230/400	9·62	..
43. Halswell County Council ..	1919	1,850	235	..	..	129	344	37·7	..	359,671	359,671	305,721	53,950	15·0	31·8	1,301*	165	A.C.	400/230	22	..
44. Inglewood Borough Council ..	1905	1,300	415	..	120	125	1,172	10·7	..	400,876	400,876	288,360	112,516	28·1	36·6	695	222	A.C.	400/230	8·13	38
45. Kaiapoi Borough Council ..	1917	1,800	460	..	..	102	560	18·2	..	269,153	269,153	217,969	51,184	19·0	30·1	474	121	A.C.	400/230	21	..
46. Mataura Borough Council ..	1913	1,300	307	..	75	70	340	20·6	..	96,436	96,436	73,257	23,179	24·0	15·7	239	56	A.C.	440/220	8	22
47. Otago Central Power Board ..	1925	2,037	698	..	..	315	1,045	30·1	..	1,235,859	1,235,859	1,023,448	212,411	17·2	44·8	1,466	502	A.C.	400/230	124	..
48. Rangiora Borough Council ..	1919	2,100	532	..	..	142	1,029	13·8	..	411,350	411,350	332,025	79,325	19·3	33·1	624	158	A.C.	400/230	12	..
49. Te Aroha Borough Council ..	1906	2,350	658	150	..	200	1,325	15·1	143,491	513,580	657,071	576,382	80,689	12·3	37·5	876	245	A.C.	400/230	15·72	600
50. Wairoa Borough Council ..	1913	2,337	631	..	..	223	1,849	12·1	..	1,236,710	1,236,710	1,129,241	107,469	8·7	63·3	1,790*	483	A.C.	400/230	13	..
51. Waitara Borough Council ..	1907	1,787	432	..	..	90	600	15·0	..	256,900	256,900	182,593	74,307	28·9	32·6	423	102	A.C.	400/230	11·63	..
Totals, 1,000 to 2,500 ..	..	18,551	4,762	150	195	1,593	9,174	17·4	143,491	5,130,611	5,274,102	4,424,623	849,479	16·1	37·8	929	239	..	..	245·10	..

* Includes wholesale supply to tramways, boroughs, large industrial, mining, and pumping loads.

TABLE XXXIII.—ELECTRIC-SUPPLY STATIONS OF NEW ZEALAND AT 31ST MARCH, 1929—*continued.*

Title.	Supply commenced.	Population included in Area of Supply.	Number of Consumers.	Capacity.			Connected Load.	Demand Factor.	Units.						Annual Load Factor.	Average Units sold (excluding Sales in Bulk) per Consumer.	Average Units sold (excluding Sales in Bulk) per Capita of Population.	System of Supply.	Supply Voltage.	Route-miles of Lines.	Static Head.
				Main Plant.	Stand-by Plant.	Maximum Load.			Generated.	Purchased.	Total.	Sold (including Sales in Bulk).	Non-productive.	Percentage Non-productive.							
DISTRIBUTING-STATIONS (CLASSIFIED ACCORDING TO POPULATION IN AREA)—*continued.*																					
POPULATION BASIS—*continued.*				Kv.a.	Kv.a.	Kw.	Kw.	Per Cent.							Per Cent.						Ft.
From 2,500 to 5,000.																					
52. Banks Peninsula Power Board ..	1921	4,050	931	..	..	340	2,745	12·4	48,637	1,366,950	1,415,587	944,376	471,211	33·3	47·6	1,014	233	A.C.	400/230	196	310
53. Lyttelton Borough Council ..	1917	3,749	603	..	..	202	1,634	12·4	..	695,416	695,416	532,439	162,977	23·4	39·3	883	142	A.C.	400/230	9·2	..
54. Stratford Borough Council ..	1898	3,400	944	..	..	380	1,754	21·7	..	1,451,956	1,451,956	1,222,694	229,262	15·8	43·6	1,295	360	A.C.	400/230	19·5	..
55. Sumner Borough Council ..	1918	3,500	930	..	..	211	1,412	14·9	..	797,474	797,474	606,719	190,755	23·9	43·1	652	173	A.C.	400/230	47·75	..
Totals, 2,500 to 5,000 ..	..	14,699	3,408	..	..	1,133	7,545	15·0	48,637	4,311,796	4,360,433	3,306,228	1,054,205	24·2	43·9	970	225	..	..	272·45	..
From 5,000 to 10,000.																					
56. Bay of Plenty Power Board ..	1923	8,525	907	..	..	774	3,664	21·1	..	1,673,765	1,673,765	1,339,012	334,753	20·0	24·7	1,429	152	A.C.	400/230	212	..
57. Cambridge Power Board ..	1921	6,000	1,203	..	..	581	2,461	23·6	..	3,454,000	3,454,000	2,625,040	828,960	24·0	67·9	2,182	438	A.C.	400/230	144·5	..
58. Heathcote County Council ..	1914	6,000	1,121	..	..	484	3,223	15·0	..	1,639,559	1,639,559	1,413,512	226,047	13·8	38·7	1,261	236	A.C.	400/230	31	..
59. Malvern Power Board	1925	5,050	590	..	..	263	1,894	13·9	..	753,540	753,540	505,415	248,125	32·9	32·7	857	100	A.C.	400/230	152	..
60. Riccarton Borough Council ..	1916	5,000	1,256	..	..	371	3,663	10·1	..	1,793,280	1,793,280	1,611,107	182,173	10·2	55·2	1,283	322	A.C.	400/230	18·25	..
61. Tai Tapu Co-operative Dairy Co. ..	1915	5,700	237	..	..	198	436	45·4	..	687,566	687,566	550,036	137,530	20·0	39·6	2,321	96	A.C.	400/230	29·8	..
62. Tauranga Power Board	1926	8,280	815	..	..	650	2,808	23·2	..	2,862,325	2,862,325	2,862,325	..	..	50·3	3,512	346	A.C.	400/230 460/230	285	..
63. Te Awamutu Power Board ..	1921	7,620	1,434	..	..	784	4,117	19·0	..	4,535,205	4,535,205	3,723,824	811,381	17·9	66·0	2,355	443	A.C.	415/230	295·6	..
64. Thames Borough Council ..	1914	5,000	1,091	100	105	345	1,568	22·0	70,000	1,283,510	1,353,510	858,270	495,240	36·6	44·8	787	172	A.C./D.C.	460/400/230	20	130
65. Tourist Department (Rotorua) ..	1901	5,500	1,557	200	187	512	3,194	16·0	684,283	1,028,030	1,712,313	1,332,914	379,399	22·2	38·2	856	242	A.C.	400/230 200/115	46·8	14
66. Wairoa Power Board	1923	5,341	314	..	..	620	3,122	19·9	..	2,825,000	2,825,000	2,238,741	586,259	20·8	52·0	1,890*	111	A.C.	415/230	84·5	..
67. Waitomo Power Board	1926	8,000	1,178	..	..	336	1,790	18·8	..	1,634,708	1,634,708	1,389,457	245,251	15·0	55·5	1,180	174	A.C.	230/400	69·5	..
68. Whangarei Borough Council ..	1915	7,000	1,918	..	..	585	4,161	14·1	..	2,274,270	2,274,270	2,033,842	240,428	10·6	44·4	1,042*	286	A.C.	400/230	30·7	..
Totals, 5,000 to 10,000 ..	..	83,016	13,621	300	292	6,503	36,101	18·0	754,283	26,444,758	27,199,041	22,483,495	4,715,546	17·3	47·7	1,499	246	..	..	1,419·65	..
From 10,000 to 20,000.																					
69. Ashburton Power Board ..	1923	17,500	3,250	..	200	1,473	10,264	14·4	1,890	5,416,142	5,418,032	4,254,801	1,163,231	21·5	42·0	1,309	243	A.C.	400/230	827	..
70. Central Power Board	1921	18,039	3,336	..	..	1,290	7,992	16·1	..	7,327,537	7,327,537	6,146,772	1,180,765	16·1	64·8	1,843	341	A.C.	400/230	415·5	..
71. Central Hawke's Bay	1925	11,000	1,369	..	80	510	3,681	13·9	..	2,497,522	2,497,522	2,011,760	485,762	19·5	55·9	1,424	177	A.C.	415/230	98	..
72. Dannevirke Power Board ..	1925	12,614	2,011	..	..	574	5,128	11·2	..	2,461,797	2,461,797	2,001,854	459,943	18·7	49·0	995	159	A.C.	415/230	292·4	..
73. Franklin Power Board	1925	16,359	2,716	..	350	1,140	5,839	19·5	..	4,995,008	4,995,008	4,162,507	832,501	16·7	50·0	1,533	254	A.C.	400/230	358	..
74. Hamilton Borough Council ..	1913	14,500	3,552	..	..	950	6,844	13·9	..	3,346,880	3,346,880	2,734,303	612,577	18·3	40·2	770	189	A.C.	400/230	47·4	..
75. Hastings Borough Council ..	1912	10,150	3,119	1,175	..	758	5,720	13·3	..	2,988,136	2,988,136	2,539,340	448,796	15·0	45·0	814	250	A.C./D.C.	400/230 460/230	54·5	..
76. Hawke's Bay	1927	15,501	1,985	..	..	2,616	17,982	14·6	..	11,542,039	11,542,039	9,579,899	1,962,140	17·0	50·4	552	71	A.C.	400/230	233	..
77. Horowhenua Power Board ..	1924	16,240	2,991	..	..	1,978	8,504	23·3	..	7,282,258	7,282,258	6,115,330	1,166,928	16·0	42·0	2,045	377	A.C.	400/230	278	..
78. Napier Borough Council ..	1913	18,680	3,782	..	1,330	1,291	6,161	21·0	1,197,565	3,870,010	5,067,575	4,183,839	883,736	17·4	44·8	1,019	206	A.C./D.C.	230/400 230/460	34·1	..
79. North Canterbury Power Board ..	1928	13,085	1,040	..	..	1,032	4,416	23·4	..	2,153,087	2,153,087	1,504,099	648,988	30·1	23·8	864	68	A.C.	400/230	193	..
80. Otago Power Board	1926	13,301	3,392	..	..	1,480	8,513	17·4	..	5,427,583	5,427,588	4,272,848	1,154,735	21·3	41·9	1,242	317	A.C.	400/230	553·5	..
81. Palmerston North Borough Council	1924	19,750	4,631	..	1,350	1,810	11,436	15·8	1,044,438	5,822,460	6,866,898	6,028,711	838,187	12·2	43·3	1,127	264	A.C.	400/230	74·9	..
82. Springs-Ellesmere Power Board ..	1922	11,370	1,849	..	..	1,061	5,922	17·9	..	3,140,820	3,140,820	2,704,633	436,187	13·9	33·8	1,463	238	A.C.	400/230	261·3	..
83. Tararua Power Board	1925	10,255	1,371	..	..	547	3,868	14·1	..	2,678,400	2,678,400	2,389,976	288,424	10·8	55·9	1,743	233	A.C.	400/230	169·2	..
84. Timaru Borough Council ..	1908	17,500	2,974	..	250	1,258	7,377	17·1	..	3,556,644	3,556,644	3,383,791	172,853	4·9	32·2	1,138	193	A.C.	420/240	53·1	..
85. Waimairi County Council ..	1916	13,000	2,888	..	..	894	9,123	9·8	..	3,984,140	3,984,140	3,585,726	398,414	10·0	50·9	1,242	276	A.C.	415/230	140	..
86. Wairarapa Power Board ..	1924	19,500	3,410	..	837	1,060	10,126	10·5	2,154,192	3,727,654	5,881,846	4,551,824	1,330,022	22·6	63·3	1,170	205	A.C.	400/230	439·3	429/290
87. Waitaki Power Board	1926	17,820	2,891	150	240	980	7,312	13·4	150,318	3,739,033	3,889,351	3,151,925	737,426	19·0	45·3	1,078	175	A.C.	400/230	355	250
Totals, 10,000 to 20,000 ..	..	286,164	52,557	1,325	4,637	22,702	146,208	15·5	4,548,403	85,957,150	90,505,553	75,303,938	15,201,615	16·8	45·5	1,224	225	..	..	4,877·2	..
From 20,000 to 30,000.																					
88. Invercargill Borough Council ..	1914	21,000	4,486	..	2,450	1,764	11,197	15·8	27,300	5,618,700	5,646,000	4,945,217	700,783	12·4	36·5	1,102	235	A.C./D.C.	400/230/600	82·3	..

* Includes wholesale supply to tramways, boroughs, large industrial, mining, and pumping loads.

TABLE XXXIII.—ELECTRIC-SUPPLY STATIONS OF NEW ZEALAND AT 31ST MARCH, 1929—*continued.*

Title.	Supply commenced.	Population included in Area of Supply.	Number of Consumers.	Capacity.			Connected Load.	Demand Factor.	Units.						Annual Load Factor.	Average Units sold (excluding Sales in Bulk) per Consumer.	Average Units sold (excluding Sales in Bulk) per Capita of Population.	System of Supply.	Supply Voltage.	Route-miles of Lines.	Static Head.
				Main Plant.	Stand-by Plant.	Maximum Load.			Generated.	Purchased.	Total.	Sold (including Sales in Bulk).	Non-productive.	Percentage Non-productive.							
DISTRIBUTING-STATIONS (CLASSIFIED ACCORDING TO POPULATION IN AREA)—*continued.*																					
POPULATION BASIS—*continued.*				Kv.a.	Kv.a.	Kw.	Kw.	Per Cent.						Per Cent.	Per Cent.						Ft.
From 30,000 to 50,000.																					
89. Hutt Valley Power Board ..	1925	38,560	8,181	..	500	3,000	25,152	11·9	..	13,812,447	13,812,447	10,774,189	3,038,258	22·0	52·6	1,317	279	A.C.	400/230	266·6	..
90. Manawatu-Oroua Power Board ..	1924	39,011	4,116	..	..	2,901	13,079	22·2	..	16,229,000	16,229,000	13,550,977	2,678,023	16·5	63·9	1,875*	198	A.C.	400/230	536	..
91. South Canterbury Power Board ..	1925	41,743	2,999	40	..	2,514	15,727	16·0	98,696	9,144,100	9,242,796	8,095,830	1,146,966	12·4	42·0	1,514*	109	A.C.	400/230	683·1	66
92. Thames Valley Power Board ..	1921	40,800	5,218	..	..	4,272	18,192	23·5	..	24,748,000	24,748,000	19,838,000	4,910,000	19·8	66·1	3,415*	437	A.C.	415/230	692	..
93. Waitemata Power Board ..	1926	38,370	6,618	..	..	1,520	13,150	11·6	..	8,012,795	8,012,795	7,273,318	739,477	9·2	60·2	1,099	190	A.C.	400/230	357·8	..
Totals, 30,000 to 50,000 ..	..	198,484	27,132	40	500	14,207	85,300	16·7	98,696	71,946,342	72,045,038	59,532,314	12,512,724	17·4	57·9	1,774	243	..	..	2,535·5	..
50,000 and over.																					
94. Christchurch City Council ..	1904	91,500	26,688	..	400	11,800	83,284	14·2	..	45,822,690	45,822,690	40,470,596	5,352,094	11·7	44·3	1,366*	398	A.C.	460/400/230	276	..
95. Wanganui-Rangitikei Power Board	1924	52,000	8,185	1,650	..	3,590	21,988	16·3	3,474,710	12,335,003	15,809,713	12,647,773	3,161,940	20·0	50·3	1,545*	243	A.C.	400/230	500	..
96. Wellington City Council ..	1888	110,000	25,000	8,000	1,650	13,682	86,600	15·8	13,874,219	34,183,480	48,057,699	37,024,751	11,032,948	23·0	24·2	1,329*	302	A.C./D.C.	400/230/105	327	..
Totals, 50,000 and over ..	..	253,500	59,873	9,650	2,050	29,072	191,872	15·2	17,348,929	92,341,173	109,690,102	90,143,120	19,546,982	17·8	43·1	1,375	325	..	..	1,103	..
Grand totals, distributing-stations ..	..	877,344	166,298	11,505	10,124	77,139·5	488,272	15·8	23,003,506	292,170,015	315,173,521	260,537,914	54,635,607	17·3	46·6	1,373	260	..	..	10,557·55	..
Dominion totals, all stations ..	..	1,360,976	266,306	174,964	15,134	..	..	..	594,907,861	345,694,164	..	..	138,810,047	23·3	..	1,591*	312	..	..	17,759	..

* Includes wholesale supply to tramways, boroughs, large industrial, mining, and pumping loads.

N.B.—(1) The maximum and connected loads and other figures given for distributing-stations have, of course, been included in the figures for generating-stations.
(2) The figures bracketed under generating-stations have been included with those for some other station.
(3) Mataura Borough Council purchases energy from the Southland Frozen Meat Co., but this company does not furnish a return. Allowance should be made for this in estimating the units generated for the whole Dominion.

SUMMARY OF UNITS.

Generated by main stations	571,904,355	Units sold in bulk by generating-stations	345,694,164
Generated by stand-by plants of distributing authorities	23,003,506	Units sold retail by generating-stations	110,403,650
Total units generated	594,907,861	Total units sold	456,097,814
Deduct non-productive units	138,810,047	Ratio of bulk sales to retail sales	3·13
Total units sold	456,097,814		

TABLE XXXIV.—ELECTRIC-SUPPLY STATIONS.—APPROPRIATIONS FOR THE YEAR ENDED 31ST MARCH, 1929.

Title.	Ownership.	Supply commenced.	Appropriations. (N.B.—These do not necessarily presuppose a credit balance for the year's operations.)									Accumulated Funds.				
			To Depreciation.	Renewal Fund.	General Reserve Fund.	Accident Insurance Fund.	Relief of Rates (Local Authorities)	Payment of Dividends.	Capital Expenditure (out of Revenue).	Unappropriated Surplus.	Total.	Depreciation.	Renewal.	Sinking.	Reserves.	Total.
GENERATING-STATIONS (CLASSIFIED ACCORDING TO NUMBER OF UNITS GENERATED).																
STEAM STATIONS.			£	£	£	£	£	£	£	£	£	£	£	£	£	£
Over 1,000,000 Units.																
1. Auckland	Power Board ..	1908	51,060	..	11,472	..	..	..	49,457	2,527	114,516	206,065	6,371	329,463	309,565	851,464
2. Grey	Power Board ..	1926	192	..	..	..	..	..	..	..	192	1,171	..	9,013	..	10,184
3. Nelson	City Council ..	1923	2,038	..	..	..	..	..	..	6,780	8,818	..	..	8,005	..	8,005
Totals, steam stations ..	..	..	53,290	..	11,472	..	..	..	49,457	9,307	123,526	207,236	6,371	346,481	309,565	869,653
GAS STATIONS.																
Under 100,000 Units.																
4. Kaikoura	County Council ..	1922	..	..	..	..	..	..	..	..	..	..	..	693	..	693
5. Motueka	Borough Council ..	1922	601	..	..	..	..	..	..	..	601	..	..	1,500	..	1,500
Totals, gas stations ..	..	..	601	..	..	..	..	..	..	..	601	..	..	2,193	..	2,193
OIL STATIONS.																
Under 100,000 Units.																
6. Uawa	County Council ..	1925	..	..	..	..	..	..	..	..	..	..	..	1,260	..	1,260
From 100,000 to 250,000 Units.																
7. Picton	Borough Council ..	1917	..	..	..	..	..	..	..	..	..	..	..	1,232	..	1,232
Over 1,000,000 Units.																
8. Poverty Bay	Power Board ..	1912	1,600	..	..	..	..	..	..	..	1,600	1,623	..	7,802	..	9,425
Totals, oil stations ..	..	..	1,600	..	..	..	..	..	..	..	1,600	1,623	..	10,294	..	11,917
HYDRO STATIONS.																
Under 250,000 Units.																
9. Ohakune	Borough Council ..	1914	..	..	..	..	687	..	205	..	892	..	..	2,282	..	2,282
10. Queenstown	Borough Council ..	1924	..	..	..	..	..	..	..	..	..	..	..	442	..	442
11. Reefton Electric Light and Power Co., Ltd.	Company ..	1887	..	..	..	..	..	..	..	497	497	..	..	..	..	..
12. Waimea Electric Supply and Manufacturing Co., Ltd.	Company ..	1912	670	..	..	..	..	..	..	529	1,199	..	..	..	..	..
13. Westland Power, Ltd. ..	Company ..	1928	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Totals, under 250,000 units	..	..	670	..	..	..	687	..	205	1,026	2,588	..	..	2,724	..	2,724

TABLE XXXIV.—ELECTRIC-SUPPLY STATIONS.—APPROPRIATIONS FOR THE YEAR ENDED 31ST MARCH, 1929—*continued.*

Title.	Ownership.	Supply commenced.	Appropriations. (N.B.—These do not necessarily presuppose a credit balance for the year's operations.)									Accumulated Funds.				
			To Depreciation.	Renewal Fund.	General Reserve Fund.	Accident Insurance Fund.	Relief of Rates (Local Authorities)	Payment of Dividends.	Capital Expenditure (out of Revenue).	Unappropriated Surplus.	Total.	Depreciation.	Renewal.	Sinking.	Reserves.	Total.
GENERATING-STATIONS (CLASSIFIED ACCORDING TO NUMBER OF UNITS GENERATED)—*continued.*																
HYDRO STATIONS—*continued.*			£	£	£	£	£	£	£	£	£	£	£	£	£	£
From 250,000 to 500,000 Units.																
14. Havelock North ..	Town Board ..	1916	..	..	..	..	501	..	..	..	501	..	..	4,419	..	4,419
15. Kaponga	Town Board ..	1916	..	..	..	..	..	..	91	..	91	..	..	1,317	..	1,317
16. Murchison	County Council ..	1922	..	..	..	6	..	..	..	335	341	..	..	1,235	..	1,235
17. Patea	Borough Council ..	1901	..	..	..	..	..	..	107	819	926	..	..	121	..	121
18. Raetihi	Borough Council ..	1917	..	..	..	..	..	..	749	..	749	..	..	3,208	..	3,208
19. Westport	Borough Council ..	1925	516	..	..	..	..	..	263	975	1,754	1,413	..	2,534	..	3,947
Totals, 250,000 to 500,000 units	..	..	516	..	..	6	501	..	1,210	2,129	4,362	1,413	..	12,834	..	14,247
From 500,000 to 750,000 Units.																
20. Taihape	Borough Council ..	1913	..	300	..	..	..	..	399	1,397	2,096	..	300	3,757	..	4,057
21. Wairere	Power Board ..	1925	374	..	..	..	..	..	..	..	374	885	..	..	..	885
Totals, 500,000 to 750,000 units	..	..	374	300	..	..	..	..	399	1,397	2,470	885	300	3,757	..	4,942
Over 1,000,000 Units.																
22. Coleridge (Public Works Department)	Public Works Dept.	1915	29,847	..	..	..	..	..	..	..	29,847	192,359	..	115,770	52	308,181
23. Dunedin	City Council ..	1907	19,809	16,409	..	..	28,884*	..	243	..	65,345	115,454	133,345	102,550	..	351,349
24. Hawera County Electric Co., Ltd.	Company ..	1902	4,310	..	100	..	..	6,857	..	3,034	14,301	11,498	..	..	..	11,498
25. Horahora (Public Works Department)	Public Works Dept.	1919	21,527	..	..	..	..	..	..	..	21,527	103,187	..	52,164	32,415	187,766
26. Kanieri Electric Light, Ltd.	Company ..	1921	1,326	..	..	..	..	..	..	6	1,332	..	..	..	..	..
27. Mangahao (Public Works Department)	Public Works Dept.	1925	−42,714	..	..	..	..	..	..	−99	−42,813	147,871	..	..	99	147,970
28. Marlborough ..	Power Board ..	1927	3,118	..	..	..	..	..	..	..	3,118	..	..	9,901	..	9,901
29. New Plymouth ..	Borough Council ..	1905	5,430	1,757	..	..	..	..	7,528	..	14,715	85,376	16,162	47,231	28	148,797
30. Opunake	Power Board ..	1924	..	..	..	..	..	..	..	..	..	..	..	11,122	..	11,122
31. Southland	Power Board ..	1925	10,936	..	..	..	..	..	6,217	..	17,153	13,845	..	171,511	..	185,356
32. Taranaki	Power Board ..	1927	..	..	..	..	..	..	..	..	..	..	..	11,318	..	11,318
33. Taumarunui	Borough Council ..	1924	600	..	..	..	750	..	237	985	2,572	..	1,246	923	2,820	4,989
34. Tauranga	Borough Council ..	1915	..	..	..	..	850	..	1,706	6,974	9,530	1,725	..	13,829	..	15,554
35. Teviot	Power Board ..	1924	..	..	..	..	..	..	..	..	..	..	..	2,220	..	2,220
36. Waikaremoana (Public Works Department)	Public Works Dept.	1928	2,587	..	..	..	..	..	..	57	2,644	11,869	..	..	57	11,926
37. Wairua Hydro Electric-power Station	Company ..	1916	..	..	..	..	..	..	..	10,388	10,388	..	..	..	..	..
38. Whakatane	Borough Council ..	1922	..	..	..	..	..	..	..	..	..	..	..	5,055	..	5,055
Totals, over 1,000,000 units	..	..	56,776	18,166	100	..	30,484	6,857	15,931	21,345	149,659	683,184	150,753	543,594	35,471	1,413,002
Totals, hydro stations ..	..	..	58,336	18,466	100	6	31,672	6,857	17,745	25,897	159,079	685,482	151,053	562,909	35,471	1,434,915
Grand totals, generating-stations	..	..	113,827	18,466	11,572	6	31,672	6,857	67,202	35,204	284,806	894,341	157,424	921,877	345,036	2,318,678

* Including £12,500, Town Hall Buildings Fund.

TABLE XXXIV.—ELECTRIC-SUPPLY STATIONS.—APPROPRIATIONS FOR THE YEAR ENDED 31ST MARCH, 1929—*continued.*

Title.	Ownership.	Supply commenced.	Appropriations. (N.B.—These do not necessarily presuppose a credit balance for the year's operations.)									Accumulated Funds.				
			To Depreciation.	Renewal Fund.	General Reserve Fund.	Accident Insurance Fund.	Relief of Rates (Local Authorities)	Payment of Dividends.	Capital Expenditure (out of Revenue).	Unappropriated Surplus.	Total.	Depreciation.	Renewal.	Sinking.	Reserves.	Total.
DISTRIBUTING-STATIONS (CLASSIFIED ACCORDING TO POPULATION IN AREA).																
ON POPULATION BASIS.			£	£	£	£	£	£	£	£	£	£	£	£	£	£
Under 1,000.																
39. Kamo	Town Board	1923	..	..	..	..	..	..	37	..	37	..	..	390	..	390
40. Mangaweka	Town Board	1913	..	..	..	..	..	..	..	..	..	..	..	1,063	..	1,063
41. Te Puke	Town Board	1921	196	212	..	..	..	..	..	516	924	1,033	1,440	896	..	3,369
Totals, under 1,000	..	..	196	212	..	..	..	..	37	516	961	1,033	1,440	2,349	..	4,822
From 1,000 to 2,500.																
42. Bluff	Borough Council	1903	..	196	..	..	..	..	100	..	296	..	833	529	..	1,362
43. Halswell	County Council	1919	1,430	..	..	..	..	..	..	185	1,615	..	..	575	..	575
44. Inglewood	Borough Council	1905	582	..	..	..	..	..	..	..	582	..	..	2,495	..	2,495
45. Kaiapoi	Borough Council	1917	..	..	..	..	214	..	61	..	275	..	..	927	..	927
46. Mataura	Borough Council	1913	..	..	..	..	..	..	..	..	..	..	..	168	..	168
47. Otago Central	Power Board	1925	..	..	..	..	..	..	..	..	..	..	..	1,939	217	2,156
48. Rangiora	Borough Council	1919	429	..	..	..	..	..	..	542	971	..	..	880	..	880
49. Te Aroha	Borough Council	1906	337	..	..	..	..	..	574	1,268	2,179	6,842	..	1,424	..	8,266
50. Wairoa	Borough Council	1913	..	..	..	..	..	..	..	575	575	..	..	2,703	..	2,703
51. Waitara	Borough Council	1907	..	..	..	..	..	..	..	..	..	..	..	1,869	..	1,869
Totals, 1,000 to 2,500	..	..	2,778	196	..	..	214	..	735	2,570	6,493	6,842	833	13,509	217	21,401
From 2,500 to 5,000.																
52. Banks Peninsula	Power Board	1921	1,000	..	..	..	..	..	..	..	1,000	4,010	..	7,196	..	11,206
53. Lyttelton	Borough Council	1917	..	..	..	..	..	..	458	..	458	..	..	100	..	100
54. Stratford	Borough Council	1898	1,000	..	..	..	..	..	..	..	1,000	8,891	..	4,608	..	13,499
55. Sumner	Borough Council	1918	286	..	..	..	..	..	1,136	466	1,888	..	..	1,138	2,491	3,629
Totals, 2,500 to 5,000	..	..	2,286	..	..	..	..	..	1,594	466	4,346	12,901	..	13,042	2,491	28,434
From 5,000 to 10,000.																
56. Bay of Plenty	Power Board	1928	..	..	..	..	..	..	..	..	..	..	..	2,105	..	2,105
57. Cambridge	Power Board	1920	400	..	..	..	..	..	..	493	893	295	..	8,835	..	9,130
58. Heathcote	County Council	1914	..	..	..	..	..	..	..	1,051	1,051	..	..	3,735	..	3,735
59. Malvern	Power Board	1925	..	..	..	..	..	..	..	..	..	..	..	2,354	..	2,354
60. Riccarton	Borough Council	1916	680	..	..	..	..	..	788	137	1,605	3,652	859	80	..	4,591
61. Tai Tapu Dairy Co.	Company	1915	357	..	..	..	..	..	..	..	357	1,102	..	..	..	1,102
62. Tauranga	Power Board	1926	538	..	..	..	..	..	..	..	538	1,423	..	4,143	..	5,566
63. Te Awamutu	Power Board	1921	500	..	..	..	*726	..	..	2,630	3,856	655	..	8,482	..	9,137
64. Thames	Borough Council	1914	210	..	..	..	..	..	48	447	705	1,060	..	4,604	..	5,664
65. Tourist Department (Rotorua)	Government	1901	1,306	..	2,848	..	..	..	..	..	4,154	9,112	..	9,112	..	18,224
66. Wairoa	Power Board	1923	768	..	..	..	..	..	..	..	768	7,690	..	4,249	..	11,939
67. Waitomo	Power Board	1926	1,738	..	..	..	..	..	..	..	1,738	2,217	..	2,451	..	4,668
68. Whangarei	Borough Council	1915	..	1,395	..	..	..	..	3,070	746	5,211	..	4,045	2,689	..	6,734
Totals, 5,000 to 10,000	..	..	6,497	1,395	2,848	..	726	..	3,906	5,504	20,876	27,206	4,904	52,839	..	84,949

* Rates written off.

TABLE XXXIV.—ELECTRIC-SUPPLY STATIONS.—APPROPRIATIONS FOR THE YEAR ENDED 31ST MARCH, 1929—*continued.*

Title.	Ownership.	Supply commenced.	Appropriations. (N.B.—These do not necessarily presuppose a credit balance for the year's operations.)									Accumulated Funds.				
			To Depreciation.	Renewal Fund.	General Reserve Fund.	Accident Insurance Fund.	Relief of Rates (Local Authorities)	Payment of Dividends.	Capital Expenditure (out of Revenue).	Unappropriated Surplus.	Total.	Depreciation.	Renewal.	Sinking.	Reserves.	Total.
POPULATION BASIS—*continued.*			DISTRIBUTING-STATIONS (CLASSIFIED ACCORDING TO POPULATION IN AREA)—*continued.*													
From 10,000 to 20,000.			£	£	£	£	£	£	£	£	£	£	£	£	£	£
69. Ashburton	Power Board	1923	3,424	..	..	..	..	..	..	..	3,424	..	12,014	13,077	..	25,091
70. Central	Power Board	1921	2,460	..	..	..	..	..	1,500	2,206	6,166	3,492	10,175	19,086	8,403	41,156
71. Central Hawke's Bay	Power Board	1925	2,194	..	700	..	..	..	..	..	2,894	..	..	4,175	..	4,175
72. Dannevirke	Power Board	1925	1,713	..	..	..	..	..	..	..	1,713	2,622	..	7,938	100	10,660
73. Franklin	Power Board	1925	2,000	..	1,000	..	..	..	3,000	90	6,090	10,081	..	5,461	6,292	21,834
74. Hamilton	Borough Council	1913	..	2,130	2,000	..	4,589	..	654	612	9,985	..	9,389	14,763	6,357	30,509
75. Hastings	Borough Council	1912	..	..	..	..	217	..	2,656	8,463	11,336	3,300	2,326	6,371	..	11,997
76. Hawke's Bay	Power Board	1927	2,250	..	200	..	..	..	..	79	2,529	2,250	..	6,348	200	8,798
77. Horowhenua	Power Board	1924	3,171	..	..	..	..	..	..	605	3,776	8,155	..	6,232	10,409	24,796
78. Napier	Borough Council	1913	..	1,286	1,286	..	..	..	..	..	2,572	..	10,695	8,585	10,071	29,351
79. North Canterbury	Power Board	1928	1,318	..	450	..	..	..	..	1,196	2,964	2,113	..	4,618	..	6,731
80. Otago	Power Board	1926	3,636	..	..	..	..	..	..	..	3,636	3,636	..	..	8,553	12,189
81. Palmerston North	Borough Council	1924	..	2,000	..	..	5,800	..	..	10,886	18,686	..	4,152	12,913	..	17,065
82. Springs-Ellesmere	Power Board	1922	1,435	..	..	..	..	..	..	..	1,435	2,061	..	5,678	..	7,739
83. Tararua	Power Board	1925	2,419	..	13	..	..	..	1,172	..	3,604	1,419	..	10,141	1,000	12,560
84. Timaru	Borough Council	1908	..	..	..	..	..	..	4,597	1,009	5,606	..	..	32,483	..	32,483
85. Waimairi	County Council	1916	..	..	..	..	..	..	6,091	..	6,091	..	..	2,142	..	2,142
86. Wairarapa	Power Board	1924	2,007	..	..	..	..	..	..	639	2,646	2,007	..	12,202	..	14,209
87. Waitaki	Power Board	1926	2,100	4,000	..	..	..	..	..	1,021	7,121	3,979	13,503	9,045	1,105	27,632
Totals, 10,000 to 20,000	..	..	30,127	9,416	5,649	..	10,606	..	19,670	26,806	102,274	45,115	62,254	181,258	52,490	341,117
From 20,000 to 30,000.																
88. Invercargill	Borough Council	1914	..	..	..	..	4,500	..	5,855	349	10,704	..	32,891	23,093	..	55,984
From 30,000 to 50,000.																
89. Hutt Valley	Power Board	1925	10,152	..	250	..	..	..	..	2,370	12,772	20,995	..	11,712	250	32,957
90. Manawatu-Oroua	Power Board	1924	2,489	..	..	..	..	..	..	..	2,489	1,003	..	34,453	..	35,456
91. South Canterbury	Power Board	1925	1,161	..	..	..	..	..	..	..	1,161	1,489	..	15,659	..	17,148
92. Thames Valley	Power Board	1921	4,087	..	..	..	..	..	..	..	4,087	1,962	..	66,871	..	68,833
93. Waitemata	Power Board	1926	1,000	..	..	..	..	..	..	6,924	7,924	4,120	..	21,427	17,047	42,594
Totals, 30,000 to 50,000	..	..	18,889	..	250	..	..	..	..	9,294	28,433	29,569	..	150,122	17,297	196,988
50,000 and over.																
94. Christchurch	City Council	1904	30,351	..	32,540	..	..	..	..	..	62,891	..	3,000	240,034	57,572	300,606
95. Wanganui-Rangitikei	Power Board	1924	16,250	..	..	..	..	..	..	1,852	18,102	..	..	19,056	4,000	23,056
96. Wellington	City Council	1888	..	18,460	18,460	..	..	..	61,259	54,080	152,259	..	87,747	158,767	54,875*	301,389
Totals, 50,000 and over	..	..	46,601	18,460	51,000	..	..	..	61,259	55,932	233,252	..	90,747	417,857	116,447	625,051
Grand totals, distributing-stations	..	..	107,374	29,679	59,747	..	16,046	..	93,056	101,437	407,339	122,666	193,069	854,069	188,942	1,358,746
Dominion totals, all stations	..	..	221,201	48,145	71,319	6	47,718	6,857	160,258	136,641	692,145	1,017,007	350,493	1,775,946	533,978	3,677,424

* Including £13,807, Accident Fund.

Table XXXV.—Return of Electric Ranges, Water-heaters, and Milking-machines.

Table showing the Number of Electric Ranges, Water-heaters, and Milking-machines connected to Electric-supply Systems as at 31st March, 1929.

Licensee.	Number of Consumers.	Ranges.				Water-heaters.			Milking-machines.	
		2 to 5 Kilowatts.	5 Kilowatts and over.	Total.	Percentage of Number of Consumers.	Number.	Total Kilowatts.	Percentage of Number of Consumers.	Number.	Horse-power.
	Number.	Number.	Number.	Number.						
Ashburton Power Board	3,250	32	530	562	17·29	331	671	10·18	38	63
Auckland Power Board	40,617	..	3,729	3,729	9·18	7,648	4,664	18·83	..	..
Banks Peninsula Power Board	931	18	118	136	14·61	116	167	12·46	153	212
Bluff Borough Council	394	..	..	..	..	..	..	..	..	..
Bay of Plenty Power Board	907	..	274	274	30·21	457	288	50·39	318	611
Cambridge Power Board	1,203	8	95	103	8·56	345	267	28·68	269	473
Central Hawke's Bay Power Board	1,369	3	79	82	5·99	146	130	10·66	58	115
Central Power Board	3,336	22	163	185	5·55	834	522	25·00	829	1,570
Christchurch City Council	26,688	..	2,431*	2,431	9·11	2,902	3,151	10·87	..	..
Coleridge (Public Works Department)	61	..	..	..	..	..	..	..	..	..
Dannevirke Power Board	2,011	..	106	106	5·27	219	152	10·89	243	347
Dunedin City Council	21,540	..	751	751	3·49	1,125	1,016	5·22	135	275
Franklin Power Board	2,716	..	256	256	9·43	670	393	24·67	532	794
Grey Power Board	1,807	1	40	41	2·20	68	68	3·76	2	6
Halswell County Council	235	18	2	20	8·51	5	5	2·13	14	37
Hamilton Borough Council	3,552	5	60	65	1·83	77	50	2·17	..	..
Hastings Borough Council	3,119	15	83	98	3·14	17	10	0·55	..	..
Havelock North Town Board	262	24	..	24	9·16	6	6	2·29	..	..
Hawera County Electric Co., Ltd.	2,449	..	23	23	0·94	49	28	2·00	164	356
Hawke's Bay Power Board	1,985	..	260	260	13·10	232	179	11·69	60	90
Heathcote County Council	1,121	30	200	230	20·52	200	190	17·84	4	12
Horahora (Public Works Department)	..	..	..	..	..	..	..	..	..	..
Horowhenua Power Board	2,991	4	369	373	12·47	635	402	21·23	422	614
Hutt Valley Power Board	8,181	49	782	831	10·16	571	710	6·98	49	87
Inglewood Borough Council	415	3	20	23	5·54	15	14	3·61	1	3
Invercargill Borough Council	4,486	10	93	103	2·30	2	2	0·04	4	8
Kaiapoi Borough Council	460	16	5	21	4·57	3	3	0·65	3	7
Kaikoura County Council	146	..	..	..	..	..	..	..	..	..
Kamo Town Board	98	1	..	1	1·02	..	..	..	..	..
Kanieri Electric Light, Ltd.	523	2	2	4	0·76	4	5	0·76	..	..
Kaponga Town Board	369	7	5	12	3·25	45	29	12·20	93	189
Lyttelton Borough Council	603	..	11	11	1·82	7	8	1·16	1	3
Malvern Power Board	590	17	87	104	17·63	42	71	7·12	5	10
Manawatu-Oroua Power Board	4,116	..	503	503	12·22	990	614	24·05	704	1,380
Mangahao (Public Works Department)	59	..	33	33	55·93	..	..	..	32	49
Mangaweka Town Board	100	..	6	6	6·00	5	3	5·00	2	4
Marlborough Power Board	1,962	..	234	234	11·93	201	150	10·24	23	45
Mataura Borough Council	307	2	2	4	1·30	1	1	0·33	4	12
Motueka Borough Council	302	..	..	..	..	..	..	..	..	..
Murchison County Council	112	..	3	3	2·68	14	10	12·50	14	30
Napier Borough Council	3,782	5	29	34	0·90	205	134	5·42	..	..
Nelson City Council	2,235	..	1	1	..	2	3	0·09	..	..
New Plymouth Borough Council	5,620	131	546	677	12·05	540	316	9·61	233	392
North Canterbury Power Board	1,040	..	31	31	2·98	25	31	2·40	42	95
Ohakune Borough Council	478	6	5	11	2·30	9	8	1·88	1	2
Opunake Power Board	1,200	..	56	56	4·67	120	73	10·00	207	369
Otago Central Power Board	698	..	72	72	10·32	85	77	12·18	11	23
Otago Power Board	3,392	7	256	263	7·75	217	276	6·40	60	120
Palmerston North Borough Council	4,631	7	333	340	7·34	612	387	13·22	4	8
Patea Borough Council	325	6	..	6	1·85	7	4	2·15	3	6
Picton Borough Council	350	..	1	1	0·28	..	..	..	..	..

* Including ranges of 2 to 5 kilowatts.

TABLE XXXV.—RETURN OF ELECTRIC RANGES, WATER-HEATERS, AND MILKING-MACHINES—*continued.*

Table showing the Number of Electric Ranges, Water-heaters, and Milking-machines connected to Electric-supply Systems as at 31st March, 1929—continued.

Licensee.	Number of Consumers.	Ranges.				Water-heaters.			Milking-machines.	
		2 to 5 Kilowatts.	5 Kilowatts and over.	Total.	Percentage of Number of Consumers.	Number.	Total Kilowatts.	Percentage of Number of Consumers.	Number.	Horse-power.
	Number.	Number.	Number.	Number.						
Poverty Bay Power Board	3,943	..	267	267	6·77	135	152	3·42	16	29
Queenstown Borough Council	214	4	1	5	2·34	..	..	..	..	..
Raetihi Borough Council	387	..	6	6	1·55	12	11	3·10	10	26
Rangiora Borough Council	532	3	20	23	4·32	22	23	4·14	..	..
Reefton Electric Light and Power Co., Ltd.	307	..	..	..	..	..	..	..	..	..
Riccarton Borough Council	1,256	6	157	163	12·98	191	176	15·21	..	..
Rotorua (see under Tourist Department).										
South Canterbury Power Board	2,999	14	423	437	14·57	274	373	9·14	71	136
Southland Power Board	8,298	..	1,155	1,155	13·92	622	840	7·50	841	2,102
Springs-Ellesmere Power Board	1,849	3	115	118	6·38	72	75	3·89	57	123
Stratford Borough Council	944	4	104	108	11·44	99	80	10·49	..	..
Sumner Borough Council	930	22	40	62	6·67	74	64	7·96	1	3
Taihape Borough Council	589	..	9	9	1·53	12	11	2·04	..	..
Tai Tapu Dairy Co., Ltd.	237	..	10	10	4·22	15	39	6·33	40	100
Taranaki Power Board	1,796	3	164	167	9·29	538	334	29·96	577	1,137
Tararua Power Board	1,371	10	159	169	12·33	277	184	20·20	225	356
Taumarunui Borough Council	764	3	16	19	2·49	19	24	2·49	..	..
Tauranga Borough Council	887	37	106	143	16·12	336	100	37·88	..	..
Tauranga Power Board	815	17	94	111	13·62	314	199	38·53	302	565
Te Aroha Borough Council	658	1	14	15	2·28	20	16	3·04	7	15
Te Awamutu Power Board	1,434	3	116	119	8·30	463	307	32·29	488	820
Te Puke Town Board	261	6	4	10	3·83	24	18	9·20	4	84
Teviot Power Board	350	4	80	84	24·00	85	65	24·29	..	..
Thames Borough Council	1,091	9	6	15	1·37	27	16	2·49	..	..
Thames Valley Power Board	5,218	70	223	293	5·62	1,658	1,092	31·77	1,793	3,627
Timaru Borough Council	2,974	191	1	192	6·46	128	131	4·30	..	..
Tourist Department, Rotorua	1,557	21	58	79	5·07	101	83	6·49	29	63
Uawa County Council	95	..	..	..	..	..	..	..	..	..
Waikaremoana (Public Works Department)	..	..	..	..	..	..	..	..	..	..
Waimairi County Council	2,888	14	358	372	12·88	437	452	15·13	13	29
Waimea Electric Supply Co.	652	..	..	..	..	2	2	0·31	..	..
Wairarapa Power Board	3,410	14	219	233	6·83	296	252	8·68	269	633
Wairere Power Board	251	..	62	62	24·70	99	55	39·44	49	73
Wairoa Borough Council	631	6	86	92	14·58	108	57	17·12	..	..
Wairoa Power Board	314	27	65	92	29·30	76	41	24·20	46	97
Wairua (Wilson's)	44	..	..	..	..	1	1	2·27	21	63
Waitaki Power Board	2,891	6	288	294	10·17	280	474	9·69	16	28
Waitara Borough Council	432	4	19	23	5·32	12	12	2·78	1	2
Waitemata Power Board	6,618	13	625	638	9·64	872	525	13·18	84	158
Waitomo Power Board	1,178	1	68	69	5·86	151	91	12·82	106	212
Wanganui-Rangitikei Power Board	8,185	..	730*	730	8·92	967	718	11·81	342	718
Wellington City Council	25,000	28	559	587	2·35	426	575	1·70	..	..
Westland Power, Ltd.†	32	..	..	..	..	3	3	9·38	4	8
Westport Borough Council	528	..	6	6	1·14	11	14	2·08	2	4
Whakatane Borough Council	432	20	..	20	4·63	23	16	5·32	4	8
Whangarei Borough Council	1,918	23	79	102	5·32	150	90	7·82	6	18
Totals, 1928–29	266,306	1,036	19,218	20,254	7·60	29,257	23,100	10·98	10,161	19,654
Totals, 1927–28	196,745	800	14,966	15,766	8·01	21,513	..	10·94	8,514	..

* Including ranges of 2 to 5 kilowatts.

† Operating under delegated license from Westland Power Board.

LIST OF ELECTRIC-SUPPLY UNDERTAKINGS OPERATING DURING THE YEAR ENDED 31ST MARCH, 1929.

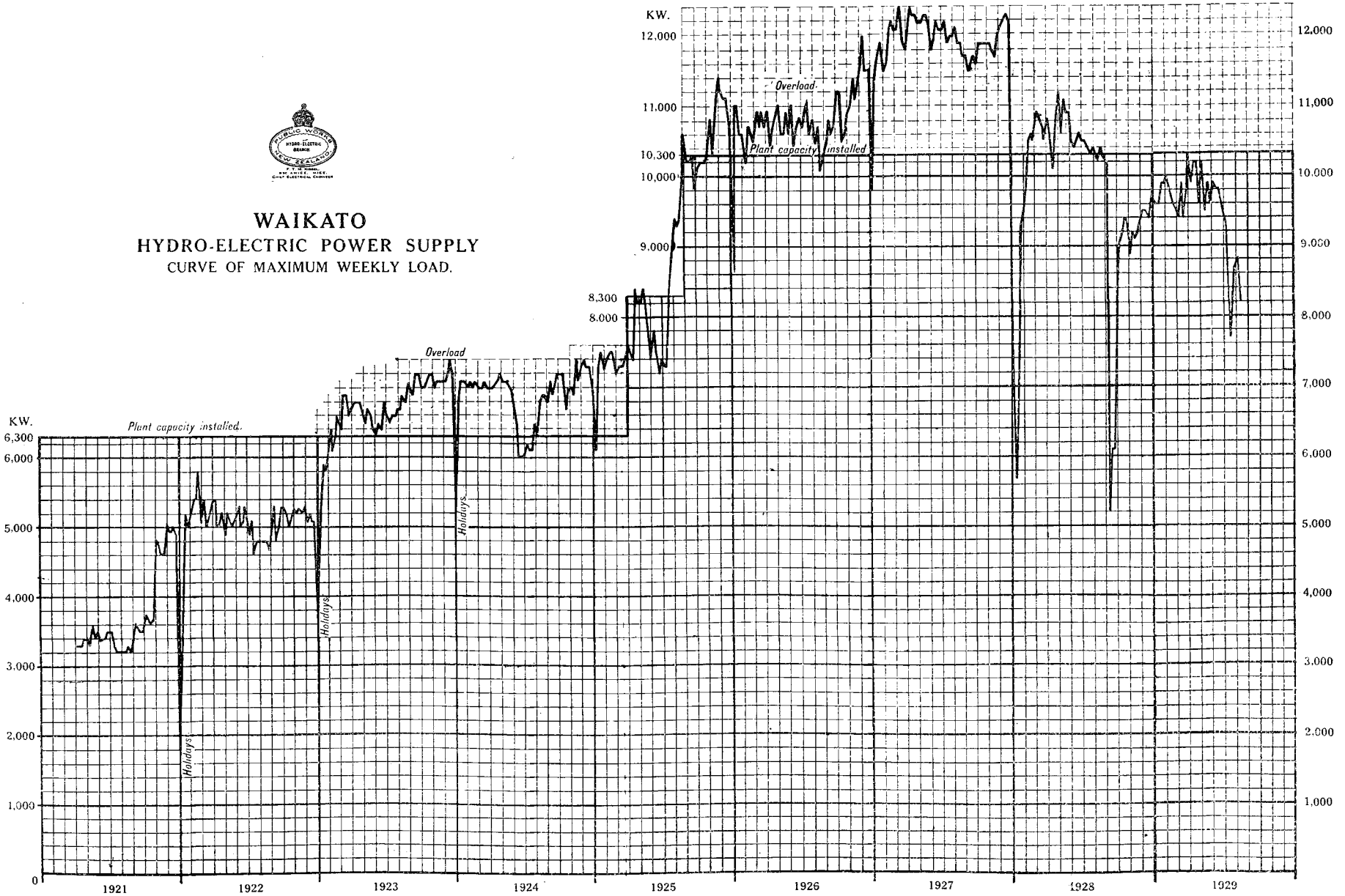
(Arranged in alphabetical order and giving the numerical position occupied by each in Tables XXXII, XXXIII, and XXXIV.)

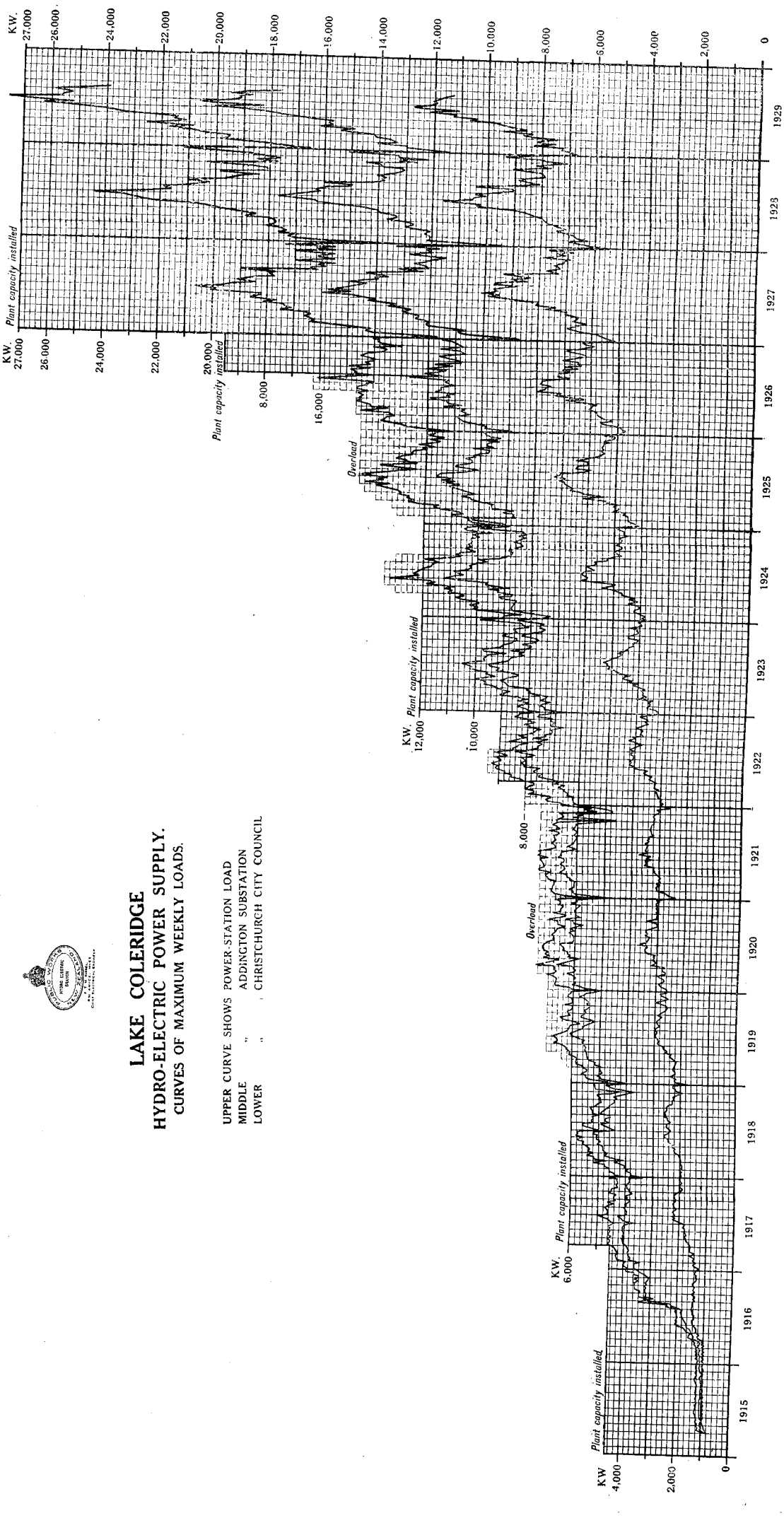
Name.	No. in Tables.
Auckland Power Board	1
Ashburton Power Board	69
Banks Peninsula Power Board	52
Bay of Plenty Power Board	56
Bluff Borough Council	42
Cambridge Power Board	57
Central Hawke's Bay Power Board	71
Central Power Board	70
Christchurch City Council	94
Coleridge (Public Works Department)	22
Dannevirke Power Board	72
Dunedin City Council	23
Franklin Power Board	73
Golden Bay Power Board	..
Grey Power Board	2
Halswell County Council	43
Hamilton Borough Council	74
Hastings Borough Council	75
Havelock North Town Board	14
Hawera County Electric Co., Ltd.	24
Hawke's Bay Power Board	76
Heathcote County Council	58
Hobson Power Board	..
Horahora (Public Works Department)	25
Horowhenua Power Board	77
Hutt Valley Power Board	89
Inglewood Borough Council	44
Invercargill Borough Council	88
Kaiapoi Borough Council	45
Kaikoura County Council	3
Kamo Town Board	49
Kanieri Electric Light, Ltd.	26
Kaponga Town Board	15
Lyttelton Borough Council	53
Malvern Power Board	59
Manawatu-Oroua Power Board	90
Mangahao	27
Mangaweka Town Board	40
Marlborough Power Board	28
Mataura Borough Council	46
Motueka Borough Council	5
Murchison County Council	16
Napier Borough Council	78
Nelson City Council	3
New Plymouth Borough Council	29
North Canterbury Power Board	79
Ohakune Borough Council	9
Opunake Power Board	30
Otago Central Power Board	47
Otago Power Board	80
Palmerston North Borough Council	81
Patea Borough Council	17
Picton Borough Council	7
Poverty Bay Power Board	8
Public Works Department—	
Coleridge	22
Horahora	25
Mangahao	27
Waikaremoana	36
Queenstown Borough Council	10
Raetihi Borough Council	18
Rangiora Borough Council	48
Reefton Electric Light and Power Co.	11
Riccarton Borough Council	60
Rotorua. (See under Tourist Department)	65
South Canterbury Power Board	91
South Taranaki Power Board	..
Southland Power Board	31
Springs-Ellesmere Power Board	82
Stratford Borough Council	54
Sumner Borough Council	55
Taihape Borough Council	20
Tai Tapu Dairy Co.	61
Taranaki Power Board	32
Tararua Power Board	83
Taumarunui Borough Council	33
Tauranga Borough Council	34
Tauranga Power Board	62
Te Aroha Borough Council	49
Te Awamutu Power Board	63
Te Puke Town Board	41
Teviot Power Board	35
Thames Borough Council	64
Thames Valley Power Board	92
Timaru Borough Council	84
Tourist Department (Rotorua)	65
Uawa County Council	6
Waikaremoana	36
Waimairi County Council	85
Waimea Electric Supply Co.	12
Wairarapa Power Board	86
Wairere Power Board	21
Wairoa Borough Council	50
Wairoa Power Board	66
Wairua Electric-power Station	37
Waitaki Power Board	87
Waitara Borough Council	51
Waitemata Power Board	93
Waitomo Power Board	67
Wanganui-Rangitikei Power Board	95
Wellington City Council	96
Westland Power Board	13
Westport Borough Council	19
Whakatane Borough Council	38
Whangarei Borough Council	68
Wilson's Cement Co., Ltd.	37

WAIKATO

HYDRO-ELECTRIC POWER SUPPLY

CURVE OF MAXIMUM WEEKLY LOAD.





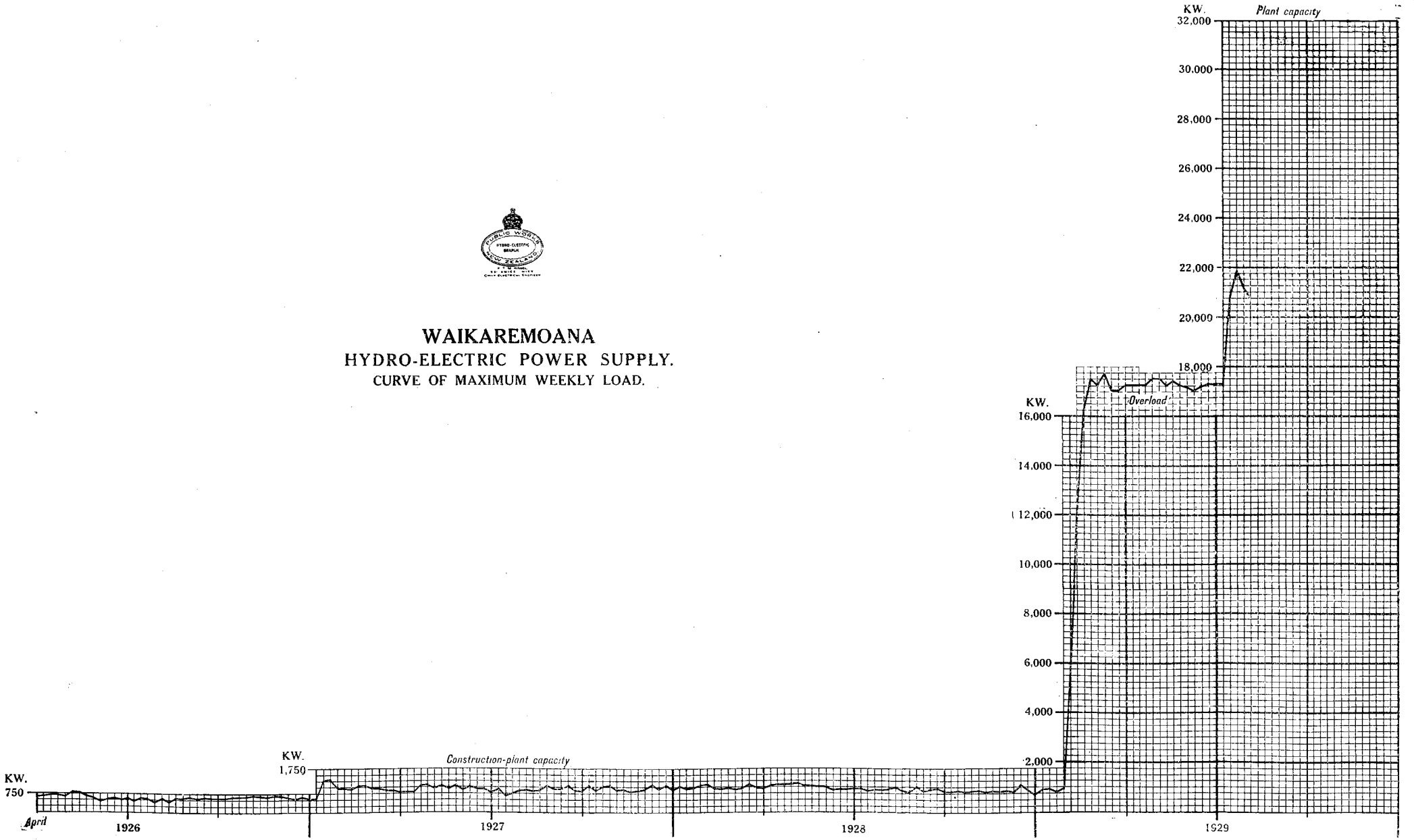
LAKE COLERIDGE
HYDRO-ELECTRIC POWER SUPPLY.
CURVES OF MAXIMUM WEEKLY LOADS.

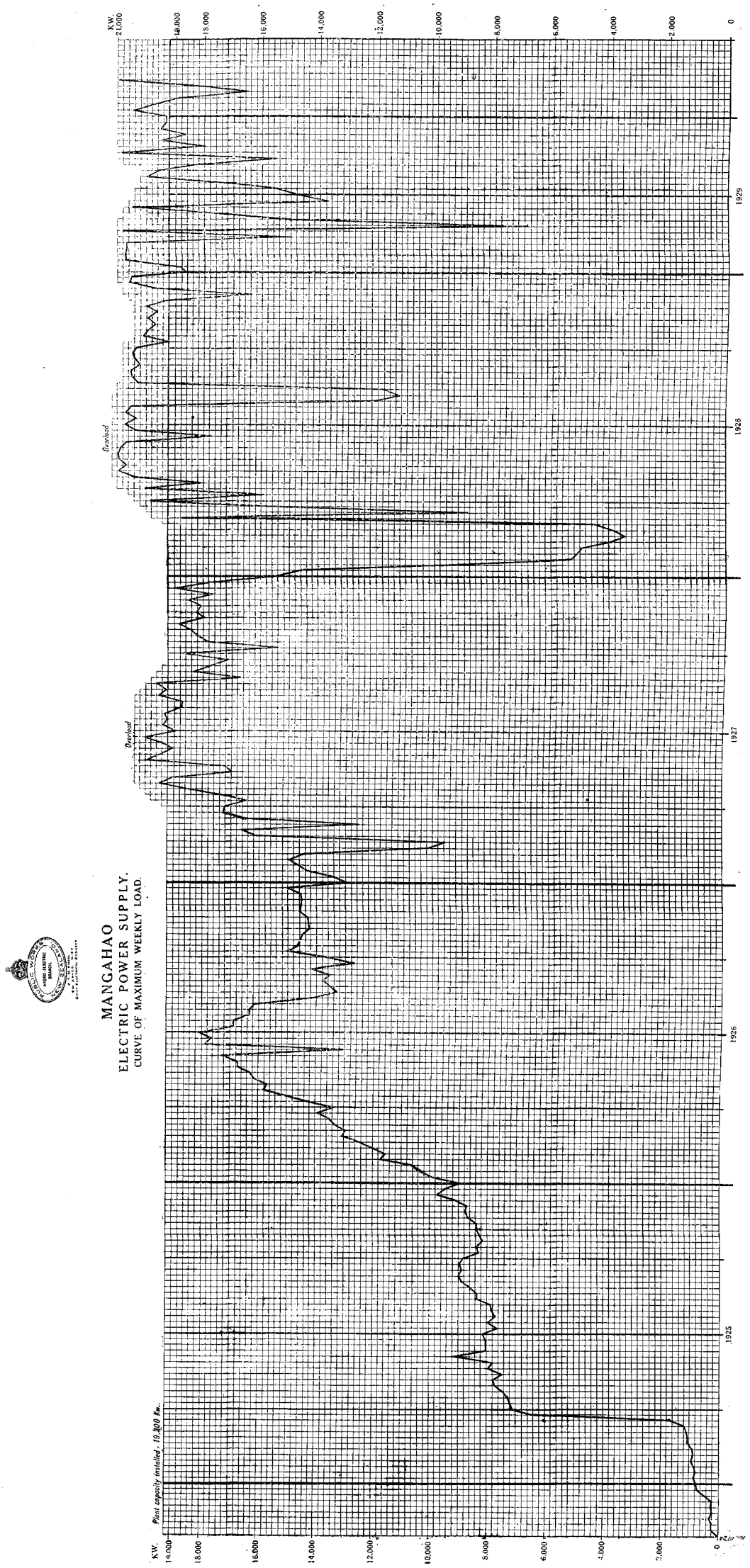
UPPER CURVE SHOWS POWER-STATION LOAD
MIDDLE " ADDINGTON SUBSTATION
LOWER " CHRISTCHURCH CITY COUNCIL

WAIKAREMOANA

HYDRO-ELECTRIC POWER SUPPLY.

CURVE OF MAXIMUM WEEKLY LOAD.





MANGAHAO
ELECTRIC POWER SUPPLY.
CURVE OF MAXIMUM WEEKLY LOAD.

NORTH ISLAND
NEW ZEALAND
SHOWING
POWER BOARD DISTRICTS.

1929

Scale. 35 miles to an inch.

Reference

	thus
Cities	AUCKLAND
Provincial Centres	NAPIER
Boroughs	FEILDING
Town Districts	MANAIA
Small Centres	Tokomaru
Railways	
Coach Routes	
Boundaries of Land Districts	

TASMAN SEA

SOUTH ISLAND

POWER BOARDS FORMED.

No	Name	Population.	Value of Rateable Property unimproved.
2	Hobson	7,180	1,424,942
5	Waitemata	21,425	5,901,473
6	Auckland	175,000	43,489,650
7	Franklin	14,444	6,800,000
9	Wairere	2,500	872,434
10	Waitomo	8,500	3,566,152
12	Taranaki	22,000	5,974,732
13	Opunake	7,000	916,111
14	South Taranaki	17,612	7,914,269
15	Wanganui-Rangitikei	60,000	7,976,750
16	Manawatu-Oroua	40,000	13,955,493
17	Horowhenua	12,095	3,403,255
18	Hutt Valley	27,275	3,119,920
19	Wairarapa	19,000	9,370,503
20	Tararua	10,255	3,983,107
21	Dannevirke	12,081	4,666,713
22	Central Hawke's Bay	10,056	6,839,951
23	Hawke's Bay	40,104	11,611,022
26	Wairoa	7,712	2,639,988
27	Poverty Bay	23,986	9,591,676
28	Bay of Plenty	10,900	2,562,042
29	Tauranga	8,425	1,232,100
30	Thames Valley	30,000	7,550,000
31	Te Awamutu	8,500	1,668,509
32	Cambridge	6,000	1,841,209
33	Central	17,512	4,630,943
	Totals	619,562	173,482,924

POWER BOARDS PROPOSED.

1	Whangaroa.	24	Waimarino.
2	Whangarei.	25	East Taupo.
4	Rodney.	27	Poverty Bay (outer area).
8	Waikato	30	Thames Valley ,,
11	Taumarunui	34	Rotorua.

Districts shown red.

ELECTRIC SUPPLY STATIONS.

Steam	▼
Gas	▲
Oil	●
Hydro	■

P.W.D. transmission lines over 30,000 v

P.W.D. proposed transmission lines over 30,000 v

Other supply authorities

Drawn by W. G. Harding

172 173 174 175 East Longitude 176 177 178

D-1.

SOUTH ISLAND

NEW ZEALAND

SHOWING

POWER BOARD DISTRICTS.

1929

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

Karamea Bight

Canterbury Bight

Tasman Bay

Golden Bay

Pegasus Bay

Banks Peninsula

Otago Peninsula

Stewart Island

LAKE COLERIDGE

WAITAKI

WELLINGTON

HOKITIKA

GREYMOUTH

WESTPORT

MOTUEKA

NELSON

CHRISTCHURCH

TIMARU

OAMARU

DUNEDIN

INVERCARGILL

ELECTRIC SUPPLY STATIONS.

Steam	▼
Gas	▲
Oil	●
Hydro	■

P.W.D. transmission lines over 30,000 v. ——

P.W.D. proposed transmission lines over 30,000 v. — — — —

Other supply authorities —·—·—·—

POWER BOARDS FORMED.

No.	Name	Population.	Value of Rateable Property (unimp)
1	Buller	9,197	696,371
2	Reefton	1,850	61,170
3	Grey	12,000	611,641
4	Westland	3,272	196,20[illegible]
6	Southland	66,099	15,493,[illegible]
7	Otago	24,082	4,696,[illegible]
8	Teviot	2,400	183,0[illegible]
9	Otago Central	5,170	1,087,51[illegible]
10	Waitaki	17,580	4,646,2[illegible]
11	South Canterbury	41,618	15,483,0[illegible]
12	Ashburton	18,091	10,047,044
13	Malvern	5,050	3,891,695
14	Springs-Ellesmere	11,270	6,480,598
15	Banks Peninsula	4,000	4,218,[illegible]
16	North Canterbury	12,868	4,941,3[illegible]
17	Hurunui	5,980	6,529,5[illegible]
19	Marlborough	20,780	6,728,[illegible]
20	Waimea	24,000	1,671,1[illegible]
21	Golden Bay	1,200	[illegible]
	Totals	303,907	86,864,455

POWER BOARDS PROPOSED

4	Westland (outer area)	18	Murchison.
5	Queenstown	20	Waimea (outer area)
17	Hurunui (outer area)	21	Golden Bay (outer area)

Districts shown red

South Latitude

East Longitude

166° 167° 168° 169° 170° 171° 172° 173° 174°

41° 42° 43° 44° 45° 46° 47°

APPENDIX E.

FIFTH ANNUAL REPORT OF THE MAIN HIGHWAYS BOARD.

The Main Highways Board to the Minister of Public Works, Wellington.

Sir,—

In accordance with the provisions of section 24 of the Main Highways Act, 1922, the Main Highways Board has the honour to submit its fifth annual report for presentation to Parliament through the Hon. the Minister.

The report covers the period from the 1st April, 1928, to the 31st March, 1929, though a few matters referred to are carried beyond the latter date for convenience and completeness of record.

As stated, the report is the fifth annual report of the Board, but it is the first occasion on which the Board has had the pleasure of presenting such a document to Parliament through yourself.

Introductory.

The total expenditure by the Board for the year under review was £1,916,408, which is greater than the expenditure in any one year in the past. Of the total amount expended, £930,577 was expended from the Revenue Fund and £985,832 from the Construction Fund. Operations under the Revenue Fund involved the payment of subsidies on the maintenance of 10,403 miles of main highway, which length includes 6,651 miles of primary highways, and 3,752 miles of secondary highways declared during the year 1928–29.

The expenditure from Construction Fund resulted in 223 miles 57 chains of highway being formed and widened, 185 miles 25 chains gravelled and metalled, and 198 miles 7 chains surfaced with bitumen and concrete.

The year's operations so far as surfacing is concerned create a record, and a special outline of the work done and a general summary of accomplishments for the five years during which the Board has been operating is given in a separate section of this report.

A total length of 9,482 ft. of bridges was erected, while engineering surveys were made over 339 miles of the highway system.

A notable feature so far as construction is concerned is the substantial increase in the amount expended in the South Island, which totalled, after excluding overhead charges, the sum of £229,820, as against the previous highest figure on record of £116,009. This substantial increase so far as the South Island is concerned is due to two factors—namely, the increase in the rate of subsidy on paving-works, and the authority vested in the Board empowering it to advance to the local authorities their share of the cost of works on main highways. Under this system the local authorities are enabled to accept an advance from the Board without taking a poll of the ratepayers, and may repay the amount out of the general revenue of the county. The County Councils in the South Island are taking considerable advantage of this system, and the Board is satisfied that it has been the means of getting the local authorities of the South Island to face the highway problem and proceed with necessary and desirable works.

The amount which the Board is recommending for allocation to the South Island for construction purposes during the financial year now current shows a further substantial increase on the amount spent last year, but to enable this to be done it has been necessary to reduce the amount recommended for construction purposes in the North Island. This does not mean that the allocation is being increased in the South Island to the detriment of the North Island, because during the past five years the local authorities in the North Island have proceeded with construction and reconstruction schemes which absorbed the greater proportion of the Board's construction funds, while the South Island local authorities have been somewhat dormant in this respect and have not taken up the amount of construction-moneys which could have been made available for their purposes.

A striking feature of the Board's construction operations during the year is the number of unmetalled sections of highway which have been metalled, and as a result of which important links in the highway system have been completed.

A summary of achievements in this direction is given elsewhere in this report.

The disastrous earthquake which took place in the Nelson and West Coast districts on the 17th June, 1929, caused extensive damage to main highways, and substantial expenditure will be involved in restoration. An outline of the damage and the steps being taken to restore the main highways are the subject of a further reference in this report.

Main Highways Amendment Act, 1928.

In the Main Highways Amendment Act passed during the 1928 session of Parliament authority was given to the Board to provide a greater proportion of the cost of the construction and maintenance of main highways than fixed by the original Act and its amendments, and also, if the Board is of opinion that such should be done, to provide the whole cost of works on any particular highway without contribution from the local authority. This power obviated the somewhat involved procedure

previously necessary. Extension of the Board's operations by the introduction of the petrol-tax, and the general policy adopted of paying a subsidy of £3 for £1 towards the cost of surfacing main highways adjacent to the large centres of population, made such a provision imperative. Another clause of importance related to the making of advances out of the Board's Revenue Fund to local authorities to enable such local authorities to meet their proportion of the cost of main-highway construction, reconstruction, and maintenance. Power to make advances to local authorities was originally vested in the Board in 1926, but doubt existed as to the power of local authorities to accept the advances. The clause in question cleared away such doubt, and also removed the limit of £50,000, which was the total the Board could advance under the 1926 Amendment Act.

A further clause gave the Board power to contribute towards the cost of combined road and railway bridges. These bridges, generally speaking, are situated on railway property, and previously no power existed whereby the Board could expend money on what was legally a railway-line.

Additional Main Highways.

As outlined in last year's annual report, in consequence of the introduction of the petrol-tax in 1927 the Board took steps to declare an additional mileage of main highways. The total mileage of secondary highways declared was 3,752, which, together with adjustments to the primary system involving the declaration of an addtiional twenty miles, makes the total length of roads under the Board's jurisdiction 10,403 miles. In the case of practically every new highway the whole of the powers which are vested in the Board were delegated to the local authorities, such delegation being made not only in respect of the control of the highways, but also in respect of the construction and maintenance, the Board paying its subsidy on the expenditure incurred by the local authorities.

A schedule is appended to this report giving the names and mileages of the various roads covered by the the recent declarations.

The provisions of section 11 of the Main Highways Act, 1922, require that an annual review of highways shall be made by District Highway Councils, and in turn by the Board. In February of this year District Highway Councils were invited to make this review. In view of the declaration of such a substantial mileage of additional highways only a few months previously, and the fact that the Board was not in a position to gauge accurately its financial liability in respect thereof, District Highway Councils were informed that the Board proposed merely to take into account any alterations considered necessary in consequence of changed traffic conditions and the declaration of a limited mileage where special circumstances were shown to exist. Local authorities, however, in a keen desire to obtain the benefits of the Board's subsidies, made applications for over 2,000 miles of additional highways, and these in practically all cases were recommended by District Highway Councils. The Board has made several recommendations to you for the alteration of the routes of existing highways, but, in view of the heavy financial commitments which have been entered into, it does not propose to recommend any further roads for declaration at the present time.

Main Highways controlled by the Board.

Section 9 of the Main Highways Act, 1922, gives authority to the Board to delegate to local authorities the powers vested in it in respect of main highways, and in most cases this has been done. In certain cases, however, no such delegation has been made, while in other cases the delegation has been restricted to traffic control of the highways, the Board retaining the powers of construction, reconstruction, maintenance, and repair.

The powers vested in the Board have been retained mostly in cases where the highway serves the ratepayers of a county to a limited degree only, where the Board itself is paying more than the ruling rate of subsidy for the time being in force, and where, for other reasons, the Board is in a position to exercise more efficient control and more economically execute the necessary works.

The greater percentage of the mileage controlled by the Board consists of what can be classified as tourist highways, serving important tourist districts such as Rotorua, Tongariro National Park, the west coast of the South Island, and the southern lakes district.

The mere fact that the Board controls any particular highway does not, in itself, mean that the local authorities are exempt from providing a proportion of the expenditure incurred in their upkeep.

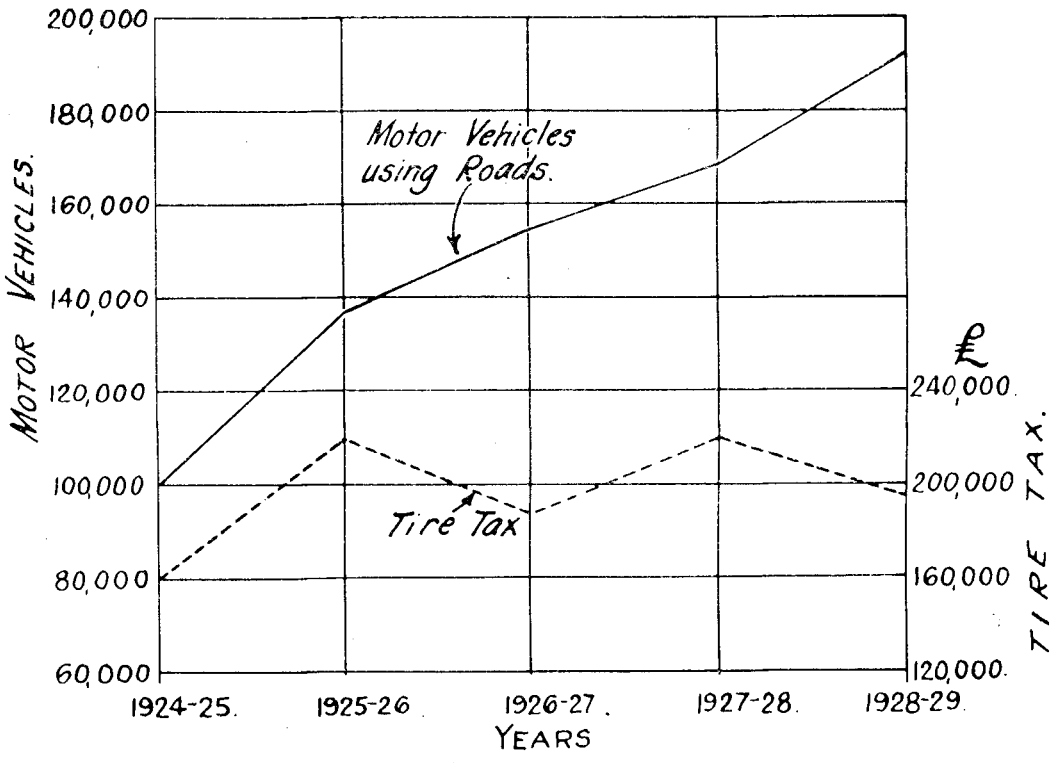
Finance.

The actual contributions to the Board's Revenue Fund from external sources for the year 1928–29 amounted to £1,303,178. The tabulation hereunder shows how this amount is made up. The income from similar sources during the past four years is also shown.

A feature of the table is the variation which has taken place from year to year in the amount of tire-tax received by the Board. Thus in 1925–26, when there were 136,715 motor-vehicles using the roads of the Dominion, the return from tire-tax was £223,699, being approximately £27,000 more than the return from tire-tax in 1928–29, when there were 56,000 more motor-vehicles on the roads. While there has been a 40 per cent. increase in the number of motor-vehicles, there has been a 12 per cent. reduction in the return from tire-tax. Again, if the average amount collected per annum during the four years prior to 1928–29 is taken, it is found to be greater than the amount collected during 1928–29. Although during this period there has been a reduction in the price of tires, which would have the effect of reducing the amount of Customs duty, the figures afford striking evidence of the improvement in the highway system. No doubt there has been an improvement in the design of tires, but the better standard of road-surface brought about by the expenditure of special motor-taxation must be recognized as the outstanding reason.

—	1928–29.	1927–28.	1926–27.	1925–26.	1924–25.
	£	£	£	£	£
Transfer from Consolidated Fund ..	35,000	35,000	35,000	35,000	35,000
Proceeds of tax on tires and tubes collected through the Customs Department	196,747	219,658	188,450	223,699	161,986
Registration and license-fees of motor-vehicles	341,017	303,861	283,963	78,038	268,178
Motor-spirits tax	730,414	130,461	..	..	..
Totals	1,303,178	688,980	507,413	336,737	465,164

The actual relationship between the number of motor-vehicles using the roads and the amount collected in tire-tax is illustrated in graph below.



GRAPH No. 1.

The total income from external sources—£1,303,178—is almost double the amount received in the previous year, for the reason that it is the first complete year during which the petrol-tax has been collected. Eliminating the transfer of £35,000 from the figure just quoted, the total direct taxation received by the Board from motorists was £1,268,178.

The total amount of petrol-tax collected by the Customs Department during the year was £851,366, and of this amount £49,135 was refunded to persons entitled to exemption under the Motor-spirits Taxation Act, making the net amount received £802,231. Charges for collection and for making refunds amounted to £8,303, and of the balance £730,414 was credited to the Main Highways Revenue Account, and £63,514 was paid to cities and boroughs of a population of more than 6,000, the allocation being made on a population basis and approved by yourself. At the time the introduction of the petrol-tax was under consideration by Parliament, it was estimated that the net yield to the Board for 1928–29 would be £754,000, and the Board's programme of works was drawn up on this basis. It will be noted that the receipts were actually a little under the estimate.

For the year ended 31st March, 1929, the appropriations and expenditure under the Revenue Fund were as follows:—

—	Available for Authorization.	Appropriated.	Expenditure.	Percentage of Expenditure to Appropriation.
	£	£	£	
North Island	670,629	534,495	500,266	93·59
South Island	358,029	285,505	256,133	89·71
Administration charges	40,000	40,000	33,004	82·51
Commission paid to Postal Department for collection of motor registration and license fees and registration of change of ownership	15,000	15,000	22,020	146·80
Miscellaneous payments, including recoupment of interest on loans to Consolidated Fund and reserve for redemption of Main Highway securities	159,084	159,084	119,154	74·90
Totals	1,242,742	1,034,084	930,577	89·99

In consequence of the authority conferred on the Board by last year's Amendment Act enabling it, at its discretion, to increase the rate of subsidies, the Board, as from the 1st April, 1928, increased the general maintenance subsidy from £1 10s. for £1 to £2 for £1. This is the third occasion on which by reason of its increased revenue the Board has been able to improve the conditions of the maintenance subsidy. In 1924, on the declaration of the original highway system, the Board paid a subsidy of 10s. for £1; in 1925 this was increased to £1 for £1; eighteen months later, in 1926, a further increase was made from £1 for £1 to £1 10s. for £1; while the present subsidy is £2 for £1. Thus the proportions found by the Board and the local authorities in 1924—*i.e.*, one-third and two-thirds respectively—have now been reversed. The subsidy of £2 for £1 applies to the additional highways declared in 1928 as well as to the original system.

In addition to the increase in the rate of subsidy for maintenance, the Board also approved an increase in the rate of bridge subsidy. The original Main Highways Act fixed the bridge subsidy at £1 for £1, except that in any special case where a bridge was situated on a Government road the Board had power to grant more liberal terms. Realizing that the cost of bridges, particularly the large structures, falls heavily on local authorities, the Board in 1925 obtained authority to increase the bridge subsidy. A sliding scale was adopted, and the rate of subsidy increased with the cost of the bridge, the rates of subsidy being one-half of the cost up to £10,000, three-fifths of the cost exceeding £10,000 but not exceeding £20,000, and two-thirds of the cost exceeding £20,000.

On bridges involving expenditure up to £10,000 the Board now, as a general rule, pays a subsidy of £2 for £1, and on expenditure above £10,000 £3 for £1. In special cases these rates may be varied.

An analysis of the expenditure by the Board and by local authorities on actual maintenance, as distinct from interest on loans and other overhead charges, is shown in the tabulation below. The tabulation has been subdivided to show, firstly, the expenditure on the original system of main highways, secondly, the expenditure on the additional main highways declared in 1928, and, thirdly, the expenditure on the whole system.

——	Board's Contribution.	Local Authorities' Contribucion.	Total.	Percentage Board's Contribution to Total.	Percentage Local Authorities' Contribution to Total.
	£	£	£		
(1) Original highway system—					
North Island	409,790	156,182	565,972	72·40	27·60
South Island	198,736	67,910	266,646	74·53	25·47
	608,526	224,092	832,618	73·08	26·92
(2) Additional highways declared, 1928—					
North Island	90,476	39,445	129,921	69·64	30·36
South Island	57,397	20,989	78,386	73·22	26·78
	147,873	60,434	208,307	70·99	29·01
(3) Complete system—					
North Island	500,266	195,627	695,893	71·88	28·12
South Island	256,133	88,899	345,032	74·23	25·77
	756,399	284,526	1,040,925	72.67	27·33

It will be noted that on the primary highway system the local authorities found £224,092, as compared with £269,065 last year—a reduction of £44,973. This is the first occasion on which the amount contributed by local authorities towards the cost of maintenance of the original highway system has shown a substantial reduction, and is accounted for by reason of the fact that, the actual cost of maintenance having stabilized to some extent, the increase in the Board's subsidy from £1 10s. for £1 to £2 for £1 has given direct relief to the local authorities. It is significant that the amount of the reduction, so far as the original highway system is concerned, forms more than two-thirds of the total amount provided by the local authorities for the maintenance of the secondary highways. The total amount provided by the local authorities for the whole of the highway system of 10,403 miles—namely, £284,526—is only £8,000 more than the local authorities provided towards the cost of maintenance of the original highway system, then 6,391 miles, in the peak year 1926-27.

The following tabulation shows the amount which has been provided by the Board and the local authorities for expenditure on the construction and maintenance of main highways during the five years which the Board has been in operation.

——	1924–25.	1925–26.	1926–27.	1927–28.	1928–29.	Totals.
	£	£	£	£	£	£
Maintenance by Board	123,675	279,404	438,762	523,581	756,399	2,121,821
Maintenance by local authorities	110,001	185,015	276,349	269,065	284,526	1,124,956
Construction by Board	222,422	421,880	540,362	449,904	936,148	2,570,716
Construction by local authorities	80,000	142,761	255,860	262,538	214,155	955,314
Total ..	536,098	1,029,060	1,511,333	1,505,088	2,191,228	6,772,807

The figures in the above tabulation do not include indirect charges such as supervision, interest, and other overhead charges.

An analysis of the actual expenditure on maintenance in each Island as compared with the number of motor-vehicles in each Island at the 31st March of each year since the inception of the main-highways scheme gives the following results, expressed in percentages of the Dominion's totals :—

——	1924–25.	1925–26.	1926–27.	1927–28.	1928–29.
North Island—					
Maintenance expenditure ..	64·49	65·27	64·86	67·51	66·13
Motor-vehicles	60·90	61·41	61·86	62·19	63·08
South Island—					
Maintenance expenditure ..	35·51	34·73	35·14	32·49	33·87
Motor-vehicles	39·10	38·59	38·14	37·81	36·92

These figures reveal the fact that the percentage of expenditure on maintenance of the main highways in the North Island each year has been greater than the percentage of motor-vehicles in that Island. This is due to two factors—namely, that the physical conditions of the North Island require a heavier expenditure to maintain the roads up to the same standard than is the case in the South Island, and, in addition, the North Island has by far the greater percentage of heavy vehicles. The tabulation also shows that the proportion of the vehicles in the North Island has increased annually since 1924. The proportion of maintenance expenditure in the South Island is greater than the proportion of the Board's revenue received from the South Island.

In accordance with the direction contained in section 21 of the original Act, and following on the Board's resolution passed in May, 1925, an apportionment of the tire-duty and license fees for the year ended 31st March, 1929, has been made between the two Islands in proportion to the number of motor-vehicles registered in each Island on that date.

No statutory provision exists requiring an apportionment of the proceeds from the petrol-tax between the two Islands, but the Board is of opinion that the most equitable method of distribution of this tax is according to the actual consumption of motor-spirit in each Island. As a guide to the basis on which the distribution should be made, the Board recently obtained from all oil companies figures showing the distribution of the petrol as between the two Islands. The information obtained shows that during the calendar year 1928 approximately 72 per cent. of the motor-spirit imported was consumed in the North Island and approximately 28 per cent. in the South Island. No adjustment has been made on these percentages to take account of rebates because the definite information is not available, and, in any case, it appears probable that the rebates in each Island will bear a similar proportion to one another as the amounts of petrol used. Moreover, the proportion of rebates is so small that a very considerable error in their proportions would not materially affect the proportion of the totals. In making the apportionment the interest on moneys borrowed for construction work in each Island has been charged against the revenue allocation to each Island, and other adjustments in connection with interest on accumulated balances have been made. On the assumption given above, the balances to the credit of the North Island and South Island respectively on the 31st March, 1929, are £209,261 and £408,869.

The following statement shows the manner in which these balances have been obtained :—

NORTH ISLAND.

	£	s.	d.		£	s.	d.
Expenditure (general)	500,265	4	9	Balance at 1st April, 1928	45,094	14	6
Abolition of toll-gates	1,807	0	0	Interest from investments—			
Interest and expenses of raising loans, &c.	32,936	8	0	Construction Fund	3,426	15	9
Commission on collection of motor fees	13,890	10	3	Revenue Fund	7,352	11	6
Miscellaneous expenditure	23,796	13	0	Motor registration—Annual license fees			
Finance Act, 1927 (No. 2), sec. 33,				and tire-tax	339,221	9	8
Wellington City Council	15,068	10	9	Motor-spirits tax	619,830	2	6
Transfer to Construction Fund ..	234,000	0	0	Transfer from Consolidated Fund ..	16,100	0	0
Balance	209,261	7	2				
	£1,031,025	13	11		£1,031,025	13	11

SOUTH ISLAND.

	£	s.	d.		£	s.	d.
Expenditure (general)	256,132	16	9	Balance at 1st April, 1928	323,764	5	10
Interest and expenses of raising loans, &c.	6,417	14	4	Interest from investments—			
Commission on collection of motor fees	8,129	19	3	Construction Fund	110	4	9
Miscellaneous expenditure	12,183	15	4	Revenue Fund	25,371	9	7
Transfer to Construction Fund ..	116,000	0	0	Motor registration—Annual license fees			
Balance	408,869	4	10	and tire-tax	198,542	9	1
				Motor-spirits tax	241,045	1	3
				Transfer from Consolidated Fund ..	18,900	0	0
	£807,733	10	6		£807,733	10	6

During the financial year 1927–28 it was necessary, as explained in the third and fourth annual reports, to exercise the powers contained in subsection (2) of section 15 of the original Act and transfer a sum of £300,000 from the Revenue Fund to the Construction Fund. This transfer, in accordance with arrangements made, was of a temporary nature only, the amount to be repaid to the Revenue Account out of loan-money when required. Actually, no repayment was made during the financial year to which this report relates, so that the account of each Island has yet to receive credit for the amount temporarily transferred. In accordance with arrangements made by the Minister of Finance, a sum of £150,000 is being repaid to the Revenue Account in the financial year now current.

In addition to the above temporary transfer, a sum of £350,000 was transferred from the Revenue Fund to the Construction Fund during the financial year 1928–29, but no repayment is to be made in this case. This transfer was made, in accordance with the announcement on the introduction of the petrol-tax, to meet the extra subsidy—*i.e.*, £3 for £1—being paid by the Board towards the cost of paving schemes adjacent to the large centres of population, the subsidy payable on construction work in small boroughs and the increased bridge subsidy. It was originally intended to confine the payment of an extra subsidy on expenditure on paving the highways adjacent to centres of a greater population than six thousand persons, but it was found possible, on account of the funds which had accumulated to the credit of the South Island, to extend the five-year programme of paving-work to include a greater length of the trunk highway between Picton and the Bluff. Accordingly negotiations were opened up with the local authorities to decide upon a schedule of works covering the above period, and the results were decidedly satisfactory.

It was pointed out in last year's report that because the large paving schemes and other construction rendered possible by the petrol-tax could not commence contemporaneously with the collection of such tax it was anticipated that there would still be a considerable accumulation of funds at the close of the financial year, 31st March, 1929. Actually this proved to be the case, but as a result of the extension of paving schemes referred to above heavy construction and surfacing programmes are now in hand, and the amount expended on construction works since the close of the financial year to which this report relates is heavier than the amount expended in any similar previous period. Also, a number of further paving contracts have been let during the past few months, and these will be in full operation in the summer construction season.

Already a sum of £400,000 has been transferred from the Revenue Fund to the Construction Fund during the financial year now current, and it will be necessary to transfer a further sum of at least £350,000. The transfer of these amounts out of the Revenue Fund, together with the increasing charges on this fund, will substantially reduce the balance in this account at the end of the year.

For the year ended 31st March, 1929, the appropriations and expenditure under the Construction Fund were as follows :—

——	Available for Authorization.	Appropriation.	Expenditure.	Percentage of Expenditure to Appropriation.
	£	£	£	
North Island	977,162	616,000	706,328	114·66
South Island	427,881	271,000	229,820	84·80
Administration charges and compensation for accidents to workmen	53,000	53,000	49,684	93·74
Totals	1,458,043	940,000	985,832	104·87

An analysis of the Board's expenditure and the expenditure by local authorities under the Construction Fund shows the following position :—

The tabulation has been subdivided to show, firstly, the net expenditure on the original system of main highways; secondly, the net expenditure on the additional main highways declared in 1928; and, thirdly, the net expenditure on the whole system.

——	Board's Contribution.	Local Authorities' Contribution.	Total.	Percentage of Board's Contribution to Total.	Percentage of Local Authorities' Contribution to Total.
	(1) *Original Highway System.*				
	£	£	£		
North Island	647,139	151,587	798,726	81·02	18·98
South Island	215,680	38,942	254,622	84·70	15·30
Totals	862,819	190,529	1,053,348	81·91	18·09
	(2) *Additional Highways declared, 1928.*				
North Island	59,189	19,661	78,850	75·06	24·94
South Island	14,140	3,965	18,105	78·09	21·91
Totals	73,329	23,626	96,955	75·63	24·37
	(3) *Complete System.*				
North Island	706,328	171,248	877,576	80·49	19·51
South Island	229,820	42,907	272,727	84·27	15·73
Totals	936,148	214,155	1,150,303	81·38	18·62

When the above figures are compared with the figures for 1927–28 it will be found that there has been a reduction of £72,000 in the amount contributed by the local authorities towards the cost of construction works on the original highway system, and the whole of that reduction has been in the North Island. The reduction has taken place despite the fact that the Board's expenditure is greater than on any previous occasion, and is a direct result of the payment of increased subsidies on paving of highways adjacent to the larger centres of population as well as on bridges. Furthermore, in the early stages of the Board's operations a large number of local authorities in the North Island borrowed substantial sums for reconstruction of main highways on a £1-for-£1 basis. Most of this borrowed money was spent prior to the financial year 1928–29.

Review of Past Operations.

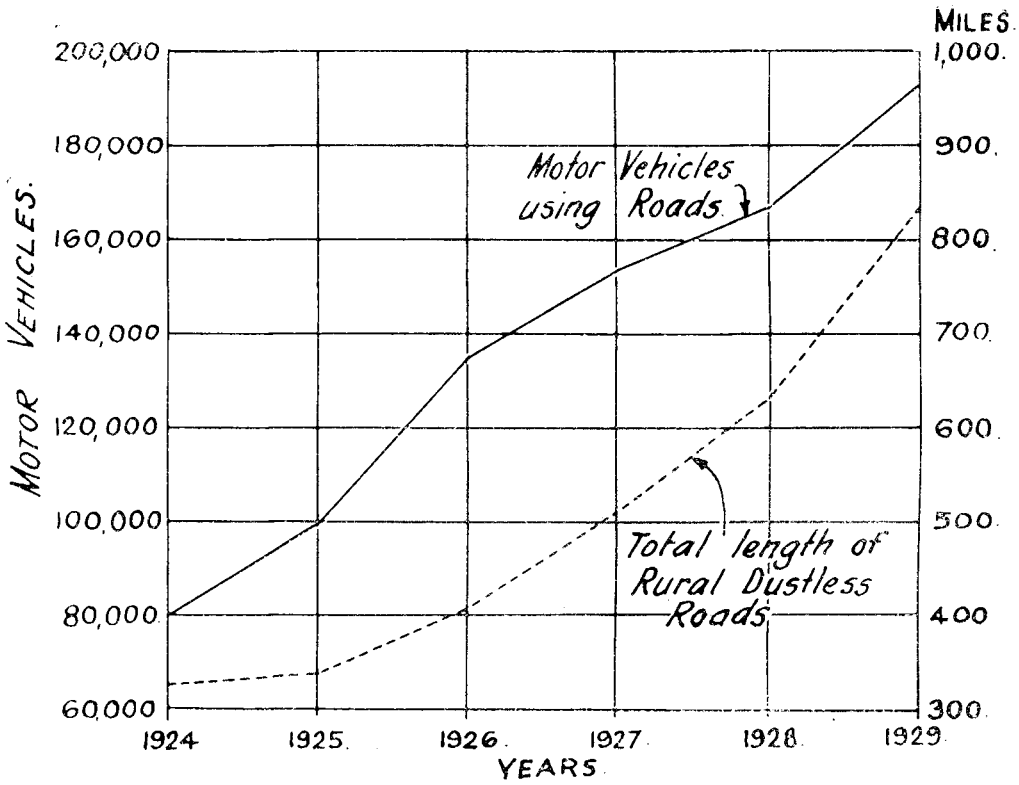
The Main Highways Board has now been operating for a period of five years. The time therefore appears opportune for the presentation of a short summarized review of its activities. The annual expenditure on main highways since 1924 has increased very substantially. It is proposed in a general way to analyse the increasing expenditure, and compare it with the development in motor transportation and with the expenditure being incurred on the main-highway systems in other countries.

The following tabulation shows the amount of construction work accomplished on main highways since the Board commenced to function :—

——	Formation and Widening.	Gravelling and Metalling.	Tar and Bituminous Sealing.	Bituminous Macadam (Penetration).	Bituminous Concrete.	Portland-cement Concrete.	Totals.	Bridges.
	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Ft.
1924–25 ..	19	63	6	6	..	..	94	2,434
1925–26 ..	45	88	16	45	4	6	204	5,168
1926–27 ..	174	151	35	38	12	16	426	6,408
1927–28 ..	173	133	83	34	..	6	429	7,760
1928–29 ..	224	185	122	51	14	11	607	9,482
Totals ..	635	620	262	174	30	39	1,760	31,252

An examination of the above figures discloses the steady progress which has been made. The question is sometimes raised as to whether highway development in New Zealand is not proceeding at too great a rate. Highway development is merely the result of development of motor transportation, therefore comparisons between the two should show some relationship.

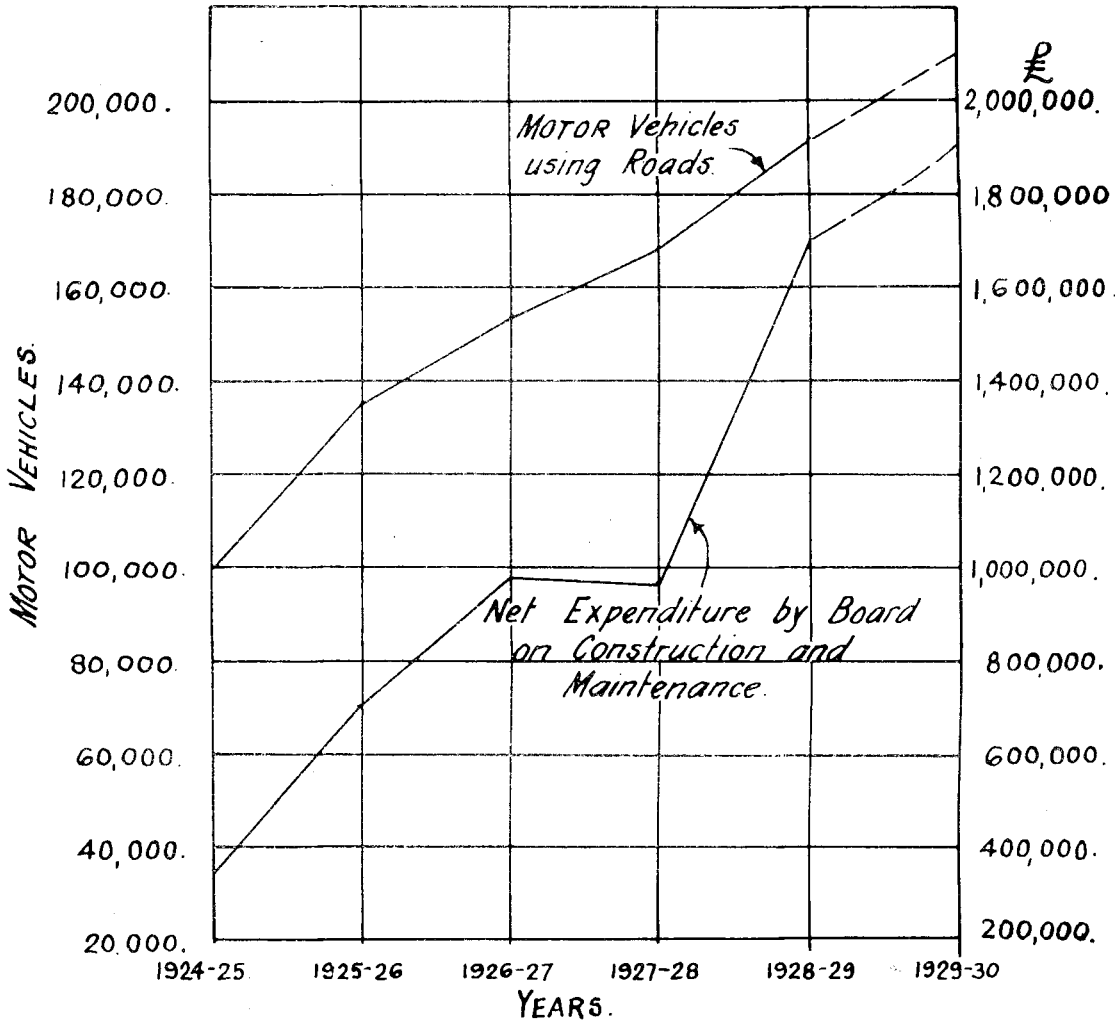
One of the main functions of the Main Highways Board is to provide such types of roads as will withstand the destructive effects of motor-vehicles, provide a reasonably smooth running-surface, and, where the circumstances warrant, eliminate the dust nuisance. These dust-free types range from a tar-sealed macadam surface to a Portland-cement concrete pavement. The total rural mileage of such improved surfaces in New Zealand in 1924 was 325 miles. As the result of the operations under the Main Highways Act, the length has been increased to the present figure of 830 miles. The following graph shows the relation between the total motor-vehicles using the roads and the mileage of improved surfaces.



Graph No. 2.

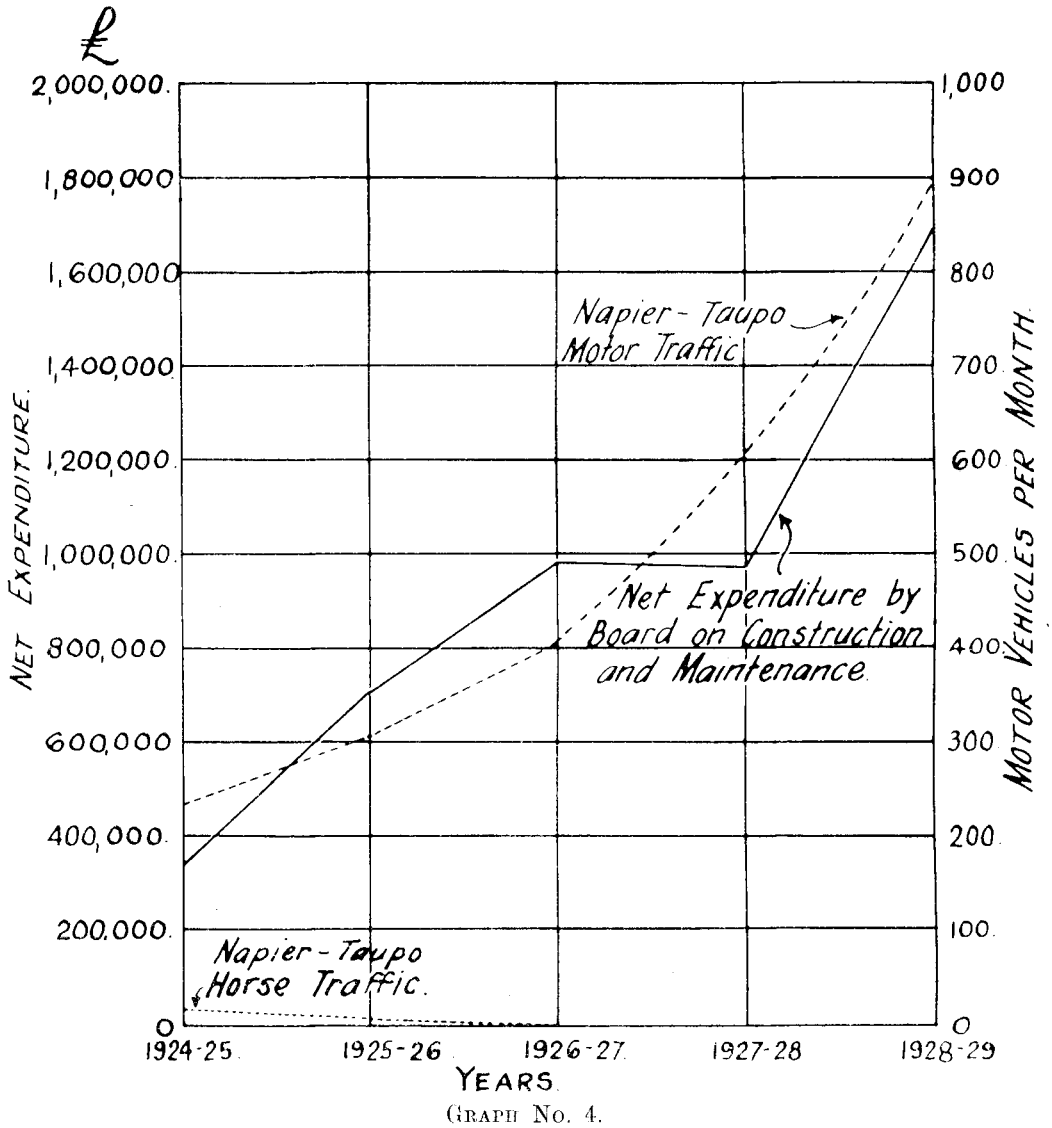
It will be noted that the advances made in road-construction have not been disproportionate to the use made of the roads by motor-vehicles.

In view of the recent substantial increase in motor-taxation it is also interesting to compare the expenditure by the Board with the number of motor-vehicles using the roads. The diagram below gives the information in graphical form. The expenditure shown is the net total provided from the Board's funds on actual construction and maintenance, overhead charges, interest on loans, &c., being omitted.



Graph No. 3.

The graph shows that the expenditure has not been inconsistent with the development of motor transportation. Also it is evident that if the petrol-tax had not been imposed in 1927 highway-activities would have lagged considerably behind motor development. The following graph in this connection is also of interest.



GRAPH NO. 4.

The above diagram shows the relation between the net expenditure on highway construction and maintenance, and the increase in traffic which has taken place over the same period on a typical rural main highway. For comparative purposes the information concerning horse-drawn traffic is also shown.

In Victoria the Country Roads Board, the counterpart of the New Zealand Main Highways Board, has been in operation about sixteen years. In New South Wales the Main Roads Board has been in operation for about four years. It is of interest to compare the annual expenditure on main highways in these two States with the corresponding amount for New Zealand. The following tabulation shows the latest figures, together with the unit expenditures per motor-vehicle and per head of population :—

—	New Zealand, for Year ending 31st March, 1929.	New South Wales, for Year ending 30th June, 1928.	Victoria, for Year ending 30th June, 1928.
Total expenditure by main-road authority	£1,917,000	£3,365,600	£2,265,500
Expenditure per motor-vehicle	£9 12s. 0d.	£16 0s. 0d.	£15 2s. 0d.
Expenditure per head of population	£1 6s. 1d.	£1 7s. 7d.	£1 5s. 7d.

The figures per head of population are in remarkably close accord, while the expenditure per motor-vehicle in New Zealand is very substantially lower than in the two Australian States.

A similar tabulation has been prepared showing the same information for eleven of the American States, the populations of which range from 800,000 to 2,500,000, a range which includes the populations of the Australian States and New Zealand. The figures relate to the year 1927.

——	Alabama.	Arkansas.	Colorado.	Kansas.	Louisiana.	Maine.
Total expenditure by main-road authority..	£2,250,000	£1,420,000	£1,240,000	£4,330,000	£2,360,000	£2,310,000
Expenditure per motor-vehicle	£9 4s. 5d.	£6 17s. 2d.	£4 12s. 5d.	£8 12s. 5d.	£9 5s. 0d.	£14 1s. 7d.
Expenditure per head of population	17s. 5d.	14s. 7d.	£1 2s. 10d.	£2 7s. 9d.	£1 4s. 3d.	£2 18s. 0d.

——	Maryland.	Mississippi.	Nebraska.	Oregon.	South Carolina.
Total expenditure by main-road authority	£1,540,000	£950,000	£1,450,000	£1,390,000	£2,650,000
Expenditure per motor-vehicle..	£5 13s. 7d.	£4 7s. 0d.	£3 17s. 6d.	£5 13s. 5d.	£13 5s. 0d.
Expenditure per head of population	19s. 0d.	10s. 7d.	£1 0s. 7d.	£1 7s. 10d.	£1 8s. 5d.

The average expenditure on highways per head of population for these eleven States is £1 6s. 6d. This figure is a shade over the New Zealand figure and is almost exactly the average between Victoria and New South Wales. Again it is obvious that if the petrol-tax had not been imposed in New Zealand highway expenditure would have lagged considerably behind that of our neighbours as the expenditure per head of population in this country for the year 1927–28 was only 14s. 7d.

Although the above information goes to show that main-highway activities have just reached a stage comparative with what is being done in other countries, it is not desired to give the impression that roading development in New Zealand as a whole has lagged behind corresponding development elsewhere.

The diagram below shows the percentage of total roads surfaced and unsurfaced in the United States of America and New Zealand. It also shows the percentage of improved surfaces, including all types, from tar-sealing upwards.

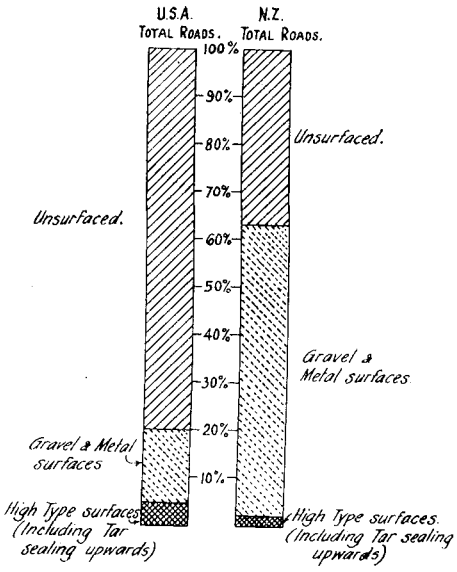


Diagram No. 1.

The diagram discloses that as far as the proportion of all-weather surfaced mileage is concerned New Zealand is many years in advance of the United States, but that New Zealand is well behind the United States in the provision of the improved surfaces required specially for motor-traffic. The latter result is largely accounted for by the fact that the traffic density per mile of road on the arterial roads of the United States of America is very much greater than in New Zealand.

Diagram No. 2 discloses the manner in which the main arterial systems in each country are surfaced. For the purposes of this comparison the main arterial system is assumed as being the most important 10 per cent. of the total road-mileage.

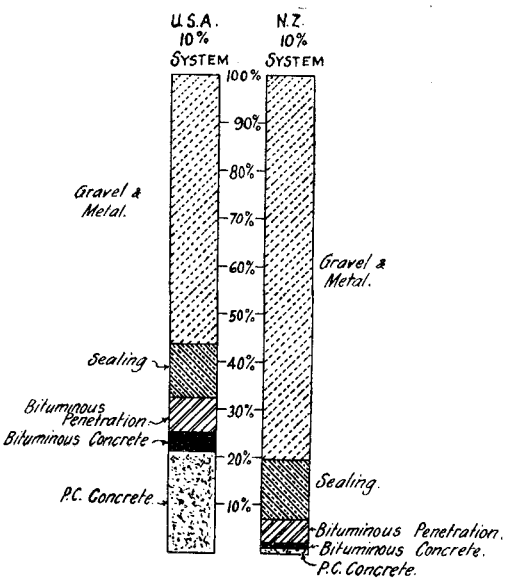


DIAGRAM NO. 2.

Again it will be seen that New Zealand lags behind in the provision of improved dustless surfaces. The popularity of Portland-cement concrete pavements in the United States of America is brought out, this being mainly due to the enormous traffic which is carried on a large mileage of the rural highway system, and which justifies the construction of such expensive surfaces.

The above review appears to support the following conclusions: (1) That highway development in New Zealand is merely keeping pace with the development of motor transportation; (2) that the rate of expenditure on highway activities has just reached a figure which is remarkably close to the rates of expenditure in other new countries where the conditions of national development and the development of motor transportation are somewhat similar to those in New Zealand.

The Main Highways Board does not desire undue exaltation of the importance of highways, or that highway development shall be at the expense of other necessary activities, but the problem to be faced is that, so long as transportation over the highways is necessary, expense is inevitable whether the roads are good or bad. Probably the expense is greater if the roads are bad, through increased operating-costs, which tax the public just as certainly as the ordinary fiscal methods.

CONSTRUCTION.

The construction work carried out or subsidized by the Main Highways Board may be discussed under three headings—(1) The closing up of unmetalled gaps in the main-highway system, a work to which the Board has consistently applied itself ever since it commenced to function; (2) the paving of sections of highway which carry traffic beyond the capacity of the ordinary gravelled or metalled road, which work has been given considerable impetus since the imposition of the petrol-tax; and (3) the construction and replacement of bridges.

With regard to the first heading—*i.e.*, the closing of unmetalled gaps—it was remarked in last year's report that the additional finance available to the Board would assist very largely in completing existing gaps in the system. Achievements in this respect have been gratifying alike to the Board and to the general public. The most important connection of this nature yet to be accomplished is that between Auckland and Whangarei. This work will involve a very heavy expenditure over a number of years, and the Board was loath to commence serious operations until it was in a position to provide a substantial annual appropriation for the project. The additional revenue enabled a commencement to be made during the year under review, and last summer a great deal of work was accomplished. Upwards of six hundred men were employed during the working season. Such activity on one roadwork has been unparalleled in the history of the Board, and indeed, it is believed, in the history of the Dominion.

An all-weather connection was established before winter between Auckland and Waiwera.

Metalling was linked up on the highway between the Townships of Kumeu and Albany, connecting the east and west coast of the North Auckland Peninsula.

A work of great importance to the Bay of Plenty has at last been completed—namely, metalled access to the Waikato via the Kamai Hill and Matamata. This accomplishment also provides the first all-year-round route from Tauranga to Auckland.

Another notable achievement has been the linking-up of Rotorua with the rest of the North Island by a metalled surface through the notorious Mamaku Bush. This work has revolutionized winter transport to the thermal region.

The King-country (including the other great tourist resort of the North Island, the Tongariro National Park) has also been connected up for the first time with the rest of the North Island by metalled roads. It is a coincidence that two connections should be accomplished in the one season—the direct connection to Wanganui via the Parapara Road, and the connection between Ohakune and Wellington via Taihape. On the former work a spectacular programme was carried out in a very short

working season. At the beginning of February, 1929, a gap of 10½ miles of clay surface existed on the Parapara Road, yet this gap was entirely closed by the end of April. Thus in record time was completed the final phases of a work which the people of Wanganui have strongly advocated for a period of forty years.

The Kawhia district was connected up with the rest of the North Island by a metalled road.

On the Ohura Road, the Township of Whangamomona and its surrounding district were provided with all-weather access to Taranaki for the first time in its history.

Another work for which motorists have been pressing for a long time is the connection between Gisborne and Opotiki. The Board has concentrated on this connection during the past two years, and succeeded in laying a base course of metal right through before the winter. The completion of this work will give Gisborne district its third important connection since the Board commenced operations, so that, as far as road transport is concerned, Gisborne can no longer complain of being isolated.

Another work on which the Board has concentrated during the past two years has been the main thoroughfare through the middle of the North Island, known as the Te Kuiti – Bulls via Taumarunui Main Highway. During the past working season a very large amount of work was accomplished between Te Kuiti and Taumarunui, and next winter light motor-vehicles should be able to traverse the whole of this highway without inconvenience.

The work of the Board under the second heading above mentioned—*i.e.*, the paving of sections of highway carrying heavy traffic—has also progressed in a very satisfactory manner. It will be remembered that when the proposal for the imposition of the petrol-tax was first placed before Parliament an announcement was made indicating how the proceeds of the tax were to be used. In particular, a substantial proportion of the tax was to be devoted to the payment of higher subsidies towards the cost of paving schemes where the traffic was such that a higher and more costly type of surface was necessary. Following upon this announcement, schemes were prepared around all the more important centres of population. The details of these schemes were decided upon after collaboration with the local authorities and automobile associations.

The development of this phase of the Board's work has given a great impetus to expenditure in the South Island, where a number of important schemes have been commenced. The changed attitude in the South Island has also been largely brought about by the use of the powers given to the Board to advance money to local authorities under the Main Highways Amendment Acts of 1926 and 1928 in circumstances where it considers this advisable.

One unavoidable result of the speeding-up of operations in the South Island will of necessity be the retardation to some extent of works in the North Island, where the local authorities for the past five years have received a heavy proportion of the Board's construction funds. The disinclination of the authorities in the South Island to proceed with schemes of construction in the past has not, of course, affected the distribution of the Revenue Fund, details of which are submitted elsewhere in this report.

The class of work being carried out under the paving schemes ranges from bituminous surface treatment of macadam and gravel roads to the construction of Portland-cement concrete pavements.

No less than 198 miles of dustless roads were constructed during the year, made up as follows: Tar and bituminous surface treatment, 122 miles; bituminous macadam (penetration), 51 miles; bituminous concrete, 14 miles; Portland-cement concrete, 11 miles.

When it is pointed out that the total rural mileage of dustless roads in New Zealand at the 31st March, 1928, was about 639, it will be seen that in one year the operations under the Main Highways Act have increased that mileage by about 30 per cent. While this accomplishment is most gratifying, it is nevertheless necessary to realize the very small proportion which these figures bear to the total length of roads under the control of the Main Highways Board—namely, 10,403 miles. At the present rate of progress it would take twelve years to provide dustless surfaces on only a quarter of the length of the highway system, and by that time a substantial length of the cheaper surfaces now being laid down would have reached or would be nearing the end of its useful life. If a more lasting material, such as concrete or bituminous concrete, were adopted universally as a surfacing-material on the highway system it would take between thirty and forty years before one-quarter of the present highway system could be surfaced, and long before the expiry of this period a substantial mileage of the work would have reached the end of its useful life as a surfacing-material.

Most of the paving-work during the past year has been carried out by contract, this being in accordance with the Board's general policy since it commenced operations. In a number of cases alternative tenders have been called for Portland-cement concrete and for bituminous concrete, and, generally speaking, the prices have been very satisfactory. In Hawke's Bay and Canterbury, in particular, good tenders have been received for Portland-cement concrete construction, the figures ranging from £5,800 per mile to £6,800 per mile for an 18 ft. concrete road 9 in.–6 in.–9 in. section with, in some cases, 3 ft. bituminous shoulders. These prices are considerably below prices for similar work in the Auckland District, where aggregate is more costly.

Another type of paving for which a number of contracts have been let is single-course bituminous concrete. Pavements of this class, and of a thickness of 2½ in., are being laid, where aggregate is reasonably cheap, at a cost of between 5s. and 6s. per square yard, or about £3,000 per mile, for an 18 ft. pavement.

It is now proposed to discuss the third division of highway construction—the erection and replacement of bridges.

Since 1924, on those roads under the control of the Main Highways Board, an aggregate length of nearly 6 miles of bridges has been built, yet only the fringe of the bridge problem has really been touched. Practically all the large bridge proposals are merely replacements, and consequently are not spectacular from the point of view of the general public, yet the necessary finance involves the Board in very heavy commitments. Moreover, much of the expenditure is impossible of postponement, as many of the existing structures are vitally important but very weak links in the main arterial routes.

In spite of the great deal of good work accomplished during the past five years, the other activities under the Highways Act, in the way of widening and improvement of the alignment, grades, and surfaces generally, merely draw more pointedly the attention of the road-user to the inadequacy of hundreds of bridges on the main thoroughfares. Such inadequate structures may be classified under five groups—(1) Bridges which are structurally unsafe; (2) bridges which are too light for modern traffic; (3) bridges which are too narrow for modern traffic; (4) bridges which are on poor alignment; (5) bridges which are unsatisfactory and often dangerous because of combined road and railway use.

The time has arrived for a methodical investigation of the condition of all our important bridges, particularly with regard to headings (1) and (2). The enormous increase in volume of traffic during recent years, and the greatly increased speeds of heavy vehicles, are proving very trying to many of the older wooden structures.

Comment is sometimes made on the great number of wooden bridges which exist in New Zealand, and on the desirability of their early replacement with structures built of so-called permanent materials. The following extract from the last biennial report of the Division of Highways in California, published this year, gives food for thought:—

"There has been an increased number of redwood and creosoted Douglas-fir bridges built during the past biennium. For several years the great majority of short-span bridges on the State highways have been built of concrete. They were built for permanent structures, but the large, unlooked-for increase in traffic and the much higher standard of alignment now in use on the connecting highways have rendered many of these bridges, with narrow roadways and poor alignment of approaches, either dangerous or very unsatisfactory for present-day conditions. Where the bridges are narrow, but on good alignment, the defect can be remedied by widening the structure, and this has been done in many cases; but where the alignment of the approaches is poor it frequently happens that this cannot be corrected without abandoning the existing bridge altogether. It has thus developed that many of these so-called permanent bridges have become obsolete in less than ten or fifteen years. Assuming a thirty-five-year life for a creosoted fir or redwood timber bridge, and neglecting the fire hazard, the timber bridge will in most cases be slightly cheaper in the long-run than a permanent concrete structure, the saving in first cost being more than enough to rebuild the timber structure at the end of thirty-five years. The disadvantages of the timber structure are the fire hazard and the inconvenience to traffic at the time of rebuilding. When the available funds for any bridge project are limited, there is therefore no loss in economy in building a timber structure, and where there is any doubt as to the permanency of location for a crossing a timber bridge is obviously the economical type."

To give an idea of the immediate bridge programme, the following list shows some of the more important structures which are now either under way or will have to be put in hand in the next year or so, and for all of which the plans are completed or are well advanced:—

Name.	Highway District.	Approximate Estimate. £
Kahoe	North Auckland	5,000
Puhoi	"	6,000
Skelton's	"	6,000
Waiwera	"	8,000
Whau	"	5,000
Awatere	Gisborne	6,000
Te Arai	"	6,000
Waipaoa	"	15,000
Mangatewainui	Hawke's Bay	8,000
Porangahau	"	6,000
Rissington	"	4,000
Waipukurau	"	22,000
Manganui-o-te-ao	King-country	7,000
Urenui	Taranaki	6,000
Bulls	Wanganui	40,000
Hautapu	"	5,000
Vinegar Hill	"	6,000
Aorangi	Wellington West	12,000
Fitzherbert	"	40,000
Kokotau	Wellington East	12,000
Ruamahanga	"	11,000
Newton	Nelson	6,000
Wairoa	"	9,000
Ahaura	West Coast	15,000
McDonald's	"	4,000
Hurunui	North Canterbury	17,000
Waimakariri	Canterbury Central	19,000
Ashburton	South Canterbury	19,000
Pareora	"	15,000
Albertown	Otago Central	6,000
Clutha	Otago South	56,000
Aparima	Southland	20,000
		£422,000

In addition to the above list, there are hundreds of minor structures requiring attention, involving the expenditure of many thousands of pounds. Other problems to be faced are the difficulties experienced on such large and important combined road and railway bridges as the Rakaia Bridge in Canterbury. Any reasonable solution of these difficulties is bound to involve the Main Highways Board in very heavy charges.

In regard to standards of construction, and this applies not only to bridges but to roads generally, satisfactory progress has been made during the year under review. Local authorities continue to appreciate the necessity for complying with the requirements of the Board, particularly as regards improved alignment and visibility. The increasing traffic, and the increasing speed of that traffic, require frequent modification of these standards, and in approving proposals an endeavour is made to anticipate in a reasonable manner the requirements of the future. An indication of the Board's attitude towards these matters is shown by the decision during the past year to increase the width of first-class bridges on the most important arterial roads to 20 ft. between kerbs, instead of 18 ft. as heretofore. In special cases widths up to 24 ft. are approved. The Board has also requested local authorities, in submitting proposals for short bridges of 12 ft. span and under, to make the trafficable width of the bridge the same as the width of the adjacent road-formation.

During the current year it is hoped to issue further data regarding standards for the assistance and information of local authorities. Such information will include a number of typical modern specifications for various classes of highway-construction.

Maintenance.

With a few exceptions, the main highways have been well maintained throughout the year. In one or two cases the Board has been reluctantly forced to use the special power conferred on it by statute, with beneficial results to the travelling public.

It was remarked in last year's report that the maintenance expenditure appeared to be stabilizing to some extent, due, no doubt, to the adoption of better methods and the use of suitable maintenance plant, and, to a certain degree, to the increase in the mileage of high-class pavements. The figures for the year under review show similar features.

The increase in maintenance cost per mile on the primary highway system of 6,651 miles is substantially lower than in previous years, the average cost per mile per annum since 1924 being as follows: 1924–25, £51·7; 1925–26, £73·2; 1926–27, £111·9; 1927–28, £119·9; 1928–29, £125·2.

It will be seen that the increase in maintenance cost during 1928–29 has amounted to only 4·4 per cent. over and above the cost for the previous year, whereas the number of motor-vehicles actually using the roads has in the past twelve months increased by 14 per cent.

With regard to secondary highways, a total length of 3,752 miles was maintained at the average cost of £55·5 per mile, the figure for the North Island being £66·2 per mile, and for the South Island £43·8 per mile.

The total sum found by the Board on secondary highways, as already pointed out, amounted to £147,873, the whole of which is a direct relief to local authorities.

Elimination and Improvement of Railway Level Crossings.

The following eliminations were completed during the past year:—

Gisborne–Opotiki via Motu Main Highway: Two crossings at Rakauroa.
Wellington–Napier via Wairarapa Main Highway: Two crossings at Matahiwi Hill; crossing at Piripiri.
Auckland–Wellington via Taranaki Main Highway: Crossing at Hawera.
Waipara–Kaikoura via Culverden Main Highway: Crossing at Weka Pass.
Dunedin–Christchurch Main Highway: Crossing at Tumai.

With regard to the problem of the level crossing generally, the Board has, during the past year, exchanged views with the Railway Department. Both authorities are prepared to continue to make reasonable sums available for elimination and improvement of level crossings, but the cost of elimination is so great that only a very few crossings can be dealt with annually.

It is agreed that it would be advisable to consider the question of diverting a substantial proportion of the capital expenditure towards the carrying-out of improvements to visibility and the installation of automatic warning-devices at a large number of railway-crossings. Such a change in policy during the next year or two would confer much greater immediate benefit upon road-users than by devoting the whole of the available funds to elimination work.

There are a great number of crossings throughout the country where the expenditure of a moderate sum could be devoted to the removal of obstructions on railway property, on the roadway, and on private land, resulting in greatly improved visibility and a proportionate reduction in danger to the road-user.

The attitude of the Main Highways Board towards these suggestions as far as main highways are concerned can be summarized as follows:—

(1) Where it is necessary for the improvement of the view at a crossing to remove obstructions on railway property, the Board is unable to make any contribution.

(2) Where it is necessary to remove any obstruction on the roadway for the purpose of obtaining an improvement to visibility, the Board will, in conjunction with the local authorities, provide the necessary cost.

(3) In cases where it is necessary to take private land for the purpose of carrying out improvements to visibility, the Board is prepared to bear half the cost with the Railway Department. The Board will negotiate with the local bodies in respect to any contribution which it thinks should be made by them.

(4) The Board is prepared to bear 50 per cent. of the cost of installation of automatic warning-devices and 50 per cent. of the annual cost of maintenance of same.

It is also considered necessary by both the Railway Department and the Main Highways Board that there should be power to enter upon private property for the purpose of removing obstructions adjacent to level crossings without going to the extent of taking the land, but at the present time there is no enabling statutory authority.

Advances to Local Authorities.

Section 2 of the Main Highways Amendment Act of 1926 vested the Board with authority to advance moneys by way of loan to local authorities for highway purposes. The Act limited the total amount to be advanced to a sum of £50,000. The section in question, however, was practically inoperative, for the reason that doubt existed as to whether local authorities in certain cases could accept advances from the Board. Such doubt, however, was cleared away by the Main Highways Amendment Act of 1928, which, in addition, removed the limit of £50,000. The maximum period of any loan is fixed by the Act at ten years.

The result of the 1928 Amendment Act is that local authorities are taking considerable advantage of their powers to obtain advances from the Board, mainly in connection with paving schemes on the arterial highways. Particularly is this the case in the South Island, where local authorities are averse to borrowing under the usual procedure. In fact, the Board is satisfied that it is only by reason of the powers conferred by this clause that it has been able to obtain the co-operation of the local authorities of the South Island in connection with the more costly forms of highway improvement.

It should here be explained that the powers conferred on local authorities are such that it is unnecessary to take a poll of the ratepayers to obtain an advance, but the Board desires to make it clear that local authorities, on this account, are not likely to embark on injudicious expenditure.

In the first case, the powers to make an advance are confined to the Main Highways Board, and no private person or other lending authority can lend money to local authorities under this section. Any amounts advanced to local authorities can be used for highway works only, and therefore the Board itself has a direct interest, in that it is required to pay a subsidy on the cost, so that in considering any application for an advance the Board satisfies itself as to the soundness of the work not only from a local-authority point of view, but also from a highway point of view. In the matter of the period of the loan the Board has due regard to the life of the asset, and in all cases is careful to allow an ample margin. All loans are made on the instalment repayment system, the local authority being required to make equal annual payments, which include interest on the amount for the time being outstanding and part repayment of principal.

Traffic-control.

The Board has on numerous occasions pointed out the necessity for an efficient system of traffic-control, particularly with regard to heavy traffic. The Board is satisfied that owing to non-enforcement of the heavy-traffic regulations much greater damage than necessary is caused to highways by reason of overloading and speeding, with the inevitable result of higher maintenance charges.

The Board recently appointed a Traffic Inspector to regulate traffic on the main highway between Auckland and Hamilton, and reports available have fully confirmed the opinion expressed above. In consequence the Board has suggested to local authorities that certain groups should combine for the purpose of administering the traffic regulations, and in a number of cases this suggestion is being adopted.

Earthquake Damage.

Serious damage was caused to the main highways in the Nelson and West Coast district by the disastrous earthquake which took place on the 17th June, 1929. Communication by road between Nelson and the West Coast was cut off by the heavy slips which took place in the Buller Gorge between Murchison and Lyell, while highway communication between Westport and Karamea was also entirely cut off. Minor damage was caused on other highways, but in these cases communication was restored within a comparatively short time.

From the first inspection made of the Buller Gorge it was evident that it would take a considerable time to restore the highway—in fact, some doubt existed at first as to whether it could be reopened—and accordingly immediate steps were taken to provide for traffic by reconditioning the road from Murchison to Reefton via Maruia. In view of reports made from later inspections, the Board has decided to reopen the main road, but as the whole length of highway affected will have to be resurveyed, and also in view of the fact that it would be unwise to commence reconstruction until the country has more or less stabilized, it may be a year to eighteen months before traffic can again travel via this route. In the meantime traffic will require to utilize the Murchison–Maruia–Reefton route, although it involves an extra sixty-three miles in travelling from Nelson to Westport and over twenty miles additional to the rest of the West Coast.

The damage between Mokihinui and Karamea is extensive, and of such a nature that it appears, although a final examination has not been made, that this section may have to be abandoned and a new road constructed along the coast.

Purchase of Plant.

The policy of purchasing and hiring plant on the hire-purchase system to local authorities has been continued. The total value of plant purchased on this system to the 31st March, 1929, amounted to £106,324. The following statement shows the plant ordered and hired to local authorities from the 31st March, 1928, to the 31st March, 1929, the amount involved being £30,617: Power graders, 15; ordinary road-graders, 3; crushers, 2; granulators, 3; motor-lorries, 12; rollers, 3; tractors, 4; bitumen-boilers, 3; sprayers, 3; elevators, 3; conveyer, 1; electric winch, 1; &c.

In addition to the above, the Board purchased the following plant for its own use, at a total cost of £33,202: Power graders, 8; ordinary road-graders, 3; road-rollers, 12; motor-lorries, 12; crushers, 6; air-compressors, 10; air-receiver, 1; tractors, 5; bitumen-boilers, 9; sprayers, 5; oil-engines, 2; concrete-mixers, 2; sweepers, 2; motor-car, 1; motor-cycle, 1; elevators, 2; road-maintainer, 1; trailers, 2; &c.

The Board has continued to encourage and urge the use of modern plant, particularly on highway-maintenance.

With a view to ascertaining the increase in roadmaking plant in the possession of County Councils, statistics were recently collected showing the numbers of the more important items of roadmaking plant being used throughout the country. Similar information was obtained in 1924. The following statement shows the two sets of figures:—

	1924.	1929.
Road-rollers	67	108
Crushers	134	165
Lorries	173	238
Graders	419	546
Tractors	15	101
Bitumen-sprayers	6	34
Bitumen-boilers	7	55

The plant now being used by the County Councils is approximately one quarter of a million pounds greater in value than the plant being used five years ago. Of this amount approximately £100,000 has been advanced by the Main Highways Board, and it is safe to say that, if it had not been for the Board's system of hire-purchase, plant to the value of this amount would not have been placed in operation.

The replacement of horse traction by motor-vehicles is revealed in the large increase in the number of tractors, from 15 in 1924 to 101 in 1929.

The development in the use of tar and bituminous surfaces is disclosed in the increase in the number of bitumen sprayers and boilers.

Testing of Highway Materials.

The Petrological Laboratory has continued to carry out the standard tests on roadmaking-materials. Table 6 shows the rock-tests carried out during the year. In addition, a large number of granulometric analyses of gravels and sands were undertaken. Several special geological investigations in connection with highway matters were carried out. The testing of samples of tar, road-oil, bitumen, bituminous emulsions, and bituminous concrete was efficiently undertaken as usual by the Dominion Analyst, Wellington.

Experimental Work.

As a result of a preliminary experiment carried out last year with the oil treatment of a section of pumice road in the Rotorua District, a further length of 51 chains on the Rotorua–Taupo Main Highway and a length of 90 chains on the Te Ngae – Paengaroa Main Highways were laid down during the summer. The results so far obtained fully justify the experiments, and the behaviour of the sections under traffic and under bad weather conditions is being very carefully watched and recorded. One interesting feature of this class of work is that the treated surface, if not satisfactory, can, months after, be loosened up and retempered by the addition of further road-oil or further dry pumice, as the case may require.

The section of light bituminous-concrete pavement laid on the Christchurch–Dunedin Main Highway about two years ago is still in perfect condition. It now happens that the section is sandwiched between two long lengths of Portland-cement concrete pavement.

In the Waimate County, in South Canterbury, on the Waimate – McNamara's Corner Highway, a length of gravel road was treated by what is known in America as the "oil-mix method." Heavy fuel oil was applied in two applications, each of approximately 0·5 gallon per square yard. The average thickness of the treated surface after compression by traffic was about $1\frac{3}{4}$ in., and the total cost was approximately 1s. 2d. per square yard. The time which has elapsed since the construction is not sufficient to enable a definite pronouncement to be made as to the success or otherwise of this type of surfacing, but up to date the indications are favourable.

During the past two years a number of proprietary bituminous emulsions have appeared on the New Zealand market. Many local authorities, in a number of cases with the assistance of the Board, have treated short sections of macadam and gravel road with these materials. The results obtained are being carefully watched by the representatives of the Main Highways Board in different districts.

Examination of Foremen and Overseers employed on Road-construction.

The fourth examination of foremen and overseers for the purpose of issuing certificates of competency was held on the 4th June, 1929. Fifty candidates sat for the examination, as compared with fifty-two last year and forty-eight the previous year. Nine candidates passed the full examination. One candidate completed the examination, having passed in one subject previously, and nine candidates obtained a partial pass.

The standard of papers submitted by candidates in this examination showed a distinct advance on the standard of papers for the previous years. It was quite evident that a number of candidates had made serious efforts to qualify themselves.

For the information of local authorities the following is a complete list of the successful candidates since the examinations were originated: S. Annabell, G. Avery, V. L. Bagnall, F. H. Bastin, J. W. Bean, H. V. Bond, D. E. Brown, W. E. Cottrell, J. G. Dennison, E. J. Ferguson, P. S. Finlayson, W. J. Hawkes, F. Hermans, O. G. Hewison, T. J. Hickey, M. H. Houlihan, J. H. Kendall, B. L. Larson, R. M. Lankshear, J. G. Mahood, O. R. Marshall, F. F. Maynard, J. E. Mays, H. N. McDonald, J. G. McIvor, F. Muggeridge, J. V. Neill, L. Oldham, R. B. Price, S. G. H. Robinson, S. G. Stockley, J. Stringer, R. H. Westbrook, J. A. Williams, H. J. L. Wotten.

Progress Report.

The following statement shows the more important construction work carried out under the control of the Main Highways Board during the year ended 31st March, 1929:—

Whangaroa–Okaihau.—Whangaroa–Kaeo: A considerable improvement has been made on this section by widening a number of dangerous corners.

Waipapakauri – Victoria Valley.—Te Rore Bridge: This bridge, consisting of rolled-steel joist spans on concrete piles, has been completed.

Victoria Valley Bridge: Concrete piles have been made for this bridge, and a contract has been let for the erection.

Waimate–Kaeo–Mangonui.—42 ch. of metalling has been completed in the Bay of Islands County.

Mangamuka – Te Karae.—Julian's Bridge and the Omakura Stream Bridge have been completed.

Kawakawa–Mangamuka.—Rangiahua–Mangamuka: Three bridges, totalling 120 ft., have been completed.

Waimamaku–Ohaeawai.—Kaikohe – County Boundary: 1½ m. of formation and 20 ch. of metalling have been finished.

Kaikohe–Omapere.—1 m. 29 ch. of this highway has been formed, thus providing a connection between the Remuera Settlement and the Kaikohe Railway.

Maungatapere–Kaikohe.—Awaroa Gorge Section: A length of 1 m. 52 ch. has been widened in rock, and 42 ch. has been metalled.

Bay of Islands County Section: 2½ m. of road has been formed and two bridges built.

Long's Corner – Tauraroa.—Two bridges, totalling 140 ft. in length, have been built, and 12 ch. of embankment and metalling completed.

Whangarei–Kawakawa.—Kamo Town District Section: 1 m. 42 ch. of this section has been reconstructed, and 36 ch. has been laid in bituminous macadam.

Otonga – County Boundary: A length of 1 m. 25 ch. has been formed. A contract has been let for the fabrication of concrete piles for five bridges north of Whakapara.

Hukerenui–Waiomio: 15 ch. of road has been formed, and one bridge erected at the county boundary.

Between Akerama and Waiomio 6½ m. of metalling has been completed.

Whangarei–Dargaville.—Maungaru Hill: A length of 1 m. 73 ch. has been formed and metalled.

Coleman's Bridge: This structure has been completed.

Dargaville–Maungaturoto.—Mititai – Naumai River Road: A length of 2 m. 19 ch. of soft formation on this section has been sandstoned.

Whakapirau – Maungaturoto Railway-station.—4 ch. of this road has been formed and metalled, and one bridge, of 40 ft. span, erected.

Kaiwaka–Mangawai.—1 m. 52 ch. of road has been metalled, thus providing an all-weather connection between Mangawai and the railway at Kaiwaka.

Warkworth–Leigh.—A length of 60 ch. has been metalled.

Meiklejohn's Bridge: This structure, consisting of two 40 ft. spans, has been completed.

Kaukapakapa – Port Albert.—In the Rodney County 37 ch. of road has been formed and 8 ch. metalled. On Putahi Flat 15 ch. of road has been formed, and 5 ch. metalled at the Hoteo River Bridge approach.

Te Hana – Tomorata.—2 m. 3 ch. has been metalled.

Wayby–Mangawai.—Tomorata–Mangawai: A length of 78 ch. has been metalled.

Wellsford–Whangaripo.—20 ch. of road has been metalled, and a further 2 m. 73 ch. is in hand.

Onewa Road.—Waitemata County Section: A length of 12 ch. of Portland-cement concrete pavement has been laid.

Birkenhead Borough Section: A length of 5 ch. of Portland-cement concrete road has been completed.

Northcote Road.—Northcote Borough Section: 25 ch. of Portland-cement concrete pavement has been laid in Queen Street.

Waitemata County Section: A length of 22 ch. of Portland-cement concrete pavement has been completed.

Auckland–Maungaturoto.—On this main highway, which is the chief connection between Auckland and the North Auckland Peninsula, the Board during the year embarked on a very heavy construction programme, the object being to provide an all-weather route as early as possible to the far North.

Birkenhead–Albany: Formation work on this section has been completed, 2½ m. being carried out during the year. 4¼ m. of metal base course and 2 m. 15 ch. of bituminous macadam have been completed.

Massey Road–Silverdale–Waiwera: A length of 60 ch. was formed and surfaced with a sandstoned base course between the Orewa and Hadfield Bay. Several short lengths of unmetalled road between Hadfield Bay and Waiwera were also sandstoned, thus providing an all-weather connection between Auckland and Waiwera.

Waiwera–Warkworth: Waiwera Bridge—The construction of the reinforced-concrete piles for this bridge has been completed; the formation of the south approach is in hand. Puhoi Bridge—A total length of 1,316 lin. ft. of reinforced-concrete piles has been fabricated for this bridge; both approaches have been completed. Hungry Creek Bridge—The reinforced-concrete piles for this bridge have been completed. Formation—A considerable amount of new formation was completed, distributed over a length of 10 m., the total amount of earthwork being 89,801 cub. yd. Metalling—A total of 1,012 cub. yd. of sandstone base course has been placed. A crushing plant has been installed on the Pohuehue Deviation.

Motutara Island Quarry: Preliminary work for the opening-up of this quarry has been undertaken. Clearing has been finished, and a large area of the quarry has been stripped, sluicing plant having been used.

Wellsford–Warkworth: Formation—Formation over a length of 4½ m. is in hand, the total amount of earthwork removed during the year being 51,120 cub. yd.

Wayby–Wellsford: Formation—Formation work has been completed over a length of 3 m. 16 ch., the yardage involved being 19,103 cub. yd. Foundations—2,408 cub. yd. of spall foundations were laid. Metalling—Wearing-course metal for this section was obtained from the Tauraroa Quarry and transported to Wellsford by rail. Up to the end of the period 13,381 cub. yd. of metal had been transported and 5,912 cub. yd. placed on the road.

Wellsford–Topuni: Bridges—The construction of the reinforced-concrete piles for Vipond's Bridge and Litten's Bridge has been completed. Formation—Formation work is in hand over a length of 4½ m., the total amount of earthwork carried out during the year being 20,151 cub. yd. Foundations—3,668 cub. yd. of spalls were used in foundation work. Metalling—1,256 cub. yd. of metal was placed on 1 m. 34 ch. of the section.

Te Hana–Topuni: Formation—Earthwork is in hand over a length of 2¾ m., the total yardage excavated during the year being 22,138 cub. yd.

The following summary shows the work accomplished during the year on the Auckland–Maungaturoto Main Highway: Earthwork, 208,207 cub. yd.; spalls, 12,280 cub. yd.; metalling, 16,151 cub. yd.; bridge-piles, 3,047 lin. ft.; field tiles, 5,496 lin. ft.; culverts, 7,022 lin. ft.; fencing, 364 ch.

Kumeu–Albany.—A length of 2¼ m. of reconstruction and metalling was well in hand at the end of the year and was completed before winter, thus providing an all-weather road.

Helensville–Waiwera.—1 m. 10 ch. of formation has been completed, together with three small bridges.

Auckland–Helensville.—Henderson–Kumeu: Formation—A length of 6 m. 26 ch. of formation was practically completed, the total quantity of earthwork involved being 27,978 cub. yd. Foundations—1,777 cub. yd. of spalls were used for foundations and stone drains.

Great South Road.—Bridge at Westfield: An overbridge, 40 ft. wide, with necessary approach ramps, was erected at Westfield by the Public Works Department in connection with the Railway deviation.

Manurewa Town District Section: A length of 6 ch. of Portland-cement concrete paving was completed at the overhead bridge.

Franklin County Section: A length of 2½ m. of formation and metalling was completed in the Mercer Town District and in the Franklin County.

Mercer–Ohinewai: Rangiriri Hills Deviation—Widening of formation to 24 ft. was completed over a length of 16 m. 1 ch., and the metal foundation was widened to 18 ft. over a length of 11 m. 25 ch. A length of 4 m. 53 ch. was surfaced to a width of 18 ft. with bituminous macadam, and a further length of 50 ch. was sealed.

Taupiri Gorge Section: A length of 71 ch. of this section was re-formed, widened to a minimum of 24 ft., and remetalled.

Huntly Town District Section: The full length of this section, 3 m. 39 ch., was surfaced with bituminous macadam to a width of 18 ft.

Pokeno–Waihi.—Waitakaruru Township Bridge: A new structure, consisting of one 30 ft. and two 25 ft. spans, has been completed.

Pipiroa–Coromandel.—Thames County Section: A considerable amount of widening and sea-wall construction has been completed.

Coromandel County Section: Several sharp corners have been improved.

Kopu–Raglan.—Thames County Section: A length of 1 m. 5 ch. has been sealed with bitumen.

Whatawhata–Raglan: 305 ch. of this road has been widened to 22 ft.

Hamilton–Rotorua (No. 2 Highway District).—Hamilton–Cambridge: A length of 7 m. 51 ch. of tar-sealing work has been completed.

Karapiro Deviation: This deviation in the Matamata County has been completed.

Tapapa–Mamaku: A length of 12 m. 63 ch. of this section was surfaced with shingle during the year, thus providing reliable all-year-round access to Rotorua.

Waitoa–Taupo.—Matamata Town District: A length of 37 ch. on this section was sealed with bitumen.

Matamata–Tauranga (No. 2 Highway District).—Kaimai Hills Section: 5 m. 15 ch. of formation and 4 m. 44 ch. of metalling were completed. This work made available an all-year-round connection between the Bay of Plenty and the Waikato.

Papakura–Clevedon.—Bull's Bridge: This structure has been completed.

Drury–Waiuku via Pukekohe.—Pukekohe Borough Section: A length of 35 ch. of bituminous macadam has been carried out.

Waiuku Town District Section: 45 ch. of road has been sealed.

Pairere–Kaimai.—A reinforced-concrete bridge of 33 ft. span has been erected over the Waihou Stream at Hinuera.

Te Aroha – Waharoa.—Matamata County Section: A length of 88 ch. of this section has been sealed.

Kihikihi–Arapuni–Putaruru.—Waipa County Section: Widening of the formation and surfacing with gravel has been completed over a length of 1 m. 31 ch.

Matamata County Section: A contract has been let for sealing the whole length of this section between Arapuni Dam and Putaruru. At the end of the year 5 ch. had received two coats and a further mile one coat.

Te Awamutu – Cambridge.—Waipa County Section: Bituminous macadam was laid over a length of 64 ch.

Ngatea–Waharoa–Morrinsville.—Piako County Section: A length of 60 ch. near Morrinsville was sealed.

Morrinsville Borough Section: A length of 1½ m. has been surfaced with bitumen.

Gisborne–Whakatane via Motu.—Motu – Willow-tree Crossing: At a number of points the road has been widened and passing-places provided for motor-vehicles.

A telephone-line has been erected between Motu and Opotiki for the convenience of motorists and to assist in the efficient maintenance of the section.

Ryan's Bridge: A contract has been let for the renewal of this bridge.

Whakatane–Tauranga.—Whakatane–Matata: A new reinforced-concrete bridge has been erected over the Eastern Drain and a contract has been let for the renewal of the Te Rahu Bridge.

Matata–Otamarakau: Contracts have been let for the erection of two reinforced-concrete bridges over the Mimihau and Herepuru Streams.

Te Puke – Tauranga: 46 ch. of metalling has been completed.

Tauranga Borough Section: A length of 97 ch. has been surfaced with bituminous macadam.

Tauranga–Waihi.—Tauranga County Section: At Corkscrew Hill 73 ch. of top-course metalling has been completed, and further contracts have been let for the metalling of 124 ch. Contracts have also been let for the renewal of the following bridges: Tahawai Bridge, Hyde's Creek Bridge, Rereatuakahia Bridge.

Hamilton–Rotorua (No. 3 Highway District).—The Utahina Bridge, consisting of two 30 ft. spans, and Dansey Road Bridge, consisting of one 35 ft. span, have been completed.

Rotorua–Taupo.—Between 47 m. and 48 m. and between 54 m. and 55 m. 40 ch. the road has been widened. Between 32 m. and 33 m. pegs 51 ch. of pumice road was treated with road-oil.

Cambridge–Taupo.—A length of 4½ m. of this highway has been widened and straightened.

Tauranga–Matamata (No. 3 Highway District).—A contract for metalling 6 m. 19 ch. of this road between Barke's Corner and Ruahihi was completed.

Whakatane–Rotorua.—A number of bends have been improved between 14 m. and 23 m. pegs. Between 22 m. and 23 m. the road has been raised.

Te Ngae – Paengaroa.—A number of sharp bends have been improved between 12 m. and 15 m. Between 10 m. and 12 m., 90 ch. of pumice road has been treated with road-oil for a width of 15 ft.

Rotorua–Tauranga Direct Road.—Rotorua County Section: A length of 10½ ch. has been metalled.

Mangapiko Gorge Deviation: 96 ch. of this deviation has been completed and surfaced with rhyolite.

Mangarewa Gorge: The road in this gorge has been widened over a length of 16 ch.

Te Puna Point – Omokoroa.—A length of 258 ch. of this road has been re-formed and metalled.

Gisborne–Opotiki via Coast.—Cook County Section: 2 m. of bituminous penetration work has been completed between 2 m. and 4 m. pegs.

Waiapu County Section: Bridges—Waiotu Bridge at 58 m. and Kopuaroa Bridge at 74½ m. have been completed. Two bridges at Mangahauini, at 61 m., the Mangaoporo Bridge, at 87·8 m., and the Maraehara Bridge, at 102½ m., are under construction. Metalling—2 m. 24 ch. of complete metalling and 10 m. 55 ch. of bottom course have been completed between 83 m. and 102½ m.

Matakaoa County Section: 10 ch. of formation on Hicks Bay Hill has been completed.

Gisborne–Wairoa via Morere (No. 4 Highway District).—Karaua Deviation: The construction of this deviation has been commenced.

Te Arai Bridge: This structure, in reinforced concrete, has been started.

Gisborne–Wairoa via Hangaroa (No. 4 Highway District).—Cook County Section: A length of 1 m. 74 ch. was surfaced with bitumen; 1 m. 51 ch. has been regraded. Top-course metalling has been completed over a length of 1 m. 24 ch., and bottom-course metalling over a length of 3 m. 40 ch.

Gisborne–Opotiki via Motu (No. 4 Highway District).—Cook County Section: A length of 3 m. 60 ch. of bituminous penetration work was completed.

Waikohu County Section: 6 m. of bottom-course metalling has been completed and 3 m. of two-course work. At the end of the period an unmetalled gap of only 1½ m. existed. This gap was closed before the winter. The Waihuka Bridge was completed.

Taurangakautuku Road.—1 m. 5 ch. of formation and 2 m. 22 ch. of metalling have been completed.

Rotokautuku Bridge – Waiomatatini.—A length of 40 ch. of metalling has been finished.

Tokomaru–Mata.—1 m. 40 ch. of metalling has been carried out.

Matawai–Hangaroa.—A concrete bridge has been erected over Falls Creek. 1 m. 20 ch. of formation and 3 m. 40 ch. of metalling have been completed.

Patutahi–Rere.—1 m. 40 ch. of bituminous penetration work has been laid down. 4½ m. of metalling has been carried out.

Gisborne–Ormond via Waiohika.—28 ch. of bituminous macadam was completed at 4 m., and a further 1½ m. of foundation course has been laid.

Napier–Gisborne via Wairoa (No. 5 Highway District).—Westshore–Petane: A length of 4 m. of bituminous surface was well in hand at the end of the year and has since been completed.

Te Ngaru Crossing – Mohaka Bridge: A new bridge at King's Creek, in the Waikare Gorge, is practically completed. A small deviation was carried out at Tutira Lake. A deviation and widening were also carried out at the north end of the Waikare Gorge. A length of special fencing was erected on the dangerous section of road on the north side of the Waikare Gorge.

Mohaka Bridge – Morere: Between the foot of the Mohaka Hill and Waihua two deviations are under construction to avoid railway-crossings on the Napier–Wairoa Railway. The Opoho Bridge was completed. The Waihua Hill Deviation was finished, and the Waiatai Bridge was also completed.

Wairoa–Gisborne via Hangaroa (No. 5 Highway District).—Horseshoe Bend Deviation: This deviation was completed and has been given its final coat of metal.

Petane–Taupo.—Dillon's Hill Bridge over the Mangahakana Stream was completed and opened for traffic.

Double Crossing Bridge: A tender has been accepted for the construction of this bridge.

Napier–Wellington via Wairarapa (No. 5 Highway District).—Hawke's Bay County Section: Between Pakipaki and the southern county boundary a contract has been let for the construction of 13¼ m. of bituminous surface; the work is well in hand. A contract has been let for the construction of a deviation on Te Aute Hill which will eliminate 20 ch. of road and several sharp corners.

Waipawa County Section: The bituminous surfacing of 8 m. of road from the Hawke's Bay County boundary to Waipawa Borough is in hand, 7 m. of first-coat work having been completed at the end of the period.

Waipukurau Borough Section: 38 ch. of first-coat bituminous-sealing work has been completed.

Waipukurau County Section: Proposals were prepared for widening and improving the Sanatorium Hill, and a contract was let after the end of the period.

Dannevirke County Section: A length of 3 m. 51 ch. of first-coat sealing-work was carried out near Matamau.

Whakaruatapu Deviation and Bridge: This work was completed. The bridge is 170 ft. long and 70 ft. high, and consists of three 50 ft. and two 19 ft. plate-girder spans.

Mangatewai-iti Deviation: This deviation, 43 ch. in length, has been completed.

Matahiwi Hill Deviation: This deviation, 70 ch. in length, has been completed. It effects a great improvement to the alignment and eliminates two dangerous railway level crossings.

Piripiri Overbridge: This bridge, to eliminate a dangerous level crossing, has been completed.

Orua–Kiritaki Deviation and Bridge: A contract has been let for the construction of this bridge and deviation, the bridge consisting of four 35 ft. spans.

Woodville County Section: 2 m. 50 ch. of second-coat sealing-work near Maharahara was carried out.

Woodville – Palmerston North.—Woodville Borough Section: 26 ch. of tar-sealing was undertaken.

Manawatu Gorge Section: The bituminous surfacing of this section was completed.

Dannevirke–Waipukurau via Porangahau.—Dannevirke Borough Section: A length of 40 ch. of bituminous penetration work has been carried out.

Dannevirke County Section: Widening-work was undertaken between the 7 m. and 8 m. pegs. A length of 2 m. 20 ch. of second-coat sealing-work from the borough boundary was completed.

Sargent's Bridge: This structure, consisting of two 40 ft. and one 25 ft. spans, has been completed.

Napier–Tukituki via Onahu.—Taradale Town District Section: 136 ch. of this section received its second coat of bitumen.

Havelock North Town District Section: A length of 26½ ch. of two-course bituminous concrete was laid from the old Ngaruroro Bridge to the centre of the township.

Taradale–Rissington.—Mangaone Stream Bridge: The erection of this structure has been commenced. It will consist of one 120 ft. steel-truss span and one 40 ft. rolled-steel-joist span.

Farndon–Hastings.—Hawke's Bay County Section: A length of 3 m. 75 ch. of Portland-cement concrete pavement was completed.

Kawhia to Auckland–Wellington Road via Kawa.—Otorohanga County Section: Between the county boundary and Waipa River the final section of base course, 2 m. 54 ch. in length, was completed, thus providing a through metalled connection from Otorohanga to Kawhia.

Auckland–Wellington via Taranaki (No. 6 Highway District).—Hangatiki – Te Kuiti: The remaining 143 ch. of top-course metalling was completed and the road opened for traffic.

Te Kuiti – Bulls via Taumarunui (No. 6 Highway District).—Eight Mile – Kaitangaweka: A commencement was made on the 14th January, 1929, with the regrading of 4 m. 32 ch. of this section. By the end of the period 250 ch. of formation, 105 ch. of rhyolite foundation, and 80 ch. of metal had been completed.

Aramatai Deviation: The formation and metalling of this deviation, 2 m. in length, was well in hand at the end of the period.

Kurakura Deviation: The formation work on this deviation was completed, and the bottom course of rhyolite laid and rolled.

Kaitangaweka – County Boundary: A contract was let for metalling 4 m. 56 ch., a length of 86 ch. being completed at the end of the period.

Hiwi Road: A contract was let for bottom-course metalling, and a length of 4 m. was completed at the end of the period. Two temporary bridges were erected to enable the metalling to be carried out. The completion of this section enables a saving of 5 m. to be made between Te Kuiti and Taumarunui.

Ongarue–Okahukura: 2 m. of formation work and several small deviations were completed.

Oio–Raurimu: 1 m. 63 ch. of formation and 68 ch. of metalling were completed. Several deviations were also made.

County Boundary – Horopito: The Mangaturuturu Bridge and the Sulphur Creek Bridge were completed. The construction of the concrete piers for the Makatote Bridge is under way.

Horopito Deviation: 1 m. 49 ch. of this deviation has been formed and 1 m. 28 ch. metalled.

Raurimu – Wade's Landing.—Dobb's Deviation has been completed and opened for traffic. A considerable amount of widening and regrading has been carried out. A length of 1 m. 45 ch. has been pumiced, and a contract has been let for the metalling of 8 m.

The Apple-trees Bridge and the Pukerimu Bridge have been completed, while the Takapu Bridge is in course of erection.

Stratford–Taumarunui.—Paparata Saddle–County Boundary: A contract was let and completed for metalling 1 m. 73 ch. on the Paparata Hill. 121 ch. of re-formation has been completed between Tokirima and the county boundary.

County Boundary–Taumarunui: 150 ch. of formation has been completed between the county boundary and Aukopae.

Pirongia–Kawhia.—A length of 40½ ch. of metalling was completed.

Te Maire–Mangaohutu.—4 m. of gravelling was completed between Te Maire and Kirikau, while 1 m. 73 ch. of formation was completed between Kirikau and Kokakoriki.

National Park–Taupo.—The deviation at Jellicoe Point, 45 ch. in length, was completed, as well as 40 ch. of widening on the Kahukiri Hill. 66 ch. of widening and regrading and 26 ch. of metalling were completed on the Waimarino–Waiotaka Deviation.

Manunui–Owhango.—A length of 89 ch. of formation was completed.

Auckland–Wellington via Taranaki (No. 7 Highway District).—Awakino–Mokau: On this section a length of 4 m. 57 ch. of sealing has been completed.

Mokau–Pukearuhe: Between the Mokau Bridge and Tongaporutu 110 ch. of bituminous macadam has been laid. A considerable amount of widening and several short lengths of regrading have been completed on Mount Messenger. 1½ m. of the section was also sealed during the year.

Uruti Stream Bridge: The construction of this bridge in reinforced concrete is in hand. It is 90 ft. in length.

Clifton County Section: The Waiau Stream Bridge and deviation has been completed. The bridge is 120 ft. in length, and the deviation 36 ch. in length. A new bridge, 140 ft. long, is in hand at the Urenui Stream. 190 ch. of bituminous macadam has been completed from Waitara northwards.

Taranaki County Section: 2 m. of bituminous macadam has been laid south of Lepperton.

Inglewood County Section: A concrete arch culvert is being installed in place of an old narrow wooden bridge.

Hawera County Section: The subway at Hawera, by means of which the railway level crossing has been eliminated, is now in use.

Lepperton Junction–Hawera via Opunake.—Taranaki County Section: The Kaitakara Stream Bridge, 120 ft. in length; the Kaihihi Stream Bridge, 36 ft. in length; and the Stoney River Bridge and arch, of 64 ft. span, are in hand. A deviation 37 ch. in length is in hand at the Kaitakara Stream. 29 ch. of bituminous macadam has been laid northwards from Timaru Stream, and the earthwork of 17 ch. of deviation has been completed south of Timaru Stream.

Egmont County Section: The Waitaha, Rautini, and Heimama Stream Bridges have all been completed in reinforced concrete. A further concrete bridge is being erected at the Mangahume Stream. A deviation, 8½ ch. in length, has been completed at Rautini. Another deviation, 8 ch. in length, has been completed at Pungarehu. A length of 3 m. 44½ ch. of bituminous macadam has been completed, and a length of 3 m. 30 ch. of the section has been reconstructed and sealed.

New Plymouth–Kaimata.—Taranaki County Section: 2 m. of regrading and widening has been completed from New Plymouth Borough southwards, and a third mile is in hand.

Inglewood County Section: From Inglewood Borough boundary eastward to the Manganui Stream a length of 3 m. 47 ch. of bituminous macadam has been laid.

Ohura Road.—Whangamomona County Section: The unmetalled gap of 6¼ m. between Ngatimaru and Pohokura has been linked up with one course of metal, and the second course is well in hand. 3 m. 54 ch. of regrading and widening of formation to 18 ft. has been completed.

Ngatimaru Road.—A length of 31 ch. has been surfaced with bitumen.

Beaconsfield Road.—A length of 2 m. of this road has been treated with road-oil.

Manaia–Mount Egmont.—92 ch. of this highway has been surfaced with road-oil.

Skeet Road.—A length of 116 ch. of this road has been tar-sealed.

Ihaia Road.—40 ch. of this highway has been sealed with one coat of road-oil and one coat of bitumen.

Auckland–Wellington via Taranaki (No. 8 Highway District).—Patea County Section: A length of 4 m. 11 ch. of bituminous macadam was completed.

Waitotara County Section: A considerable amount of reconstruction work has been put in hand between Goat Valley and Kai Iwi.

Wanganui County Section: A length of 1 m. 45 ch. of re-formation and bituminous surfacing from the Wanganui City boundary southwards was completed.

Rangitikei County Section: A commencement has been made with reconstruction work in the Turakina Township. A contract has been let for the reconstruction of the Kohurauponga Bridge.

Turakina River Bridge: This structure, consisting of two 100 ft. steel-truss spans, has been completed.

Te Kuiti–Bulls via Taumarunui (No. 8 Highway District).—Rangitikei County Section: 3 m. 28 ch. of new metalling was completed between Hihitahi and Waiouru.

Waimarino County Section: 4 m. 20 ch. of widening and 4 m. of metalling were completed from the Manganui-o-te-ao Stream southwards.

Waiouru–Karioi Section: A contract was let to complete the unmetalled gap on this section, of approximately 6 m. in length. The work was well in hand at the end of the period.

Curl's Bridge–Upper Tutaenui.—A contract was let for the construction of Riddiford's Bridge.

Feilding–Hunterville.—Rangitikei River Bridge: A contract was let for the construction of a steel bridge over the Rangitikei River at Vinegar Hill. The structure consists of two steel-truss spans, of 90 ft. and 120 ft. The work is well in hand.

Raetihi–Ohakune.—25 ch. of bituminous surfacing was completed.

Wanganui–Horopito.—In this highway at the end of January, 1929, there was an unmetalled gap of approximately 10½ m. It was decided to endeavour to close the gap before winter. By the end of April the whole of the base course and about 3½ m. of top course had been completed. This connection ensures an all-weather route between Wanganui and the Tongariro National Park.

Wanganui–Karioi.—1 m. of this road was re-formed and 2 m. of metalling completed.

Wellington–Auckland via Taranaki (No. 9 Highway District).—Ngahauranga – Tawa Flat: A contract was let for the paving in bituminous concrete of this section, extending over a length of 6¼ m. At the end of the period 4 m. 74 ch. had been completed, and the whole contract was finished before winter.

Johnsonville Town District Section: A length of 30 ch. of bituminous-concrete paving has been completed, also 12 ch. of sealing.

Tawa Flat – Porirua: A contract was let for the paving in bituminous concrete of this length of 2 m. At the end of the period 1 m. 20 ch. had been completed, and the whole length was paved before the winter. 20 ch. of sealing-work was carried out in Porirua Township.

Paremata–Waikanae: A length of 6 m. 22 ch. of this section was widened to 24 ft. A deviation at Pahautanui, 35 ch. in length, was constructed and metalled. One coat of bitumen was applied over a length of 7 m. of the section, and two coats were applied over a length of 47 ch.

Horokiwi–Paekakariki: 56 ch. of widening to 24 ft. was carried out, and a large slip of approximately 8,500 cub. yd. was cleared. A length of 2 m. 42 ch. was prepared for bituminous sealing.

Otaki Borough Section: This section, 40 ch. in length, has been widened and consolidated in preparation for bituminous surfacing.

Horowhenua County Section: Between Otaki and Manakau 10 ch. of metalling was carried out on a small deviation and 1 m. of bituminous macadam completed.

Foxton–Himatangi: 3 m. 30 ch. of this section was widened and consolidated.

Levin – Palmerston North via Shannon.—Horowhenua County Section: 5 m. of bituminous macadam was completed. The Kara Stream Bridge, consisting of one 20 ft. and two 10 ft. spans, was also completed.

Kairanga County Section: The construction of Lynch's Bridge and Keeble's Bridge has been completed.

Foxton–Shannon.—Manawatu River Bridge and Approaches: This bridge, consisting of twelve 60 ft. spans, was completed during the year.

In the Manawatu County 33 ch. of formation and metalling was completed, while in the Horowhenua County 68 ch. of new metalling was undertaken, also the erection of two small bridges.

In the Shannon Borough 8 ch. of new formation and metalling was completed, and the Mangaore Stream Bridge erected.

Himatangi – Ashhurst via Palmerston North.—Himatangi–Rangiotu: On this section 60 ch. of re-formation and foundation metalling was completed.

Rangiotu–Whakarongo: A length of 3 m. 40 ch. was widened and prepared for paving. Bullocky Creek Bridge was completed. The construction of the Mangaone Stream Bridge at Awapuni is in progress.

Sanson – Palmerston North.—Sanson–Awahuri: On this section 6 m. 60 ch. has been widened and prepared for paving. A length of 71 ch. of bituminous concrete has been completed.

Awahuri – Palmerston North: A length of 3½ m. of this section has been re-formed and prepared for paving. 1 m. 20 ch. of bituminous concrete has been laid.

Greatford – Woodville via Feilding and Ashhurst.—Oroua County Section: On this length two reinforced-concrete bridges, at Swamp Creek and McDonnell's, were completed.

Kimbolton–Apiti.—Pohangina County Section: A deviation 12 ch. in length has been formed and metalled.

Wellington–Napier via Wairarapa (No. 9 Highway District).—Taita Gorge Section: A length of 1 m. 24 ch. of road was widened, and a 10 ch. deviation formed and metalled.

Taita Section: A length of 31 ch. was laid down in bituminous concrete and 16 ch. sealed.

Silverstream Section: 40 ch. of sealing-work was completed, also 6 ch. of bituminous-concrete pavement.

Akatarawa – Rimutaka Summit: On this length 2 m. 45 ch. was widened to 24 ft. A new bridge, consisting of two 40 ft. spans, was erected over the Mungaroa River.

Upper Hutt – Waikanae.—Hutt County Section: A length of 7 m. 60 ch. was widened to a minimum of 16 ft.

Taonui–Raumai.—Wallean's Bridge was completed.

Wellington–Napier via Wairarapa (No. 10 Highway District).—Rimutaka Summit – Featherston Borough: On this section 1 m. 28 ch. has been widened to 24 ft., and a deviation 8 ch. in length has been formed and metalled. 3 m. 73 ch. of one-coat sealing has been carried out, also 77 ch. of two-coat sealing.

Featherston County Section: 3 m. of bituminous macadam has been completed.

Wairarapa South County Section: 1 m. of road has been widened and 20 ch. raised between Carterton and the Waiohine Bridge. Bituminous-macadam surfacing over a length of 20 ch. has been completed.

Mauriceville County Section: 35 ch. of road on the Mount Bruce Hill was widened to 24 ft.

Eketahuna County Section: A length of 2 m. 73 ch. was widened to 24 ft. A concrete bridge over the Makakahi River, consisting of four 30 ft. spans, has been completed. The metalling of the Eketahuna Deviation is well in hand.

Pahiatua–Pongaroa.—Tuscan Hills Bridge: This bridge, consisting of a reinforced-concrete arch of 55 ft. span, has been completed.

Murphy's Bridge: This structure, consisting of one 38 ft. span reinforced-concrete arch, has been completed.

Dreyer's Rock Highway.—Mauriceville County Section: A length of 12 ch. has been widened to 24 ft.

Pahiatua Station Highway.—Pahiatua Borough Section: A length of 30 ch. of sealing has been carried out.

Masterton–Tinui.—Masterton County Section: Bituminous surfacing has been completed over a length of 1 m. 50 ch.

Masterton–Weraiti.—Masterton County Section: A length of 15 ch. of this highway has been raised above flood-level and metalled.

Masterton–Weber via Alfredton.—Wangaehu Stream Bridge: This structure, consisting of two 26 ft. and one 27 ft. spans, has been completed in reinforced concrete.

Carterton–Longbush.—Nix's Bridge: This bridge has been completed.

Carterton Borough Section: A length of 21 ch. of sealing-work has been carried out.

Kahautara Highway.—A length of 3 m. of bituminous surfacing has been completed. Belcher's Bridge, consisting of one 30 ft. span, has been erected.

Greytown–Bidwell's Cutting.—Greytown Borough Section: 34 ch. of bituminous sealing has been completed.

Te Ore Ore–Bideford.—Masterton County Section: 10 ch. of this road has been widened and improved.

Picton–Bluff (No. 11 Highway District).—Marlborough County Section: A reinforced-concrete bridge at Riverlands has been completed.

Blenheim Borough Section: Tar-sealing is in hand.

Nelson–Blenheim.—Marlborough County Section: Between Blackball and Canvastown widening and metalling of 36 ch. has been completed. A reinforced-concrete bridge at Rai Valley over Flat Creek has been erected.

Rai Hill Section: A further length of 37 ch. has been widened.

Waimea County Section: The widening and regrading of the Whangamoa and Rai Hills was well in hand at the end of the period and has since been completed.

Nelson–Westport (No. 11 Highway District).—Waimea County Section: Between Stoke and Richmond laying of bituminous macadam is in hand, 1 m. 4 ch. having been completed at the end of the period.

Wairoa River Bridge at Brightwater: This structure, consisting of ten 42 ft. spans in reinforced concrete, has been commenced. A temporary bridge, 360 ft. in length, has been erected.

Norris Gully Bridges: These two bridges are in hand, and a contract has been let for the formation of 23½ ch. of approach road.

Murchison County Section: Between Glenhope and Owen two dangerous corners have been widened. A 10 ft. arched concrete culvert at Crooked Bank Creek has been completed. At Glen's Creek, in Murchison Township, a large reinforced-concrete culvert and 1½ ch. of approach road have been completed. A new bridge has been erected over Doughboy Creek.

Collingwood–Bainham.—A reinforced-concrete culvert and 4 ch. of approach road at Fisher's Creek have been completed.

Wakefield–Woodstock.—Waimea County Section: The construction of Dovedale Hill Creek Bridge is in hand.

Westport–Karamea.—Little Wanganui River Bridge: Materials have been delivered at the site for the erection of this bridge, consisting of six 40 ft. spans.

Lamplough's Creek Bridge: The renewal of this structure has been completed.

Buller County Section: Between 16 m. 20 ch. and 20 m. 16 ch. a contract has been let for bituminous surfacing, and the work is in hand.

Westport–Nelson (No. 12 Highway District).—Ten-mile Creek Bridge: Materials have been delivered for the erection of this bridge.

Ohikanui River Bridge: Approaches to this structure have been considerably improved.

Little Hawk's Crag: A concrete parapet wall and protective fence have been erected.

Twelve-mile Creek Bridge: The erection of this structure is in hand.

Stitt's Bluff: The widening of the road at this bluff is in hand.

Dublin Terrace Bridge: The construction of this bridge is in hand.

Waimea Creek Bridge: The materials have been delivered for this structure.

Black Pine Creek Bridge: The erection of this bridge has been completed.

Bridge No. 38: This bridge has been completed.

Whitecliffs Bridge: Materials are being delivered on this site.

Dee Creek Bridge: This bridge was completed.

Passing-places: A number of passing-places for motor-vehicles have been completed.

Inangahua Junction–Waiho.—A large number of small bridges have been completed on this highway. The following is a list of same: Larry's Creek Overflow Bridge, Leggoes No. 2, Maimai Station Bridge, McInroe's No. 1, Stoney Creek Bridge, Overflow Bridge at Maimai, Horseshoe Creek Bridge, Slaty Creek Bridge. The following bridges are in hand: Fitzgerald's Bridge No. 1, Vine's Creek Bridge, McCullough's Bridge, McDonald's Creek Bridge, Red Jack's Creek Bridge, Half bridge at Omoto, La Fontain Creek Bridge.

Arnold Hill at Ten Mile: Improvements to alignment were carried out over a length of 10 ch.

Paroa–Taramakau: The widening of this section over a length of 48 ch. is in hand.

Spring Creek Railway-crossing near Kamaka: Improvements to this crossing over a length of 11 ch. were completed.

Mount Hercules and Ianthe Hill: A number of bad corners were improved and 22 ch. of road widened.

Wataroa Deviation: 60 ch. of new road was constructed at Wataroa and a considerable amount of protective work completed.

Arthur's Pass–Kumara.—Rocky Creek Bridge: This structure has been completed.

Westport–Greymouth Coast Road.—Four Mile–Fox's River: A contract for metalling 1½ m. has been completed. An additional length of 40 ch. of metalling has also been carried out. Widening and formation has been undertaken between 4 m. and 12 m.

Charleston–Brighton: 70 ch. of formation and 83 ch. of metalling have been completed. Between 20 m. 45 ch. and 22 m. 45 ch. the road has been widened and generally improved.

Greymouth–Punakaiki: Widening-work is in hand.

Waimangaroa–Burnett's Face.—Widening-work has been completed.

Lake Kanieri Road.—A small amount of widening has been carried out.

Granity–Stockton.—Several bad corners have been improved and a fair amount of widening carried out.

Picton–Bluff (No. 13 Highway District).—Clarence River Protective Works: Further work to strengthen the existing groynes is in hand.

Hapuku River – Clarence River: Over a length of 140 ch. widening has been completed. Stone walls to a total length of 13 ch. have been erected.

Conway–Oaro: A length of 114 ch. of this section has been widened and generally improved.

Ngaio Downs Bridge: Tenders have been called for the erection of this structure.

Middle Creek Bridge: A contract was let for this work, and a commencement has been made.

Waipara–Kaikoura via Culverden.—Weka Pass Deviation: This deviation, eliminating a dangerous railway-crossing, has been completed.

Waiau–Lyndon.—Mason River Bridge: This bridge, consisting of twenty-four spans of 25 ft., has been erected near the Waiau Township.

Picton–Bluff (No. 14 Highway District).—Styx–Chaney's: A contract for the paving of 2 m. 72 ch. in Portland-cement concrete, with 3 ft. bituminous shoulders, has been completed.

Kaiapoi–Woodend: A contract for the paving of 3 m. 5 ch. of this section in Portland-cement concrete has been let.

Waimakariri River Bridge: A contract has been let for the erection of this structure. It will be 1,120 ft. in length, and will have a deck-width of 20 ft. between wheel-guards.

Sockburn–Templeton: A contract for the paving of 3 m. 73 ch. of this section in Portland-cement concrete is well in hand, a length of 2 m. 72 ch. being completed at the end of the period.

Templeton–Rolleston: A contract for the paving in Portland-cement concrete of 4 m. 14 ch. of this section is in hand, a length of 65 ch. being completed at the end of the period.

Rolleston–Rakaia: The work of re-forming and light-gravelling this section, 20 m. in length, has been completed. Over a length of 2¾ m. the road reserve has been increased from ½ ch. to 1 ch. in width.

Christchurch–Akaroa.—Christchurch City Boundary – Halswell Post Office: A length of 2 m. 53 ch. of this section has been paved with two courses of bituminous concrete. Tar-sealed shoulders 3 ft. in width have also been provided.

Picton–Bluff (No. 15 Highway District).—Pareora River Bridge: This bridge, 660 ft. in length, is being constructed in reinforced concrete. It was well in hand at the end of the period.

Brookland's Hill Deviation: This deviation, 19¼ ch. in length, is well in hand.

Pukeuri–Kurow.—Kurow Creek Bridge: This light-traffic timber bridge, consisting of thirty-eight 20 ft. spans, has been completed.

Picton–Bluff (No. 16 Highway District).—Merton–Palmerston: Approximately 18 m. of this section was widened and generally improved.

Tumai Railway-crossing Elimination: A reinforced-concrete overbridge and its approaches were completed, thus eliminating a dangerous level crossing.

Waipiata–Styx.—61 ch. of formation and gravelling was carried out near Linburn.

Dunback–Middlemarch.—40 ch. of formation and metalling was completed near Macraes.

Palmerston–Queenstown.—Kawarau Gorge Section: Approximately 2 m. of widening and improvements to alignment were completed.

Picton–Bluff (No. 17 Highway District).—Green Island – Henley: A considerable amount of reconstruction work has been carried out on this section. Formation work was completed between 5 m. 79 ch. and 18 m. Deviations at Lookout Point, Saddle Hill, and Allanton have been completed. A complete stone-crushing plant was erected in the Mosgiel quarry. A water-bound macadam foundation was completed between 5 m. 79 ch. and 16 m., with the exception of a short length of 24 ch. A contract for a bituminous-macadam wearing-course was let over a length of approximately 4 m.; the work is in hand.

Stoney Creek Deviation: This work was completed and opened to traffic.

Waipahi Stream Bridge at Arthurton: This reinforced-concrete structure, 105 ft. in length, has been completed.

Green Island – Taieri Mouth.—A length of approximately 80 ch. of widening and improvements to visibility and curvature has been completed. Several bad corners near the Township of Brighton have been widened.

Dunedin–Portobello (Low Road).—This highway has been widened and greatly improved between 0 m. and 4 m., and a deviation at Company Bay has been partially completed. A contract for a bituminous-concrete pavement over a length of 4 m. has been let, and the work has been commenced.

Mosgiel Junction – Middlemarch.—1 m. 43 ch. of gravelling was completed near Clark's Junction, and a small bridge over Shannon Creek was erected.

Invercargill–Riverton.—Southland County Section: A length of about 3 m. of this section was given one seal coat, and a second coat was applied over a length of 1½ m.

Iron Bridge: This bridge over the Oreti River was extended by 40 ft. and a considerable amount of protective work carried out.

Aparima Bridge at Riverton: A commencement has been made with this structure, and the construction of the approaches is well under way.

Invercargill–Fortrose.—Southland County Section: 2¾ m. of new gravelling and a considerable amount of widening were carried out.

Winton–Ohai.—Wrey's Bush Bridge: This structure, consisting of thirty-seven 25 ft. spans, has been completed.

Gore – Te Anau.—Mossburn–Key: Five bridges over small mountain streams on this section have been completed.

Hillside–Manapouri.—2¼ m. of formation and a small bridge have been completed.

Manapouri – Te Anau.—A length of 6 m. of formation was completed during the year.

Signed on behalf of the Main Highways Board,

F. W. FURKERT, C.M.G.,
Chairman.

LIST OF ROADS DECLARED TO BE MAIN HIGHWAYS, 1928–29.

No. 1 Highway District (North Auckland)—	M.	ch.
Waimauku – West Coast	6	40
Takapuna-Silverdale	13	48
Warkworth–Leigh	15	0
Onewa Road	0	79
Northcote Road	2	62
Titirangi Road	2	50
Paparoa–Pahi	4	20
Kaiwaka – Kaiwaka Station	1	0
Otonga–Opuawhanga	6	28
Whangarei–Tameterau	8	60
Long's Corner – Tauraroa	11	0
Kamo – Hikurangi Bridge	18	40
Kaikohe Railway-station Road	0	30
Okaihau Station Road	0	60
Kahoe Bridge – Totara North	2	20
Broadwood–Runaruna	7	48
Waimate–Kaeo–Mangonui	43	8
Parkhurst Road	1	23
Beach Road	7	0
Henderson–Kumeu via Swanson	11	0
Henderson Valley Road	4	20
Kaukapakapa – Port Albert via Glorit and Tauhoa	31	2
Waikumete – West Coast	8	0
Te Hana – Tomorata	4	0
Wellsford–Whangaripo	10	0
Whakapirau–Maungaturoto Railway-station	7	20
Ruawai Creamery (Awaroa) – Armstrong's Corner	3	40
Tangowahine Valley Road	10	0
Dargaville – Kaihu via Awakino and Mamaranui	25	72
Whakapara – Matheson's Bridge	6	32
Whangarei–Whareora	5	0
Whangarei–Kiripaka	8	76
Okaihau–Horeke	14	8
Otiria Station Road	1	0
Ngapuhi Station Road	1	0
Fairburn Road	11	0
Bayley's Coast Road	7	5
Mititai – Mangonui Bridge (upper)	7	24
Grant's Corner – Wairau Bridge	0	75
	331	30
Auckland–Maungaturoto (extension)	12	77
	344	27

No. 2 Highway District (Auckland)—		
Coromandel – Mercury Bay	20	0
Mangere Bridge – Papatoetoe	7	48
Tahuna–Ohinewai	22	10
Pairere–Kaimai via Hinuera	15	0
Te Aroha – Waharoa	15	40
Kihikihi–Arapuni–Putaruru	29	76
Orongo–Netherton	8	50
Hikutaia – Netherton Ferry	3	20
Mount Albert – Royal Oak	3	0
Te Awamutu – Barton's Corner	8	14
Te Awamutu – Cambridge	14	68
Ngaruawahia – Waingaro	19	50
Pukekohe–Glenmurray via Tuakau	27	0
Cambridge–Morrinsville via Eureka	11	20
Te Kauwhata – Waerenga	17	0
Papakura–Hunua	8	32
Pukekohe–Bombay	5	34
Puni–Otaua	9	12
Wharepoa Road	3	8
Papatoetoe–Howick	5	54
Howick–Manurewa	14	74
Tuakau–Onewhero	6	0
Kauroa – Te Mata	4	60
Huntly–Rotongaro	6	27
Ngatea–Waharoa via Morrinsville	34	74
Waitoa–Maukoro	12	10
Panmure–Howick	0	51
	334	32
Great South Road—		
Bombay Hills Deviation	7	14
	341	46

No. 3 Highway District (Tauranga)—	M.	ch.
Opotiki – East Cape	19	0
Waioeka Road	6	28
Maraeroa Road	3	40
Rotorua–Tauranga (direct)	31	10
West Bank North Road	5	40
Maketu Road	4	0
Taupo – National Park	43	0
Tongariro Bridge – Tokaanu	3	0
Te Puna Point – Omokoroa	6	0
Papamoa – Mount Maunganui	8	60
Rotoma–Matata	22	0
Wainui Road	18	0
	170	18
Whakatane–Rotorua Main Highway—		
Extension to Whakatane Wharf	0	15
	170	33

No. 4 Highway District (Gisborne)—		
Gisborne–Ormond via Waiohika	6	8
Patutahi–Rere	23	0
Matawai – Koranga Bridge	12	40
Tolaga–Tauwhareparae	11	64
Te Puia – Waipiro	3	64
Taurangakautuku Road	5	40
Rotokautuku Bridge – Waiomatatini	9	64
Puha–Mangatu–Whatatutu	7	48
Tokomaru–Mata	4	0
Takapau–Ihungia	4	0
Tapuwaeroa Valley Road	3	0
	91	8

No. 5 Highway District (Hawke's Bay)—		
Frasertown – Lake House	35	0
Ruakituri Valley Road	14	0
Tukituki–Elsethorpe	21	0
Fernhill–Takapau via Maraekakaho and Tikokino	42	0
Waipawa–Omakere	14	40
Woodville–Tamaki	21	40
Ongaha – Mangatoro Valley	13	20
Woodville–Hopelands	4	20
Waipukurau–Matamau via Hatuma Takapau and Ormondville	31	24
Omakere–Pourerere	9	20
Mangateretere – Havelock North	3	45
Hastings–Pakipaki	4	0
Tukituki–Waimarama	12	0
Mangateretere – Te Awhanga	7	40
Petane–Eskdale	2	20
	235	29

No. 6 Highway District (King-country)—		
Te Maire – Mangaohutu	19	28
Taringamotu Valley Road	10	0
Te Kumi – Te Anga	54	40
Kopaki Road	5	0
Kumara–Paraheka	8	0
Mairoa Road	10	0
Manganui Road	19	0
Okahukura–Ohura	22	0
Tokirima Road	6	0
Pirongia – Junction Kawhia Road	9	60
Otorohanga – Honokiwi	15	40
Kawa Junction – Wharepuhunga	12	0
Takiri Road	8	0
National Park – Taupo	22	0
Mokauiti–Takiri	17	0
Okupata Road	11	0
Manunui–Owhango	19	40
Ahoroa and Tapairu Roads	11	55
Te Awamutu – Barton's Corner	1	40
Otunui Road	11	40
	293	23

LIST OF ROADS DECLARED TO BE MAIN HIGHWAYS, 1928-29—*continued.*

	M. ch.
No. 7 Highway District (Taranaki)—	
Ihaia Road	6 40
Pukearuhe Road	7 20
Ngatimaru Road	4 10
Lower Mangorei Road	2 40
Egmont Road	8 0
Oxford–Saunders	5 0
Skeet Road	20 40
Normanby–Manaia	2 0
Rawhitiroa Road	9 0
Pembroke Road	6 0
Beaconsfield Road	5 60
Hawera–Mokoia	10 40
Junction Road	19 0
Inland North Road	4 20
Carrington Road	3 0
Ngamotu Road	1 16
Toko Road	3 0
Turuturu Road	5 40
	123 6
No. 8 Highway District (Wanganui)—	
Ball Road	3 0
Kaharoa Road	3 0
Waverley Beach Road	4 20
Kohi Road	5 40
Rapanui Road	6 40
Springvale–Francis	3 40
Wanganui–Karioi	26 0
Curl's Bridge – Upper Tutaenui	9 30
Turakina – Cliff Road via Marton	12 35
Taihape–Mataroa	7 10
Murray's Track	10 0
Feilding–Hunterville	1 0
Raetihi–Ohura	7 40
Pipiriki–Raetihi	17 40
Heads–Mosstown	1 40
Bonny Glen – Norwood Corner	9 0
Onga Road	8 0
Taihape–Napier	12 0
	147 15
Raetihi–Ohakune (extension)	0 12
	147 27
No. 9 Highway District (Wellington West)—	
Karori–Makara	4 0
Upper Hutt – Waikanae	22 0
Waikanae–Waimea	2 60
Te Horo – Waihoanga	5 20
Levin–Hokio	6 0
Longburn–Rongotea	13 40
Bunnythorpe–Kairanga	7 20
Feilding–Hunterville	20 20
Lower Hutt – Eastbourne	6 0
Tangimoana Road	8 20
Foxton Beach Road	3 20
Pahautanui–Plimmerton	4 0
Taonui–Raumai	13 0
Pohangina Valley Road	7 0
	122 40
No. 10 Highway District (Wellington East)—	
Pongaroa–Akitio	10 0
Makuri–Conoor–Mangatoro	14 56
Newman–Nireaha	5 40
Tinui–Castlepoint	14 40
Westmere Road	6 0
Westmere – Te Wharau	9 40
Ponotahi Road	11 20
Lake Ferry Road	8 30
Weraiti–Stronvar	8 40
Rimu Road	6 0
Te Ore Ore – Bideford	9 0
Mangaone Valley Road	6 56
Opaki–Eketahuna via Mauriceville	4 0
	114 2

	M. ch.
No. 11 Highway District (Nelson)—	
Collingwood–Bainham	12 40
Spring Creek – Raranga	7 0
Kaituna–Tuamarina	9 40
Murchison–Reefton	34 0
Appleby–Motueka via Tasman	19 0
Motueka–Kohatu	32 40
Motueka Wharf Road	1 20
Renwicktown – Branch River	36 0
Renwicktown–Summerlands	12 0
Lindsay's–Clifton	9 70
Wakefield–Woodstock	19 40
	193 10
No. 12 Highway District (West Coast)—	
Westport–Greymouth (coast road)	52 75
Ahaura–Haupiri	23 38
Kokatahi–Koiterangi	12 0
Upper Kokatahi Road	4 0
Lake Kanieri Road	8 55
Reefton–Maruia	28 0
Granity–Stockton	4 40
Waimangaroa – Burnett's Face	8 0
Wataroa Settlement Road	3 40
	145 8
No. 13 Highway District (Canterbury North)—	
Dashwood–Upcot	40 0
Waiau–Lyndon	9 20
Flinthoff – Mouse Point	2 40
Waiau Road	2 0
Beach Road	1 0
Puhipuhi Road	3 60
Motunau – Motunau Beach	11 0
Hawarden–Heathstock	9 0
McKenzie – Core Bay	5 60
Leader–Mendip	3 40
Ethelton–Hurunui	1 40
	89 20
No. 14 Highway District (Canterbury Central)—	
Hilltop Junction – Long Bay Saddle	17 0
Loburn–Whiterock	7 40
Southbridge – Rakaia Huts	5 40
Lake Road – Yankee Crossing	8 60
Leeston–Rakaia	13 40
Kaiapoi – West Eyreton via Ohoka	14 0
West Eyreton – Cust	3 0
Christchurch–Halswell	2 40
Christchurch – New Brighton via Wainoni Road	2 40
Christchurch – New Brighton via Page's Road	2 40
Cashmere–Heathcote via Hill's Road	5 0
Ashley–Balcairn via Marshmans	8 0
Sefton – Saltwater Creek	2 60
Yaldhurst – Sheffield	20 40
Coalgate–Hororata	5 10
Dunsandel–Hororata	14 40
Aylesbury – Lake Coleridge via Hororata	31 20
Port Levy – Little River	12 40
West Oxford – Cooper's Creek	4 60
Hornby–Springston	8 20
Halswell–Lincoln via Stoddarts	7 60
Christchurch – Russley Road Junction via Burnside Road	4 15
Rangiora–Woodend	4 0
Waikuku – Waikuku Beach	2 20
Lincoln – Selwyn Huts	6 20
Ashley Gorge Road	17 0
Masham–Belfast	7 20
New Brighton Road	2 0
Beach Road (Kaiapoi)	2 60
	242 65

LIST OF ROADS DECLARED TO BE MAIN HIGHWAYS, 1928–29—*continued.*

No. 15 Highway District (Canterbury South)—	M.	ch.
Tinwald–Mayfield	18	60
Mayfield–Valetta	4	60
Methven – Alford Forest	6	20
Ashburton–Staveley	21	0
Ashburton–Wakanui	9	55
Surveyor's Road	4	20
Isleworth Road	7	40
Arundel – Cooper's Creek	3	0
Geraldine–Orari via Ruapekapeka	3	40
Gapes Valley Road	8	0
Temuka–Clandeboye	8	40
Pleasant Point – Fairlie via Middle Valley	19	20
Pleasant Point – Arowhenua	5	40
Main Otipua Road	9	40
Lake Pukaki – Hermitage	36	0
Waimate–Makikihi via Hunters	15	0
Kurow–Omarama	34	0
Ngapara–Duntroon	11	0
Whitstone – Five Forks Bridge	7	0
Maheno – Kauroo River	7	0
South Oamaru – Waianakarua via Kakanui	14	40
Hillgrove–Moeraki	1	40
Timaru–Queenstown via Tekapo and Lindis Pass	76	0
Cave–Pareora via Martin's Bridge	20	0
Waihao Downs – Wright's Bridge via Hakataramea	38	0
Waimate – Studholme Junction	3	40
Temuka – Upper Stumps	4	0
Arundel – Peel Forest	6	40
River Road	12	0
	415	35

No. 16 Highway District (Otago Central)—		
Dunback–Middlemarch	20	0
Dunedin – Port Chalmers	8	27
St. Bathan's Loop	16	40
Ida Valley Railway-station – Moa Creek School	16	0
Waipiata–Styx	22	40
Lumsden–Kingston	17	40
Timaru – Queenstown via Tekapo and Lindis Pass	93	17
Dunedin–Waitati via Leith Valley	5	50
Evansdale–Merton via Seacliff	9	60
Skipper's Road	14	0
	223	34

No. 17 Highway District (Otago South)—		
Dunback–Middlemarch	14	20
Outram–Berwick via Woodside	9	0
Dunedin – Duke's Road Railway-station	6	60
Green Island – Taieri Mouth	17	10

No. 17 Highway District (Otago South)—contd.	M.	ch.
Dunedin–Highcliff via Tomahawk	2	60
Balclutha–Kaitangata	8	4
Stoney Creek – Hillend	6	60
Waiwera–Clydevale	8	60
Waiwera Railway-station Road	1	20
Balclutha–Papatowai	16	0
Balclutha – Kaka Point	13	6
Waikaka – Matheson's Corner via Kelso	18	60
Roxburgh – Roxburgh Railway-station	1	40
Waipahi–Pomahaka	9	0
Owaka–Purekireki	12	60
	145	60

No. 18 Highway District (Southland)—		
Mataura–Wyndham	10	60
Mataura–Waiarikiki	6	63
Gore–Waikaka via Chatton	7	60
Chatton–Pyramid	8	30
Waiparu–Pyramid	9	57
Makarewa–Brown's	15	0
Brown's–Limehills	8	14
Rakahouka–Dacre	5	42
Waikaka – Matheson's Corner via Kelso	3	60
Riverton–Orepuki	18	44
Wyndham–Mokoreta	13	79
Lumsden–Kingston	20	34
Lorne–Hedgehope	16	62
Winton–Otautau	10	59
Fortrose–Otara	7	60
Kennington–Rakahouka	3	10
Wyndham–Glenham–Letter-box	10	67
Otautau–Nightcaps via Waikouro	12	36
Fairfax – Paulin's Bush	1	62
The Key – Te Anau	15	70
Hillside–Manapouri	9	70
Te Anau – Manapouri	12	40
Fingerpost–Pyramid	2	16
Waimahaka–Fortification	5	6
Pukerau–Kaiwera	5	68
Wrey's Bush – Mossburn	25	36
Invercargill–Riverton	1	60
Woodlands – Morton Mains	5	61
Dacre – Gorge Road	5	61
Bay Road	2	30
Dunns Road	1	72
Waimatuku Road	4	35
Hundred Line Road	6	65
Limehills – Centre Bush	5	6
Riversdale – Nine Mile	7	14
Gropers Bush – Waimatuku	8	62
Ohai–Orawia	16	25
	335	16

TABLE 1.—MAIN HIGHWAYS ACCOUNT.

CONSTRUCTION FUND.

INCOME AND EXPENDITURE ON CAPITAL ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 1929, AND TOTAL TO DATE.

EXPENDITURE.	Government Roads.	Ordinary Main Highways.	Total for Year 1928–29.	Total since Declaration of Main Highways (9/6/24).
To Net expenditure on construction and improvement of main highways, including cost of administration by Public Works Department and accident compensation :—				
Highway District—	£ s. d.	£ s. d.	£ s. d.	£ s. d.
No. 1	103,027 19 5	52,468 0 4	155,495 19 9	338,179 12 11
No. 2	51,163 6 3	80,912 3 3	132,075 9 6	388,943 14 0
No. 3	11,789 1 1	16,499 3 8	28,288 4 9	116,817 10 5
No. 4	39,210 10 3	29,144 8 5	68,354 18 8	223,681 6 0
No. 5	309 15 3	48,656 11 1	48,966 6 4	129,678 18 6
No. 6	50,282 15 8	11,494 6 10	61,777 2 6	181,223 10 9
No. 7	28,166 3 9	29,222 6 5	57,388 10 2	247,904 5 10
No. 8	22,252 17 11	6,832 18 11	29,085 16 10	90,635 12 10
No. 9	41,767 17 3	81,882 0 0	123,649 17 3	319,744 6 0
No. 10	26,453 15 0	11,745 0 7	38,198 15 7	90,332 7 7
Totals for North Island ..	374,424 1 10	368,856 19 6	743,281 1 4	2,127,141 4 10
No. 11	16,307 13 6	8,808 5 9	25,115 19 3	44,594 8 9
No. 12	5,617 13 6	3,246 6 8	8,864 0 2	83,347 13 8
No. 13	3,954 15 6	13,948 10 3	17,903 5 9	78,955 12 4
No. 14	10,538 4 11	50,875 13 6	61,413 18 5	96,705 0 2
No. 15	..	10,020 8 9	10,020 8 9	19,786 11 2
No. 16	8,853 1 0	16,651 11 3	25,504 12 3	60,513 17 8
No. 17	1,068 11 8	80,154 13 0	81,223 4 8	157,528 3 1
No. 18	568 18 9	11,936 3 0	12,505 1 9	46,874 15 3
Totals for Dominion ..	421,333 0 8	564,498 11 8	985,831 12 4	2,715,447 6 11

INCOME.	Total for Year 1928–29.	Total since Declaration of Main Highways (9/6/24).
By Recoveries on account of expenditure of previous years :—		
Highway District—	£ s. d.	£ s. d.
No. 3, Government roads	7 1 6	..
No. 16, ,, ...	0 11 7	..
No. 17, ,, ...	0 4 6	..
	7 17 7	..
Receipts under section 15, Finance Act, 1923, from Public Works Fund, General Purposes Account*	200,000 0 0	1,026,000 0 0
Loans raised under Main Highways Act, 1922—		
Consolidated stock	*Dr.* 3 3 2	542,004 10 10
Debentures	83,450 0 0	183,450 0 0
Inscribed stock	146,550 0 0	196,550 0 0
Temporary transfers from other accounts	50,000 0 0	50,000 0 0
Transfer from Revenue Fund	350,000 0 0	350,000 0 0
Charges and expenses of raising loans (adjustment)	3 3 2	3 3 2
Balance, excess of expenditure over income, carried to general balance-sheet	155,823 14 9	367,439 12 11
	985,831 12 4	2,715,447 6 11

* Interest on these amounts is paid from Consolidated Fund.

TABLE 1.—MAIN HIGHWAYS ACCOUNT—*continued.*

REVENUE FUND.

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 1929, AND TOTAL TO DATE.

EXPENDITURE.	Government Roads.	Ordinary Main Highways.	Total for Year 1928-29.	Total since Inception of Main Highways Act, 1922, to 31/3/29.
To Net expenditure on maintenance of main highways :—				
Highway District—	£ s. d.	£ s. d.	£ s. d.	£ s. d.
No. 1	9,793 8 1	47,958 10 7	57,751 18 8	143,879 18 2
No. 2	9,392 17 8	96,198 10 7	105,591 8 3	241,115 0 8
No. 3	27,868 17 0	11,709 17 8	39,578 14 8	111,199 19 4
No. 4	13,399 7 10	15,402 2 1	28,801 9 11	82,167 13 4
No. 5	6,882 19 5	51,988 11 5	58,871 10 10	187,535 8 6
No. 6	13,543 10 8	15,098 8 9	28,641 19 5	77,364 13 0
No. 7	21,064 19 3	29,027 0 7	50,091 19 10	158,040 13 0
No. 8	1,047 3 3	25,151 7 10	26,198 11 1	104,888 4 5
No. 9	13,772 17 8	46,727 14 1	60,500 11 9	167,699 17 4
No. 10	6,703 5 2	37,533 15 2	44,237 0 4	120,064 19 2
Totals for North Island ..	123,469 6 0	376,795 18 9	500,265 4 9	1,393,956 6 11
No. 11	10,143 16 10	21,339 17 9	31,483 14 7	98,098 13 3
No. 12	48,531 11 8	15,005 15 8	63,537 7 4	183,590 3 1
No. 13	3,008 4 3	20,475 15 10	23,484 0 1	69,450 15 2
No. 14	762 15 9	30,554 8 8	31,317 4 5	84,210 11 3
No. 15	..	40,099 7 7	40,099 7 7	105,964 7 4
No. 16	3,440 19 3	12,953 3 11	16,394 3 2	44,493 16 6
No. 17	1,493 10 8	21,342 18 11	22,836 9 7	61,772 10 5
No. 18	572 9 11	26,408 0 1	26,980 10 0	80,282 15 2
Totals for Dominion ..	191,422 14 4	564,975 7 2	756,398 1 6	2,121,819 19 1
Abolition of toll-gates (section 20, Finance Act, 1925)			1,807 0 0	12,151 14 7
Accident compensation			166 16 3	879 17 2
Administration and supervision expenses, including salaries and travelling-expenses of Public Works officers, printing, stationery, postages, and miscellaneous expenses			33,004 7 2	102,271 17 1
Charges and expenses of raising loans			58 5 0	42,525 19 6
Commission on collection of motor-registration fees by Postal Department			12,315 6 6	43,412 8 6
Commission on registration of change of ownership			9,705 3 0	9,705 3 0
Depreciation of furniture, fittings, &c.			46 7 2	178 13 8
Depreciation of plant not in service			8 0 0	18 0 0
Erection of signposts (subsidies to) on county boundaries			574 10 7	1,345 3 2
Expenses of District Councillors attending District Council meetings and annual conference			90 16 5	397 9 8
Fees and travelling-expenses of members of the Main Highways Board, other than Government members			1,392 16 5	7,330 17 0
Finance Act, 1927 (No. 2), section 33, Wellington City Council ..			15,068 10 9	15,068 10 9
Interest on loans, recoupment to Consolidated Fund (section 4, Finance Act, 1919)			39,130 12 2	112,405 15 6
Management charges of consolidated stock on account of Construction Fund			165 5 2	520 16 11
Miscellaneous expenses—				
Advertising, maps, rent of halls, traffic tallies, transport of samples, &c.			381 12 10	1,324 4 6
Compensation under Section 3, Public Works Amendment Act, 1925			315 1 6	315 1 6
Reserve for redemption of main highways securities			59,948 0 0	59,948 0 0
Transfers to Construction Fund			350,000 0 0	350,000 0 0
			1,280,576 12 5	2,881,619 11 7
Balance, being excess of income over expenditure, carried to general balance-sheet			58,862 14 1	829,746 12 0
			1,339,439 6 6	3,711,366 3 7

INCOME.	Total for Year 1928-29.	Total since Inception of Main Highways Act, 1922, to 31/3/29.
By Income from—		
Interest from investments of—	£ s. d.	
Construction Fund	3,537 0 6	
Revenue Fund	29,451 6 9	
	£ s. d.	£ s. d.
	32,988 7 3	150,096 16 1
Interest from local bodies on plant purchased on their behalf ..	3,065 9 5	7,570 12 0
Interest on advances to local bodies	168 18 7	168 18 7
Miscellaneous receipts	38 6 4	38 6 4
Motor-registration licenses, fees, and fines (section 24, Motor-vehicles Act, 1924)	341,016 14 11	1,275,058 4 4
Motor-spirits tax (section 9, Motor-spirits Taxation Act, 1927) ..	730,414 6 2	860,875 3 9
Recoveries on account of expenditure of previous years—Ordinary main highways	..	28 12 0
Rent of and tolls from ferries	..	2,081 10 6
Tire-tax (sections 13 and 14, Main Highways Act, 1922)	196,747 3 10	1,240,448 0 0
Transfer from Consolidated Fund (section 14, Main Highways Act, 1922)	35,000 0 0	175,000 0 0
	1,339,439 6 6	3,711,366 3 7

TABLE 1.—MAIN HIGHWAYS ACCOUNT—*continued.*

General Balance-sheet as at 31st March, 1929.

LIABILITIES.	Revenue Fund.	Construction Fund.	Total.
	£ s. d.	£ s. d.	£ s. d.
Accumulated Revenue Fund—			
Balance at 31/3/28	770,883 17 11	..	..
Add excess of income over expenditure for 1928–29	58,862 14 1	..	..
	829,746 12 0	..	829,746 12 0
Sundry creditors—			
Public Works Department	15,332 13 1	33,746 12 6	49,079 5 7
Other Government Departments	538 3 0	2,300 3 11	2,838 6 11
Non-departmental	77,099 19 2	95,863 1 7	172,963 0 9
Interest accrued on loans	5,515 1 9	..	5,515 1 9
Motor-registration fees paid in advance	59,188 0 0	..	59,188 0 0
Writings-off in Suspense	88 7 2	371 15 3	460 2 5
Temporary transfer from Revenue Fund	..	300,000 0 0	300,000 0 0
Reserve for redemption of securities	59,948 0 0	..	59,948 0 0
	1,047,456 16 2	432,281 13 3	1,479,738 9 5

ASSETS.			Revenue Fund.	Construction Fund.	Total.
			£ s. d.	£ s. d.	£ s. d.
Cash in Public Account—					
At call			213,704 1 6	8,090 4 0	221,794 5 6
Invested temporarily until required			307,900 0 0	..	307,900 0 0
			521,604 1 6	8,090 4 0	529,694 5 6
Sundry debtors—					
Public Works Department			2,355 1 4	2,457 13 9	4,812 15 1
Other Government Departments			2,383 4 0	35 12 7	2,418 16 7
Non-departmental			1,633 12 5	5,879 14 10	7,513 7 3
Motor-registration fees in hands of Postal Department			4,708 6 8	..	4,708 6 8
Interest due and accrued			9,607 11 5	..	9,607 11 5
Stocks of material, tools, &c.			6,892 17 9	40,539 15 2	47,432 12 11
Roadmen's cottages, huts, and road buildings generally			3,469 0 0	7,839 0 0	11,308 0 0
Furniture, fittings, &c.—	£ s. d.				
Expenditure to 31/3/29	628 2 6				
Less depreciation to 31/3/29	182 11 1				
			445 11 5	..	445 11 5
Plant and equipment—					
For Main Highways Board—					
Expenditure to 31/3/29	64,060 5 1				
Less depreciation charged to works	4,026 8 6				
			60,033 16 7	..	60,033 16 7
Purchased for local bodies—					
Expenditure to 31/3/29	87,921 10 10				
Less repayments of principal	19,145 17 9				
			68,775 13 1	..	68,775 13 1
Amount in Loans Redemption Account			59,948 0 0	..	59,948 0 0
Construction Fund—	£ s. d.				
Balance at 31/3/28	211,615 18 2				
Add excess of expenditure over income, 1928–29	155,823 14 9				
			..	367,439 12 11	367,439 12 11
Temporary transfer to Construction Fund			300,000 0 0	..	300,000 0 0
Advances to local authorities (Main Highways Amendment Act, 1926, section 2)			5,600 0 0	..	5,600 0 0
			1,047,456 16 2	432,281 13 3	1,479,738 9 5

J. J. Gibson, Accountant, Public Works Department.

F. W. Furkert, C.M.G., Chairman, Main Highways Board.

I hereby certify that the Income and Expenditure Accounts and Balance-sheet have been duly examined and compared with the relative books and documents submitted for audit, and correctly state the position as disclosed thereby, subject to the above departmental notes. The following comment is appended: A reserve of £59,948 for redemption of securities has been set up and paid over to the Loans Redemption Account, but the amount has not yet been applied to the redemption of securities.—G. F. C. Campbell, Controller and Auditor-General.

TABLE 2.—LENGTHS OF MAIN HIGHWAYS AT 31ST MARCH, 1929.

Number and Name of Highway District.	Original Main Highways.	Additional Main Highways.	Total.
	M. ch.	M. ch.	M. ch.
1. Auckland North	590 4	331 30	921 34
2. Auckland South	486 1	334 32	820 33
3. Tauranga	447 15	170 18	617 33
4. Gisborne	242 16	91 8	333 24
5. Napier	456 18	235 29	691 47
6. King-country	329 30	293 23	622 53
7. Taranaki	309 67	123 6	432 73
8. Wanganui	327 48	147 15	474 63
9. Wellington West	315 40	122 40	438 0
10. Wellington East	338 48	114 2	452 50
Totals, North Island ..	3,842 47	1,962 43	5,805 10
11. Nelson	305 23	193 10	498 33
12. West Coast	348 43	145 8	493 51
13. Canterbury North	307 40	89 20	396 60
14. Canterbury Central	399 32	242 65	642 17
15. Canterbury South	425 45	415 35	841 0
16. Otago Central	258 54	223 34	482 8
17. Otago South	299 37	145 60	445 17
18. Southland	463 52	335 16	798 68
Totals, South Island ..	2,808 6	1,790 8	4,598 14
Totals for Dominion ..	6,650 53	3,752 51	10,403 24

TABLE 3.—CONSTRUCTION WORK COMPLETED DURING YEAR 1928-29.

Number and Name of Highway District.	Formation and Widening.	Gravelling and Metalling.	Tar and Bituminous Sealing.	Bituminous Macadam (Penetration).	Bituminous Concrete.	Portland Cement Concrete.	Bridges.	Engineering Surveys.	
								Surveys completed.	Plans completed.
	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	Ft.	M. ch.	M. ch.
1. Auckland North	44 29	30 24	..	2 51	..	0 64	600	95 23	71 4
2. Auckland South	2 55	23 13	23 53	12 51	..	0 6	1,647	31 15	16 4
3. Tauranga	..	9 60	3 28	..	..	..	77	2 30	2 30
4. Gisborne	12 76	38 43	8 7	..	..	..	135	14 55	14 55
5. Napier	7 26	3 27	25 62	11 69	0 33	3 75	552	10 15	10 15
6. King-country	20 26	20 44	..	..	..	..	305	23 40	23 40
7. Taranaki	10 21	7 35	15 6	13 20	..	..	263	12 29	12 29
8. Wanganui	14 71	20 6	4 13	..	..	..	228	24 22	25 42
9. Wellington West ..	38 23	2 24	9 75	6 12	9 12	..	1,184	52 56	46 56
10. Wellington East	6 37	0 59	10 45	3 20	..	..	434	13 7	13 7
11. Nelson	5 4	5 4	1 57	1 4	..	..	755	11 37	17 41
12. West Coast	2 1	2 54	0 19	..	..	..	350	3 79	2 75
13. Canterbury North ..	3 14	..	2 0	..	..	..	600	..	..
14. Canterbury Central ..	0 55	0 55	2 66	..	2 64	6 49	..	6 21	6 21
15. Canterbury South ..	0 19	0 19	8 9	..	..	..	760	..	..
16. Otago Central	24 16	3 70	..	..	..	..	318	3 15	3 15
17. Otago South	17 51	11 69	0 50	..	1 43	..	152	23 56	21 56
18. Southland	13 13	4 59	5 64	..	..	..	1,122	11 4	4 31
Totals	223 57	185 25	121 74	50 67	13 72	11 34	9,482	339 24	291 41

TABLE NO. 4.—APPROPRIATIONS AND EXPENDITURE FOR THE YEAR ENDING 31ST MARCH, 1929.

Number and Name of Highway District.	Construction.		Maintenance.	
	Available for Authorization.	Expenditure.	Available for Authorization.	Expenditure.
	£	£	£	£
1. Auckland North ..	167,374	147,733	83,708	57,752
2. Auckland South ..	206,825	125,386	113,286	105,591
3. Tauranga	47,614	26,798	51,366	39,579
4. Gisborne	82,157	65,779	36,747	28,802
5. Napier	85,354	46,607	72,846	58,872
6. King-country	55,767	58,468	40,370	28,642
7. Taranaki	67,764	54,542	67,386	50,091
8. Wanganui	45,026	27,488	49,106	26,199
9. Wellington West ..	158,805	117,357	91,658	60,501
10. Wellington East ..	60,476	36,171	64,156	44,237
11. Nelson	52,999	23,895	50,795	31,484
12. West Coast	22,475	8,386	72,046	63,537
13. Canterbury North ..	27,212	17,107	31,454	23,484
14. Canterbury Central ..	118,429	58,652	46,311	31,317
15. Canterbury South ..	34,073	9,502	47,467	40,099
16. Otago Central	48,339	24,076	24,337	16,394
17. Otago South	81,375	76,672	31,277	22,837
18. Southland	42,979	11,529	54,342	26,981
Totals for Dominion ..	1,405,043	936,148	1,028,658	756,399
Totals for North Island..	977,162	706,329	670,629	500,266
Totals for South Island..	427,881	229,819	358,029	256,133

TABLE NO. 5.—MAINTENANCE OF MAIN HIGHWAYS (INCLUDING BRIDGES).

Number and Name of Highway District.	Length Maintained.		Expenditure.							
			Board.	Local Authorities.	Total.	Average per Mile per Annum.				
						1928–29	1927–28.	1926–27.	1925–26.	1924–25.
Primary System.										
	M.	ch.	£	£	£	£	£	£	£	£
1. Auckland North ..	590	4	42,063	18,289	60,352	102·28	103·6	65·6	56·1	77·0
2. Auckland South ..	486	1	80,689	32,950	113,639	233·82	203·3	181·0	85·1	53·5
3. Tauranga	447	15	35,018	5,494	40,512	90·59	80·3	69·1	48·6	28·1
4. Gisborne	242	16	23,736	11,723	35,459	146·40	104·3	152·7	93·9	59·5
5. Napier	456	18	51,307	21,104	72,411	158·72	170·0	169·4	104·5	73·4
6. King-country	329	30	22,509	7,195	29,704	90·18	56·2	69·8	55·4	58·5
7. Taranaki	309	67	42,841	13,839	56,680	182·93	195·7	198·8	105·0	67·1
8. Wanganui	327	48	19,158	12,330	31,488	96·12	145·3	167·6	88·9	54·4
9. Wellington West ..	315	40	54,463	17,757	72,220	228·91	228·9	166·3	120·2	91·7
10. Wellington East ..	338	48	38,006	15,501	53,507	158·02	138·8	138·0	104·7	77·7
Totals, North Island ..	3,842	47	409,790	156,182	565,972	147·29	141·2	131·6	82·9	62·9
11. Nelson	305	23	26,296	10,737	37,033	121·31	102·1	119·9	63·9	48·1
12. West Coast	348	43	51,072	4,193	55,265	158·56	118·3	114·2	94·6	61·6
13. Canterbury North ..	307	40	20,998	7,926	28,924	94·06	90·1	79·5	47·7	37·7
14. Canterbury Central ..	399	32	21,815	9,277	31,092	77·85	87·3	81·4	46·1	52·2
15. Canterbury South ..	425	45	28,959	11,763	40,722	95·69	105·0	79·5	73·9	39·7
16. Otago Central	258	54	11,407	4,437	15,844	61·25	77·2	49·3	26·1	12·6
17. Otago South	299	37	17,637	9,004	26,641	88·96	90·5	81·7	54·2	22·5
18. Southland	463	52	20,552	10,573	31,125	67·13	63·4	76·0	56·6	24·6
Totals, South Island ..	2,808	6	198,736	67,910	266,646	94·96	91·4	85·4	59·6	38·5
Totals for Dominion ..	6,650	53	608,526	224,092	832,618	125·19	119·9	111·9	73·2	51·7

TABLE NO. 5.—MAINTENANCE OF MAIN HIGHWAYS (INCLUDING BRIDGES)—*continued.*

Number and Name of Highway District.	Length Maintained.	Expenditure.			
		Board.	Local Authorities.	Total.	Average per Mile.
		Secondary System.			
	M. ch.	£	£	£	£
1. Auckland North ..	331 30	15,689	7,125	22,814	68·85
2. Auckland South ..	334 32	24,902	11,589	36,491	109·12
3. Tauranga	170 18	4,561	926	5,487	32·23
4. Gisborne	91 8	5,066	1,110	6,176	67·79
5. Napier	235 29	7,565	3,254	10,819	45·97
6. King-country	293 23	6,133	2,423	8,556	29·17
7. Taranaki	123 6	7,250	3,570	10,820	87·91
8. Wanganui	147 15	7,041	3,503	10,544	71·64
9. Wellington West ..	122 40	6,038	3,049	9,087	74·18
10. Wellington East ..	114 2	6,231	2,896	9,127	80·04
Totals, North Island..	1,962 43	90,476	39,445	129,921	66·20
11. Nelson	193 10	5,188	1,985	7,173	37·14
12. West Coast	145 8	12,465	3,783	16,248	111·98
13. Canterbury North ..	89 20	2,486	755	3,241	36·31
14. Canterbury Central ..	242 65	9,502	3,622	13,124	54·05
15. Canterbury South ..	415 35	11,140	3,913	15,053	36·23
16. Otago Central	223 34	4,987	2,151	7,138	31·95
17. Otago South	145 60	5,200	2,470	7,670	52·62
18. Southland	335 16	6,429	2,310	8,739	26·07
Totals, South Island..	1,790 8	57,397	20,989	78,386	43·79
Totals for Dominion ..	3,752 51	147,873	60,434	208,307	55·51
		Complete Highways System.			
1. Auckland North ..	921 34	57,752	25,414	83,166	90·26
2. Auckland South ..	820 33	105,591	44,539	150,130	182·99
3. Tauranga	617 33	39,579	6,420	45,999	74·50
4. Gisborne	333 24	28,802	12,833	41,635	124·91
5. Napier	691 47	58,872	24,358	83,230	120·35
6. King-country	622 53	28,642	9,618	38,260	61·44
7. Taranaki	432 73	50,091	17,409	67,500	155·92
8. Wanganui	474 63	26,199	15,833	42,032	88·53
9. Wellington West ..	438 0	60,501	20,806	81,307	185·63
10. Wellington East ..	452 50	44,237	18,397	62,634	138·38
Totals, North Island..	5,805 10	500,266	195,627	695,893	119·87
11. Nelson	498 33	31,484	12,722	44,206	88·69
12. West Coast	493 51	63,537	7,976	71,513	144·87
13. Canterbury North ..	396 60	23,484	8,681	32,165	81·07
14. Canterbury Central ..	642 17	31,317	12,899	44,216	68·85
15. Canterbury South ..	841 0	40,099	15,676	55,775	66·32
16. Otago Central	482 8	16,394	6,588	22,982	47·67
17. Otago South	445 17	22,837	11,474	34,311	77·06
18. Southland	798 68	26,981	12,883	39,864	49·90
Totals, South Island..	4,598 14	256,133	88,899	345,032	75·04
Totals for Dominion ..	10,403 24	756,399	284,526	1,040,925	100·06

TABLE 6.—TESTS OF STONE COMPLETED DURING THE YEAR ENDING 31ST MARCH, 1929.

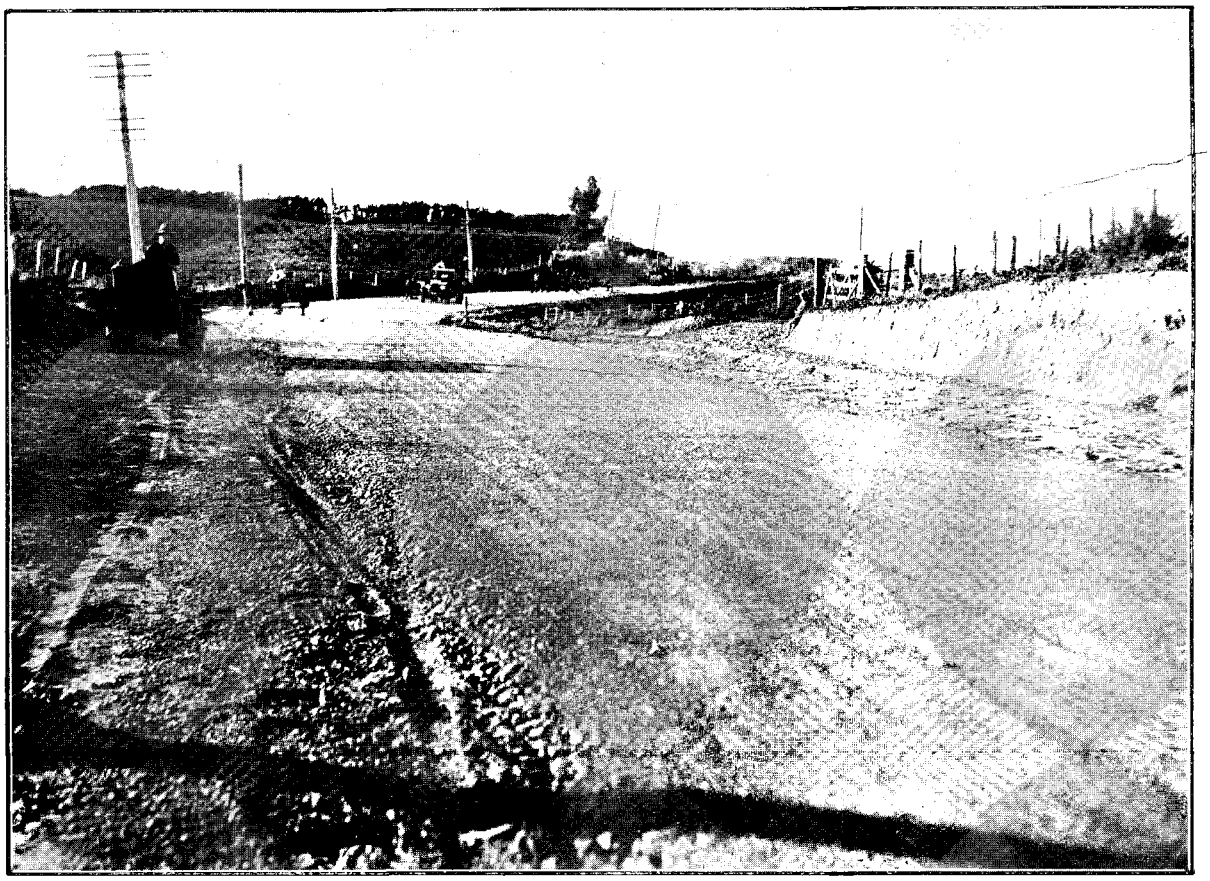
Number of Test and Locality.	Weight in Pounds per Cubic Foot.	Absorption of Water in Pounds per Cubic Foot.	Abrasion.		Hardness.	Toughness.	Geological Classification.
			Percentage of Wear.	French Coefficient.			
121. Rimutaka Saddle	165	0·32	6·68	5·84	18·6	17·5	Greywacke.
122. Waipoua, Whangarei ..	176	1·09	4·0	10·0	18·9	17·5	Dolerite.
122A. Waipoua Forest, Whangarei ..	..	..	9·8	4·1	..	..	Conglomerate.
123. Ngaruawahia	167	0·27	2·12	18·9	18·4	49·0	Fine greywacke.
124. Auckland	190	0·36	2·46	16·3	19·2	27·5	Basalt.
Kate's quarry, Dannevirke—							
125. No. 1	159	1·05	4·4	9·1	15·2	15·5	Glauconite sandstone.
126. No. 2	151	2·2	5·16	7·75	8·3	15·0	Glauconite marl.
127. No. 3	148	3·85	5·24	7·63	8·1	14·5	Glauconite marl.
128. Smeed's riverside quarries, Mercer	189	0·31	2·12	18·9	..	..	Basalt.
130. Christchurch	178	0·93	2·9	13·7	19·1	18·5	Trachyte.
131. Ngongotaha, Rotorua ..	138	3·75	22·7	1·2	..	..	Spherulitic rhyolite.
132. Waimea Plains, Nelson ..	185	0·26	2·6	15·5	18·9	33·0	Altered basalt.
133. Moutere Plains, Nelson ..	177	0·36	3·98	10·9	16·7	16·0	Mica-schist.
134. Taylor's quarry, Waiomio ..	178	0·42	4·9	8·2	16·6	12·5	Compact limestone.
135. Raglan County—Ngaruawahia Weber County—	167	0·17	2·48	16·1	18·9	32·0	Greywacke.
136. Dannevirke–Waipukurau Main Highway at 38 m.	134	5·29	12·48	3·2	3·0	5·5	Fine micaceous sandstone.
137. Morgan's quarry, Dannevirke–Waipukurau Main Highway at 37 m. 10 ch.	131	3·15	12·78	3·13	..	..	Fine micaceous sandstone.
138. Angora Road quarry	135	8·98	12·08	3·3	..	..	Fine micaceous sandstone.
139. Angora Creek, Boulders ..	161	1·2	..	..	..	..	Glauconite sandstone.
140. Waimea County—Takaka Hill ..	170	0·35	..	..	19·5	24·0	Quartzite.
Motutara Island, Whangarei—							
141. Outcrop (weathered sample)	166	0·68	13·5	2·96	18·7	23·0	Greywacke.
142. Boulder	171	0·47	2·28	17·54	18·8	32·0	Greywacke.
143. Municipal quarry, Tikipunga, Whangarei	160	2·0	4·54	8·81	17·0	12·5	Basalt.
Mackersey's quarry (Tennant), Whangarei—							
144. Upper level	169	1·74	4·4	9·09	17·1	16·5	Basalt.
145. Lower level	174	1·3	3·38	11·83	17·2	31·0	Basalt.

By Authority: W. A. G. SKINNER, Government Printer, Wellington.—1929.



FORMATION WORK.

AUCKLAND–MAUNGATUROTO MAIN HIGHWAY.—POHUEHUE DEVIATION.



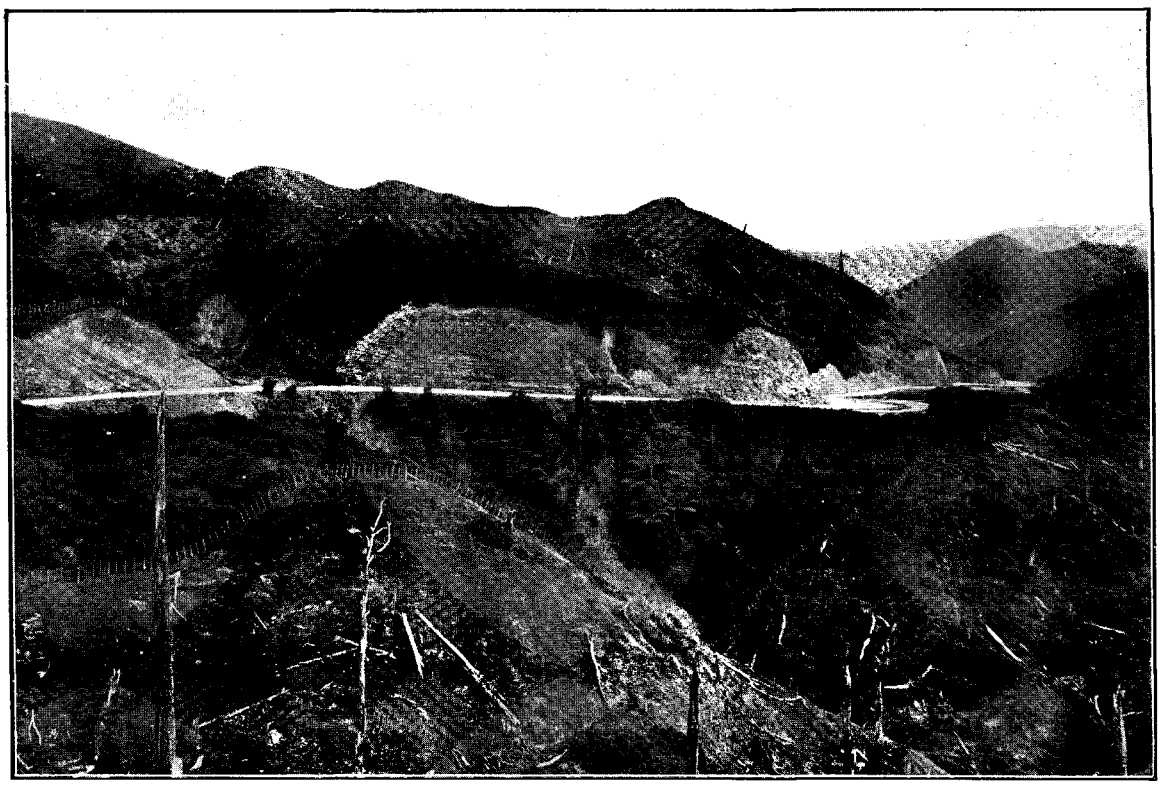
BITUMINOUS PENETRATION SURFACE.

GREAT SOUTH ROAD.—RANGIRIRI HILLS DEVIATION.



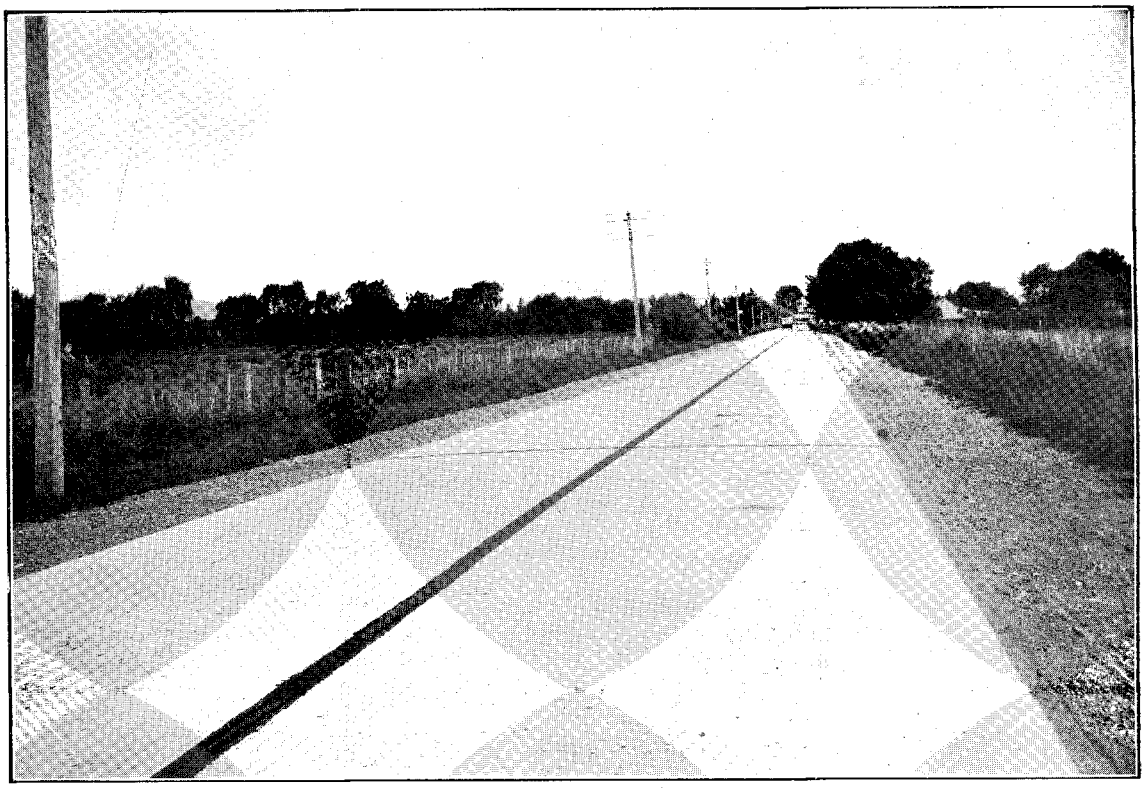
Bituminous Penetration Surface.

GREAT SOUTH ROAD.—HUNTLY TOWN DISTRICT.

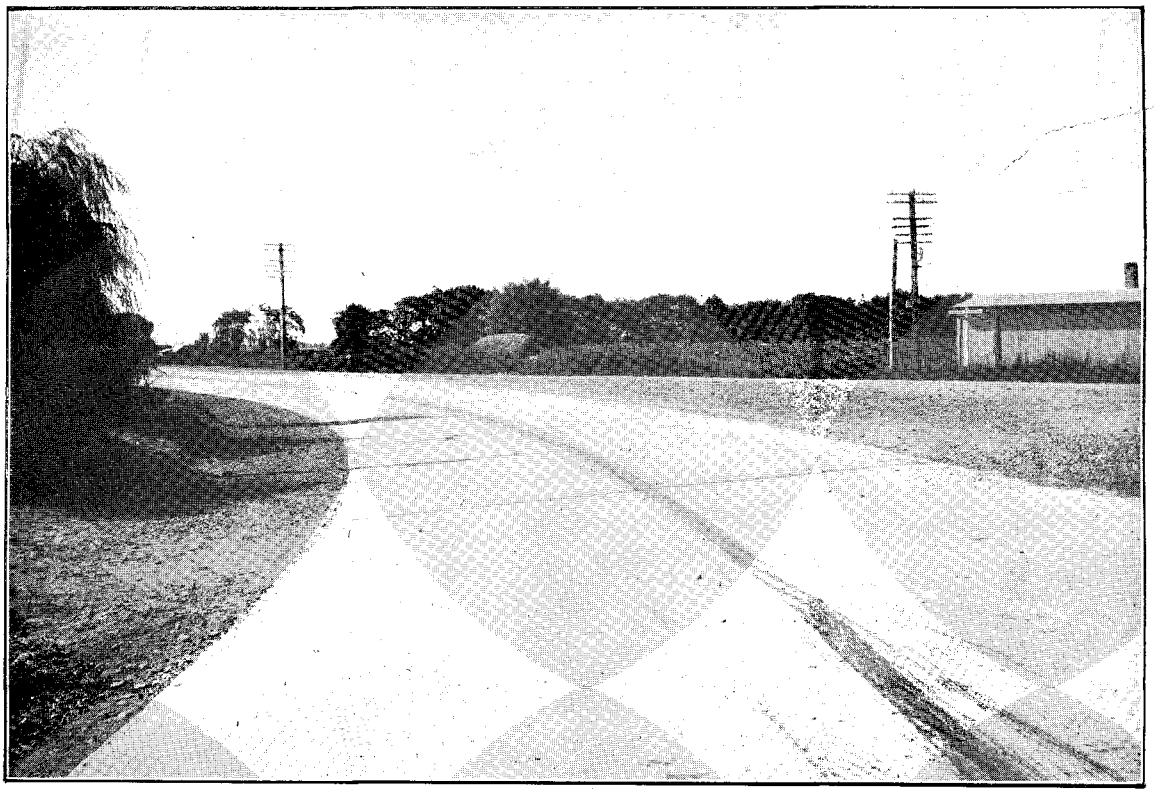


Widening-work.

WHATAWHATA–RAGLAN MAIN HIGHWAY.

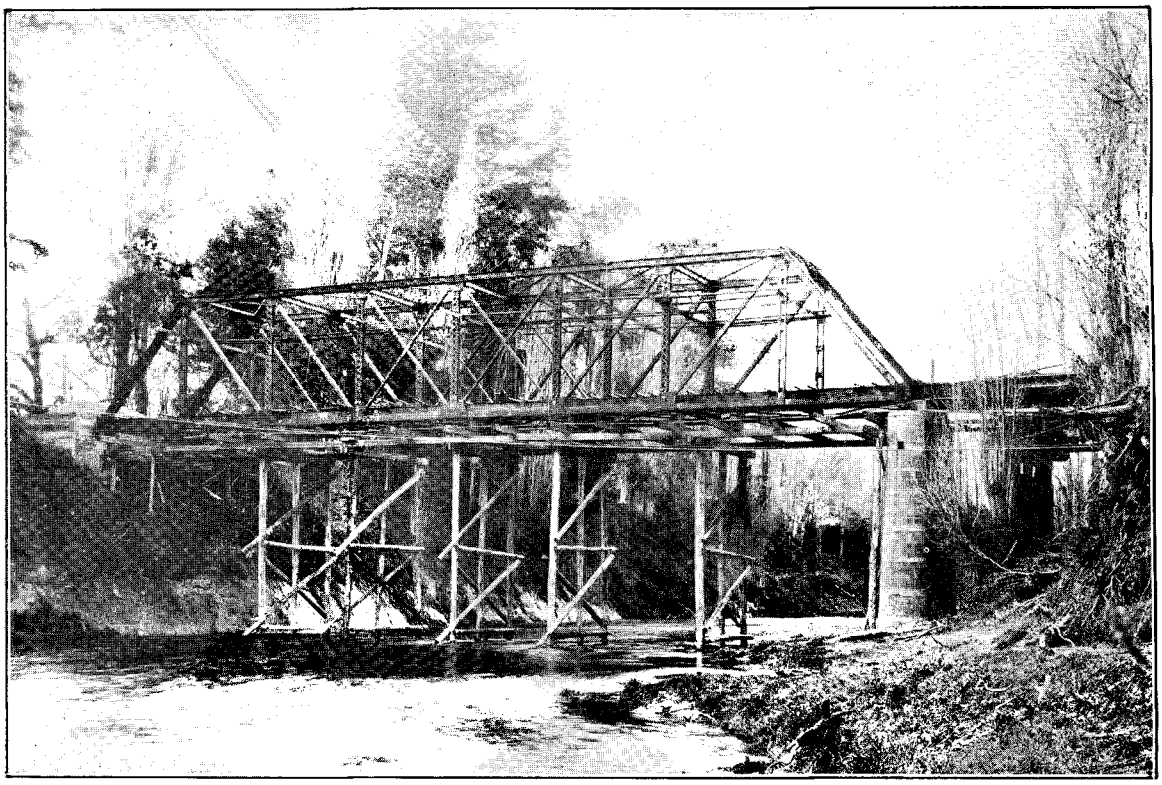


PORTLAND-CEMENT CONCRETE PAVEMENT.

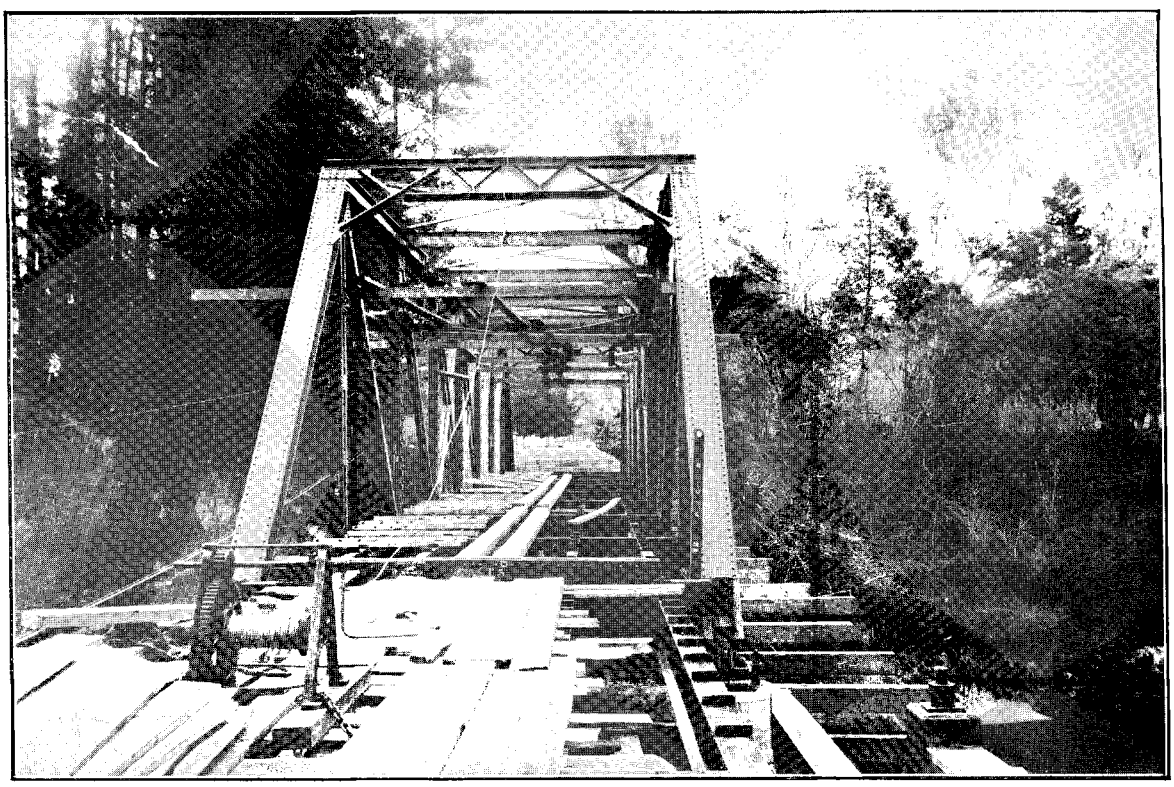


PORTLAND-CEMENT CONCRETE PAVEMENT: TYPICAL CURVE.

FARNDON–HASTINGS MAIN HIGHWAY.

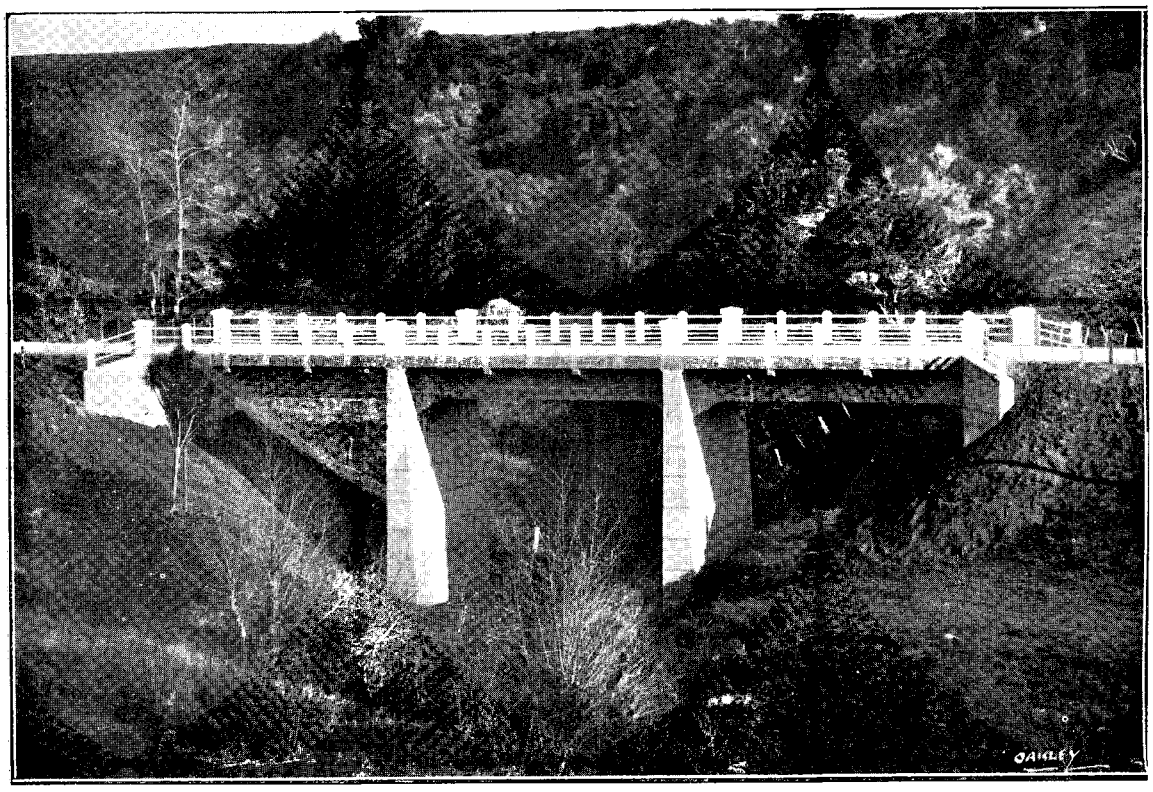


MANGAONE STREAM BRIDGE UNDER CONSTRUCTION.
One 120 ft. through steel truss and one 40 ft. rolled steel joist spans; 18 ft. roadway.



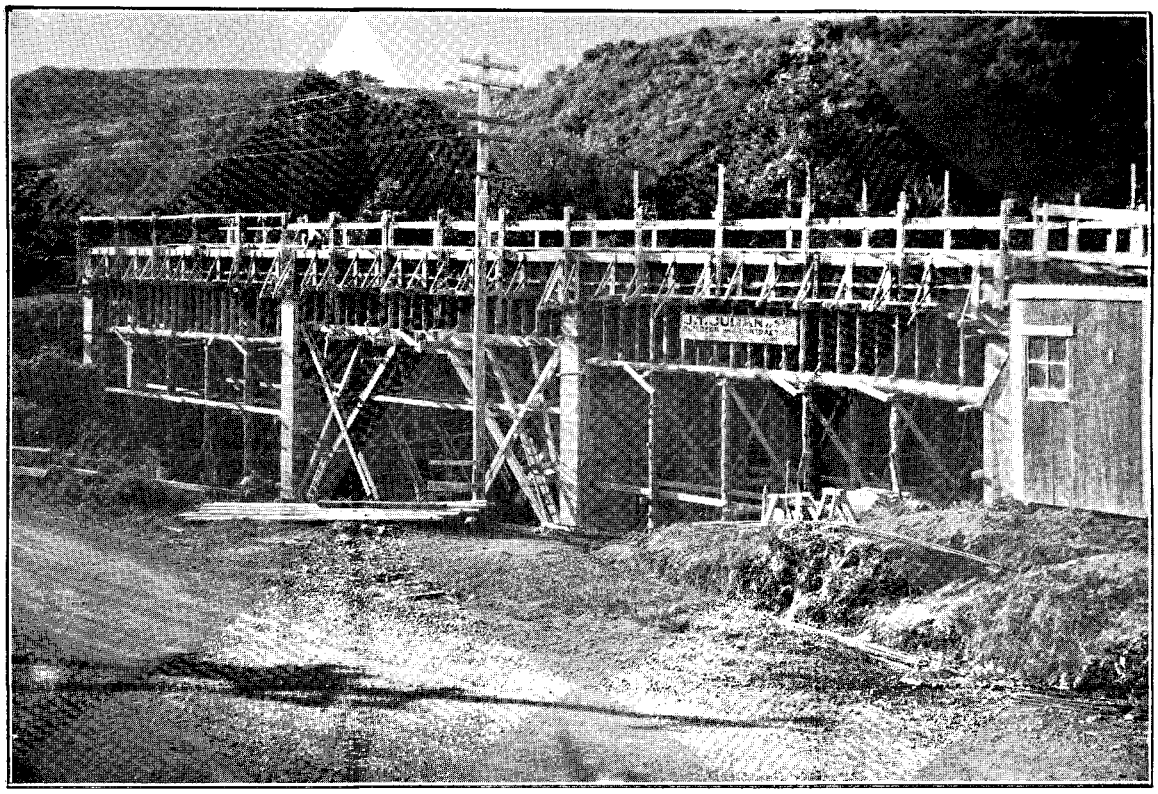
MANGAONE STREAM BRIDGE UNDER CONSTRUCTION.

TARADALE-RISSINGTON MAIN HIGHWAY.



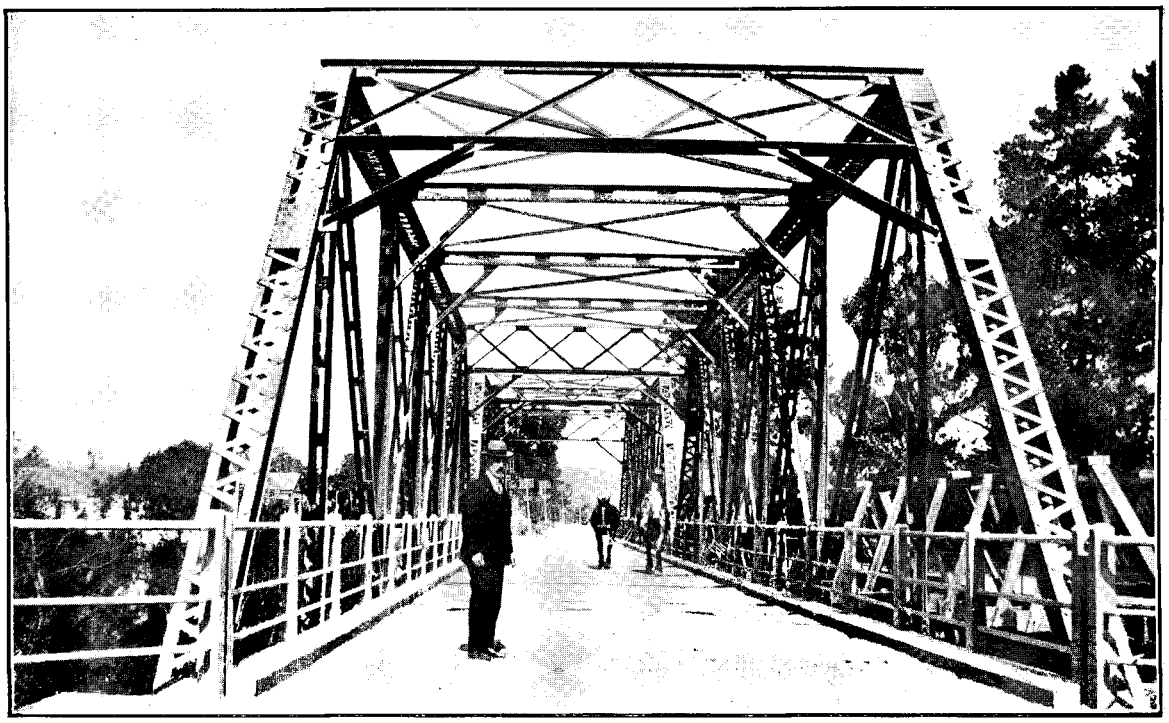
WAIAU STREAM BRIDGE.
Three 40 ft. reinforced-concrete spans.

AUCKLAND–WELLINGTON (VIA TARANAKI) MAIN HIGHWAY.—CLIFTON COUNTY SECTION.



KATIKARA STREAM BRIDGE UNDER CONSTRUCTION.
Three 40 ft. reinforced-concrete spans.

LEPPERTON JUNCTION – HAWERA (VIA OPUNAKE) MAIN HIGHWAY.

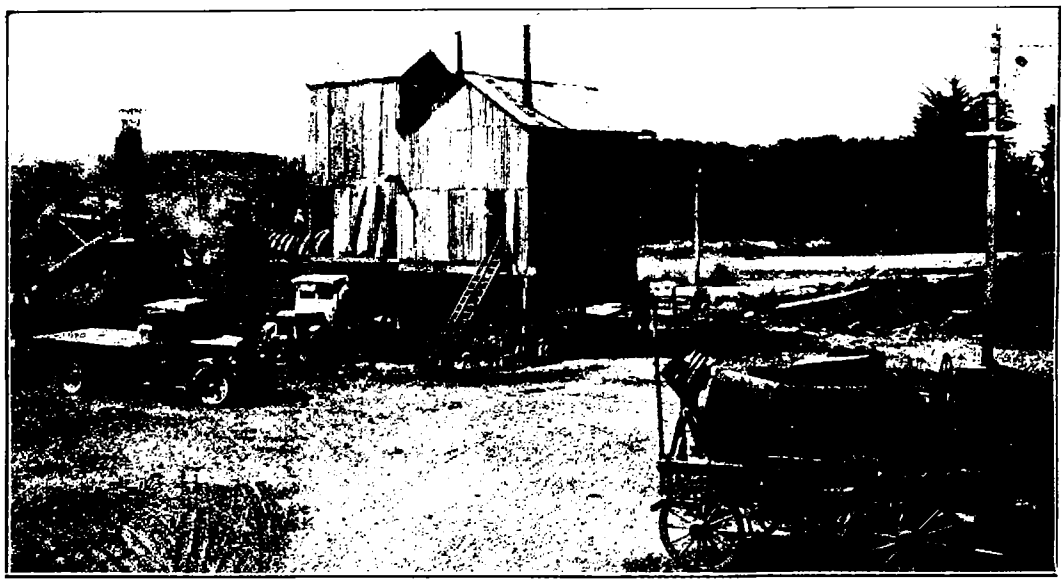


Turakina River Bridge.
Two 100 ft. through steel trusses; 18 ft. roadway.

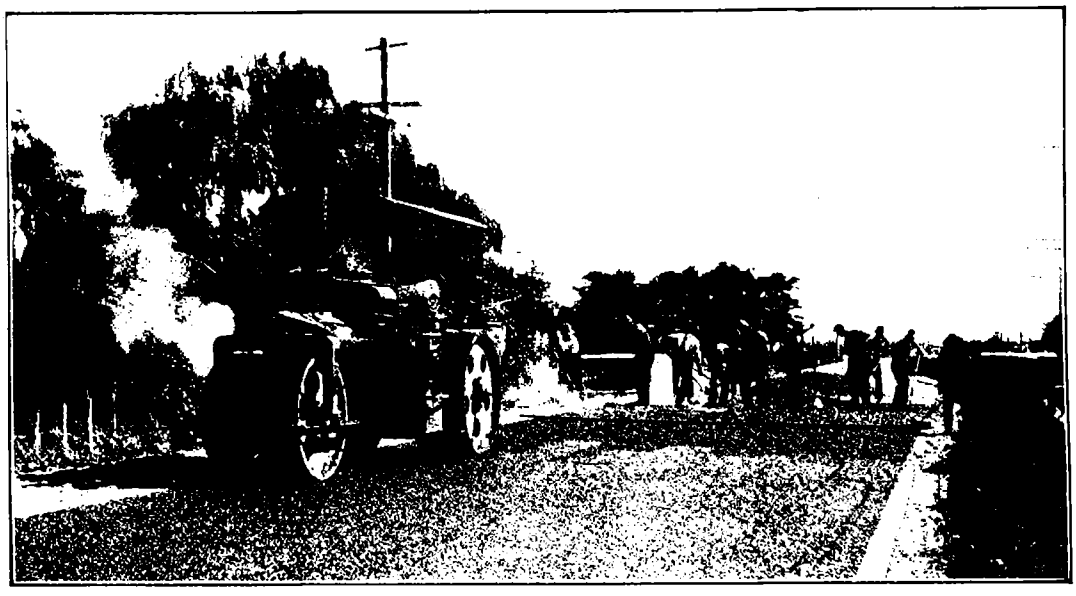


Turakina River Bridge.
Old wooden structure in background.

AUCKLAND–WELLINGTON (VIA TARANAKI) MAIN HIGHWAY.



Bituminous Paving Plant.



Bituminous-concrete Pavement under Construction.



Applying Squeegee Coat to Bituminous-concrete Pavement.

SANSON - PALMERSTON NORTH MAIN HIGHWAY.

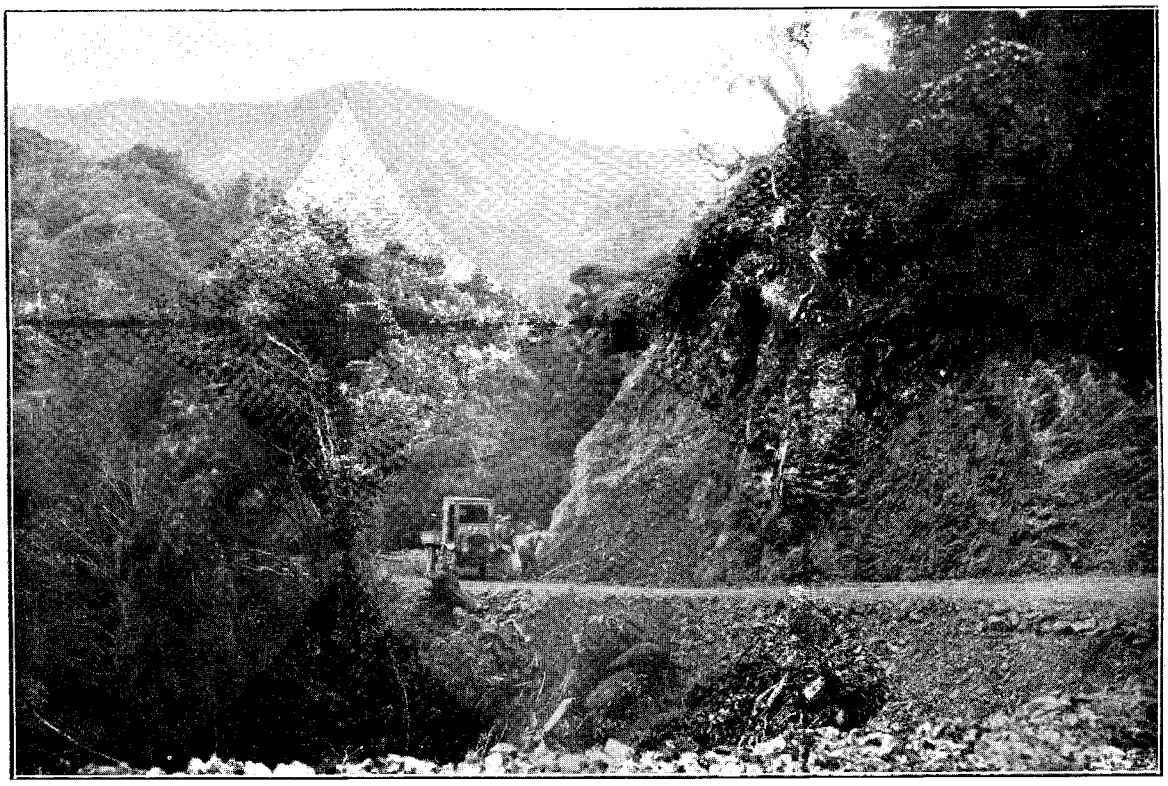


Bituminous-concrete Paving in Half Widths.



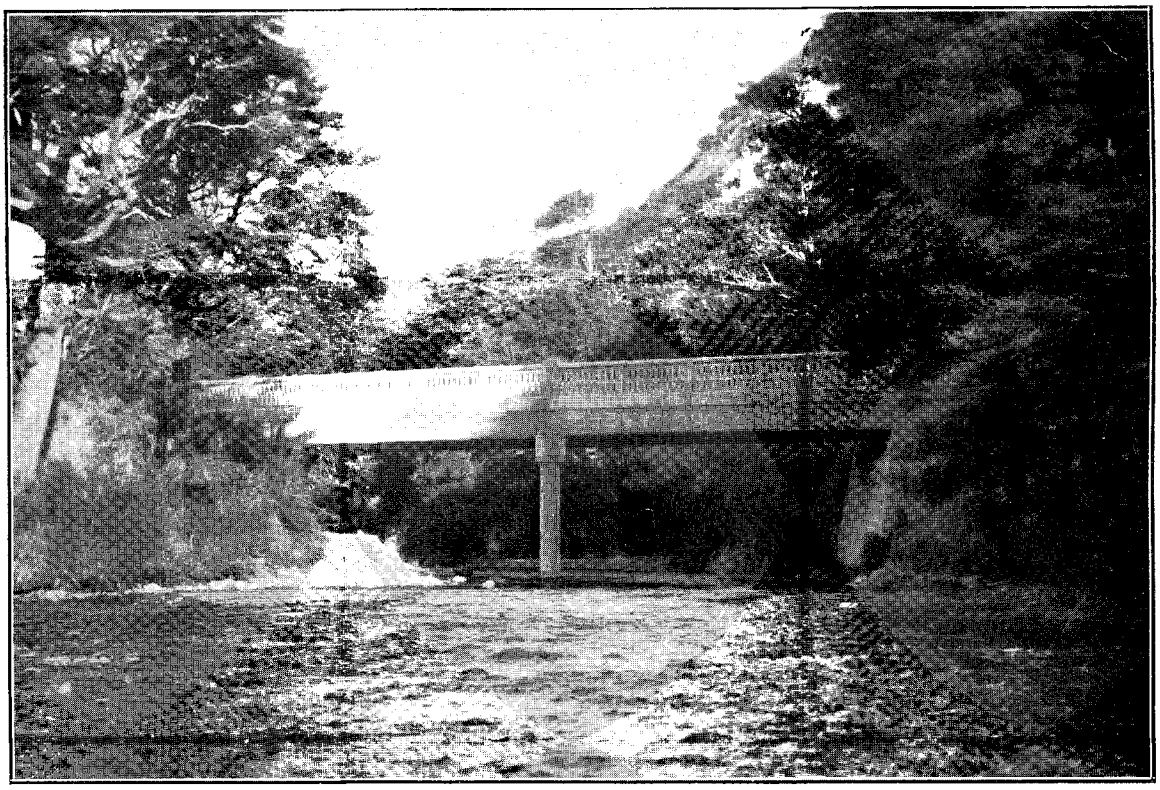
Bituminous-concrete Pavement: Base Course.

AUCKLAND WELLINGTON (VIA TARANAKI) MAIN HIGHWAY.—JOHNSONVILLE–TAWA FLAT SECTION.



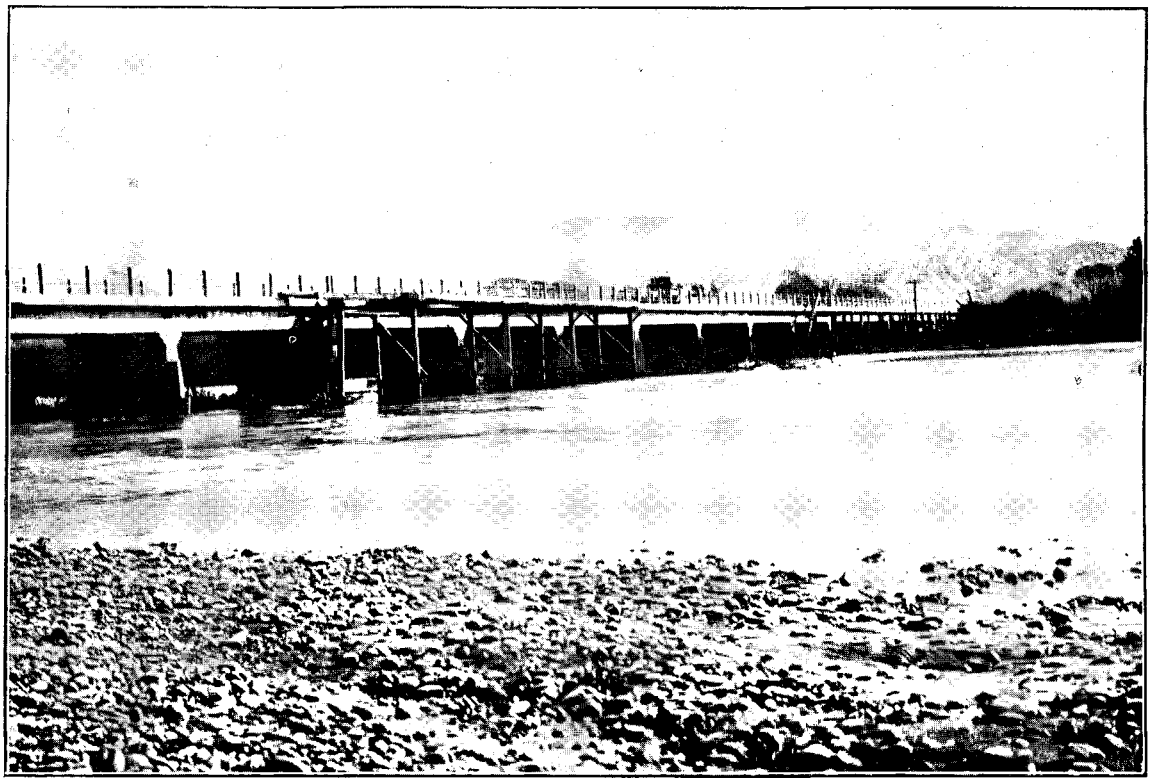
Widening-work.

UPPER HUTT – WAIKANAE MAIN HIGHWAY.

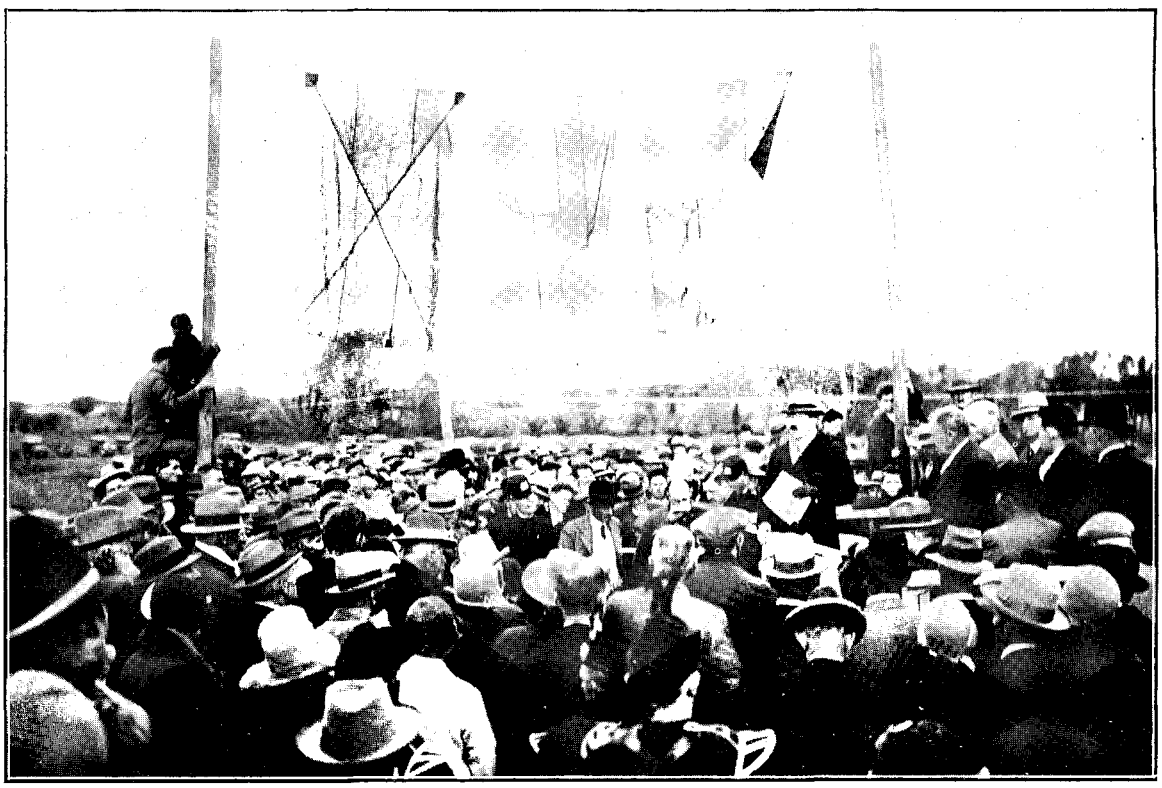


Mungaroa Stream Bridge.
Two 40 ft. reinforced-concrete spans.

WELLINGTON – NAPIER (VIA WAIRARAPA) MAIN HIGHWAY.

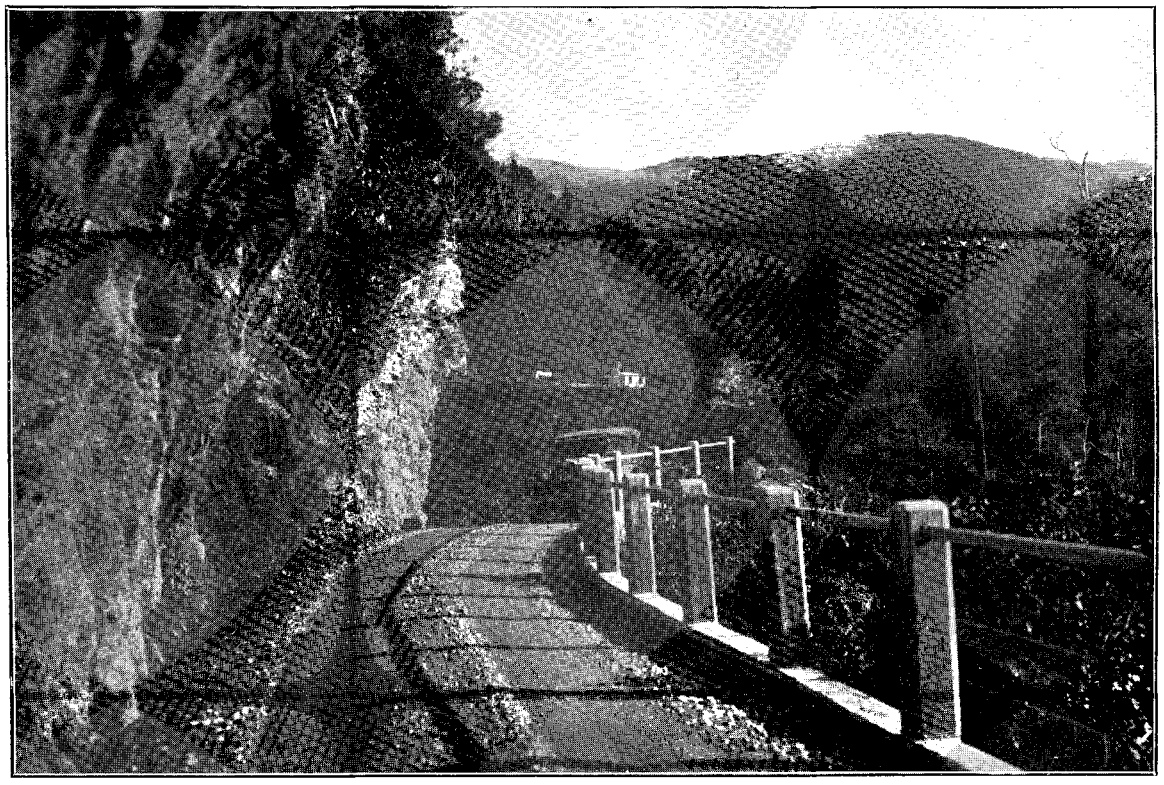


MOTUEKA BRIDGE.
Twenty-five reinforced-concrete spans; 18 ft. roadway. Total length, 1,075 ft.



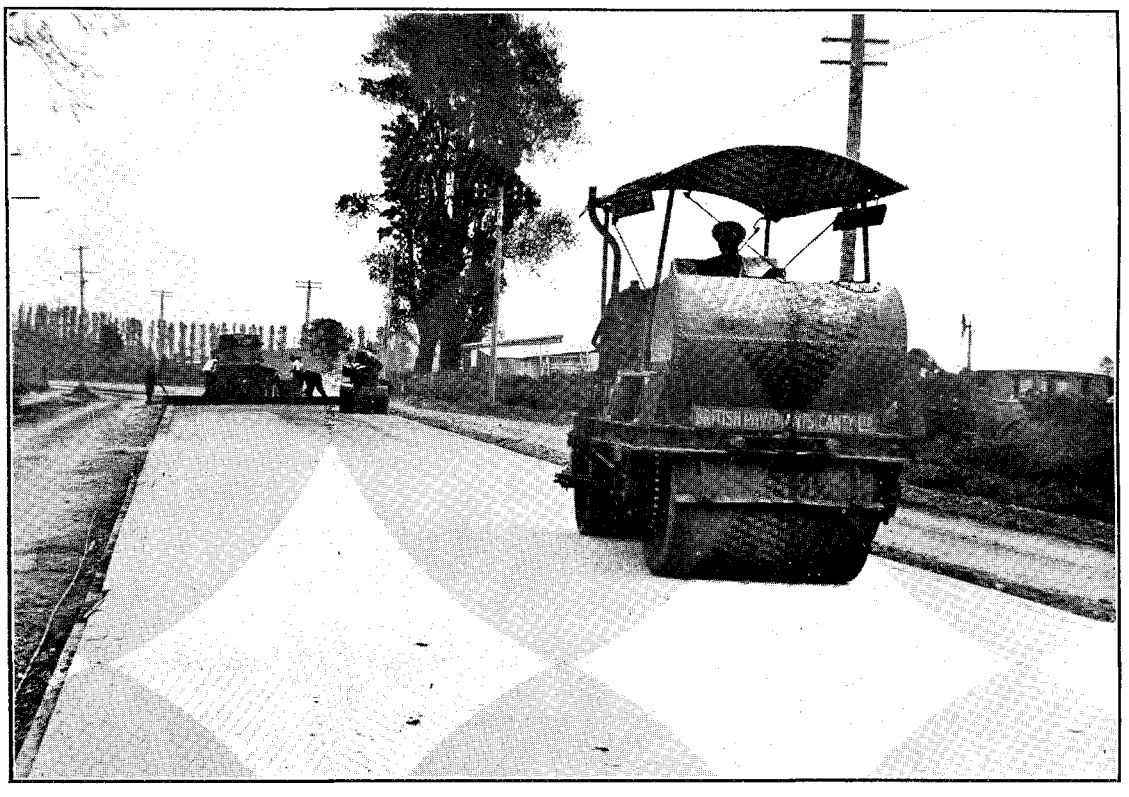
MOTUEKA BRIDGE: OPENING CEREMONY.

RICHMOND–COLLINGWOOD MAIN HIGHWAY.



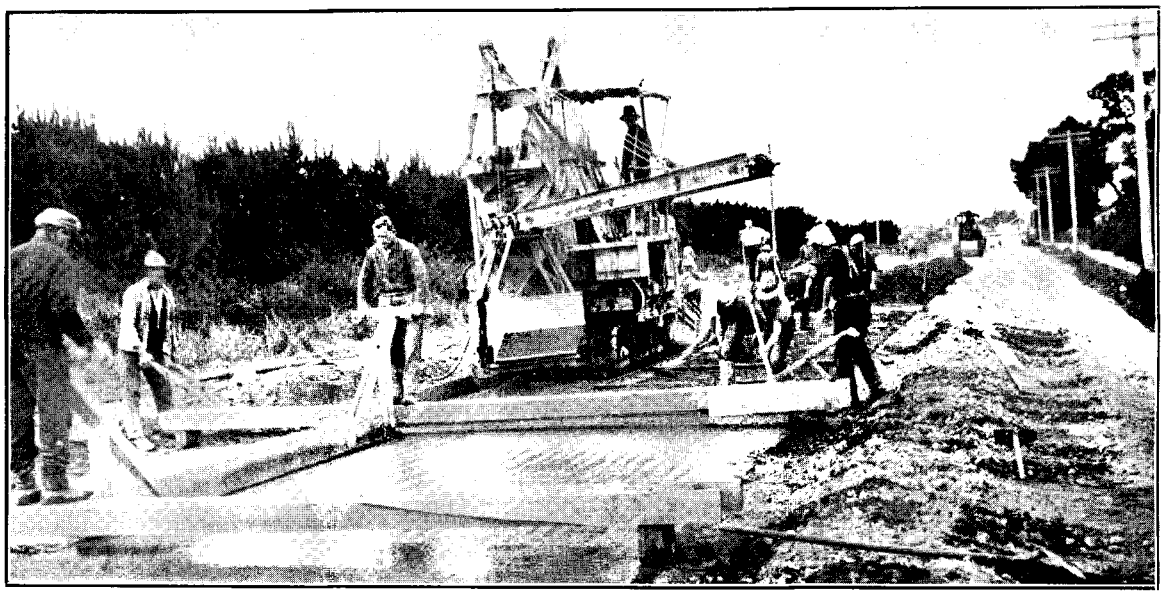
IMPROVEMENTS AT LITTLE OHIKA BLUFF, BULLER GORGE.

WESTPORT–NELSON MAIN HIGHWAY.

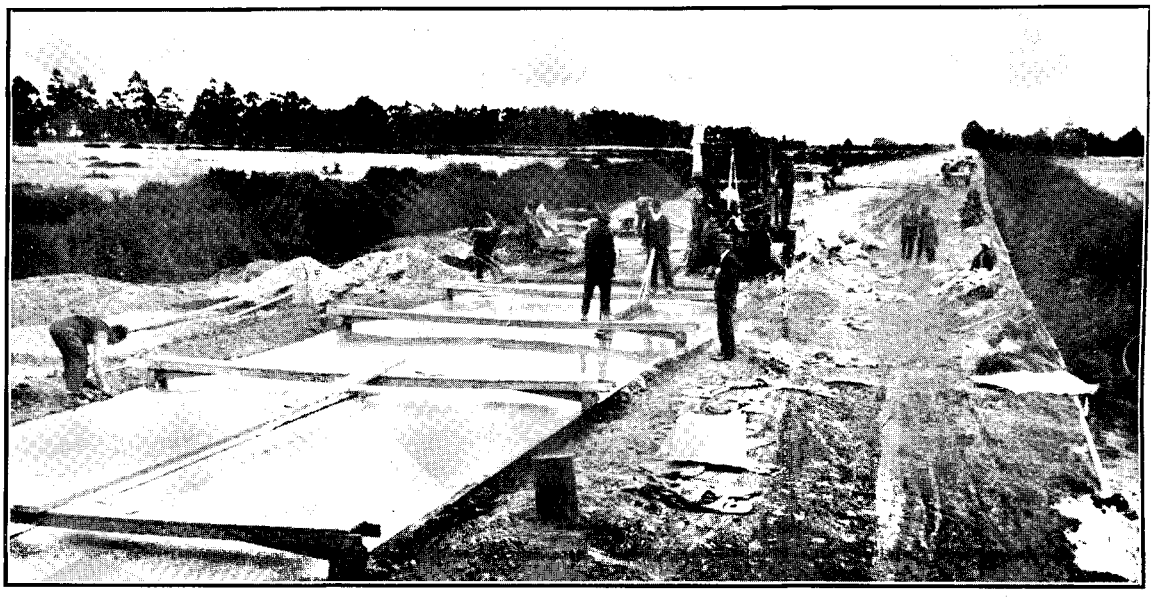


BITUMINOUS-CONCRETE PAVEMENT.

CHRISTCHURCH–AKAROA MAIN HIGHWAY.



Sockburn–Templeton Section.

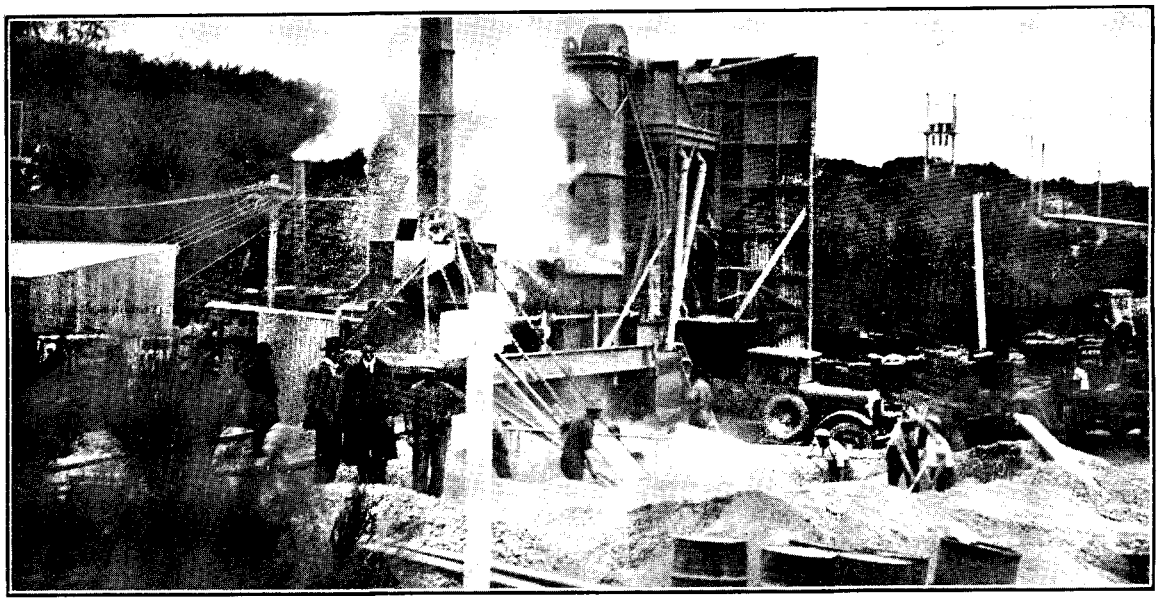


Paparua County Section.

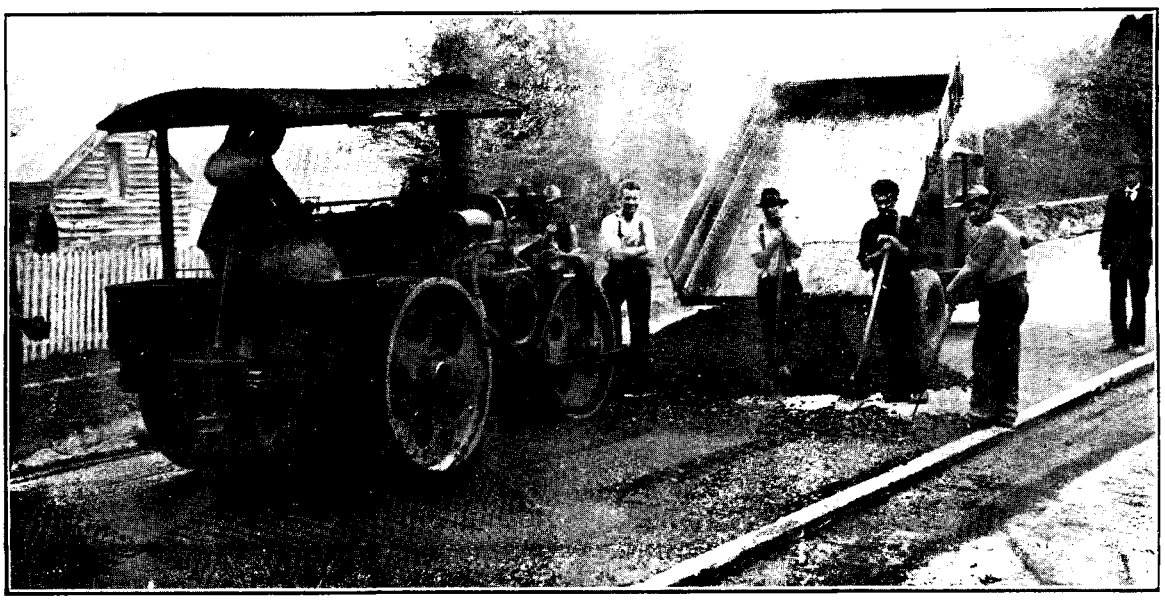


Templeton–Rolleston Section.

CHRISTCHURCH–DUNEDIN MAIN HIGHWAY.—PORTLAND-CEMENT CONCRETE PAVEMENT UNDER CONSTRUCTION.



Bituminous-concrete Paving Plant.

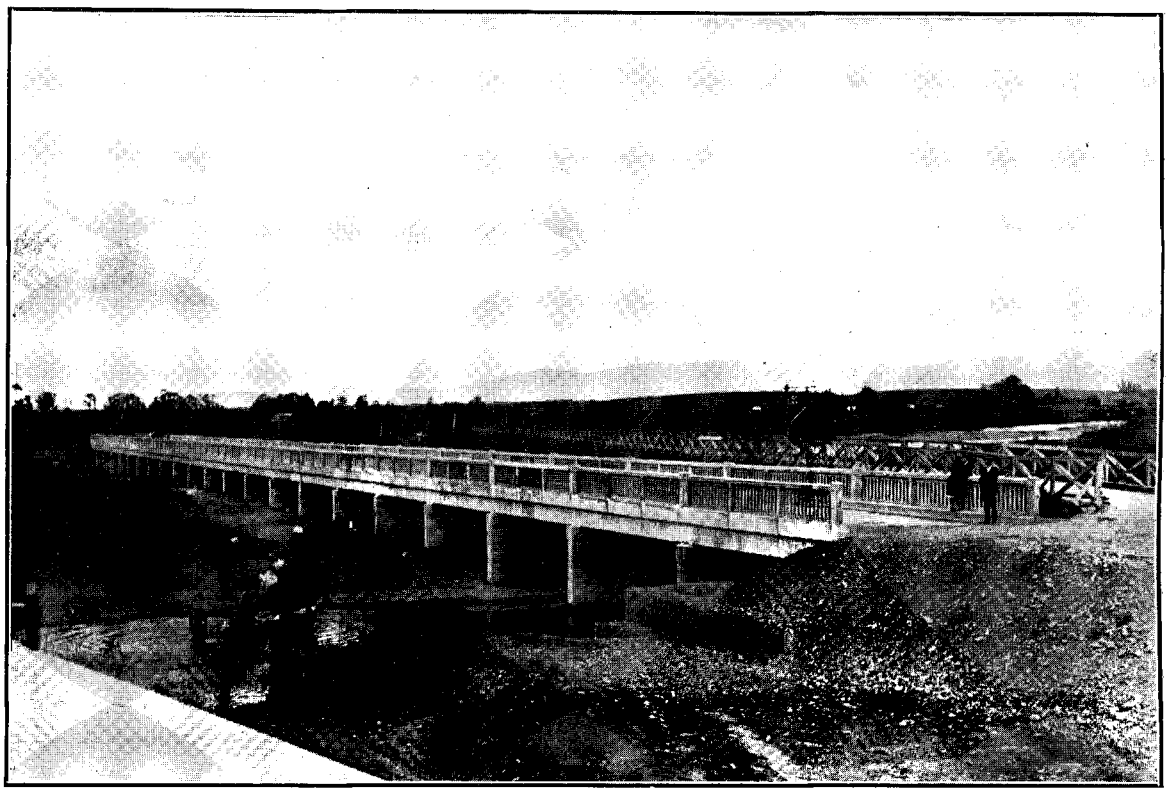


Bituminous-concrete Paving on Macadam Base.



Deviation at Allanton.

DUNEDIN–INVERCARGILL MAIN HIGHWAY.—TAIERI COUNTY SECTION.



Pareora River Bridge.
Twenty-two 30 ft. reinforced-concrete spans; 18 ft. roadway.

CHRISTCHURCH–DUNEDIN MAIN HIGHWAY.

MAP OF THE
NORTH ISLAND
(NEW ZEALAND)
SHOWING
MAIN HIGHWAYS
AS DECLARED
(See Main Highways Act N.Z. 1922)

Scale of Miles

10 5 0 10 20 30 40 50 60 70 80 90

Reference

Main Highways ..... thus
Main Highways numbered ..... ,, (13)
Boundaries of ,, ... ,, Dists ,,
Numbers of ,, ... ,, Dists ,, (2)
County Boundaries ..... ,,

AUCKLAND NORTH (1)
AUCKLAND SOUTH (2)
TAURANGA (3)
GISBORNE (4)
HAWKES BAY (5)
KING COUNTRY (6)
TARANAKI (7)
WANGANUI (8)
WELLINGTON WEST (9)
WELLINGTON EAST (10)

Waipapakauri, Kaitaia, Broadwood, Mangonui, Whangaroa, Victoria Val., Mangamuka, Kohukohu, Rawene, Kohe, Waimamaku, Kaihu, Dargaville, Te Kopuru, Newman, Paparoa, Maungaturoto, Te Pahi, Kaiwaka, Wellsford, Wayby, Pt Albert, Takapuna, Warkworth, Waiwera, Silverdale, Helensville, Kaukapakapa, Waimauku, Kumeu, Birkenhead, Auckland, Devonport, Clevedon, Papakura, Drury, Pukekohe, Bombay, Tuakau, Waiuku, Otaua, Waitakere, Russell, Ohaeawai, Kawakawa, Hikurangi, Whangarei, Kamo, Hikurangi Bridge, Kaikohe, Okaihau, Kohukohu, Omapere, Opononi, Waipoua, Tangowahine, Dargaville, Kaihu, Maungaturoto, Mangawai, Kaiwaka, Wellsford, Wayby, Warkworth, Waiwera, Silverdale, Takapuna, Helensville, Kaukapakapa, Waimauku, Kumeu, Birkenhead, Auckland, Devonport, Clevedon, Papakura, Drury, Pukekohe, Bombay, Tuakau, Waiuku, Otaua, Waitakere, Coromandel, Whitianga, Thames, Kopu, Hikutaia, Paeroa, Waihi, Ohinewai, Huntly, Ngaruawahia, Hamilton, Raglan, Te Mata, Kawhia, Lemon Point, Waitomo, Te Awamutu, Pirongia, Kihikihi, Matamata, Cambridge, Morrinsville, Waharoa, Tauranga, Te Aroha, Paengaroa, Matata, Whakatane, Opotiki, Hicks Bay, Te Puia, Tokomaru Bay, Gisborne, Tolaga Bay, Matawai, Puha, Patutahi, Frasertown, Wairoa, Rotorua, Te Ngae, Otorohanga, Hangatiki, Te Kuiti, Piopio, Aria, Awakino, Ohura, Tatu, Taumarunui, Manunui, Okahukura, Tokaanu, Owhanga, Wairakei, Taupo, Waitara, New Plymouth, Tikorangi, Lepperton, Kaimata, Inglewood, Egmont Vil, Kaponga, Stratford, Eltham, Opunake, Pihama, Manaia, Hawera, Mokoia, Patea, Waverley, Waitotara, Kai Iwi, Wanganui, Awahuri, Sanson, Bulls, Foxton, Shannon, Himatangi, Feilding, Kimbolton, Sanson, Apiti, Hunterville, Ohakune, Raetihi, Pipiriki, Taihape, Mangaweka, Mangamahu, Fordell, Turakina, Marton, Waiouru, Rangitatau, Ongaonga, Tikokino, Waipawa, Otane, Waipukurau, Elsthorpe, Dannevirke, Whetukura, Takaraiti, Woodville, Pahiatua, Eketahuna, Pongaroa, Rakaunui, Alfredton, Tinui, Castlepoint, Masterton, Carterton, Greytown, Featherston, Gladstone, Longbush, Westmere, Martinborough, Otaki, Waikanae, Te Horo, Plimmerton, Lr Hutt, Up Hutt, Pigeon Bay, Eastbourne, Ngahauranga, Wellington, Napier, Petane, Rissington, Taradale, Farndon, Meeanee, Omahu, Hastings, Maraekakaho, Tikokino, Ongaonga, Waipawa, Otane, Waipukurau, Elsthorpe, Porangahau, Waipukurau, Waipawa, Otane, Dannevirke, Whetukura, Takaraiti, Woodville, Pahiatua, Eketahuna, Pongaroa, Rakaunui, Alfredton, Tinui, Castlepoint, Masterton, Carterton, Greytown, Featherston, Gladstone, Longbush, Westmere, Martinborough, Otaki, Waikanae, Te Horo, Plimmerton, Lr Hutt, Up Hutt, Pigeon Bay, Eastbourne, Ngahauranga, Wellington, Napier, Petane, Rissington, Taradale, Farndon, Meeanee, Omahu, Hastings, Maraekakaho, Tikokino, Ongaonga, Waipawa, Otane, Waipukurau, Elsthorpe, Porangahau, Waipukurau, Waipawa, Otane, Dannevirke, Whetukura, Takaraiti, Woodville, Pahiatua, Eketahuna, Pongaroa, Rakaunui, Alfredton, Tinui, Castlepoint, Masterton, Carterton, Greytown, Featherston, Gladstone, Longbush, Westmere, Martinborough, Otaki, Waikanae, Te Horo, Plimmerton, Lr Hutt, Up Hutt, Pigeon Bay, Eastbourne, Ngahauranga, Wellington

DIAGRAMS
Scale
0 1 2 3 4 8 12 M.

MASTERTON, CARTERTON, FEATHERSTON, MARTINBOROUGH

Corrected to the 30th September, 1929.

MAIN HIGHWAYS.

NORTH ISLAND.

1. Waipapakauri to Wellington, via Taranaki.
2. Victoria Valley – Mangonui.
3. Broadwood–Kaitaia.
4. Mangamuka – Oue Junction.
5. Waimamaku–Ohaeawai.
6. Whangaroa–Okaihau.
7. Omapere–Maungaturoto.
8. Whangarei – Te Kopuru, via Dargaville.
9. Dargaville–Maungaturoto.
10. Takapuna to Junction Auckland–Maungaturoto
11. Wellsford – Port Albert.
12. Warkworth–Tauhoa, via Kaipara Flats.
13. Wainui–Auckland, via Helensville.
14. Kumeu–Pukeatua.
15. Pokeno–Wellington, via Gisborne and Wairarapa.
16. Pokeno – Waihi Junction to Coromandel.
17. Kopu–Raglan, via Te Aroha.
18. Hamilton–Rotorua–Petane.
19. Waitoa–Wairakei.
20. Matamata–Tauranga.
21. Kawhia – Wharepuhunga, via Kawa.
22. Hangatiki – Lemon Point.
23. Auckland – Wellington Junction to Bulls, via Taumarunui.
24. Rotorua–Whakatane.
25. Te Ngae – Paengaroa.
26. Hicks Bay – Gisborne.
~~26A. Rotokautuku Bridge–Tikitiki.~~
27. Patutahi–Wairoa, via Hangaroa.
28. Napier – Tukituki River Bridge, via Omahu and Havelock.
29. Taradale–Rissington.
30. Farndon–Hastings.
31. Otane–Tukituki, via Elsthorpe.
32. Waipawa–Tikokino.
33. Waipawa–Ongaonga.
34. Danneviike–Waipukurau, via Porangahau.
35. Norsewood–Whetukura.
36. Lepperton Junction – Hawera, via Opunake.
37. New Plymouth – Kaimata – Junction Road.
38. Egmont Road.
39. Opunake–Rukumoana, via Eltham.
40. Stratford–Taumarunui.
41. Manaia – Mount Egmont (radius line).
42. Normanby to Manaia – Mount Egmont Main Highway.
43. Ball Road.
44. Kaharoa Road.
45. Kohi Road.
46. Momohaki State Farm Road.
47. Rangitatau East and Watershed Roads.
48. Wanganui–Horopito.
49. Ohakune–Pipiriki, via Raetihi.
50. Wanganui–Karioi.
51. Taihape–Erewhon.
52. Mangaweka–Awahuri, via Kimbolton.
53. Kimbolton–Apiti.
54. Feilding–Stanway.
55. Greatford–Woodville, via Feilding and Ashhurst.
56. Mount Stewart Road.
57. Sanson – Palmerston North.
58. Himatangi–Ashhurst, via Palmerston North.
59. Shannon–Foxton.
60. Palmerston North – Levin, via Shannon.
61. Pahiatua–Pongaroa–Akitio.
62. Eketahuna–Alfredton.
63. Weber–Masterton, via Alfredton.
64. Masterton – Weber Junction to Castlepoint, via Tinui.
65. Junction Tinui Road to Stronvar.
66. Masterton–Martinborough, via Gladstone.
67. Tuparupuru – Te Wharau.
68. Carterton – Longbush Junction to Gladstone.
69. Carterton–Longbush.
70. Greytown – Bidwell's Cutting.
71. Martinborough – Otaraia Junction to Awhea.
72. Martinborough–Piriuoa.
73. Kahautara Road.
74. Featherston – Pigeon Bush.
75. Raurimu – Wades Landing.
76. Hastings–Makaroro.
77. Featherston–Martinborough.
78. Ashhurst–Pohangina.
79. Stratford to Junction Manaia – Mount Egmont.
80. Wayby–Mangawai Kaiwaka Railway-station.
81. Te Awamutu – Kawhia Road Junction, via Pirongia.
82. Piopio – Tatu, via Aria.
83. Papakura–Clevedon.
84. Pahiatua Station Road.
85. Tokomaru Bay Wharf Road.
86. Tolaga Bay Harbour Road.
87. Dreyers Rock Road.
88. Waitotara Railway-station Road.
89. Panmure–Howick.
90. Drury–Waiuku.
91. Hoteo Railway–station Road.
92. Paparoa–Maungaturoto Railway-station Road, via Huarau.
93. Waimauku – West Coast.
94. Takapuna–Silverdale.
95. Warkworth–Leigh.
96. Onewa Road.
97. Northcote Road.
98. Titirangi Road.
99. Paparoa–Pahi.
100. Otonga–Opuawhanga.
301. Whangarei–Tameterau.
302. Long's Corner–Tauraroa.
303. Kamo – Hikurangi Bridge.
304. Kaikohe Railway-station Road.
305. Okaihau Station Road.
306. Kahoe Bridge – Totara North.
307. Broadwood–Runaruna.
308. Waimate–Kaeo–Mangonui.
309. Coromandel – Mercury Bay.
310. Mangere Bridge – Papatoetoe.
311. Tahuna–Ohinewai.
312. Pairere–Kaimai, via Hinuera.
313. Te Aroha – Waharoa.
314. Putaruru–Arapuni–Kihikihi.
315. Orongo–Netherton.
316. Hikutaia – Netherton Ferry.
317. Mount Albert – Royal Oak.
318. Te Awamutu – Barton's Corner.
319. Te Awamutu – Cambridge.
320. Ngaruawahia–Waingaro.
321. Pukekohe–Glen Murray, via Tuakau.
322. Cambridge–Morrinsville, via Eureka.
323. Waioeka Road.
324. Maraeroa Road.
325. Rotorua–Tauranga.
326. West Bank – North Road.
327. Maketu Road.
328. National Park – Taupo.
329. Tongariro Bridge – Tokaanu.
330. Gisborne–Ormond, via Waiohika.
331. Patutahi–Rere.
332. Matawai – Koranga Bridge.
333. Tolaga–Tauwhareparae.
334. Te Puia – Waipiro.
335. Taurangakautuku Road.
336. Rotokautuku–Waiomatatini.
337. Frasertown – Lake House Landing.
338. Ruakituri Valley.
339. Fernhill–Takapau, via Maraekakaho.
340. Waipawa–Pourerere.
341. Woodville–Tamaki.
342. Makuri–Conoor–Mangatoro–Ongaha.
343. Woodville–Hopelands.
344. Te Maire–Mangaohutu.
345. Te Kumi – Te Anga.
346. Kopaki Road.
347. Kumara–Paraheka.
348. Mairoa Road.
349. Manganui Road.
350. Okahukura–Ohura.
351. Tokirima Road.
352. Otorohanga–Honokiwi.
353. Takiri Road.
354. Ihaia Road.
355. Pukearuhe Road.
356. Ngatimaru Road.
357. Lower Mangorei Road.
358. Oxford–Saunders.
359. Skeet Road.
360. Pembroke Road.
361. Beaconsfield Road.
362. Hawera–Mokoia.
363. Waverley Beach Road.
364. Rupanui Road.
365. Springvale–Francis.
366. Curl's Bridge – Upper Tutaenui.
367. Turakina – Cliff Road, via Marton.
368. Taihape – Mataroa – Murray's Track.
369. Raetihi–Ohura.
370. Karori–Makara.
371. Upper Hutt – Waikanae.
372. Waikanae–Waimea.
373. Te Horo – Waiboanga.
374. Levin–Hokio.
375. Longburn–Rongotea.
376. Bunnythorpe–Kairanga.
377. Feilding–Hunterville.
378. Lower Hutt – Eastbourne.
379. Newman–Nireaha.
380. Westmere Road.
381. Ponotahi Road.
382. Parkhurst Road.
383. Beach Road.
384. Henderson–Kumeu, via Swanson.
385. Henderson Valley Road.
386. Kaukapakapa – Port Albert, via Glorit and Tauhoa.
387. Waikumete – West Coast.
388. Te Hana – Tomorata.
389. Wellsford–Whangaripo.
390. Whakapirau – Maungaturoto Railway-station.
391. Ruawai Creamery (Awaroa) – Armstrong's Corner.
392. Tangowahine Valley Road.
393. Dargaville–Kaihu, via Awakino and Mamaranui.
394. Whakapara – Matheson's Bridge.
395. Whangarei–Whareora.
396. Whangarei–Kiripaka.
397. Okaihau–Horeke.
398. Otiria Station Road.
399. Ngapuhi Station Road.
400. Fairburn Road.
401. Te Kauwhata – Waerenga.
402. Papakura–Hunua.
403. Pukekohe–Bombay.
404. Puni–Otaua.
405. Wharepoa Road.
406. Papatoetoe–Howick.
407. Howick–Manurewa.
408. Tuakau–Onewhero.
409. Kauroa – Te Mata.
410. Te Puna Point – Omokoroa.
411. Papamoa – Mount Maunganui.
412. Rotoma – Matata.
413. Wainui Road.
414. Puha–Mangatu–Whatatutu.
415. Waipukurau–Matamau, via Hatuma, Takapau and Ormondville.
416. Mangateretere – Havelock North.
417. Hastings–Pakipaki.
418. Tukituki–Waimarama.
419. Mangateretere – Te Awhanga
420. Petane–Eskdale.
421. Mokauiti–Takiri.
422. Okupata Road.
423. Manunui–Owhango.
424. Aharoa and Tapuiru Road.
425. Inland North Road.
426. Carrington Road.
427. Ngamotu Road.
428. Toko Road.
429. Turuturu Road.
430. Heads–Mosstown.
431. Bonny Glen – Norwood Corner.
432. Ongo Road.
433. Station Road (Matamata).
434. Taringamotu Valley Road.
435. Tangimoana Road.
436. Foxton Beach Road.
437. Pahautanui–Plimmerton.
438. Taonui – Raumai Road.
439. Pohangina Valley Road.
440. Rimu Road.
441. Te Ore Ore – Bideford.
442. Mangaone Valley Road.
443. Opaki–Eketahuna, via Mauriceville.
444. Bayley's Coast Road.
445. Mititai – Mangonui Bridge (Upper).
446. Huntly–Rotongaro.
447. Ngatea–Waharoa, via Morrinsville.
448. Waitoa–Maukoro.
449. Tokomaru–Mata.
450. Takapau–Ihungia.
451. Tapuwaeroa Valley Road.
452. Massey Road Junction – Wainui.
453. Grant's Corner – Wairau Bridge.
454. Otunui Road.
455. Opotiki – East Cape.

MAP OF THE SOUTH ISLAND (NEW ZEALAND) SHOWING MAIN HIGHWAYS AS DECLARED

(See Main Highways Act N.Z. 1922)

Scale of Miles

10 5 0 10 20 30 40 50 60 70 80 90

Reference

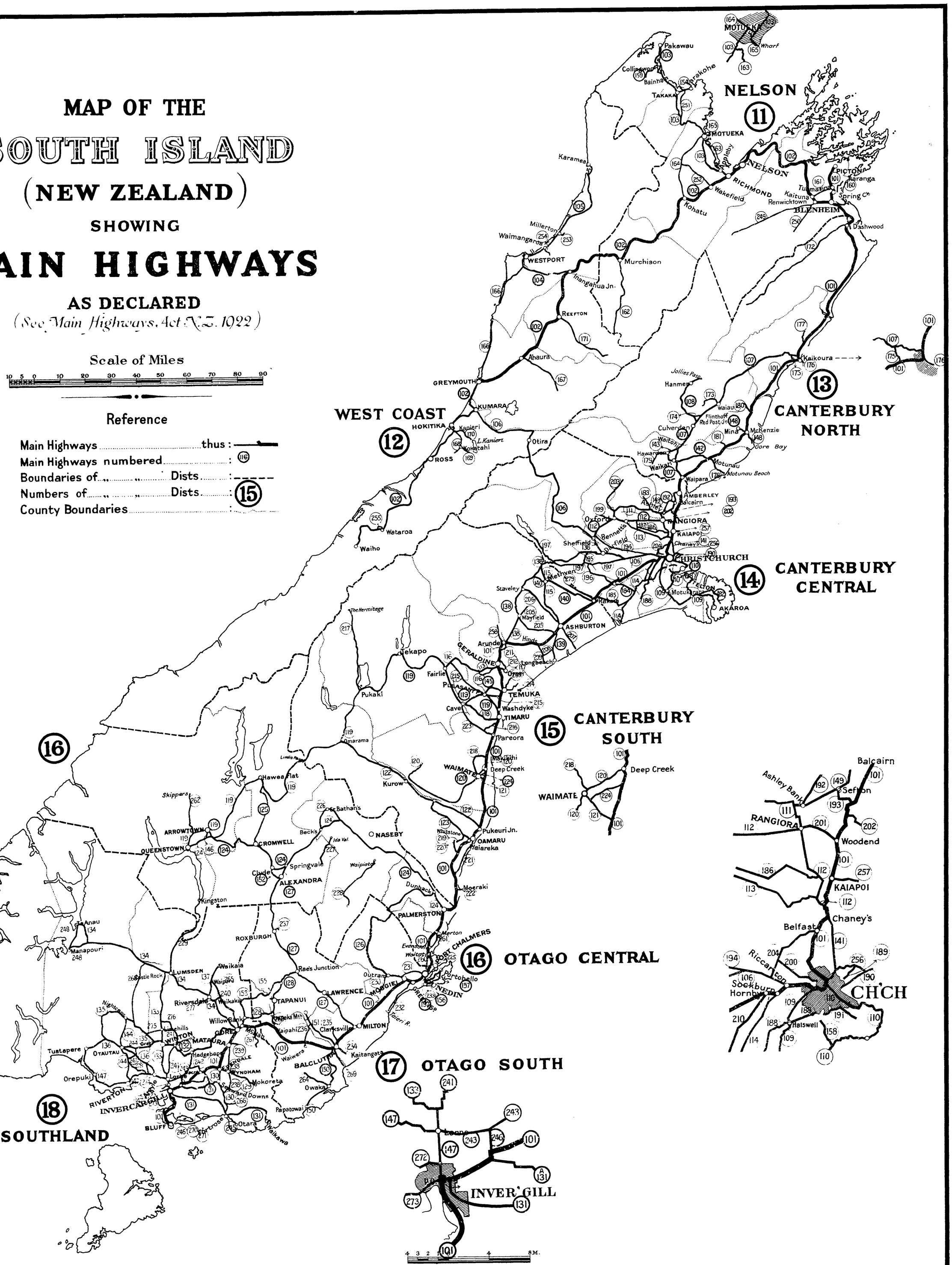
Main Highways ..... thus : ——

Main Highways numbered ..... : (116)

Boundaries of „ „ Dists ..... : – – – –

Numbers of „ „ Dists ..... : (15)

County Boundaries ..... : ·····


NELSON 11
MOTUEKA
Wharf
Pakawau
Collingwood
Bainham
Takaka
Parakohe
Karamea
Appleby
NELSON
PICTON
Waratah
Kaiteriteri
Riwaka
Tasman
Kaiteriteri Beach
Marahau
Torrent Bay
Totaranui
Anchorage
Awaroa
Awaroa Inlet
Wakefield
RICHMOND
Kohatu
Tuamarina
Kaituna
Renwicktown
Spring Ck
BLENHEIM
Dashwood
Millerton
Waimangaroa
WESTPORT
Murchison
Inangahua Jn.
Reefton
Ahaura
GREYMOUTH
WEST COAST 12
KUMARA
HOKITIKA
Kanieri
L. Kanieri
Kokatahi
ROSS
Otira
Wataroa
Waiho
Jollies Pass
Hanmer
Culverden
Waiau
Flinthoff Red Post Jn
Mina
McKenzie
Gore Bay
Hawarden
Waikari
Motunau
Motunau Beach
Waipara
Kaikoura
13 CANTERBURY NORTH
AMBERLEY
Balcairn
Ashley
RANGIORA
Oxford
Bennetts
Sheffield
Darfield
KAIAPOI
Chaneys
CHRISTCHURCH
14 CANTERBURY CENTRAL
Methven
Staveley
Rakaia
Motukarara
LYTTELTON
AKAROA
ASHBURTON
Hinds
Arundel
Longbeach
GERALDINE
Orari
Temuka
TEMUKA
Timaru
TIMARU
Pareora
Waimate
Deep Creek
Kurow
Pukeuri Jn.
OAMARU
Waiareka
Waitstone
Naseby
Becks
Ida Val.
Waipiata
Springvale
Clyde
ALEXANDRA
Cromwell
CROMWELL
ARROWTOWN
QUEENSTOWN
Skippers
Hawea Flat
Lindis Pass
The Hermitage
Tekapo
Pukaki
Fairlie
Cave
Omarama
Kingston
Moeraki
Dunback
PALMERSTON
Merton
Evansdale
Waitati
PORT CHALMERS
Portobello
DUNEDIN
Outram
Roxburgh
Rae's Junction
Waikaia
Waipiata
Lumsden
Riversdale
Waikaka
Willowbank
TAPANUI
LAWRENCE
MILTON
Clarksville
Waipahi
Waipeka Mouth
Nightcaps
Ohai
Wairio
Winton
MATAURA
Gore
Edendale
WYNDHAM
Mokoreta
Hedgehope
Tuatapere
OTAUTAU
Orepuki
Longbush
RIVERTON
INVERCARGILL
Downs
Papatowai
Owaka
Otara
Fortrose
BLUFF
Waikawa
Kaitangata
BALCLUTHA
Waiwera
Clutha R.
Toiere R.
Mosgiel
Green Island
Abbotsford
Halfway Bush
Mihiwaka
Saddle Hill
Brighton
Taieri Mouth
Middlemarch
Sutton
Outram
Seacliff
Merton
Warrington
Karitane
Waikouaiti
Palmerston
Shag Point
Moeraki
Hampden
Otepopo
Kakanui
Oamaru
Weston
Pukeuri Jn.
Waitaki Bridge
Ngapara
Duntroon
Kurow
Otematata
Omarama
Lindis Pass
Tarras
Cromwell
Clyde
Alexandra
Roxburgh
Lauder
Ranfurly
Naseby
Becks
Ida Valley
Waipiata
Oturehua
Hyde
Middlemarch
Outram
Mosgiel
Green Island
Abbotsford
Halfway Bush
Mihiwaka
Saddle Hill
Brighton
Taieri Mouth
Sutton