

NEW ZEALAND.

**PUBLIC WORKS
STATEMENT.
1938.**

BY THE

Hon. R. SEMPLE,

MINISTER OF PUBLIC WORKS.



WELLINGTON.

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1938.

INDEX.

HON. MINISTER'S STATEMENT.

	PAGE
Summary of Votes under Control of Minister of Public Works for Year ended 31st March, 1939	v
Summary of Votes under Control of Ministers other than Minister of Public Works, Year ended 31st March, 1939	vi
Finance Statement : Expenditure, 1937-38, Public Works Fund	viii
Receipts, Public Works Department, 1937-38	ix
Main Highways	x
Hydro-electric Development	xii
Railway-construction	xvi
Railways : Improvements and Additions to Open Lines	xx
Settlement and other Roads	xxi
Hawke's Bay Floods	xxiii
Irrigation and Water-supply	xxiv
Public Buildings—	
New Departmental Buildings	xxvii
Courthouses	xxvii
Agricultural Buildings	xxviii
Prison Buildings	xxviii
Police Stations	xxix
Post and Telegraph Buildings and Land	xxix
Mental Hospitals	xxx
Health and Hospital Institutions	xxx
Education Buildings	xxxi
Establishment of Aerodromes and Subsidiary Services	xxxi
Telegraph Extensions	xxxii
Tourist and Health Resorts	xxxiv
Land Improvement	xxxiv
Settlement of Unemployed Workers	xxxv
Plant and Mechanical Equipment	xxxv
Harbour-works	xxxvi
Lighthouses	xxxvi
Native Land Settlement	xxxvi

GRAPHS.

Annual Public Works Expenditure : Loan-money	vi
Graph of Receipts and Expenditure, Public Works Fund, Year 1937-38	ix
Electric Supply—	
North Island System : Maximum Quarterly Loads	xii
South Island System : Maximum Quarterly Loads	xiii
Percentage earned on Operating Capital after paying Net Operating Expenses	xiv
Net Expenditure on Road-construction, including Main Highways, for Years 1913-14 to 1938-39	xxii
Irrigation Graph : Total area for which Irrigation Water is available	xxvi

TABLES.

No. 1.—Total Expenditure : Summary showing Total Expenditure out of Public Works Fund	1
No. 2.—Yearly Expenditure out of Public Works Fund (General Purposes Account), 1916-17 to 1937-38	2-7
No. 3.—Railways Statement showing Expenditure on Construction of Railways to 31st March, 1938	8-10
No. 4.—Expenditure and Liabilities on Public Buildings out of Public Works Fund to 31st March, 1938	11
No. 5.—Development of Water-power : Statement of Accounts as at 31st March, 1938	12-19
No. 6.—Irrigation and Water-supply : Schedule of Schemes completed or under Construction at 31st March, 1938	20-22

TABLES—continued.

	PAGE
<i>Electric Supply Tables</i> as per index on page	119
 <i>Main Highways Tables—</i>	
No. 1.—Annual Main Highways Accounts as at 31st March, 1938	234–237
No. 2.—Length of Main Highways at 31st March, 1938	238
No. 3.—Construction Work completed during the Year 1937–38	238
No. 4.—Lengths of Main Highways metalled and surfaced since Inception of Board's Operations (9th June, 1924)	239
No. 5.—Maintenance of Main Highways (including Bridges)	239
No. 6.—Tests of Stone completed during Year ended 31st March, 1938	240

APPENDICES.

Appendix A.—Expenditure for the Year : Audited Statement of Expenditure out of Public Works Fund for the Year 1937–38	23–24
Appendix B.—Annual Report on Public Works by the Engineer-in-Chief	25–76
Appendix C.—Annual Report on Public Buildings by the Government Architect	77–81
Appendix D.—Annual Report on Electrical Works and Water-power Schemes by the Chief Electrical Engineer	82–118
Appendix E.—Fourteenth Annual Report on Main Highways by the Main Highways Board	175–233

1938.

NEW ZEALAND.

PUBLIC WORKS STATEMENT

(BY THE HON. R. SEMPLE, MINISTER OF PUBLIC WORKS).

MR. SPEAKER,—

This is the third occasion upon which I have been privileged to bring forward an annual statement of the progress made on public works and proposals contemplated for the ensuing year.

The number of works of a necessary character which the ever-increasing development of the country demands has become so great that the number of men on public works has had to be increased during the year by upwards of two thousand.

The works undertaken are to a great extent indirectly, and in most cases directly, remunerative or reproductive. The expenditure last year by the Public Works Department was a record one, the gross amount being £11,868,931.

I feel sure, however, that the ability and experience of the officers of the Department, and the energy and willingness of its employees, have resulted in full value being obtained for every pound that has been expended.

As far as possible all men are placed on co-operative contract at prices which necessitate a good day's work for a good day's pay, and no better incentive can be given to encourage a reasonable output than this well-tried system of employment. Wherever co-operative contract work is not feasible or advisable every effort has been made to obtain sufficient and competent supervision to ensure adequate results without undue hardship to any one.

Under both systems full use has been made of modern plant and machinery on the principles set forth in my last year's statement. Here I indicated that some works might quite economically be carried on with a large proportion of man-power, but others again would simply result in wasteful expenditure unless machine-power was employed to its maximum capacity. Where this is the case my engineers have not hesitated to use a maximum amount of machinery and a minimum amount of man-power.

The satisfactory progress made on all works undertaken throughout the year has shown that it is quite possible to employ a large body of men in conjunction with a comparatively large amount of machinery. It must be freely admitted, however, that in the classes of work likely to be undertaken in the future machinery must play an ever-increasing part if such works are to prove reasonably productive or remunerative.

Where it has been desirable and possible to entirely employ machinery the saving in the cost of works has been remarkable, and I would instance irrigation and aerodrome-construction work in this respect. On the latter the work required is of such a nature that manual labour is quite prohibitive in cost, while the former, in many cases, cannot be undertaken at a cost that would enable settlers to pay a price for irrigation water commensurate with a reasonable return to the Government.

✓ This year, again, I would like to refer to the good relationship that exists between the officers of the Department and the New Zealand Workers' Union. The agreement between this union and the Department provides for appeal to myself in the event of non-agreement, but in very few cases indeed has this been necessary throughout the year. Sincere co-operation between the direct representatives of the men, as embodied in union organizers and other officials, and officers of the Department can produce nothing but good, and infuses a spirit of desire for sound and efficient work on both sides.

✓ It is regrettable that this year the country has been visited by frequent and unprecedented floods, bringing much damage and loss of life to both the Government's and local bodies' works. In the Napier and Gisborne districts floods of a height and magnitude far beyond the memory of any living man have caused untold damage. The effect of these floods is unbelievable to one who has not seen them. In addition to wholesale damage to roads, railways, and bridges, large areas of fertile country have been utterly destroyed.

In other districts the damage is not so great, and I would impress upon all local bodies the necessity of not depending on the Government when there is a reasonable and justifiable demand upon their own resources. If they do this, then the Government will be in a better position to help those who have suffered damage far beyond their power to restore.

✓ In connection with the question of damage by floods, serious thought has been given to systematic control of rivers that are, or are likely to be, dangerous in this respect. The matter was referred to in my last Statement, and it is one of vital importance to this country. It has only been for want of suitable staff, due to the large amount of work already in hand by the Department, that progress has not been made to the extent I should like to have seen.

On the works now in hand there is still a shortage of engineering staff, and after exhaustive inquiries, both in New Zealand and Australia, the Department has been quite unable to obtain the services of more engineers. I find, therefore, much as I would like to have set up a special branch of the Department to undertake investigations and make surveys for river-control, I have so far been unable to do so. The matter is one, however, that I shall continue to press, and I am in hopes of doing more at an early date. The first procedure will be to collect data and make surveys for protective works in their order of urgency. Some work was done this year by utilizing the services of one of the Department's engineers who has had considerable experience in river-control work. He will be retained on this work.

Under the control of the Public Works Department it is proposed this year to expend an amount of £12,757,200.

Much criticism has been levelled at the Government because its proposals for this year's expenditure are on a large scale in comparison with those of former years. This may be so, but I wish to say definitely that the money will be expended only on well-planned proposals. In projecting public works it is futile to plan without giving consideration to the future needs of the country. I feel that we have now arrived at a time when we can better foresee our needs and provide for them. A country that stands still will go back: science, engineering skill and ingenuity, and increasing human needs compel us to advance.

Engineering skill has so improved our motor-vehicles that we must rebuild our roads to higher standards not only to make human life safe but also to provide rapid, ample, and safe roads for the development of industries and businesses dependent upon road transport facilities; improvement in electric equipment and facilities for its use are advancing so rapidly that we are hardly keeping pace with the generation of power to meet the demand; public buildings to house our public servants are woefully inadequate and out of date; we have isolated railway systems that would not be tolerated in other countries, and we have land that can produce immeasurably more than it produces to-day. Surely it cannot be called extravagance to endeavour to build to keep pace with these necessary things? I therefore make no apology for the amount of money I am asking Parliament to provide to enable demands such as these to be met; and every penny of the money will be expended within a well-planned and far-sighted policy.

Before coming to more detailed statements concerning work done last year and the proposed work for this year in the directions I have outlined, I would particularly desire to draw attention to one thing I have already mentioned—that is, the lack of proper accommodation for public servants.

A properly planned scheme of building for adequately housing public servants has been prepared, and will be adhered to as far as possible, but some time must elapse before its full effect can be felt. In the meantime, many State Departments are working under conditions entirely insufficient to give their staffs the degree of comfort they are entitled to. The Government is most anxious, therefore, to press forward with a complete building programme, and the provision of a substantial sum of money for this purpose is more than justified.

As in former years, I wish to point out that of the total estimated expenditure by my Department of £12,757,200 for this year, a sum of £4,784,000 will be expended from revenue, representing approximately 38 per cent. of the total.

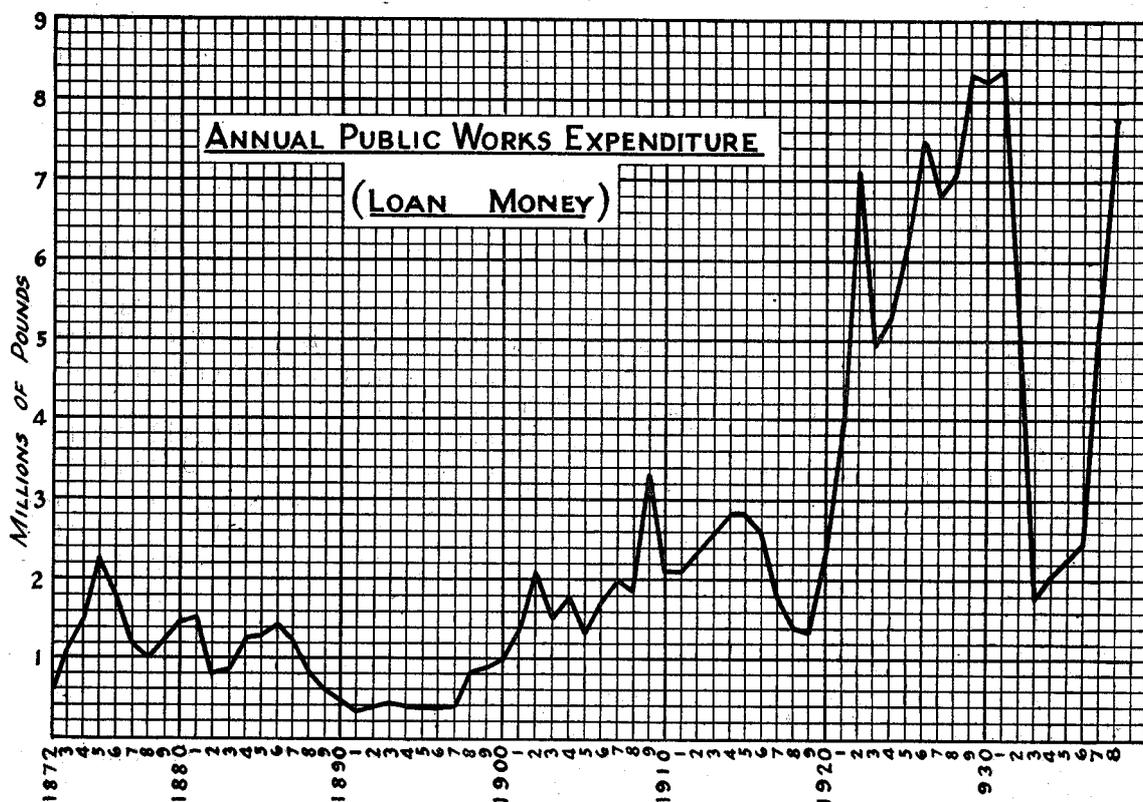
The following schedule sets out in detail the amounts for works under the control of the Minister of Public Works:—

Summary of Votes under Control of Minister of Public Works and Proposed Ways and Means of Raising the Necessary Funds, Year ending 31st March, 1939.

—	Loans.	Consolidated Fund.	Employment Promotion Fund.	Special Revenue.	Total.
	£	£	£	£	£
Departmental	198,000	20,000	2,000	..	220,000
Railway-construction	1,440,000	..	..	..	1,440,000
Public Buildings	1,500,000	10,000	..	30,000	1,540,000
Lighthouses and Harbour-works	46,000	..	4,000	..	50,000
Development of Tourist Resorts	50,000	..	..	..	50,000
Roads	1,410,000	..	90,000	..	1,500,000
Lands Improvement	187,000	..	113,000	..	300,000
Irrigation	140,000	..	85,000	..	225,000
Electric Supply	742,000	..	..	814,000	1,556,000
Main Highways	2,603,000	..	100,000	2,334,200	5,037,200
Consolidated Fund .. .. .	..	639,000	200,000	..	839,000
Totals	8,316,000	669,000	594,000	3,178,200	12,757,200

For the current financial year 1938–39 a sum of £668,972 will be provided from the Consolidated Fund for expenditure on maintenance of public works and services. The expenditure on main highways from revenue is estimated to reach £2,677,000, and from loan-moneys £2,603,000, whilst one-third of the cost of the level-crossing-elimination programme will be met from the Employment Promotion Fund and one-sixth by the Railways Department. It is estimated that approximately £437,000 revenue from the Electric Supply Account will be available after providing for sinking fund, interest, and operating-expenses for expenditure on construction works, the balance of the year's construction programme under this heading—i.e., £742,000—will be raised by way of loans.

The diagram below gives the annual public-works expenditure from loan-money since 1872. It is interesting to note that for the last few years the expenditure from this source has not reached the peak year of 1931.



The proposed expenditure from loan-moneys and revenue for votes comprised in the Public Works Fund coming under the control of other Ministers of the Crown is set out hereunder :—

Within the Public Works Fund.

	Loans.	Employment Promotion Fund.	Special Revenue.	Total.
	£	£	£	£
Railway Improvements and Additions to Open Lines (Minister of Railways)	2,844,000	203,500	698,500	3,746,000
Education Buildings (Minister of Education) ..	820,000	..	..	820,000
Telegraph Extension (Postmaster-General) ..	750,000	..	..	750,000
Swamp-land Drainage (Minister of Lands) ..	19,000	7,500	..	26,500
Settlement of Unemployed Workers (Minister of Lands)	340,000	212,500	42,500	595,000
Native Land Settlement (Minister of Native Affairs)	375,000	350,000	225,000	950,000
Total	5,148,000	773,500	966,000	6,887,500

The above figures, plus those shown in the summary of votes under the control of the Minister of Public Works, amount to £19,644,700.

In the Budget an additional £1,075,000 was shown under the heading of Public Works for expenditure on State forests, lands for settlement, and State coal-mines.

This year again the schedule shows that the largest expenditure will be on main highways, this item alone being 40 per cent. of the total. It will also be seen that approximately half this expenditure is from loan-money and half from special revenue.

In the annual report of the Transport Department it is pointed out the tremendous increase in traffic on main highways that has taken place in the last three years. The average increase on State highways for this period is approximately 52 per cent. The general increase for all roads would appear to be about 46 per cent.

It will be seen, therefore, that increase in expenditure on main highways is quite justified by the increasing volume of traffic using the highways. Increasing power and speed in modern motor-vehicles also call for as much expenditure on improvement of our highways as increasing traffic. We may deplore the desire for speed and power, but we cannot prevent it, and if we are to progress we must meet its demands.

New Zealand is a difficult country to road, and standards of construction that may easily be attained in other highly motorized countries are costly to obtain here.

Increasing demands for electric power throughout the country call for continued addition to hydro-electric-generation plants. The revenue from electric supply again shows an increase, and has reached £1,470,043 this year.

Work has now commenced for the further development of power by an extension of the Waikaremoana Power Scheme.

Owing to pressure of other work, I have not yet been able to make the alterations in the policy of electric-power supply which I have had in mind, but the matter will be thoroughly investigated as soon as time and opportunity offer. In the meantime, a procedure is being adopted that will fit in with future proposals.

A vote of £1,440,000 is asked for this year to continue railway-work on four lines now under construction. Further details of this work are given later in this Statement. Excellent progress is being made on all these railways.

For settlement and backblock roads a sum of £1,500,000 is proposed this year. The policy of providing a metalled access road to all settlers is being actively pursued. Two large road-improvement works to give adequate outlet roads from Wellington are now well in hand. One, the Haywards-Pahautanui Road, will be completed this year, and the other, the Pimmerton-Paekakariki Road, by the end of next year. The extension of the road through South Westland to link up Otago and Westland is progressing very satisfactorily. The Lewis Pass Road was completed and opened for traffic during the year.

I have already drawn attention to the urgent necessity for public buildings to accommodate the Public Service staffs. New public buildings are in course of erection in Wellington and Auckland, which when completed will to some extent ease the position, but consideration must be given at once to further buildings for Departments in Wellington. Plans are now being prepared for the new Printing Office, Broadcasting House, and National Library.

Aerodrome-construction has proceeded actively during the year, all money from this purpose being provided from the Consolidated Fund. Details of this work are given in this Statement.

Special attention has been given this year to extension of irrigation works in Canterbury. Extensive areas of land will be irrigated, and electric power developed from a large race now under construction to lift water from the Rangitata River. I am still firmly convinced that irrigation is one of the best works that can be undertaken in this country, and the Government will continue to encourage all such projects.

It has still been found necessary to purchase additional plant to economically carry on works in progress. This plant is purchased by calling tenders, and very satisfactory machinery is being obtained by this method. Most of the plant now being purchased is for special purposes.

I would like to mention again this year that although a heavy burden has been placed upon the officers of the Department due to the increasing volume of work without a corresponding increase in staff, they have carried out their work well and have worked very hard throughout the year.

I would like also to express my keen appreciation of the work done by the Main Highways Board, and the whole-hearted way in which it has co-operated with the Government in carrying out its roading policy. Its fourteenth annual report, which is a valuable one, is included in this Statement.

FINANCE.

The payments and receipts and accumulated totals in connection with the Public Works Fund and other associated votes and accounts for the year 1937–38 are shown in the tabulation below.

The gross expenditure amounted to £15,647,516, of which £3,778,585 was expended by other Government Departments; the recoveries in reduction of expenditure amounted to £3,345,904, of which £1,166,998 was recovered by other Departments; the net expenditure totalled £12,301,612, of which £2,611,587 was expended by other Departments.

In addition, the Department collected £1,466,380 for the supply of electric energy, irrigation receipts, and miscellaneous revenue from other sources.

Class of Work.	Expenditure, 1937–38.			Total Net Expenditure to 31st March, 1938.
	Gross.	Recoveries.	Net.	
EXPENDITURE, PUBLIC WORKS FUND.				
Railways—	£	£	£	£
New construction	1,202,138	81,920	1,120,218	40,376,484
Improvements and additions to open lines	1,561,844	269,072	1,292,772	19,636,772
Roads	1,297,781	171,024	1,126,757	25,026,359*
Public buildings	1,335,822	101,043	1,234,779	13,978,530†
Lighthouses, harbour-works, and harbour defences	19,532	7,855	11,677	1,334,822
Tourist and health resorts	23,534	375	23,159	757,084
Telegraph extension	531,512	219,252	312,260	12,300,690
Departmental	448,637	260,597	188,040	3,380,541
Irrigation, water-supply, and drainage	174,961	103,302	71,659	1,385,900
Lands-improvement	282,816	135,380	147,436	1,117,080
Swamp land drainage	30,203	10,801	19,402	100,283
Settlement of unemployed workers	460,265	149,600	310,665	1,067,167‡
Native-land settlement	814,177	559,308	254,869	696,717
Dairy industry loans	4,565	..	4,565	45,825
Cost and discount, raising loans, &c. .. .. .	..	..	..	3,828,307
Closed accounts (for more detail see Table I) .. .. .	..	..	..	8,133,133
Totals, General Purposes Account	8,187,787	2,069,529	6,118,258	133,165,694§
Electric Supply Account (previously Aid to Water-power Works Account)—				
Construction	710,008	23,816	686,192	15,554,923¶
Working-expenses	327,054	5,281	321,773	..
Waihou and Ohinemuri Rivers Improvement Account .. .. .	..	..	..	709,740||
Totals, Public Works Fund	9,224,849	2,098,626	7,126,223	149,430,357
EXPENDITURE, OTHER VOTES AND ACCOUNTS.				
Main Highways Account—				
Annual appropriation—				
Construction, reconstruction, and improvement	2,388,016	205,718	2,182,298**	9,553,679††
Maintenance, repairs, and renewal	1,300,034	48,343	1,251,691**	..
Administration, plant, and miscellaneous expenditure	353,496	26,257	327,239**	..
Interest, fees, and loan redemptions	270,500	..	270,500**	..
Permanent appropriation (rate subsidies, interest on transfer from Public Works Fund, &c.)	332,694	..	332,694	..
Consolidated Fund—				
Maintenance, public buildings, roads, &c.‡‡	231,744	29,341	202,403	..
Aerodromes and landing-grounds	276,295	48,399	227,896	..
Plant, material, and miscellaneous services‡‡	1,171,698	889,220	282,478	..
Closed accounts (for details see Public Works Statement, 1933) .. .. .	..	..	..	18,955,387
Employment Promotion Fund (expenditure by Public Works Department): Amounts not included above	98,190	..	98,190	..
Totals, Other votes and accounts	6,422,667	1,247,278	5,175,389	28,509,066
Grand total of expenditure, Public Works Fund and other votes and accounts for the year ended 31st March, 1938	15,647,516	3,345,904	12,301,612	..
Capital expenditure to date .. .. .	..	..	..	177,939,423

* Includes £4,500 expended under section 16, subsection (1), Native Land Amendment and Native Land Claims Adjustment Act, 1923. † Excludes expenditure on workers' dwellings totalling £319,918 transferred to State Advances Account; includes £60,263 expended under Reserves and other Lands Disposal Act, 1936, section 32. ‡ Includes £4,865 expended under Finance Act, 1932 (No. 2), section 6. § Does not include expenditure under Ellesmere Land Drainage Act, 1905, or £1,226,000 transferred to and included in Main Highways Construction Fund. ¶ Excludes interest and loan charges. ** Total capital, excluding suspense items as per accounts in Table No. 5. †† For annual income and expenditure accounts see Appendix E. ‡‡ As per accounts in Appendix E. ‡‡ Excludes transfers to Public Works Fund votes, &c. (£381,005.)

Class of Work.	Recoveries, 1937-38.
RECEIPTS,* PUBLIC WORKS DEPARTMENT.	
Ordinary Revenue Account—	£
Irrigation (receipts for year)	24,740
Miscellaneous receipts for year	14,164
Electric Supply Account (sales of energy, miscellaneous receipts, &c.): Receipts for year ..	1,400,457
Main Highways Account (repayment of advances, &c., and interest): Receipts for year ..	27,019
Total receipts	1,466,380

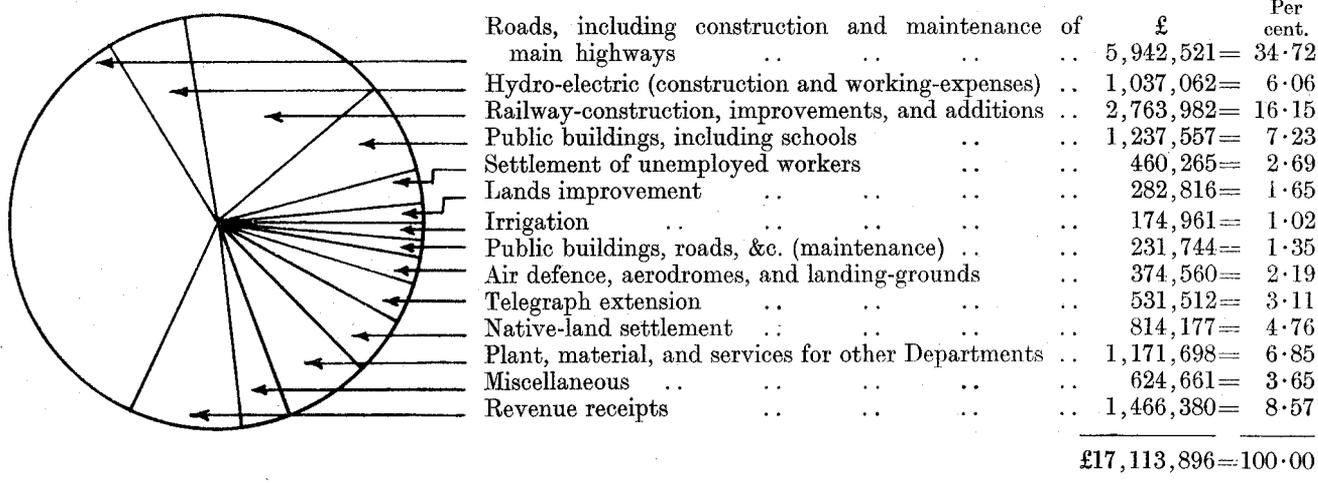
Summary.

	Public Works Department.	Other Departments.	Total.
	£	£	£
Gross expenditure	11,868,931	3,778,585	15,647,516
Recoveries and receipts	3,645,286	1,166,998	4,812,284

* Excludes motor-spirits tax, registration fees, &c., collected by other Departments.

Of the net expenditure of £12,301,612 previously mentioned, £7,795,058 may be regarded as having been expended from loan-moneys (£6,118,258 General Purposes Account, and £1,676,800 Main Highways Account) the balance—*i.e.*, £4,506,554—being expended from revenue and taxation.

In diagrammatic form the ratio which the various classes bear to the whole is shown below. It should be noted that the figures are gross—that is, before deducting recoveries, which include subsidies from the Employment Promotion Fund, contributions from the Consolidated Fund, and similar amounts which if deducted, would detract from the true portrayal of activities.



In regard to the ways and means of the General Purposes Account of the Public Works Fund the position is as under:—

	£
Balance available 1st April, 1937	2,118,026
Add funds received during the year—	£
Finance Act (No. 3), 1934, section 2	555,081
Finance Act (No. 2), 1936, section 2	3,419,645
Miscellaneous	179,603
	<u>4,154,329</u>
Deduct expenditure during 1937-38—	6,272,355
Under annual appropriations	6,118,030
Under permanent appropriations	465
	<u>6,118,495</u>
Balance available 31st March, 1938	<u>£153,860</u>

The estimated net expenditure under the General Purposes Account for the current financial year, 1938-39, is £10,145,000, and arrangements are being made with the Minister of Finance to provide the necessary funds. This is the amount shown on the Public Works estimates, which also show an estimated net expenditure of £1,532,030 from the Electric Supply Account and £5,037,200 from the Main Highways Account, a total for all these accounts of £16,714,230.

MAIN HIGHWAYS.

I have this year used my best endeavours to advance the welfare of the Dominion by providing good roads. This applies both to settlement roads required for backblock access and to main highways which carry the bulk of our rural traffic. Land-settlement cannot be encouraged nor can primary industries be fostered unless reasonable roading facilities are available. The main highways comprise the principal routes for general road transport, and it is most essential that they be constructed and maintained to a sufficiently good standard.

On previous occasions I have drawn attention to the growing road traffic not only in the matter of the number of vehicles registered, but also in the increased mileage travelled. These developments have continued, and to-day there is more highway traffic than ever before. It is absolutely necessary, therefore, that steps be taken to expedite the reconstruction of roads that were built many years ago for slower-moving traffic, in order to make them fit for the modern fast-moving motor-vehicle.

During the year under review improvement works on main highways have been pushed forward in order to meet the demands of increasing traffic and particularly to make for the greater safety of the travelling public.

I am aware that my policy in regard to highways expenditure has been questioned in some quarters and that complaint has been made that unnecessary work has been, and is being, carried out to a standard in excess of requirements. I offer no apology for the extensive highway improvements which have been effected, nor for the large amount of work at present in progress. It must be remembered that changes are continually taking place in the design and capacity of motor-vehicles, particularly in regard to speed, and, though I do not for a moment suggest that roads should be built to suit maximum speeds of modern vehicles, it is imperative that low-standard roads of inadequate width and dangerous curvature should be made fit and safe for the traffic which uses them. Although a great deal of progress has been made towards improving a substantial portion of the highways system, it is not yet entirely reconditioned for motor traffic.

Some sections of highway in closely settled areas were reconstructed several years ago, but to-day they are carrying such large volumes of traffic that further improvements are required to bring them up to a reasonable standard. As far as possible present-day improvements are being carried out in such a way as to allow for further traffic development. I am bound to remark that most of the criticism is voiced during the period when earthwork is in full swing and before the full effect of the proposals is apparent to the inexperienced observer. I have not yet experienced a single instance where, after completion, an improvement work has been held to be unnecessary or unjustified, and this fact in itself is a sufficient answer to that type of criticism.

The activities of the Main Highways Board for the past financial year are described in greater detail in its annual report appended to this Statement. The report indicates that the total receipts from revenue sources amounted to over £2,600,000, as compared with £2,380,000 for the preceding period. This is the largest sum that has so far been credited to the Main Highways Account by way of revenue from special motor-taxation. The total expenditure from the same account for the year ended 31st March, 1938, in respect of actual works, as distinct from loan and special charges, amounted to £3,392,000, which exceeds the previous year's figure by almost £1,000,000. More than £2,000,000 was spent last year on reconstruction and improvement works, inclusive of level railway-crossing eliminations, over £1,000,000 on maintenance, and nearly £140,000 on the renewal of bridges. In addition to the foregoing, interest and loan charges accounted for £338,494, while general rate subsidies paid to local authorities and charged to the account totalled £206,000. The reconstruction programme carried out last year involved the borrowing of £1,676,800 for main highways purposes.

With regard to the replacement of highway bridges, new structures totalling 11,000 lineal feet were completed during the year, as against 9,000 ft. during the previous period. The construction of several lengthy bridges is in hand, and in some cases a substantial proportion has been built, but the figures quoted exclude such structures and relate only to those opened to traffic. Progress with the bridge programme has been retarded by delays in the delivery of reinforcing material.

In the matter of improvements the Board reports that reconstruction and widening were carried out on sections totalling over 330 miles, and metalling was undertaken on lengths aggregating 240 miles.

A more favourable paving season than the previous year resulted in approximately 300 miles of initial dustless surfacing being completed. At the 31st March, 1938, the length of paved highways was some 2,400 miles out of a total of approximately 12,100 miles.

The Government's programme for eliminating dangerous railway-crossings on main highways was substantially advanced during the past year, during which thirty-five further crossings were completed, compared with fifteen for the previous year. At the close of the year under review work was in progress, or contracts had been arranged, for eliminating a further fifty-six of the most urgent crossings. The number of crossing accidents which are reported from time to time shows the necessity for removing these danger spots, and there is no doubt that very much safer conditions now exist where road traffic has been separated from railway traffic by the erection of overbridges or the construction of subways, &c.

In connection with the financing of highway work, including State highways, it is interesting to note that, as far as maintenance was concerned, the State provided 87·5 per cent. and local authorities 12·5 per cent. In respect of renewals, the State found 91·1 per cent. and local authorities 8·9 per cent., while the corresponding figures for improvements and construction were 95·8 per cent. and 4·2 per cent. respectively. This indicates the substantial degree of financial assistance which has been extended to local roading authorities and the consequent relief to ratepayers in the matter of current highways expenditure.

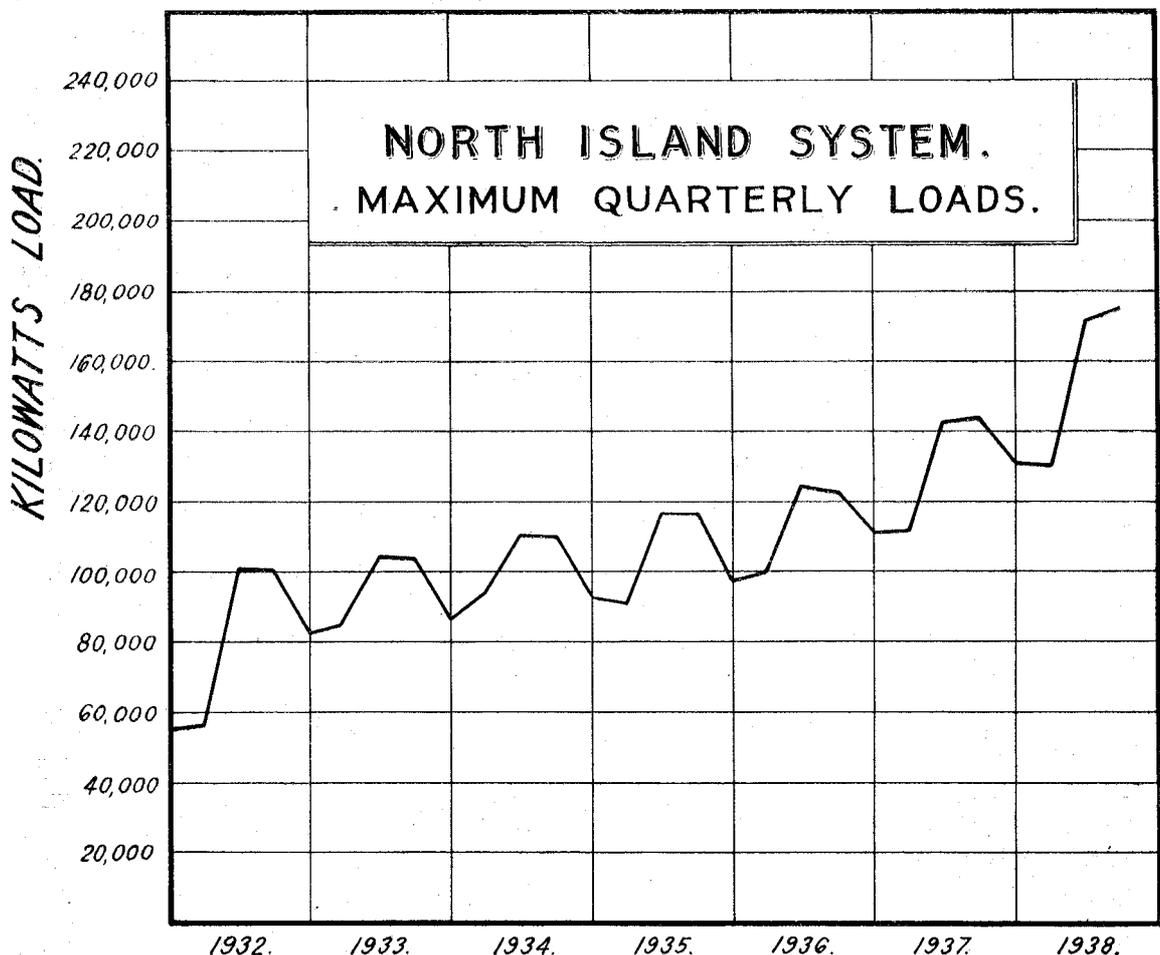
In addition to general improvement and reconstruction carried out on the State highways, which are now under the immediate jurisdiction of the Main Highways Board, marked progress was made in linking up the paved sections of several arterial routes. For example, the Christchurch-Dunedin State highway has been completely paved with the exception of the Rangitata Deviation which is under construction and well on to completion. Also the State highway from Wellington to New Plymouth is paved throughout except for certain portions which are being

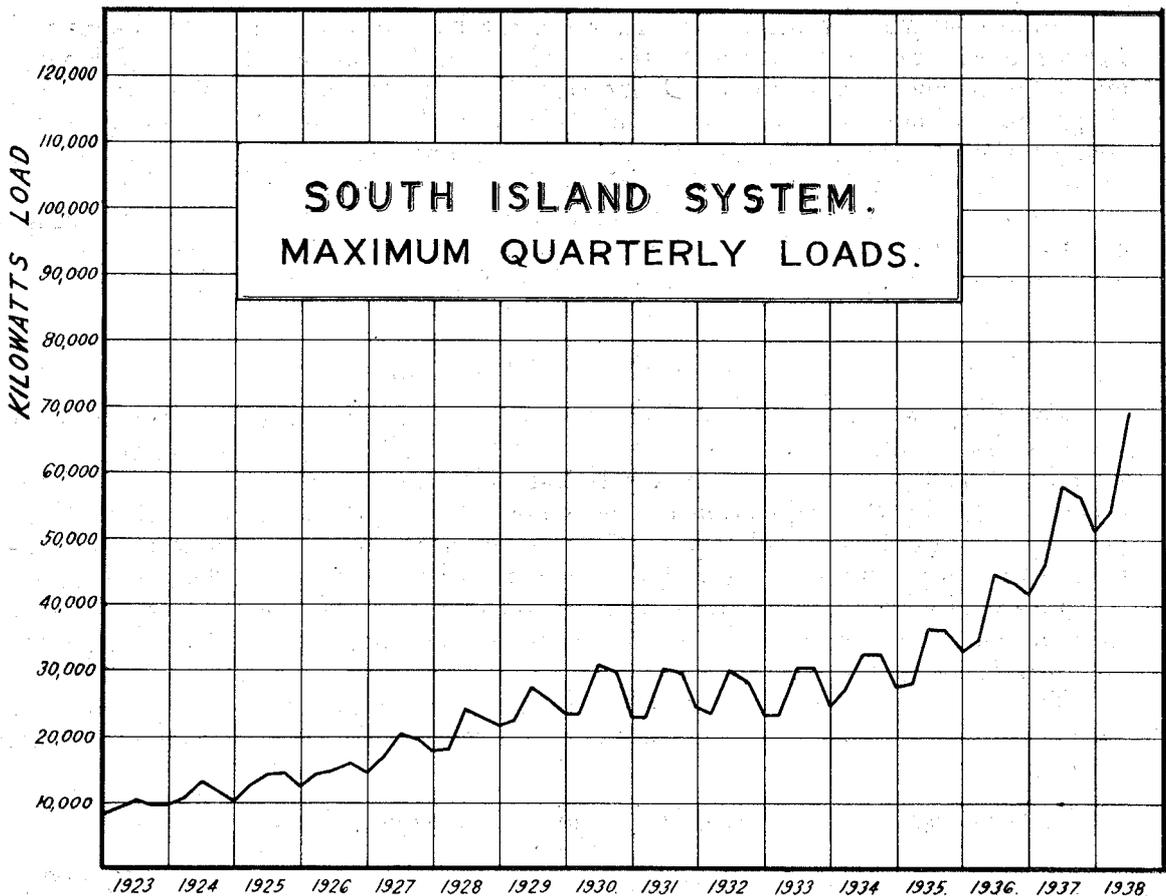
brought up to modern standard. A notable feature of the past year's operations was the improved standard of general maintenance throughout the State highways system as the result of utilizing up-to-date plant and equipment under one organization. The superelevation of curves, the painting of bridges, the erection of white direction posts, and of protective fencing, combined with centre-line marking on pavements, have also contributed largely towards safer conditions, notwithstanding the greater density of traffic on these important connecting routes.

It is intended to continue these activities and also to extend paving operations, as far as possible, on heavily trafficked highways, where the dust nuisance creates danger conditions, especially during the holiday season.

HYDRO-ELECTRIC DEVELOPMENT.

The hydro-electric developments have continued to be one of the Government's most successful undertakings. The conditions attendant on the more prosperous times of the past two years have given the public more confidence and a greater sense of security which is reflected in continually increasing demands for electric power. The amount of power supplied from the Government system has shown phenomenal increases during the year, and a comparison with the conditions existing a few years ago is well illustrated in the diagrams, which show the maximum kilowatts supplied from the Government stations quarter by quarter over a period of years.





The operation of the various existing power schemes and financial returns received therefrom continue to be satisfactory. The gross revenue has increased to £1,470,043, and after paying operating-expenses, interest, and depreciation it has been possible to make available a sum of £179,641 to the Sinking Fund Account which is still, however, £942,757 in arrears.

Although so far as the people actually supplied are concerned the Dominion's electricity schemes can be considered eminently successful, there are still some twenty thousand or more homes in which it has not yet been possible to make a supply of electricity available. I have given considerable thought to the problem of making it available to these people wherever it can be done in a reasonably economical way, but have not yet been able to evolve any completely satisfactory method. There are other problems connected with the distribution of electricity with which this particular one is allied, and the whole question is one which needs special attention at an early date.

To meet the increasing demand for additional power in all directions the Department has been actively engaged on new work and additions to power stations and transmission lines and on surveys and investigations for additional works and lines. To provide the additional generating capacity the erection of two additional units, each of 21,000 kW. capacity, has been completed at Arapuni; a commencement has been made with a new development of 40,000 kW. capacity below the existing one at Waikaremoana, whilst a further 20,000 kW. generator has just been delivered for installation in the existing power-station on that scheme. In the South Island orders have been placed for two additional units, each of 15,000 kW. capacity, for installation in the existing power-station at Waitaki, and the Diesel-engine plant 5,760 kW. capacity previously located as a standby station at Lyttelton has been transferred and re-erected at Dobson, on the West Coast, to meet the special demand for mining purposes in that area. In addition to actual construction work, surveys and investigations have been carried on in relation to further power schemes on the Waikato River, and as to control works at Lake Tekapo, and for a power-station on the Rakaia River to utilize in the winter months the water diverted from the Rangitata River and used for irrigation in the summer months.

Additional main transmission lines are being built to give supply to the Bay of Islands Power Board, to duplicate the supply from Arapuni to the Bay of Plenty, and later to act as a main interconnection between Arapuni and Waikaremoana, to provide an additional double circuit line from Arapuni to Auckland, to interconnect the existing main substations at Melling and Masterton, and so provide a triplicate line to Wellington and an alternative to the Wairarapa.

Work is also in hand on the main transmission lines between Lake Coleridge and the West Coast, and between Dunedin and Southland. In both cases, however, work has been delayed by irregular deliveries of poles from Australia.

OPERATING RESULTS.

For the year just closed the number of units generated in the Government stations showed an increase over the previous year of 15·95 per cent. in the North Island and 33·3 per cent. in the South Island. The latter increase is to some extent accounted for by the acquisition of the Arnold River station of the Grey Electric-power Board, the first complete year of operation of Monowai Station under Government ownership, and to increased demands by Christchurch and Dunedin Cities.

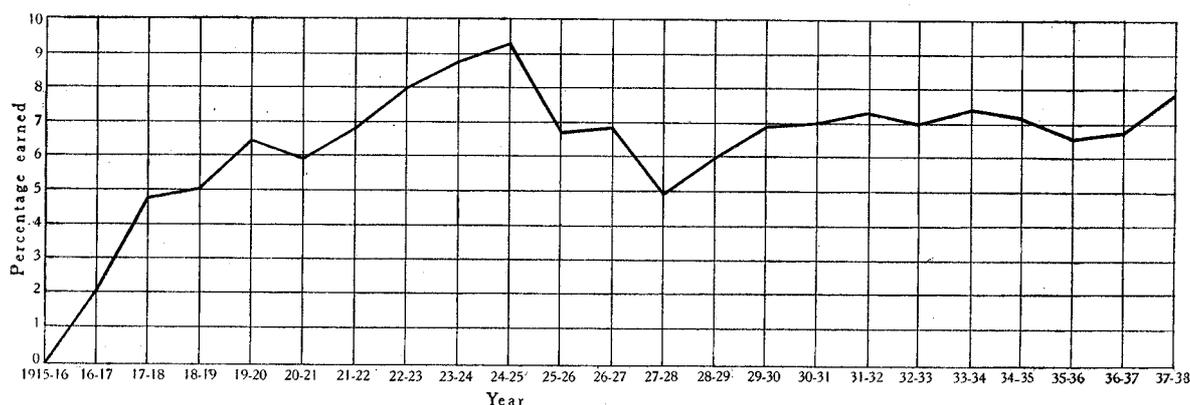
Financially the year has been a successful one, and the whole Electric Supply Account has been able to earn 7·84 per cent. on the operating-capital after paying net operating-expenses.

The position of the account is summarized in the following table, and the result since the State commenced operation in the electric supply business is shown in the following graph:—

Percentage earned on Operating-capital after paying Working-expenses.

	Average Operating-capital.	Gross Revenue.	Working-expenses.	Net Balance.	Percentage of Net Balance to Operating-capital.
	£	£	£	£	Per Cent.
North Island system	8,861,213	978,492	177,545	800,947	9·039
South Island system	6,011,425	491,551	126,715	364,836	6·069
Totals ..	14,872,638	1,470,043	304,260	1,165,783	7·838

PERCENTAGE EARNED ON OPERATING-CAPITAL AFTER PAYING NET OPERATING-EXPENSES.



In the North Island the Depreciation Reserve required by the State Supply of Electrical Energy Act—viz., 12½ per cent. of the capital invested—has already been reached, and an amount sufficient only to maintain this 12½ per cent. is therefore chargeable to depreciation, with a consequential credit balance of £360,662 on the year's operations. This balance has been used to wipe out the deficiency which has been accumulated in earlier years. In the South Island, where in the past the Depreciation Reserve had reached the 12½-per-cent. limit mentioned above, the addition of a large amount of additional capital has necessitated the resumption of full payments into the Depreciation Reserve Fund, yet the year's operations show a profit of £30,987.

The general position to date is that the Electric Supply Account has been able to meet all operating and interest charges, has provided the statutory requirement of £1,568,289 for depreciation, and, in addition, has provided £506,686 towards sinking-fund requirement of £1,396,307, and £82,399 to General Reserve from profits made from time to time on Lake Coleridge system. In other words, the electric-supply system as a whole has paid interest and operating charges and provided £2,157,374 in reserves, of which £315,364 has already been utilized by Treasury for the paying-off of loans which formed part of the original capital. There are, however, still arrears of sinking fund, amounting to £942,757, to be met.

ELECTRIC-SUPPLY OPERATING ACCOUNTS.

(a) North Island Electric-power Supply.

The Arapuni-Mangahao-Waikaremoana plants have operated satisfactorily throughout the past year, and the revenue shows an increase of £92,019 over that of the previous year.

The result of the year's operations was as follows:—

	£	£
Capital investment at end of year .. .. .	..	9,216,414
Revenue	978,492	
Operating-expenses	177,545	
		<hr/>
Balance	£800,947	
		<hr/> <hr/>

The balance has been used in paying interest charges (£349,816) and £37,593 as the Department's share of the capital charges on the King's Wharf generating-plant of the Auckland Electric-power Board, also £50,725 to provide the full statutory contribution to depreciation, and £2,151 has been charged against cost of raising loans.

The reserve accounts established in connection with this system show that £1,016,184 has been credited to depreciation and £210,868 to sinking fund.

(b) South Island Electric-power Supply.

The accounts under this heading formerly had reference to the interconnected Lake Coleridge and Waitaki systems, but this year have been amalgamated with those of the Southland system, which was purchased from the Southland Electric-power Board in October, 1936, and with the Arnold River scheme purchased from the Grey Electric-power Board and taken over on the 1st February of this year. These latter portions of the system are, however, not yet actually interconnected with the Coleridge-Waitaki section. The respective plants have operated satisfactorily throughout the year.

The year's operations resulted as under:—

	£	£
Capital investment at end of year .. .. .	..	6,319,615
Revenue	491,551	
Operating-expenses	126,715	
		<hr/>
Balance	£364,836	
		<hr/> <hr/>

The balance has been used in payment of interest (£220,112), £112,375 has been paid to depreciation, and £1,363 has been charged against cost of raising loans. The net result was a profit of £30,987, which has been credited to sinking fund.

GENERAL.

The capital invested in the electric-supply systems operating throughout the Dominion totals £35,527,342, which includes £15,536,029 of Government expenditure, and the gross revenue received for the year was £5,686,397. After paying working-costs, interest, sinking fund, and depreciation charges the net profit for the year under review was £878,594, as compared with £570,131 for 1937, which indicates

that the electric-supply business as a whole is in a healthy condition. The average revenue received by the Government for each unit sold was 0·366d., compared with 0·359d. for last year. This increase is due to the revenue received from the retail side of the Department's business in Southland. Excluding the retail business, the average for this year is 0·337d. per unit. The average revenue per unit sold by all the retail supply authorities to consumers throughout the Dominion was 1·028d.

An analysis and summary of the operating results and other statistics furnished by each electric-supply authority reveals the fact that there has been an increased consumption of electrical energy amounting in the aggregate to approximately 14 per cent. over that of 1937. This is due mainly to intensive load-building campaigns on the part of many of the retail supply authorities, a phenomenal increase being noticeable in the electric cooking and electric water-heating side of the business.

The statistics also indicate that during the past year 17,553 new consumers have been connected at an average rate of approximately 1,460 per month, and the completed figures for the year show that the ratio of number of consumers of electricity to the total population of the Dominion (1,591,974) is 24·4 per cent., or 26·2 per cent. of population in areas supplied with electricity.

The statistical data relative to each electric-supply authority will be found in the series of tables accompanying the report of the Chief Electrical Engineer.

RAILWAYS.

Dargaville Branch Railway.—Work on this railway has been continued during the year.

When the present Government decided last year to complete this line, further surveys were made in order to ascertain the best route into Dargaville. On the previously adopted route the station-yard at Dargaville was very cramped and this route also made it very difficult, if not impossible, to eliminate a number of level crossings in the borough.

After careful investigations had been made it was decided to adopt a line running round the back of the town, eliminating thereby all level crossings, giving a very much better site for the railway-station, at a distance from the post-office of only 20 chains.

The new route is longer and somewhat more costly than the old one, but its adoption is in keeping with the modern trends in railway location, which are to keep railway-lines out of the more thickly populated and business areas and to avoid all level crossings.

Pending the result of investigations into alternative routes, work on the railway was confined to the unopened section between Kirikopuni and Tangowahine and between Tangowahine and Te Wharau where the new route diverges.

The principal activity on the former section has been the completion of ballasting, and on the latter the formation has been restored, fences overhauled, and the erection of plant, bridges, and accommodation proceeded with.

With the question of the route now decided it will be possible to accelerate construction considerably.

Paeroa-Pokeno Railway.—During the year the Government decided to proceed with the construction of this railway, which will shorten the distance from Auckland to Paeroa and the Tauranga District by about forty-four miles, and will also open up and give direct railway access to a very considerable area of land between Pokeno and Paeroa, including the fertile Hauraki Plains.

As soon as the decision to construct the railway was made survey parties were started from each end, and construction work has now actually started at various points.

Plant has been arranged for, and some of it is now on the ground. The erection of stores, offices, accommodation for staff and workmen, and all the necessary adjuncts for the speedy prosecution of the work is all arranged for and the work should soon be well under way.

Gisborne-Napier Railway.—Until February of this year excellent progress was made with the construction of this railway.

In that month, however, phenomenal rainfall in the Kopuawhara and Maretaha Valleys on the Gisborne-Waikokopu section of the line caused unprecedented flooding in these streams. During the night of 19th February the single-men's quarters at No. 4 Camp, Kopuawhara, were swept away by the swiftly rising flood-waters and twenty-two valuable lives were lost. The disaster was so sudden that nothing could be done to save the lives of those lost, but many heroic efforts were made to save life, and in some instances men undoubtedly lost their own lives in trying to save others.

In addition to the loss of life, very considerable damage was done to the railway-construction works, the principal damage being to service roads giving access to the various sections of the railway. On these, bridges were swept away and whole sections of the service roads disappeared.

At the northern end of the railway at Boyds Camp, seven married-men's quarters were swept away by the rising flood-waters, but, fortunately, the camp had been awakened and only one life was lost.

The unprecedented nature of the rainfall and run-off can be gauged from the fact that the flood-waters covered ground which had not been covered by flood-waters within living memory and probably not for a century. The run-off from the drainage areas was far greater than anything that has hitherto been recorded in New Zealand, and a search of hundreds of records from all over the world fails to reveal anything of as great an intensity.

No concern had at any time been felt for the safety of the camps, and those living in them had not for a moment entertained any doubts as to their safety.

The Government has decided to treat this disastrous loss of life as though the lives had been lost by accident at work, and compensation is being arranged accordingly.

As well as the loss of life, many inmates of the camps lost all their belongings, and immediate succour was rendered to them by the Department and by means of special funds subscribed for the purpose.

The spirit displayed by all during and after the disaster was admirable, and I would like to take this opportunity of once more paying tribute to the work of the staff and men for the fine work they did in this sudden emergency.

I would also like to again express my sympathy with the relatives of those who lost their lives in such tragic circumstances.

The damage occasioned by this disaster had scarcely been remedied when another disastrous storm, of somewhat less intensity but more widespread in its effects, occurred on Anzac Day, 25th April.

Reference to this storm is made elsewhere, but its effect on the railway-construction works was very severe, and on the opened line between Napier and Putorino the damage was so great that it has completely changed the programme of operations on the section from Napier to Wairoa.

The restoration of the Napier-Putorino section, which had been badly damaged by the 1931 earthquake and left neglected for five years, was completed by my Department last year and the Railway Department has been running regular traffic over it. Last August the Railway Department, in conjunction with my Department, had inaugurated a through goods traffic to Wairoa. This goods service had been well patronized, as can be seen from figures given in the Engineer-in-Chief's report.

It was intended that the section between Putorino and Wairoa should be completed and handed over to the Railway Department in June last, but the disastrous floods of Anzac Day completely eliminated any chance of this being done. Although the damage between Putorino and Wairoa was not very great, the Napier-Putorino section, particularly in the Esk Valley, suffered very severely. Bridges were washed away, embankments scoured out, and cuttings were filled with slips. It is anticipated that it will take four to five months to restore the line to a condition suitable for traffic, so that it will probably be towards the end of the year before the line to Wairoa is opened for regular traffic.

Despite the handicaps inflicted by these disastrous floods and almost continuous wet weather, particularly in the Gisborne area, good progress is being made on the railway, and it is anticipated that construction will only be a few months behind schedule.

Tunnelling operations on the Gisborne-Waikokopu section are now in full swing, and most of the larger tunnels are now fully equipped with mechanical

equipment for excavating and concreting work. The plant installed has proved very successful, and besides considerably accelerating the work, has reduced the amount of heavy manual labour to a very small percentage of the total.

During the year the bottom heading of the coast tunnel was completed, and excavation and lining on the three major tunnels is well advanced.

On the Gisborne and Wharerata sections of the railway the earthwork is almost completed, and on the Kopuawhara section considerable progress has been made on the earthwork, and it should not be long before this part of the work is completed.

Culverts and water-drives are practically completed throughout, and the bridging programme is being accelerated.

Progress is still somewhat hampered by the delay in delivery of materials, and floods have considerably retarded this part of the work.

All piers on the Waipaoa Bridge have been completed, and the erection of the steel spans is now under way. Six 30 ft. spans are in position and four 60 ft. spans have been launched. Two of the 30 ft. spans and two of the 60 ft. spans have been riveted up.

Work is in progress on a number of other smaller bridges at this end of the line.

At the Waikokopu end the Opoutama Stream Bridge has been completed and piles have been made for the Waikokopu and Kopuawhara Bridges.

At the Gisborne end of the line the permanent track has been laid from Gisborne to the north abutment of the Waipaoa Bridge, a distance of about five miles. The first lift of ballast has been completed over this length and the second lift for a distance of two miles.

Work on the Napier-Wairoa section of this railway has proceeded steadily, and, as mentioned previously, but for the disastrous flood of Anzac Day this length would by now have probably been handed over to the Railway Department.

Full details of the year's operations on the Napier-Gisborne and other railways are given in the Engineer-in-Chief's report.

East Coast Main Trunk Railway: Extension to Opotiki.—The Government decided recently that the construction of the railway from Taneatua to Opotiki was to be proceeded with, and for the past month or so survey parties have been investigating the question of alternative routes.

It has now been decided to adhere to the route through the Waimana Gorge, and a survey party is proceeding to peg the permanent line.

It will be necessary to carry out a fair amount of survey work before construction can commence, but it is anticipated that the work will be under way before the end of the year.

The construction of the railway necessitates the abandonment of portions of the existing State highway through the Waimana Gorge, and investigations are at present in hand to ascertain the possibility of constructing the State highway on a different route. Even if this is done it will be necessary to construct a new road through the Waimana Gorge also, so as to give farmers the same road access as they have at present.

Turakina-Okoia Railway Deviation.—This work has been put in hand to avoid the heavy grades and sharp curvature on the existing main line. A start was made with construction during the previous period, and this year the work has been very vigorously prosecuted.

The outstanding feature of this deviation, which is 10 m. 20 ch. in length, is the driving of the Fordell and Turakina Tunnels, which are 72 ch. and 104 ch. in length respectively. During the past year these tunnels have been opened up and equipped with the latest type of machinery, and approximately 43 ch. of tunnelling has been completed. Simultaneously the excavation of cuttings, the building of culverts, &c., has been carried on, and preliminary work in connection with the erection of the Wangaehu and Turakina Bridges is in hand.

South Island Main Trunk Railway.—In my last Statement I described the restarting of this work, the building of the necessary accommodation, and the provision of mechanical equipment, together with the progress made to the end of June, 1937.

During the period just passed the Department have been able to concentrate on the actual work of construction, and has extended its activities over practically the whole length between Wharanui and Parnassus, the old railheads at either end of the line.

For the purposes of construction the work has been divided into two main sections—the north end, from Wharanui to the Kahautara River, a distance of 48 m. 70 ch., and the south end, from the Kahautara Bridge to Parnassus, a distance of 29 m. 40 ch.

On the north end construction work is almost complete, with the exception of the Blue Slip, to the Clarence Bridge, a length of approximately twenty miles, plate-laying and ballasting is in hand, and it is anticipated that it will be available for stock traffic by the end of the year. The Blue Slip, which has been the main obstacle on this length, is becoming well stabilized, and when the additional drainage now in hand has been completed I do not anticipate that it will give a great deal of extra trouble. From the Clarence Bridge to the Kahautara River the whole section is manned and very good progress is being made.

The piers of the Clarence Bridge, which will consist of twelve 122 ft. steel-truss spans on caisson foundation, are being constructed under contract and are almost completed, while the steel superstructure is being fabricated ready for erection in the railway workshops.

The heaviest section, which is between the Ohau Bluffs and the Hapuka River, and includes all the tunnelling-work on the northern end, will govern the time of completion, and it has been very heavily manned. The greater portion of the tunnel-work is complete, and all cuttings are well under way.

The construction of the section between the Hapuka and Kahautara Rivers has been kept back somewhat owing to the necessity for resurveying the route in order to bring the Kaikoura Railway-station closer to the centre of the town. This has been finalized, however, and as the formation is comparatively light on this area there will be no difficulty in completing this portion in time to keep in step with the rest of the construction.

On the south end the completion of the Hawkswood Tunnel and the bridging of the Leader and Conway Rivers has opened the way for platelaying and ballasting to proceed as far as Hundalee Station, a distance of approximately eleven and a half miles, and it is hoped to have this section sufficiently far advanced to handle stock traffic by the end of the year, and this will then shorten the distance between rail-heads by approximately thirty-one miles.

Between the Hundalee Station and the Oaro River the main obstacles are the Amuri Bluffs Tunnel and the Okarahia Bridge. Work on Amuri Bluff Tunnel is making good progress on the north end, and on the south end it has been necessary to adopt a specially reinforced section to cope with the very difficult and unstable country which has to be passed through before reaching the more solid country through which the main tunnel is being driven. Preliminary work on the Okarahia Bridge is in hand, and adjacent cuttings, culverts, &c., will be completed in ample time to synchronize with the completion of the bridge and tunnel. On the section between the Oaro and Kahautara Rivers we have seven miles and a half of extremely difficult country; high precipitous bluffs come right down to high-water mark, and consequently we have a series of short tunnels through the points with stretches of line across the various embayments between them, the latter necessitating heavy protection works on the seaward faces. A further complication is caused by the necessity of providing for the main highway alongside the railway, and numerous deviations of the highway have also to be constructed.

A heavy concentration of men and plant has been brought to bear on this section, most of the tunnels are being opened up, and a large quarry is supplying stone for the sea-protection work. At the same time it will probably be necessary to cast massive concrete blocks to withstand the heavy wave-stroke on the more exposed portions.

Westport Inangahua Railway.—This railway, which will link up the Westport section with the main-line system of the South Island is twenty-seven and three-quarter miles long, of which nine miles between Westport and Cascade Creek was operating before constructional activities were renewed last year. The gap between the railheads is eighteen and a half miles, and the construction work involved comprises extensive rock cuttings, tunnels, and bridges.

The average number of men employed during the year was 330, this being the maximum number that can be usefully employed, as the bulk of the earthwork is completed.

The remaining work is largely the erection of bridges and culverts and the laying of the permanent-way. The major work still to be done is the construction of twelve large bridges, one hundred and seventy culverts, and two short tunnels.

During the year the following progress was made:—

Cascade Bridge: Five 80 ft. and one 40 ft. steel-plate-girder spans were completed.

Redmond Creek Bridge: Three 40 ft. girder spans and one 85 ft. arch span in reinforced concrete is now approaching completion.

Stable Creek Bridge: Ten 40 ft. and one 20 ft. reinforced-concrete-girder spans are under construction.

Buller River Bridge: Six 100 ft., one 45 ft., and one 30 ft. steel-plate-girder spans in reinforced-concrete cylinder piers. The piers are almost completed, and the steel superstructure is now arriving on the site.

Inangahua River Bridge: Nine 60 ft. steel-plate-girder spans. The piers are constructed, and the steel girders have been delivered on the site, erection is proceeding, and two spans have been completed.

Considerable progress has been made in the completion of the two remaining tunnels at 13 m. The longer tunnel, 13 ch. long, has been excavated, and $5\frac{1}{2}$ ch. have been lined. The shorter tunnel, 2.4 ch. long, is in hand, and $1\frac{3}{4}$ ch. of the bottom heading is completed.

Seventeen culverts were completed during the year, three of which were of considerable magnitude.

The earthwork has been completed throughout except for a four-mile section between 20 m. and 24 m., where some large block cuttings and fillings are being constructed by modern plant consisting of Diesel shovels, and locomotives and carry-all power-scrappers.

The work on the bridges and culverts has been hampered to some extent by lack of skilled tradesmen, but the difficulty is being overcome and construction work is proceeding more rapidly.

During the year a Y.M.C.A. hut was erected at Inangahua Junction, and electric light was installed in the main camps at Tiroroa and Inangahua Junction.

RAILWAYS: IMPROVEMENTS AND ADDITIONS TO OPEN LINES.

The net expenditure out of the Public Works Fund under the above heading for the year ended 31st March, 1938, was £1,292,772. This amount was expended on the various works shown in the following statement:—

	£
Wellington new station and yard	215,332
Wellington—Paekakariki electrification	18,039
Wellington—Johnsonville electrification	29,493
Christchurch new station and yard rearrangement ..	19,660
Papakura—Horotiu duplication	77,179
Plimmerton—Paekakariki duplication	20,127
Sawyer's Bay—St. Leonards duplication	16,407
Turakina—Okioia deviation	111,943
Scroggy Hill deviation	8,997
Grade easements	17,780
Elimination of level crossings	95,426
Oamaru foreshore protection	15,000
Stratford—Okahukura safety appliances and tablet-working	19,284
Dwellings	8,962
Rolling-stock	662,032
Workshops buildings and machinery	49,097
Road services	31,779
Miscellaneous	Cr. 123,765
	<u>£1,292,772</u>

The Wellington new station building was completed early in the year and was officially opened on 19th June, 1937. The layout of the new yard was also sufficiently advanced to allow of the satisfactory working of the new station. The Tawa Flat deviation which had been used for goods traffic for some time was brought into full use as from 19th June, 1937. The electrification of the Wellington—Johnsonville section was proceeded with throughout the year, and the electric

service was brought into use on 2nd July, 1938. During the year a considerable quantity of electrical equipment arrived for and was installed on the Wellington-Paekakariki section. The station-yard rearrangement at Christchurch, work on which was commenced in the previous year, was further advanced during the year. Extensive progress was made during the year on the three large duplication works—namely, Papakura – Horotiu, Plimmerton – Paekakariki, and Sawyer's Bay – St. Leonards. A considerable amount of work was done on the Turakina–Okoia deviation, while satisfactory progress was made on the deviation at Scroggy Hill and on other grade-easement works.

Special attention was paid to the elimination of level crossings, and considerable headway was made during the year, several of the new overbridges being brought into use. Considerable progress was made on other major works. Great activity was displayed in connection with the rolling-stock programme, the construction of standard rail cars for the New Plymouth – Wellington service and the building of electric locomotives for the Wellington–Paekakariki service being special features, while extensive constructional work was carried out on cars, vans, and wagons.

The site of the old station at Auckland was disposed of, and a credit of £111,323 received.

SETTLEMENT AND OTHER ROADS.

I would like to again emphasize the undoubted importance of good roads in the rural development of this country. Honourable members will recollect that early last summer I announced that arrangements had been made for a special additional allocation of £500,000 for the purpose of extending road-metalling activities during the year. These funds were made available purely for the metalling of roads in backblocks areas where settlers in many cases were still working their farms under access conditions which could only be considered as primitive. These people were virtually still pioneering, and I can confidently claim that the plan instituted last year is the first real attempt which has ever been made to deal adequately with the difficulties and hardships of these unfortunate settlers.

In all, an amount of £1,587,360 (gross) was available last financial year for the betterment and metalling of country roads, and of this, a sum of £1,297,781 (gross) was expended. The actual net expenditure, after allowing for credits from other votes, was £1,126,757, as against £913,720 for the previous year. By the close of the season on 30th June, 600 miles of settlement roads were formed, reformed, or widened, and 1,006 miles were newly metalled, the corresponding figures for the preceding period being 465 miles formed and 792 miles metalled.

Having regard to the fact that in practically all instances local authorities had not had an opportunity of budgeting for any extra large expenditure on settlement roads, of which they were, of course, required to find some part, I consider the season's results to be highly satisfactory.

A great deal of bridging and culverting was also done, some 123 new bridges, totalling 10,710 lineal feet, having been erected with grants or subsidies, and 71,570 lineal feet of culverts installed. My own view in connection with the erection of new bridges is that structures should be in reinforced concrete wherever possible, as this form of construction gives greater permanency and better service with comparatively low maintenance-costs. Local bodies have sometimes objected at first to insistence on the use of reinforced concrete, but careful examination of alternative designs has generally shown that, with the advanced methods now being adopted, there is no really great saving in cost by building in timber—that is, having regard to first cost, maintenance-cost, and ultimate replacement. On consideration of these different aspects local authorities have been ready enough to agree in most instances that the reinforced-concrete bridge has definite financial, as well as practical, advantages.

As in previous years, local authorities have continued to approach the Government for grants to assist with the cost of restoring flood damage, and where a full investigation of the circumstances has indicated that the counties concerned could not meet the full cost of repairs without financial embarrassment varying measures of assistance have been granted. Undoubtedly the disastrous floods on the East Coast caused the greatest damage during the year, and in each county it was necessary for the Government to afford some relief by making grants-in-aid.

For the information of honourable members I intend now to make a few brief remarks concerning some of the major works on which construction was proceeding during the year.

The Western Hutt Road has been practically completed between Melling and Silverstream, and good progress is being made with the erection of the large reinforced-concrete bridge which will carry the traffic across the Hutt River at Silverstream on to the existing main north highway to the Wairarapa.

The entire reconstruction of the Haywards—Pahautanui Road has been well advanced, and I have no hesitation in saying that the improvement over the old road is really amazing.

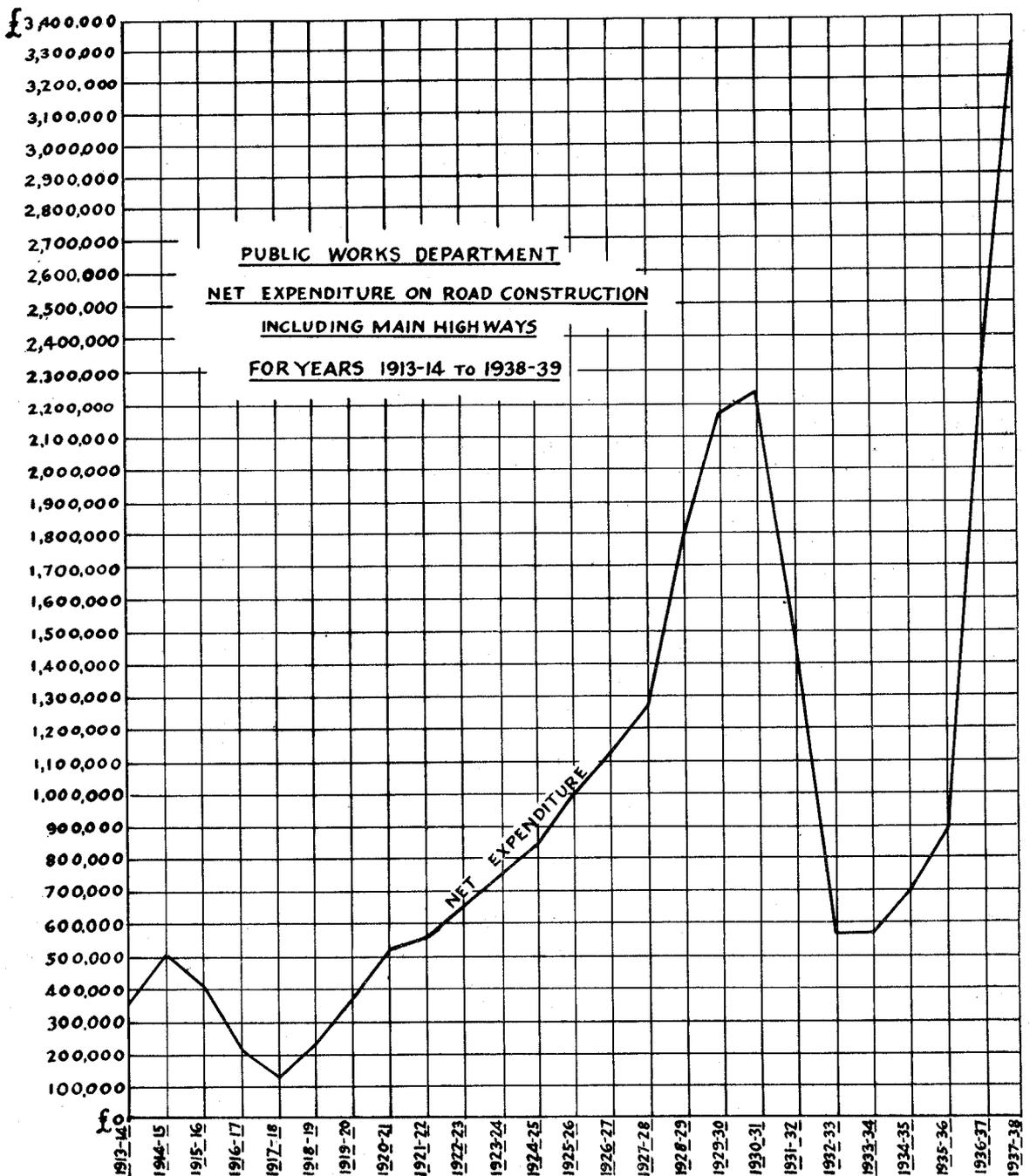
Construction work on the Main South Road in Westland has been continued vigorously during the year. The new steel suspension bridges over the Fox and the Cook Rivers have been completed, and of the 32 miles of road to be built between Weheka and Bruce Bay, 22 miles have now been constructed. Surveys are being made of the road between Bruce Bay—Haast—Jackson's Bay, and the construction has actually begun on the Jackson's Bay end, where a wharf is also being erected.

The large works on the Haast Pass Road from the Cold Lakes District to South Westland, and on the Hollyford to Lake McKerrow Road, have progressed steadily during the year.

In the King-country work on the Taumarunui—Tokaanu Road, giving a direct connection from Taumarunui to Lake Taupo, and on the Waiouru—Tokaanu Road, giving a direct north-south route on the eastern side of the mountains Ruapehu, Tongariro, and Ngauruhoe, has been continued steadily.

The new road, known as Coronation Drive, on the Waitakere Ranges at Auckland has been partly completed, and has proved so popular with motorists that complaints have been made regarding the insufficiency of parking-space.

The rise and fall of expenditure on roading generally over the last twenty-five years is illustrated by the graph hereunder.



HAWKE'S BAY FLOODS.

The year has been marked by the large number of intense storms which have occurred in various parts of the Dominion.

The disastrous storm of 19th February has been referred to when discussing railway matters.

Another and, in some respects, more disastrous storm occurred in April.

Very intense rainfall in the Hawke's Bay and Gisborne districts over the week-end, amounting in some cases to nearly 40 in., culminated in a disastrous flood on Anzac Day, in which farms were obliterated by deposits of silt, roads blocked by slips and washouts in all directions, and bridges were carried away by the tremendous volume of water and debris carried by the abnormally swollen rivers and streams. In certain areas, such as the Esk Valley, the flood-heights were greater than anything known since the white man settled there.

Road access from Napier was cut off in all directions, except south to Hastings via Fernhill. Thousands of acres were under water and silt, and settlers were isolated on their farms with access indefinitely cut off.

The seriousness of the disaster was not realized at first either in the stricken area or outside it, but as soon as the true position became evident immediate steps were taken to cope with the situation.

An assurance of State assistance to the stricken area was given by the Government, and I immediately arranged for the transfer of plant from other districts to assist with the opening-up of the roads, and instructed that all the resources of the Department were to be used to restore communications as quickly as possible.

Two Government aeroplanes were despatched to Hastings to assist with the distribution of food to isolated settlers by air. This work had already been well organized by Judge Harvey and the East Coast Aero Club, and food was being dropped from aeroplanes where it was most urgently required. On arrival of the Government planes Squadron Leader Burrell took charge of the aerial distribution of food, and was ably assisted by the aero club and Judge Harvey, who was of great assistance in this connection on account of his local knowledge of the area.

The Post and Telegraph Department did splendid work, under very difficult conditions, restoring telephone and telegraphic communications as quickly as possible.

In the meantime further knowledge of the state of the roads and bridges had been obtained, both from aerial surveys and from inspections on foot, as well as telephone messages. Steps were immediately taken to organize gangs of men for clearing slips and getting machines on to the sections of the damaged roads where they could be used to best advantage. The construction of temporary bridges was also immediately taken in hand.

By concentrating men at suitable points and getting machinery on to various sections as quickly as possible the Napier-Taupo Road was opened for traffic on 8th May and the Napier-Wairoa Road on 4th June.

The opening-up of this road in a little over five weeks was a noteworthy feat best realized by those who have been over the road since it was opened.

The road that was opened was, of course, only a comparatively narrow track in places, and heavy rain since has at times caused trouble and occasionally blocked the road for a short time again.

The part played by machinery on the work of restoration has been remarkable. The Department now has five Diesel shovels, four tractors with bull-dozer attachment, and four tractors with scoops at work on roads and farms.

It is estimated that with the aid of machines it will take about four months more to clear up the damage to the highways. Without the help of machines it would probably take double that time.

The reconstruction of the bridges in permanent material will, of course, take much longer. It will probably be twelve to eighteen months before they are completed.

The staff and men in the Hawke's Bay and Gisborne districts have done great work in connection with the restoration of communications and the repair of flood damage, and I wish to express my appreciation of the manner in which they have carried out their duties.

The reason for the enormous damage in the flooded areas can be seen from a study of some of the rainfall records in the Hawke's Bay District.

The rainfall at the places mentioned below on various days in April and the total for the month were as follows :—

Locality.	Rainfall (Inches), April, 1938.				
	23rd.	24th.	25th.	Total for Three Days.	Total for Month.
Puketitiri	9·14	15·39	14·87	39·40	55·70
Tarewa, Morere	2·22	6·50	11·42	20·14	41·10
Putorino	4·00	16·50	11·60	32·10	36·85
Mangaone Valley, Nuhaka	7·25	4·50	5·35	17·10	31·57
Maraetotara	1·84	10·88	10·74	23·46	31·43
Hawke's Bay Forests, Waikoau	4·00	11·76	8·50	24·26	..
Onepoto, Waikaremoana	2·03	7·16	6·04	15·23	25·27
Kotemaori	1·95	9·03	7·80	18·78	24·39
Maungaharuru Range	2·03	10·68	6·21	18·92	26·29
Wharerata	4·71	11·22	2·11	18·04	..

IRRIGATION AND WATER-SUPPLY.

Accelerated progress is being made with this important developmental work, especially in Canterbury, where irrigation projects over a large area situated between the Rangitata and Rakaia Rivers are now under construction.

During the past season the central and eastern portions of the South Island has experienced a drought of exceptional severity, and the sales of water have exceeded previous records.

In Central Otago the existing irrigation schemes undoubtedly saved the district from extreme hardship and loss of production, even though rationing of the water-supply had to be resorted to for a short period on some small areas dependent on stream-flow.

In Canterbury the drought conditions did not extend beyond the middle of December, and since then the weather has been abnormally wet and the demand for irrigation dropped to zero.

On the Redcliff Scheme the demand was above expectations during the early portion of the season, and the area watered amounted to 50 per cent. of the irrigated area.

The response was very satisfactory and, notwithstanding the relatively short season, the revenue obtained was treble that of the previous year.

The farmers express general satisfaction at the results, and further areas are being prepared for irrigating next season.

The Levels Scheme was completed by the construction of No. 7 lateral, having a total length of 3 miles 34 chains.

As in the case of the Redcliff Scheme, the dry spring and early summer resulted in a demand for water and assistance in farm reticulation that taxed the Department's organization to deal with it.

Thirty-one farmers used water for 1,100 acres, or approximately 8 per cent. of the irrigable area.

One farmer who keeps an accurate account showed that his stock-carrying capacity was increased fourfold for the whole season.

In consequence of the unprecedented drought conditions obtaining last summer the demand for irrigation investigation was very insistent in various portions of New Zealand, but this work had necessarily to be deferred on account of the available staff being fully employed on active current construction work representing the most favourable schemes to be proceeded with.

The question of further investigation work will again engage my attention when the additional staff is available.

The following is a brief description of the works in hand or completed during the year:—

The Omakau Scheme has now been completed, and last season fifty-nine farmers irrigated 7,000 acres. The sales of water rose from 4,032 acre feet to 10,380 acre feet.

An extension of 3,000 acres, called the Dunstan Scheme, was completed, and some sales of water were made towards the end of the season.

On the Earnsclough Scheme the Fraser Dam, 102 ft. in height and containing 12,560 cubic yards of concrete, was completed.

The value of this dam was amply demonstrated during the drought, and an adequate supply of water was maintained where shortage would have resulted in a large loss of production.

On the Manuherekia Scheme a 78-chain tunnel is completed, and the concrete lining is in hand.

The renewal of pipes on the Teviot Scheme to replace the old mining-pipes has been completed.

The only new work authorized in Central Otago is a small extension of the Ida Valley Scheme at German Hill.

On the Ashburton-Lyndhurst Scheme the area to be irrigated was increased from 25,500 acres net to 34,000 acres net.

The total length of race-construction completed to date is 44 miles, involving 222,000 cubic yards of excavation, or 65 per cent. of the total.

The number of special concrete structures completed during the year was 364, making a total of 470 to date, or 30 per cent. of the total involved in the scheme.

The year was marked by the introduction of new types of earth-moving machinery, which have greatly accelerated this phase of the work.

A demonstration area of 36 acres was levelled and sown in fine class pasture in the autumn of 1937. This has been regularly irrigated, and during the season approximately ten ewes and their lambs were carried to the acre. The pasture was in nowise taxed, and the indications are that this figure is likely to be frequently equalled or exceeded throughout the area of the scheme. The soil type in this case is slightly below the average for the whole scheme.

The construction of the Rangitata Diversion Race was continued during the year, and a decision was made to keep the capacity of this race to 900 cusecs for its whole length to the Rakaia River, so as to utilize the winter flow of the race for the generation of electricity. A fall of 320 ft. is available at this point which will enable a maximum power of 30,000 h.p. to be generated.

The race will therefore serve a dual purpose of irrigation in summer and the generation of electricity in the winter.

The total length of this race is 41 miles, requiring approximately 2,900,000 cubic yards of excavation.

The work completed to date is 370,000 cubic yards of excavation over a completely or partially completed length of 14 miles.

One heavy-traffic bridge has been built over the race, and a commencement will shortly be made of the numerous large structures such as syphons, drops, regulating-gates, and intake.

Modern machinery has been employed throughout the work, and its completion is scheduled for the spring of 1940.

During the year a further extension of the Canterbury Irrigation, known as the Mayfields-Hinds Scheme, was authorized, and construction work is now proceeding.

It embraces an area of approximately 110,000 acres lying between the Rangitata and Hinds Rivers, and approximately 54,000 acres will be irrigated.

The water will be taken from the Rangitata River, and the main race will have a capacity of 450 cusecs.

In all, there will be a length of 230 miles of races involving 900,000 cubic yards of excavation and approximately 2,000 concrete structures.

The work completed at present is the establishment of camps and buildings to accommodate the 145 workmen to be employed on the work. At present 60 men are employed, and the materials and machinery are coming to hand.

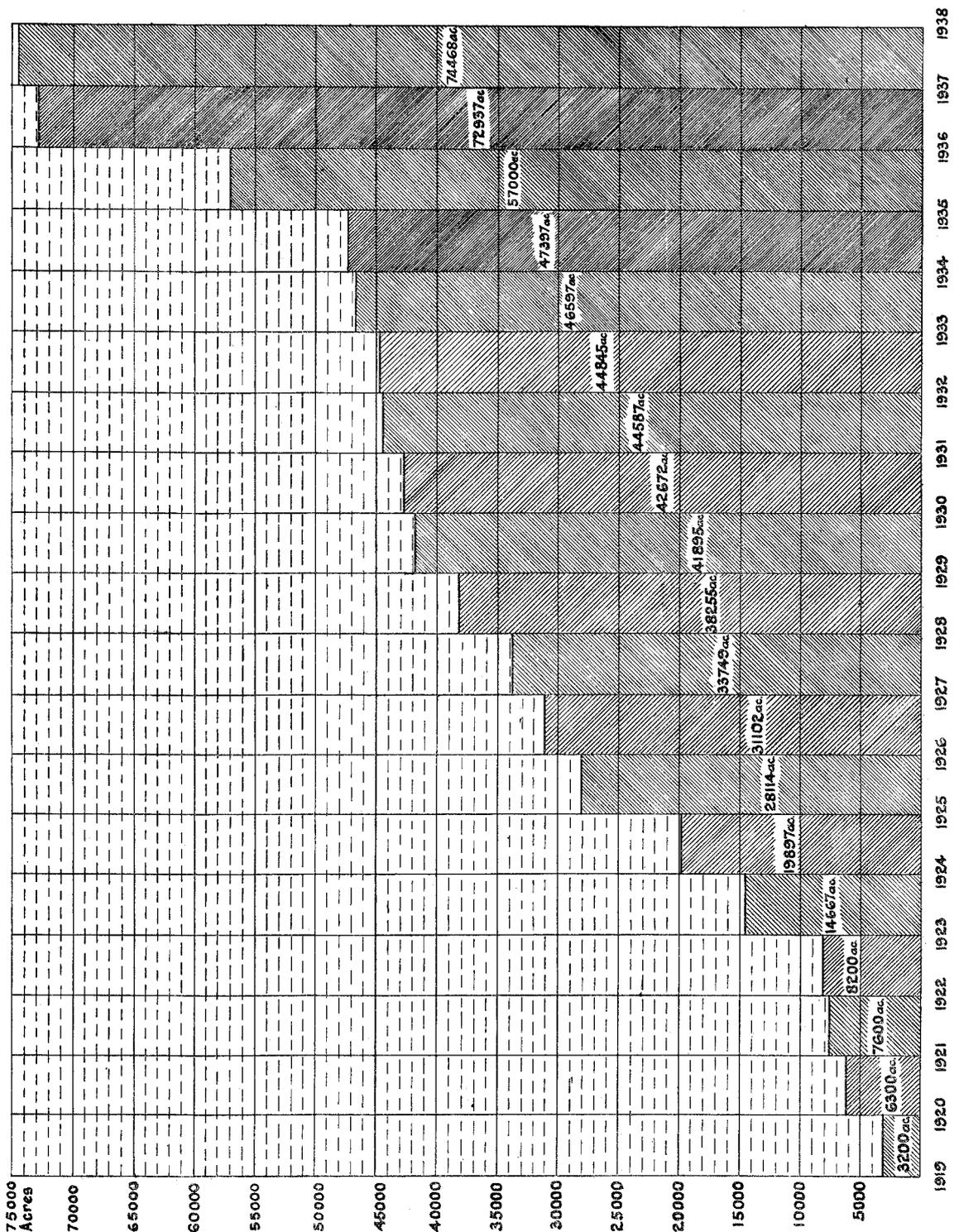
The revenue for the year on the Otago Central Schemes was £27,190, and the working-expenses £27,054, which includes £6,725 for the replacement of pipe-lines on the Teviot Scheme.

The revenue on the Canterbury Schemes for the year was £266 and the working-expenses £771.

This revenue was mainly derived from the Redcliff Scheme, where the rates charged have not yet reached their maximum, the policy being to charge lower rates during the first few years whilst the schemes are being brought into operation to encourage farmers to prepare their land.

The following graph shows the growth of irrigation acres under Government schemes in the last nineteen years :—

TOTAL AREA FOR WHICH IRRIGATION WATER IS AVAILABLE.



During the year legal and financial arrangements were finalized enabling portions of Levels, Waimate, Mackenzie, and Geraldine Counties to be brought within the scope of the Downs Water Supply Scheme commanding an area of 153,000 acres, and requiring 800 miles of pipe-lines to be laid to serve every property within the area with domestic and stock water.

The work was authorized last March, and up to date considerable progress has been made in establishing construction buildings and camp accommodation for the work. Plant is on order and a contract has been prepared for the first section of pipes, comprising 16 miles of main pipe-line.

The present number of men employed is 47, and it is expected to complete the work by 1941.

PUBLIC BUILDINGS.

The net expenditure for last year in the various classes of buildings was:—

	£
General Government buildings	261,017
Courthouses	16,403
Prison buildings and works	9,476
Police-stations	11,086
Post and Telegraph buildings	248,144
Mental Hospital buildings	125,829
Health and Hospital institutions	15,747
	<hr/>
	£687,702
	<hr/> <hr/>

NEW DEPARTMENTAL BUILDINGS.

The ever present problem of providing accommodation for Government offices has been tackled resolutely, and large blocks of offices are under construction in Jean Batten Place, Auckland, and Stout Street, Wellington. Work on these structures was delayed owing to difficulties in obtaining steel of the necessary sizes, but supplies have come to hand and no further difficulty is anticipated from that source; new Government offices at Napier are approaching completion, and a new block of offices was erected at Palmerston North. Unforeseen difficulties over the supply of certain specialized equipment has delayed the completion of the new Government Life Building in Wellington, but it is anticipated that the building will be occupied in a few months. As a temporary measure a large wooden structure is being erected in Aitken Street for Government offices, but here again delays in the deliveries of timber have not helped to relieve the problem of providing new accommodation; this building is being erected by day labour under the supervision of this Department. A new building for the Government Life Insurance Department in Nelson and one for the State Fire Insurance Department in Invercargill will also provide accommodation for other Departments, and a three-storied building in Christchurch has been purchased and is being remodelled for a similar purpose.

Other departmental buildings include a large building for the Scientific and Industrial Research Station at Auckland, a new meteorological office at Kelburn, garages and plant depots at Maungaturoto, Gisborne, and Wellington, and extensions of the garages and depots at Whangarei and Rotorua. Staff cottages have been erected and other accommodation provided in the Whangarei, Auckland, Taumarunui, Tauranga, and Gisborne districts, and a number of buildings erected in connection with the Ahuriri development scheme. The restoration of buildings damaged in the recent disastrous floods has been undertaken by this Department and is well in hand.

The Customs building in Wellington is being strengthened; the old building which was originally used as the Railway Head Office is being adapted for other Departments, and the Ministerial residence in Tinakori Road has been converted into two flats.

COURTHOUSES.

Although not as accelerated as anticipated, steady progress is being made in giving effect to the Government's plan for replacement of a number of inadequate courthouses throughout the Dominion. There is still, however, a good deal of work ahead, and the Justice Department and this Department are in close collaboration in respect of all works contemplated and in hand.

The new courthouse at Blenheim is almost completed and will probably be in occupation by the time this report is presented. This building will be noteworthy for its up-to-date heating and air-conditioning plant. This was found desirable owing to the exceptional range of the seasonal temperatures at Blenheim.

One of the principal events of the year was the laying of the foundation stone for the new Law Court Building in Christchurch to take the place of the existing inadequate buildings. A contract has been let for a new courthouse at Invercargill, and the foundation stone was laid on the 31st May last. A small courthouse is now in course of erection at Matainui.

During the year fairly extensive alterations and additions were carried out to the courthouses at Levin and Dargaville.

A number of improvements to heating and acoustic properties in existing courthouses has been carried out during the year. This almost completes a minor programme of the past three years. The principal work carried out under this head during the year was at Gisborne, where complete heating of the courthouse was installed, and at the Magistrates' Court, Wellington, where improvements by means of circuit boosters were carried out. At Timaru improvements to the acoustics of the courtroom have been effected.

The programme of rebuilding courthouses will engage attention for several years to come. The following are the main works in contemplation: At Whangarei a site has been acquired and a commencement will have been made on foundations of a new building before this report is presented; at New Plymouth and Nelson negotiations are in progress for enlargement of the present sites, and it is hoped that plans of a new building for New Plymouth will be in preparation by the end of this calendar year, and that plans for Nelson may be undertaken during the next year; at Thames a new site has been acquired and plans are being prepared, and at Napier a courthouse is under consideration for the near future.

At Wellington there is considerable inconvenience at both Head Office and the Supreme Court through inadequate accommodation. It is frequently necessary for Judges to share rooms. Extensions to the Law Library are also essential. It is proposed to provide additions to the Arbitration Court building, which was designed for such extension. This will enable more suitable accommodation to be provided for the Judges and will relieve the congested staff accommodation at Head Office.

AGRICULTURE.

During the past financial year it was not possible to proceed with the erection of the proposed new building at the Wallaceville Veterinary Laboratory, but its erection is now in hand, and when completed will provide the Veterinary Research staff with the facilities which are essential to the development and performance of the exhaustive programme of research into live-stock diseases which the Government has initiated.

Laboratory accommodation is also being provided at the Mamaku Experimental Farm for the use of the research officers who have been detailed to undertake a special and exhaustive investigation into cobalt and its relation to health of stock.

The investigation and research work being carried out at the Ruakura Farm of Instruction into matters associated with animal husbandry, facial eczema, weed-eradication, and pasture work necessitates the erection of suitable laboratory buildings to house the Chemist, Animal Physiologist, Botanist, and Veterinarian. Provision has therefore been made in this year's estimates for an item to cover the cost of the proposed building.

Other work of major importance that is contemplated is the erection of new staff quarters at Flock House, Bulls. Plans have been prepared, and it is anticipated that the building will be completed during the current financial year.

PRISONS.

The continuance of reduced numbers at all institutions enables existing accommodation to meet the Department's needs. Expenditure during the year, apart from maintenance, has been confined mainly to mechanization of industries, improvements to plant and buildings, and erection of staff cottages. These cottages meet the needs of additional officers appointed consequent upon the introduction

of the forty-hour week. The net expenditure out of Public Works Fund, vote "Prison Buildings and Works," amounted to £9,476.

At Waikeria Borstal Institution and Reformatory improvement to the farm and institution water-supply for domestic, live-stock drinking, and fire-fighting purposes was put under way and is now nearing completion. This has been a necessary major work involving an expenditure of approximately £3,000.

At the Invercargill Borstal Institution the new mechanized laundry has been completed and the roof of the swimming-bath renewed. A newly installed plant now supplies tepid water to the swimming-bath. This important improvement, awaited for thirteen years, will enable the bath to be enjoyed throughout the year, and meets with great appreciation. The boilers for both the laundry and the bath-house at this Institution are capable of burning run-of-mine slack purchased at the mine at 6s. per ton, resulting in a very low fuel-cost.

At Auckland Prison the installation of up-to-date machines in the boot-workshop has displaced the previous method of making footwear by hand. This has resulted already in better and faster work, and also provides vocational experience conducing to the rehabilitation of prisoners upon re-entering the outer world.

The additional staff cottages at Waikeria were completed during the year, and at Paparua Prison several new cottages were nearing completion at 31st March. These will, in the meantime, complete the Department's programme for married staff accommodation.

The meat and milk chilling plant at Waikeria was completed during the year, but some minor defects have deferred the regular use of the plant up to the present.

POLICE-STATIONS.

The gross expenditure on police-stations during the year was £16,086, of which the sum of £5,000 was made available out of the Consolidated Fund towards the renewal and replacement of buildings.

New police-stations to replace buildings which had become unserviceable were erected at Kaeo, Manunui, and Te Whaiti and new offices at Newmarket and Tauranga. Extensive alterations to the Central Police-station at Wellington were carried out to provide much needed and improved barrack accommodation. Houses and land were purchased for police-stations at Manurewa, Papatoetoe, Matawai, and Millerton, and land for police purposes was acquired at Hamilton and Moera.

Many of the police-stations which were built over fifty years ago are now beyond repair and quite inadequate for present requirements. It is necessary to replace them at an early date, and provision in this direction is being made in this year's estimates.

POST AND TELEGRAPH BUILDINGS AND LAND.

The erection of the following post-office buildings was completed during the year: Belfast, Dunedin (chief post-office), Kamo, Kerikeri Central, Kumeu, Mangaweka, Maungaturoto, Mayfield, Omakau, Pahiatua, Queenstown, Thames (chief post-office), Waikari, and Waimana. In addition, residences were erected for the Postmasters at Maungaturoto, Ohaï, Omakau, Oturehua, Putaruru, Queenstown, and Waikari; and a residence was provided for the Superintendent, Awarua-Radio, and for the staff at Oturehua. Other buildings completed were an automatic telephone exchange at Napier; combined line-depot and garage buildings at Eketahuna, Levin, Pokeno, Queenstown, Te Awamutu, and Wakefield; and a line-depot, garage, and workshop building at New Plymouth; line-depot, garage, battery, and power buildings at Rotorua; garages at Bulls, Hamilton, Morrinsville (two), Patea, Reefton, and Winton; cable-repeater stations at Blind River (Seddon) and Lyall Bay (Wellington); a power and battery building at Greymouth, and a small rural automatic telephone exchange building at Porirua.

Alterations providing for improved accommodation were carried out at a number of offices, and substantial additions were made to the automatic telephone exchange building at Hamilton and the post-office buildings at Dunedin North, Epsom, Kilbirnie, Kingsland, Mount Eden, and Waimate.

During the year several buildings and sites at various places which were no longer required were disposed of, and in some cases portions of post-office sites were disposed of to the local authorities for street purposes. Seven buildings at various places were demolished in order to make room for new buildings. Some thirteen sites and three buildings were acquired for departmental purposes.

At the end of the financial year the following buildings were in course of erection : Amberley (line-depot and garage), Avondale (post-office), Christchurch (chief post-office, first block), Clyde (line-depot and battery building), Devonport (post-office and garage), Gisborne (line-depot and garage), Huntly (line-depot), Invercargill (chief post-office), Kaipara Flats (residence for Postmaster), Linwood (post-office and quarters), Little River (post-office and quarters), Mangaweka (residence for Postmaster), Milton (post-office and quarters, and line-depot and garage building), Sumner (post-office and quarters), Tauranga (post-office), Waiau (Postmaster's residence), Wellington (office building and line-depot).

Also in progress were large additions to the chief post-office building at Oamaru and the post-office buildings at Newmarket and Te Awamutu ; additions to the post-office buildings at Geraldine, Mount Albert, Taradale, Te Akau, Waimauku, and Wakefield ; alterations to the Wellesley Street (Auckland) post-office building, and the conversion to a lineman's residence of the old post-office building at Maungaturoto.

The Post and Telegraph Department's building programme for the financial year 1938-39 will be equally large, plans having been prepared for new chief post-office buildings at Hamilton, New Plymouth, and Wanganui ; for large additions to the chief post-office buildings at Auckland and Palmerston North ; and for post-office buildings at Grey Lynn, Otorohanga, Owaka, St. Albans, and Te Kuiti. In addition, plans are in preparation for post-office buildings at Lower Hutt, Taupo, Waipawa, Wellesley Street (Auckland), and Whakatane, and also for additional residences, telephone-exchange buildings, line-depot and garage buildings, and additions to existing post-office buildings.

MENTAL HOSPITALS.

Work in connection with Kingseat Mental Hospital continues to occupy a major part of the programme, the most important item being the new Hospital Block. This will be a typical example of modern hospital design, peculiarly adapted to mental-hospital requirements. Other works at Kingseat include new residences for the Medical Officer and the Engineer, oil-store, bakery, and butchery complete with equipment, and a mortuary. Telephone and fire-alarm systems have been installed throughout.

New construction also includes extensive additions to the Nurses' Home at Avondale, a residence for the Assistant Medical Officer, a mortuary and farm buildings at Tokanui, new store block, boiler-house, and workshops complete with equipment at Porirua, Nurses' Home at Ngawhatu, bakehouse and extensions to other buildings at Sunnyside, and a laundry at Templeton.

Repairs and maintenance generally have been kept up to date, including restoration of fire-damage at Hokitika.

In addition to the building programme, such works as water-supply and drainage, roading, telephone, and fire-alarm systems are installed or extended as required in order that the institutions shall lack no modern conveniences.

HEALTH AND HOSPITAL INSTITUTIONS.

An excellent site has been acquired and provision has been made to cover the cost of this and for initial payments in respect of a modern Obstetric Hospital of approximately forty beds to replace the present St. Helens Hospital at Christchurch.

Improvements at the St. Helens Hospital in Auckland, Wellington, and Invercargill are also provided for.

It is proposed to commence erection of a new sanitarium and bathhouse at Rotorua during the coming year.

A contract has been let for the new hospital for male patients at Queen Mary's Hospital, Hanmer Springs. It is expected that this building will be completed during the coming financial year. Other extensions provided for include boiler-house and laundry, and a new massage and bathhouse block.

A contract has been let for the new Dental Training Clinic in Wellington, and the work is now well in hand and will be completed during the coming financial year. It is also proposed to proceed with the erection of a hostel for dental nurses in training at Wellington.

EDUCATION.

The net expenditure of capital funds on the erection of school buildings, additions, and teachers' residences, and the purchase of sites amounted to £561,944 for the year. This sum includes £15,098 provided by the Consolidated Fund to meet the cost of other small capital works.

The following table shows for the last four years the capital expenditure on school buildings, additions, teachers' residences, and sites:—

	1934-35.	1935-36.	1936-37.	1937-38.
	£	£	£	£
Public schools	35,105	87,908	162,894	331,558
Secondary schools	14,679	23,516	24,092	58,924
Technical schools	12,851	59,350	77,836	97,740
Training colleges .. .. .	..	610	6,730	1,984
Native schools	5,419	8,399	12,172	34,180
University colleges .. .. .	..	..	3,022	39,086
Massey Agricultural College .. .. .	..	..	525	..
Child-welfare institutions .. .. .	..	221	..	351
Special schools .. .. .	..	..	2,473	312
School for Deaf, Sumner .. .. .	..	..	..	4,841
Kindergartens .. .. .	..	..	..	881
Gross total	68,054	180,004	289,744	569,857
Less credits-in-aid	10,894	48,547	7,848	7,913
	<u>£57,160</u>	<u>£131,457</u>	<u>£281,896</u>	<u>£561,944</u>

ESTABLISHMENT OF AERODROMES AND SUBSIDIARY SERVICES.

Air transport has assumed a position of considerable importance throughout the Dominion, especially where speed is required or difficult country has to be traversed, and during the past year considerable progress has been made with the work of establishing aerodromes, landing-grounds, and other facilities which are essential to its development.

No very extensive alterations to operating air services were initiated during the year, except that East Coast Airways extended its service between Gisborne and Napier to connect with Union Airways at Palmerston North, and Air Travel, Ltd., now operate regularly in South Westland as far as Jackson's Bay. The steady growth of traffic due to increased patronage and more frequent schedules on existing services is shown in the following table:—

Quarter ending.	Length Air Lines (Miles).	Distance flown (Miles).	Passengers.		Freight.		Mail.	
			Number.	Passenger-miles.	Pounds.	Ton-miles.	Pounds.	Ton-miles.
31st March, 1936 ..	1,108	188,300	5,440	563,000	7,090	356	6,400	348
30th June, 1936 ..	1,108	168,600	5,050	554,000	8,500	369	19,900	1,621
30th September, 1936	1,108	163,100	4,750	540,600	8,660	449	25,550	2,245
31st December, 1936	1,108	187,300	6,130	705,000	13,770	633	33,560	2,889
31st March, 1937 ..	1,114	257,965	8,386	874,000	13,180	596	32,340	2,533
30th June, 1937 ..	1,566	249,582	7,351	770,000	16,500	661	36,800	2,883
30th September, 1937	1,566	302,000	9,873	1,265,000	17,700	838	48,100	4,011
31st December, 1937	1,671	390,629	12,600	1,725,000	27,700	1,229	68,500	5,755
31st March, 1938 ..	1,712	388,906	13,958	1,758,000	29,800	1,573	62,800	5,556

A notable feature of air-service operation has been the regularity and safety achieved and the very few schedule runs which have been cancelled.

With the completion of new aerodromes and the improvement of existing ones it is anticipated that extensions to present air-lines and some entirely new main or feeder services will be placed in operation during the summer of 1938-39. To this end concentration has been centred during the year particularly on developing flying-fields and other facilities and aids to navigation that will provide for such new services and improve conditions on the existing ones.

At June, 1938, a total of 53 aerodromes and landing-grounds were licensed for regular operation. On 27 of these enlargement or improvement work was in hand during the year, while an additional 14 new fields were under construction with a view to licensing. In addition, 9 fields, of which improvement work is in hand on 7, are maintained and available as Government emergency-landing grounds, and 4 additional fields are to be developed immediately. Investigations, detailed surveys, and construction proposals for many other fields have been considered with a view to their development in the future, either as licensed aerodromes to augment the network serving air-transport needs or as emergency-landing grounds.

Another major activity has been the provision of radio facilities, undertaken in conjunction with the Radio Section of the Post and Telegraph Department. Work on the first of the special radio-stations for aircraft service was commenced in June, 1937. There are now thirteen stations in operation, and the service given during the past year has been very satisfactory. Also there are eleven receiving and direction-finding stations in various stages of construction, while plans are in hand for the first of the radio approach beacons, to be located at Taieri Aerodrome.

Other avenues in which the Department is associated in relation to air transport are: Compilation of the *New Zealand Air Pilot*; notices to airmen affecting aerodromes; aviation strip maps; air photography; collection and compilation of meteorological data; and the inspection of aerodromes for licensing purposes.

A temporary aeradio and meteorological reporting station has been established on Raoul Island in the Kermadec Group, and steps are being taken to proceed with the establishment of a permanent station.

The large expansion in the Royal New Zealand Air Force establishment has involved much work during the past year and is reflected in the big programme of development-work now in hand on the Air Force stations. The existing station at Wigram is being developed as a flying training school and that at Hobsonville as an aircraft base and repair depot. The establishment of a new operations station at Ohakea, near Bulls, has been commenced, and arrangements are in hand to commence immediately a similar station at Whenuapai, in the vicinity of Auckland.

Most of the major work has been let to contractors, after the calling of public tenders and modern excavating machinery has been utilized, while for those works undertaken by the Department itself similar methods have been used wherever practicable.

The total sum spent on aerodrome and air-route development during the year ending 31st March, 1938, was £276,300. Of this sum, £228,000 was provided from the Consolidated Fund, vote, "Aerodromes and Landing-grounds," the balance, comprising approximately £30,000, from the Employment Promotion Fund, £5,000 from the Civil Aviation vote, and miscellaneous small recoveries. In addition to the work indicated above, the Department designed and carried out or supervised the construction of buildings, structures, services, and facilities on the New Zealand Air Force Stations, the funds for which were made available from votes controlled by the Air Department.

TELEGRAPH EXTENSION.

The expenditure on telegraph extension by the Post and Telegraph Department for the financial year in respect of telephone, telegraph, and radio facilities throughout the Dominion amounted to £312,260, as against £232,512 for the year ended 31st March, 1937.

An important event during the year was the laying of a second telephone cable across Cook Strait from Lyall Bay (North Island) to Blind River (South Island) in June. The new cable, which is 40.3 nautical miles long, is of the single-core coaxial type designed for high-frequency carrier-current operation, and will permit the simultaneous operation of twenty-three telephone channels and as many as thirty-six two-way teleprinter channels. After the completion of the necessary tests and the delivery of the high-frequency terminal equipment, four telephone channels were established over the new cable in October. These four channels will enable the Department to meet the increasing traffic demands pending the installation of the first instalment of the permanent associated equipment which provides for a total of seven telephone channels. It is expected that the full equipment necessary for the additional circuits will be installed and ready for service in June or July, 1938.

The long-distance toll service was further improved during the year by the installation of a three-channel carrier-telephone system between Wellington and Christchurch. This system is being operated over the new coaxial telephone cable between Wellington and Seddon, and thence over one of the open aerial metallic circuits between Seddon and Christchurch. Consequent on the establishment of this carrier system and a new voice-frequency circuit between Wellington and Blenheim, there will become available shortly a total of thirteen telephone channels across Cook Strait. It is proposed that these thirteen channels shall be allocated for use as follows :—

Wellington-Christchurch toll service	Eight.
Wellington-Christchurch voice-frequency telegraph service	One.
Wellington-Blenheim toll service	Two.
Wellington-Blenheim voice-frequency telegraph service	One.
Wellington-Nelson toll service	One.

Two three-channel carrier systems were also brought into operation between Auckland and Whangarei. The installation of these two systems has resulted in the speech-efficiency between Auckland and Whangarei being increased to a high level, while the release of the open-aerial circuits previously in use between those centres has made it practicable to provide improved facilities between Auckland and several other exchanges south of Whangarei. The installation of the three-channel systems has also displaced from service two single-channel carrier systems, and this equipment will be reinstalled at other places in order to effect still further improvements in the North Auckland section of the toll network. In addition, carrier systems were brought into service during the year between the following centres :—

Auckland-Rotorua : One three-channel system.
Napier-Wellington : One three-channel system.
Napier-Dannevirke : One single-channel system.
Masterton-Wellington : One single-channel system
Christchurch-Dunedin : One single-channel system.

Teleprinter equipment for the despatch of telegraph traffic was installed during the year at Thames, which now has a direct teleprinter outlet to Auckland.

In keeping with the remarkable growth of toll and telegraph traffic the number of telephone installations continues to increase rapidly, and the net gain in subscribers totalled 9,706, as against 8,938 for the previous year. The grand total of telephone-stations in the Dominion on the 31st March now stands at the record figure of 192,019, which is 13,420 in excess of the previous year's figure. The following is a brief summary of the more important additions which have been

made to telephone-exchange plant in order to provide for the ever-increasing demands for exchange service and to improve the standard of service for existing subscribers :—

The laying of 1½ miles of underground cable ducts.

The laying or erecting of 50 miles of lead-covered cable containing 10,667 miles of wire for subscribers' circuits.

The erection of 523 miles of pole-line and 5,111 miles of open aerial wire for the connection of telephone-exchange subscribers' stations.

The establishment of 112 public-call offices and pay-stations.

The opening of a new magneto-telephone exchange at Thorpe.

The reconstruction or partial reconstruction of open-aerial systems at a large number of telephone exchanges.

The provision of additional switching-apparatus at 21 exchanges.

The installation of branching multiple switchboard equipment at the Te Awamutu Telephone Exchange.

The replacement of existing switchboards at 16 manual exchanges.

The equipment for the new automatic telephone exchange to be installed at Napier is now arriving in the Dominion and the installation work is being proceeded with. Tenders have been called for the automatic-telephone-exchange equipment to be installed at Gisborne and New Plymouth to replace the existing manually-operated systems; and the initial equipment for two new sub-exchanges to be installed at New Brighton and Mount Pleasant (Christchurch) is due to arrive in the Dominion within the next few months. In addition, extension equipment for the St. Albans (Christchurch), Dunedin (Main), Hamilton, Hastings, Hawera, and Khandallah (Wellington) automatic exchanges is under order, while branching multiple-switching equipment has been ordered for improving the service of a number of the larger manual exchanges.

An extensive rearrangement and improvement in the transmitting-aerial system at Wellington-Radio has been undertaken during the year. At present these aerials are for the most part suspended from temporary wooden poles, but these will be replaced at an early date by steel towers. When these are erected the existing tower, which is in an unsatisfactory condition, will be dismantled. Extensive additions to the building at this station were completed recently in order to provide accommodation for the additional equipment necessitated by the continually expanding services being provided. At Awarua-Radio the 400-ft. tower which was erected in 1913 was dismantled and temporary masts were provided to carry the various aerials pending the making of permanent arrangements.

TOURIST AND HEALTH RESORTS.

The expenditure for the year ending 31st March last was £23,159, as against £16,789 for the previous year.

Major works completed during the year were improvements to the reserve and baths at Morere, extensions to the water and drainage and electrical systems at Rotorua, additions to the Te Anau Hotel and Lake House, Waikaremoana.

Tracks were formed and bridges erected to give better access to some of the scenic attractions of the West Coast of the South Island. Flood-lighting in the Rotorua Gardens was completed and has proved an added attraction.

LANDS IMPROVEMENT.

The net capital expenditure from the Public Works Fund on this class of work and on dairy-industry loans during the year was £152,001, as against £62,672 for the previous period. The actual total expenditure was considerably more, £287,381, there being credits of £135,380, representing local-body contributions and recoveries from revenue funds.

The work carried out under this section of the Department's activities comprises the improvement and control of rivers, reclamation of tidal-flat areas, reclamation of sand-dune country, and drainage schemes.

Some of the more important schemes in hand during the year were the Taupiri and the Te Kawa drainage schemes in the Auckland District, the Ngaruroro and Tutaekuri Rivers control in Hawke's Bay, the Karamea River control scheme on the West Coast, and the Ashley River control scheme in North Canterbury.

Large areas of sand-dune country are being reclaimed or arrested along the west coast of the Auckland and North Auckland districts.

SETTLEMENT OF UNEMPLOYED WORKERS.

The development of land for the Small Farms Board was continued satisfactorily, although the number of blocks was gradually reduced as the Board established and extended its own organization.

The number of men employed on this particular scheme varied throughout the year from 925 to 1,185.

The gross total expenditure from vote, "Settlement of Unemployed Workers," was £460,264, but this figure included wages, part of which were recovered from subsidies provided by the Consolidated and Employment Promotion Funds.

At 31st March, 1938, 73,000 acres were under development, the highest total since the scheme started, and this did not include 27,840 acres in 394 farms already allotted to tenants.

PLANT AND MECHANICAL EQUIPMENT.

For the year under review the Government's policy of mechanization of construction works again shows a striking comparison with the methods adopted in the past, both in the costs of the work performed, time saved in completion of various projects, and the increased number of men absorbed in these national undertakings.

In all cases this plant was purchased on competitive tenders from New Zealand, British, and foreign manufacturers, and the successful selection of machinery suitable for the varied and arduous conditions found in New Zealand is reflected in the actual performances of these machines in the field.

For the information of honourable members, and to emphasize the benefit that has accrued to the country through the Government's policy in this regard, I would quote only a few instances from the outstanding performances by these various modern machines on construction works throughout New Zealand.

On the Kaipara Harbour reclamation works a large crawler-type Diesel tractor and angledozer were used to clear an area of heavy mangrove swamp. The use of the machine not only showed an 83·3 per cent. saving in cost, but is estimated to be twenty times as fast as manual labour for the same work.

At Turangi it was found necessary to cut a channel averaging 40 ft. in width and 3 ft. in depth in the Tongariro River. A large Diesel crawler-type tractor and angledozer were employed for this work, the material excavated including boulders of a size up to $\frac{1}{3}$ cubic yard.

The actual machine cost per cubic yard against the estimated cost by manual methods showed a saving of 97·5 per cent., but as the water of this river is mainly derived from melting snow and ice it has a very low temperature and with a surface velocity of the stream through the cut of 5 ft. per second, the actual employment of manual labour under such extreme conditions would, it is considered, have greatly increased the estimated cost of £1 per cubic yard. Moreover, the men employed would have been subjected to unreasonable working-conditions.

Again, on the irrigation works in Canterbury a Diesel crawler tractor and grader were employed on stripping turf for racebank foundation at a 93 per cent. saving on the cost of manual methods, and, in addition, it is estimated that the machine does this work ten times as fast as a gang of eight men, and makes a better job.

Right through the construction programme in New Zealand to-day the introduction of modern plant, of which the larger units comprise Diesel crawler-type excavators and drag-lines, Diesel crawler-type tractors and road-building equipment, Diesel locomotives, winches, and graders, and pneumatic-tired scrapers, has shown a tremendous saving in cost and time in carrying out the work.

It might be assumed that the use of this large amount of plant would reduce the number of men employed on public works. This is not the case, however, as the Government's policy in mechanizing the construction works absorbs the men available by the increased number of projects that can be undertaken and completed at a cost no greater than what in the past was the cost of one undertaking with manual labour without any assistance from modern equipment.

Actually the average number of men employed has increased, the figures for the last three years being: 1935-36, 12,889; 1936-37, 17,452; 1937-38, 19,881.

In my visits to various works during the year I have had the opportunity of observing the operation and performance of the various types of machines in use. I was exceptionally pleased to see the progress that is being made and the manner in which the machines are functioning. This is attributable in no small degree to the high state of efficiency of the Department's organization and the ability of the machine operators.

HARBOUR-WORKS.

During the year the harbour at Westport was maintained by the Government. Operation of the Port at Waikokopu has been carried out by the Wairoa Harbour Board on behalf of the Public Works Department.

The contract for the new reinforced-concrete wharf at Mangonui was almost completed during the year, and a new wharf was completed at Whangaparapara. General repairs have been carried out to the wharves at Waitaria Bay, Portage, and Little Wanganui Harbour, and a scheme has been prepared for the renewal of a portion of the south training-wall at Hokitika. A survey and preparation for a wharf and access thereto was carried out at Jackson's Bay.

LIGHTHOUSES.

The radio-beacon towers at Baring Head have been erected, the radio equipment has been installed, and a beacon put into operation.

Erection of the power-house at Cape Campbell was completed during the year. Investigations were carried out in connection with proposals to electrify the light and install a radio beacon at Cape Maria van Diemen, Cuvier Island, and Moko Hinau.

Plans for the renewal of the lighthouse at Ponui have been finalized, the new tower has been fabricated, and the erection of the structure will be undertaken at an early date.

Stevens Island.—An engineering survey has been made for the purpose of installing a new tower and radio beacon. A power-house has been designed, all machinery and the steel mast ordered, and the necessary building will proceed immediately.

NATIVE-LAND SETTLEMENT.

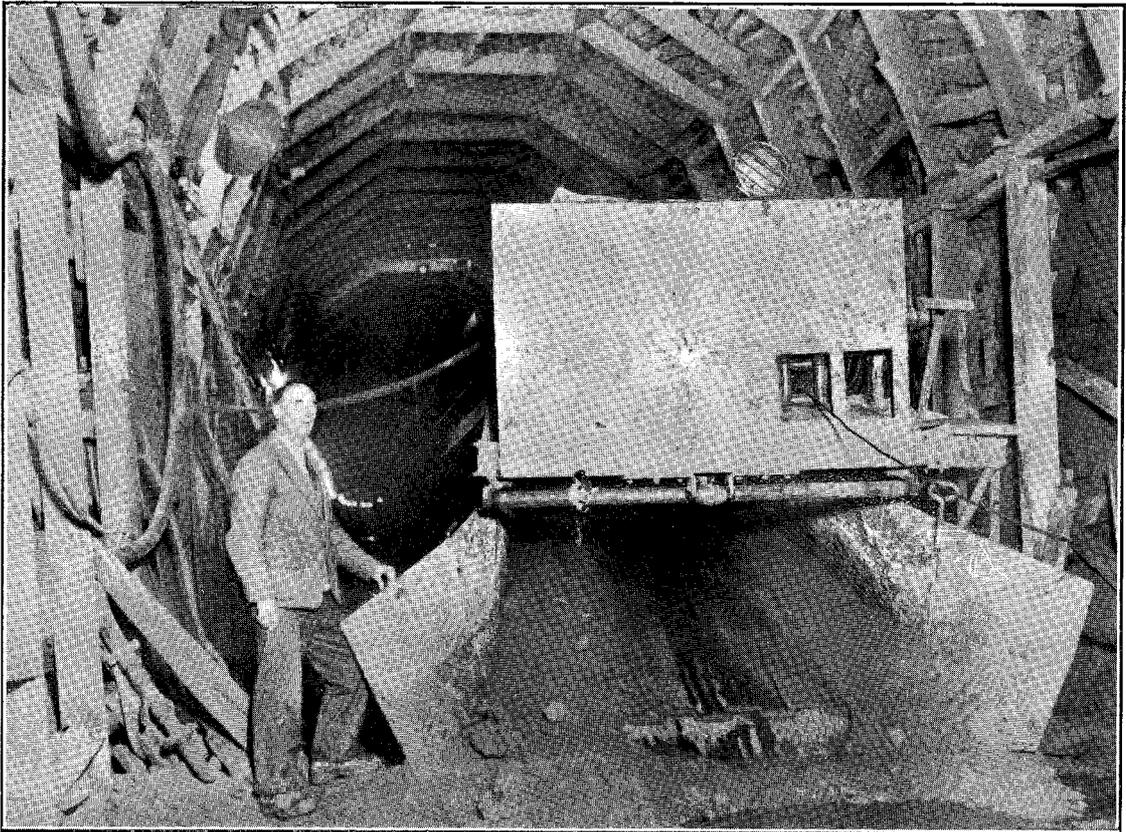
The net expenditure from the Public Works Fund for the year under review was £254,869, as compared with £112,319 for the previous year. The gross expenditure this year was £814,177, as against £521,962 last year. The difference between the gross expenditure and the net capital expenditure this year—viz., £559,308—is represented by grants from the Employment Promotion Fund amounting to £335,500 and farm receipts from Native lands in course of development totalling £223,808.

With the exception of a small amount expended under the Native Housing Act, 1935, the above figures represent expenditure on the development, settlement, cultivation, and improvement of Native lands, and the progress achieved in regard to these activities is indicated in the following statement, which shows the position at the 31st March, 1938 :—

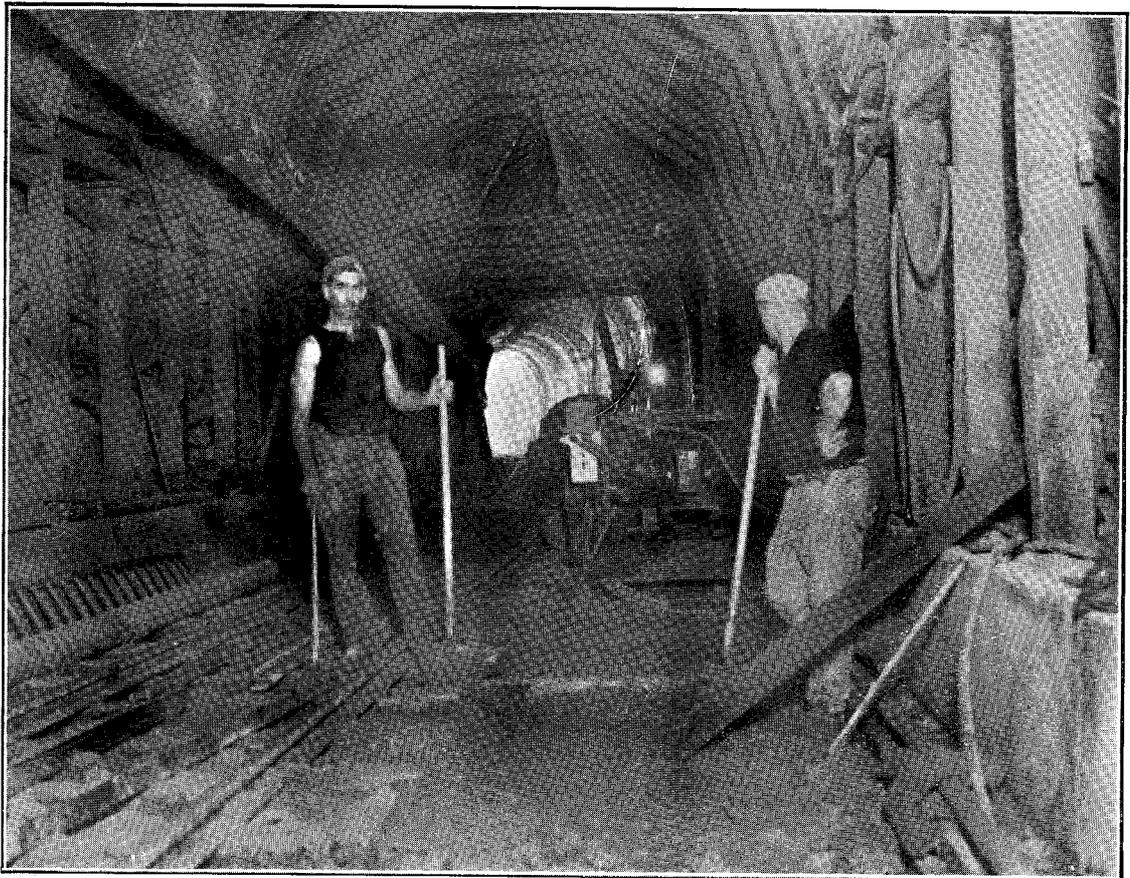
Number of schemes	..	..	..	..	126
Area gazetted for development (acres)	..	..	..	..	801,090
Area under development (acres)	..	..	..	..	214,804
Individual settlers established	..	..	..	..	1,722
Labourers employed	..	..	..	..	3,163
Dependants (excluding settlers and labourers)	..	..	..	..	15,823
Houses erected to date (total)	..	..	..	..	654
Live-stock tallies—					
Dairy stock	..	..	..	..	41,817
Sheep	..	..	..	..	140,327
Run cattle	..	..	..	..	15,653
Receipts for year—				£	
Butterfat	..	..	..	..	93,841
Wool	..	..	..	..	22,903
Live-stock	..	..	..	..	93,991
Sundries	..	..	..	..	13,073
					£
					223,808

The development and settlement of Native lands is directed by the Board of Native Affairs and controlled by the Native Department, and a full report dealing with the operations of the Board and the policy adopted to encourage and assist the Maori to follow his natural calling—the cultivation of the soil—is contained in parliamentary paper G.—10.

During the year the Assistant Under-Secretary to the Department, Mr. H. Arthur, retired on account of ill health after thirty-nine years' service, and I have pleasure in recording my appreciation of his services to the Public Service of this Dominion.

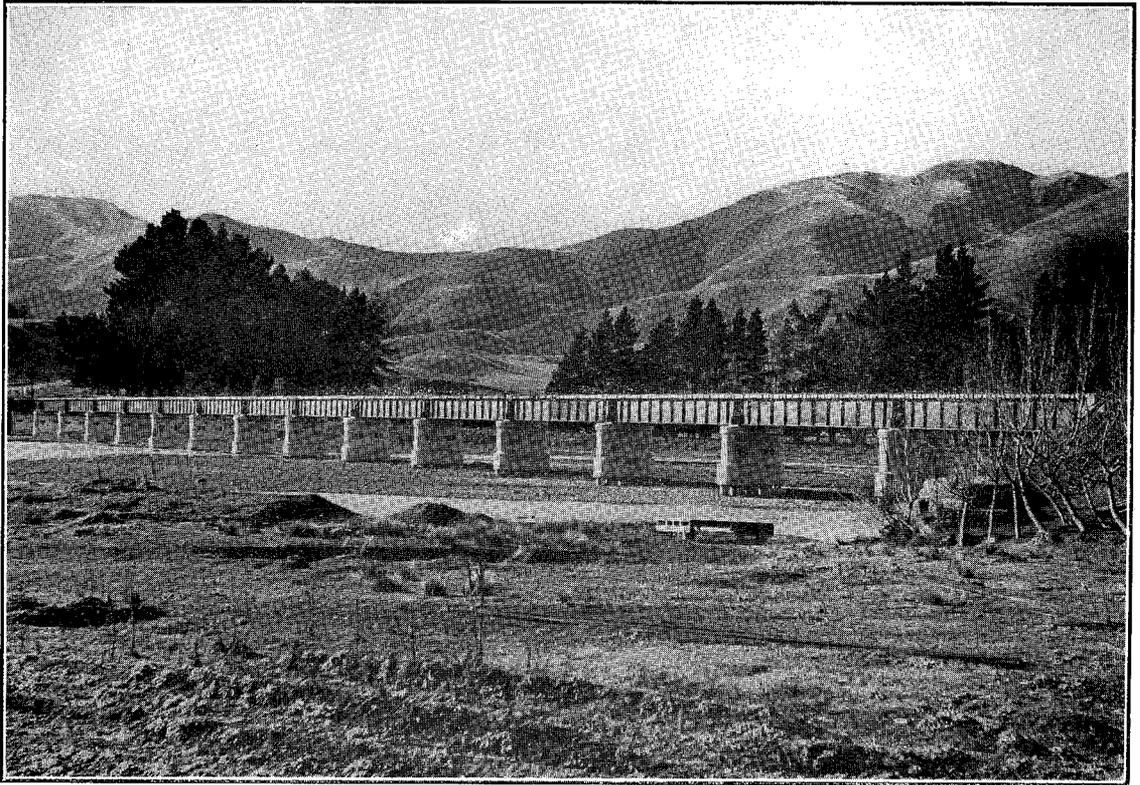


MUCK-SCRAPER SLIDE AND SHIELD USED FOR RAPID CONVEYANCE OF MATERIALS FROM THE WORKING-FACE.

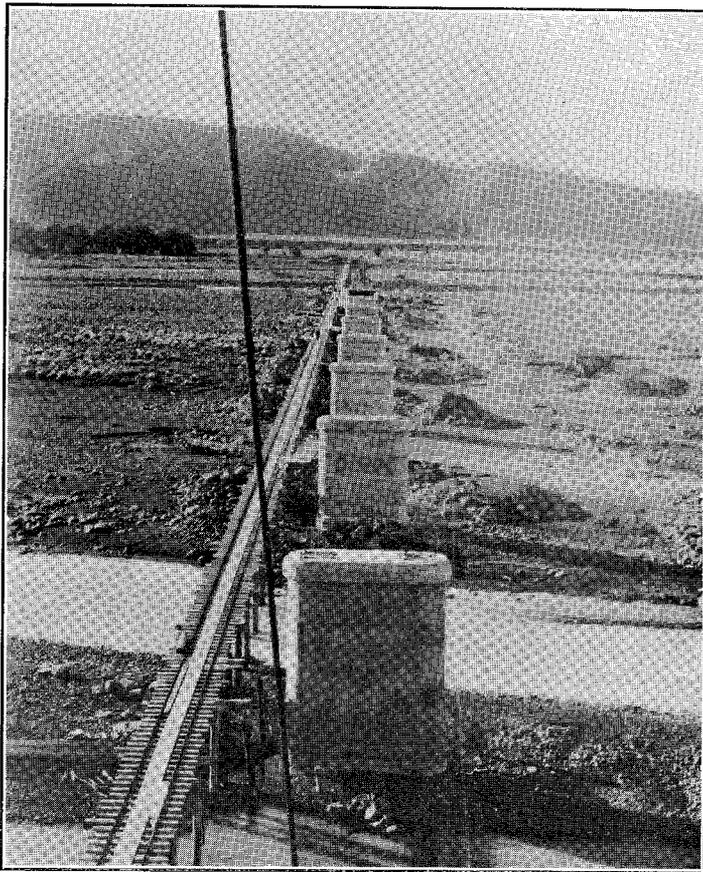


VIEW OF CONSTRUCTION, SHOWING CONCRETE-PUMP IN CENTRE FOREGROUND. NOTE STEEL FORMWORK IN MIDDLE DISTANCE AND COMPLETED CONCRETE LINING IN BACKGROUND.

WAIKOURA TUNNEL, WHARERATA SECTION, NAPIER-GISBORNE RAILWAY.

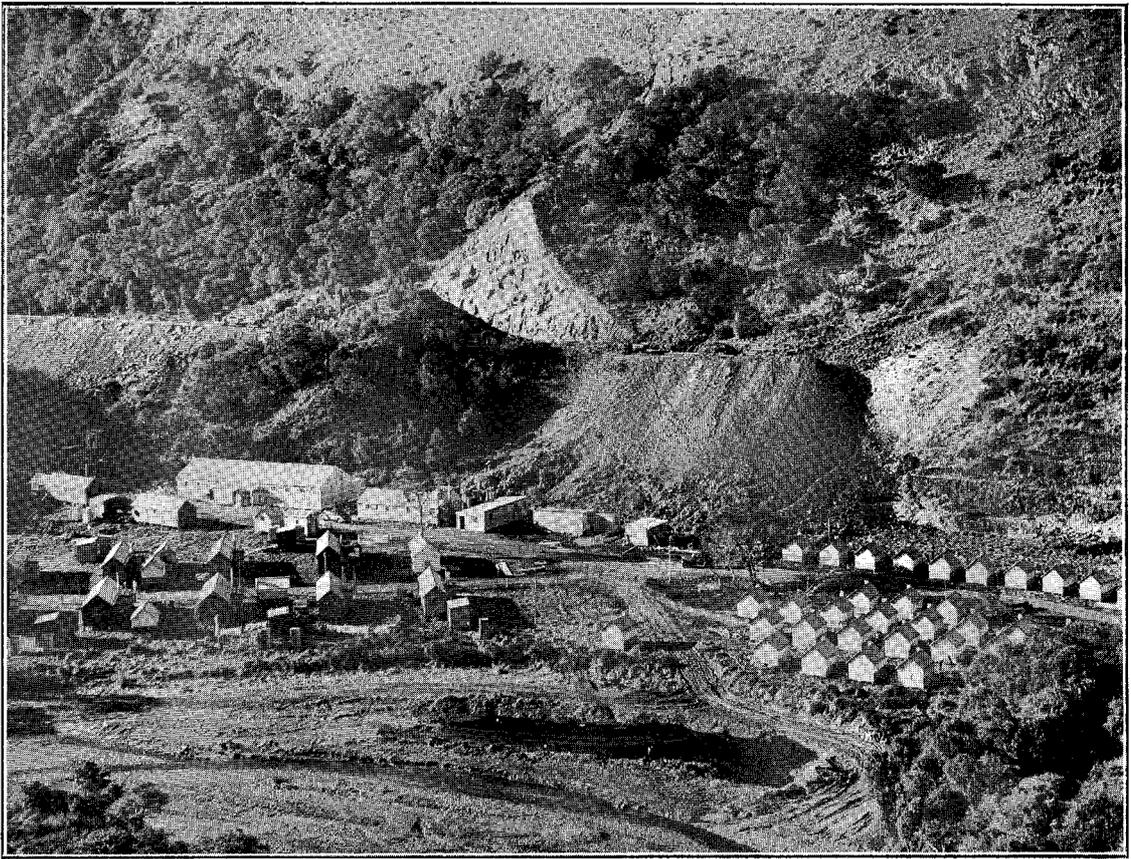


LEADER RIVER BRIDGE. SIXTEEN 45 FT. STEEL PLATE GIRDER SPANS.



CLARENCE RIVER BRIDGE. VIEW SHOWING PIERS
UNDER CONSTRUCTION AND SERVICE TRACK;
LENGTH, 1,530 FT.

SOUTH ISLAND MAIN TRUNK RAILWAY.

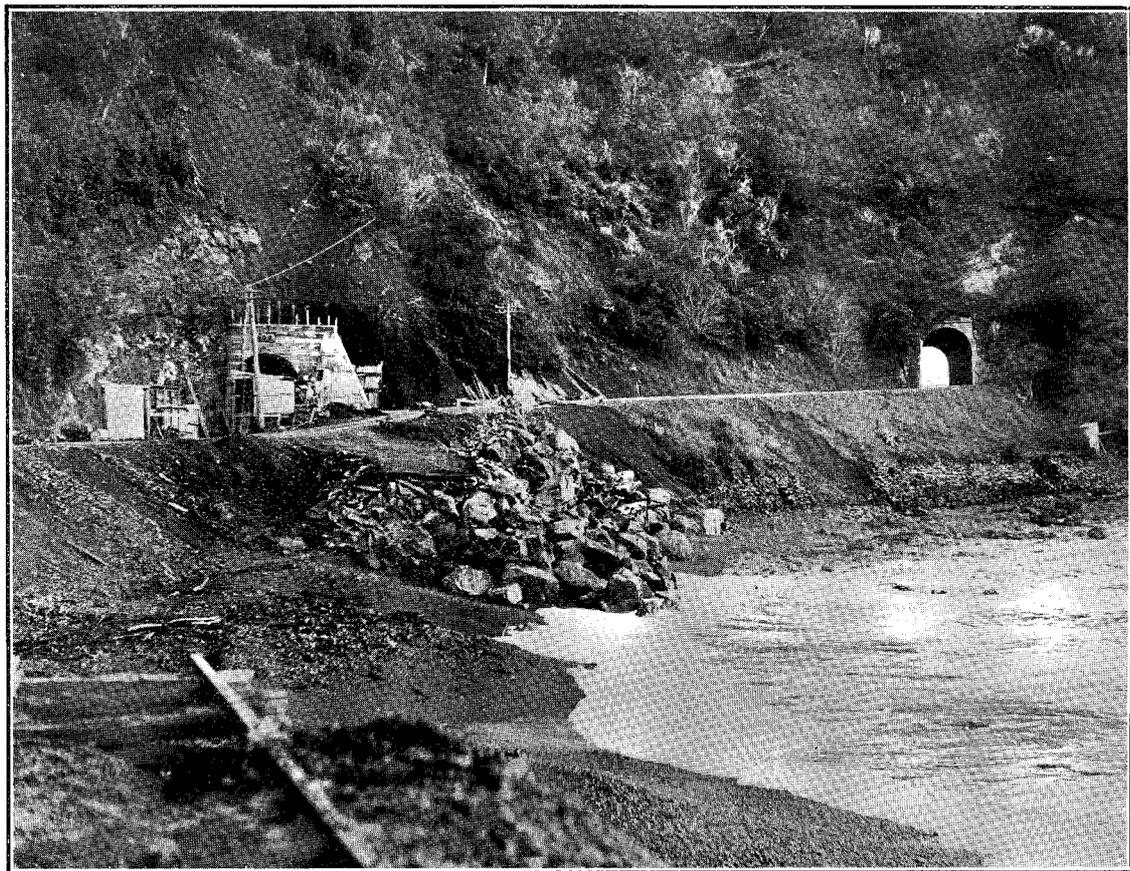


TARATUHI CAMP AT SOUTH END OF AMURI BLUFF TUNNEL.

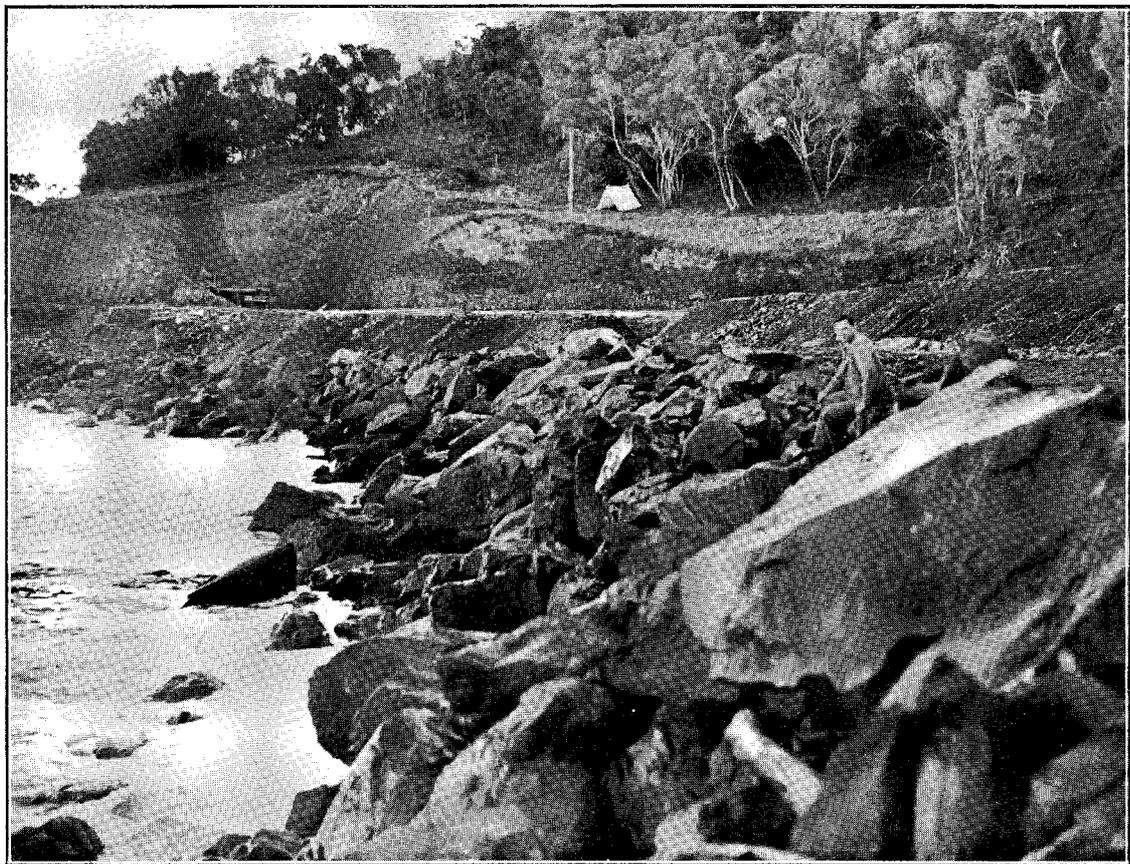


AERIAL VIEW LOOKING UP CONWAY RIVER, SHOWING RAILWAY-FORMATION AND ROAD. P.W.D. CAMP ON RIGHT.

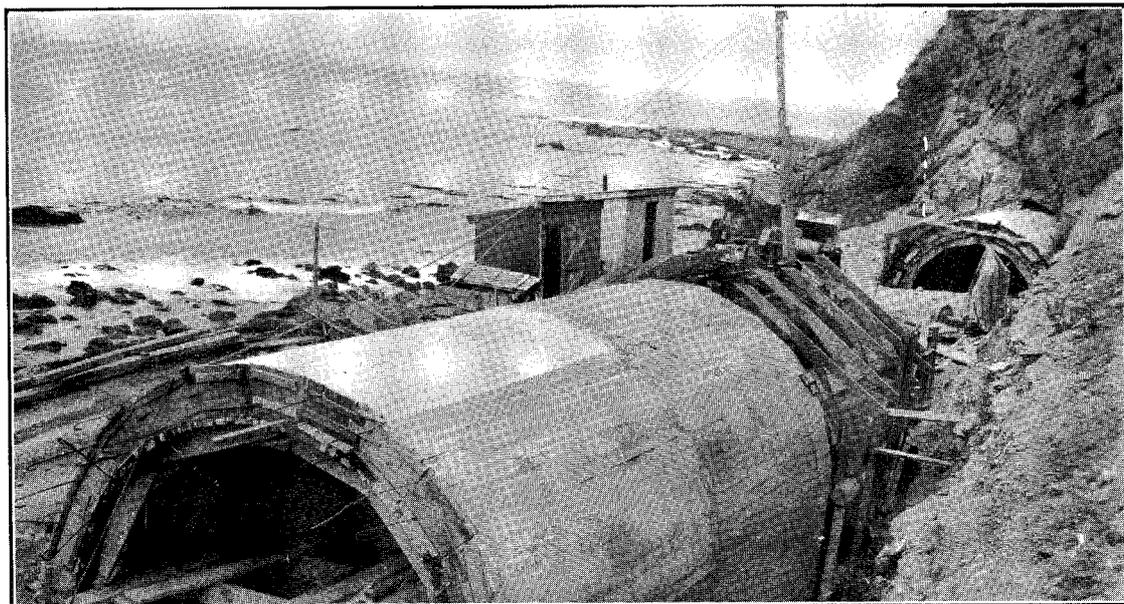
SOUTH ISLAND MAIN TRUNK RAILWAY.



PORTAL OF RAILWAY-TUNNEL NORTH OF GOOSE BAY, AND RAILWAY-FORMATION IN FOREGROUND. ROAD TUNNEL ON RIGHT.

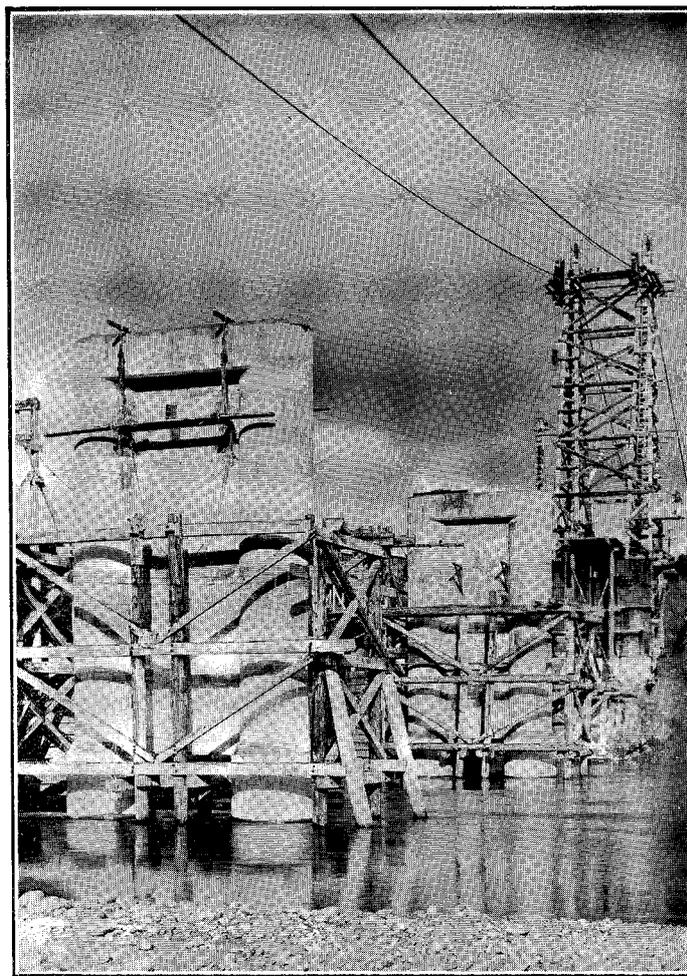


PROTECTION OF RAILWAY-FORMATION FROM THE SEA, NORTH OF OARO.
SOUTH ISLAND MAIN TRUNK RAILWAY.



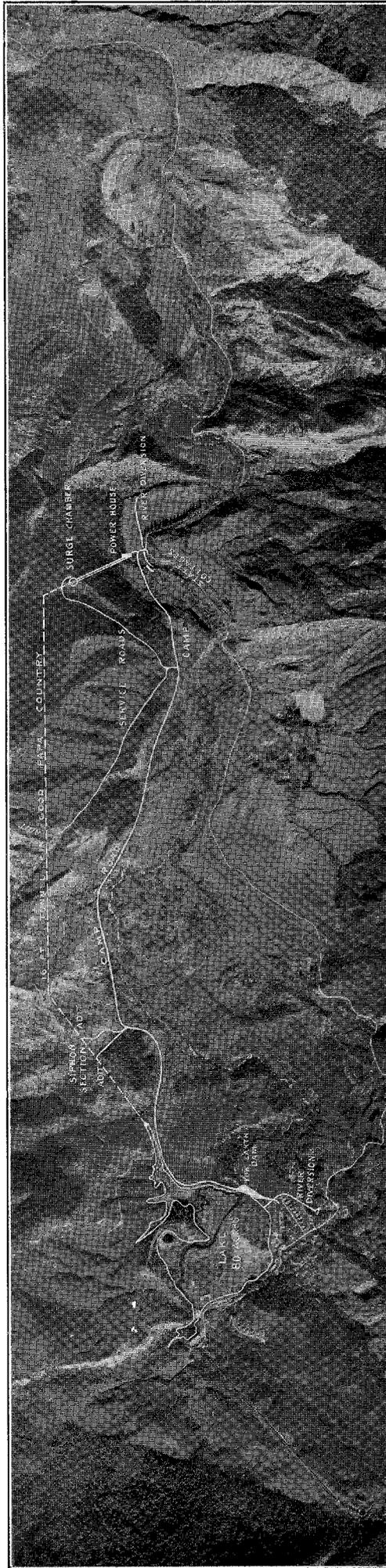
TUNNEL AT 82 M. 1 CH. LOOKING SOUTH. SPECIAL REINFORCED-CONCRETE LINING BEING BUILT PAST BAD SLIP COUNTRY.

SOUTH ISLAND MAIN TRUNK RAILWAY.



BULLER RIVER BRIDGE. PIER-CONSTRUCTION AND ERECTION CABLEWAYS.

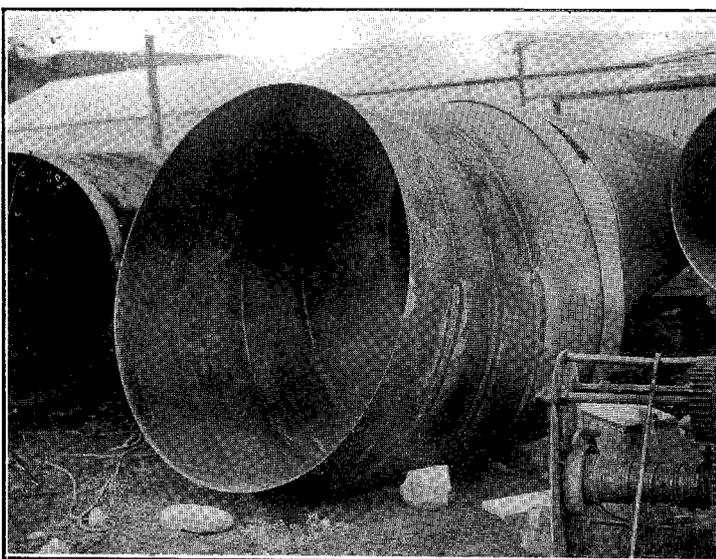
WESTPORT-INANGAHUA RAILWAY.



WAIKAREMOANA: AERIAL VIEW SHOWING LOWER DEVELOPMENT PROPOSALS.



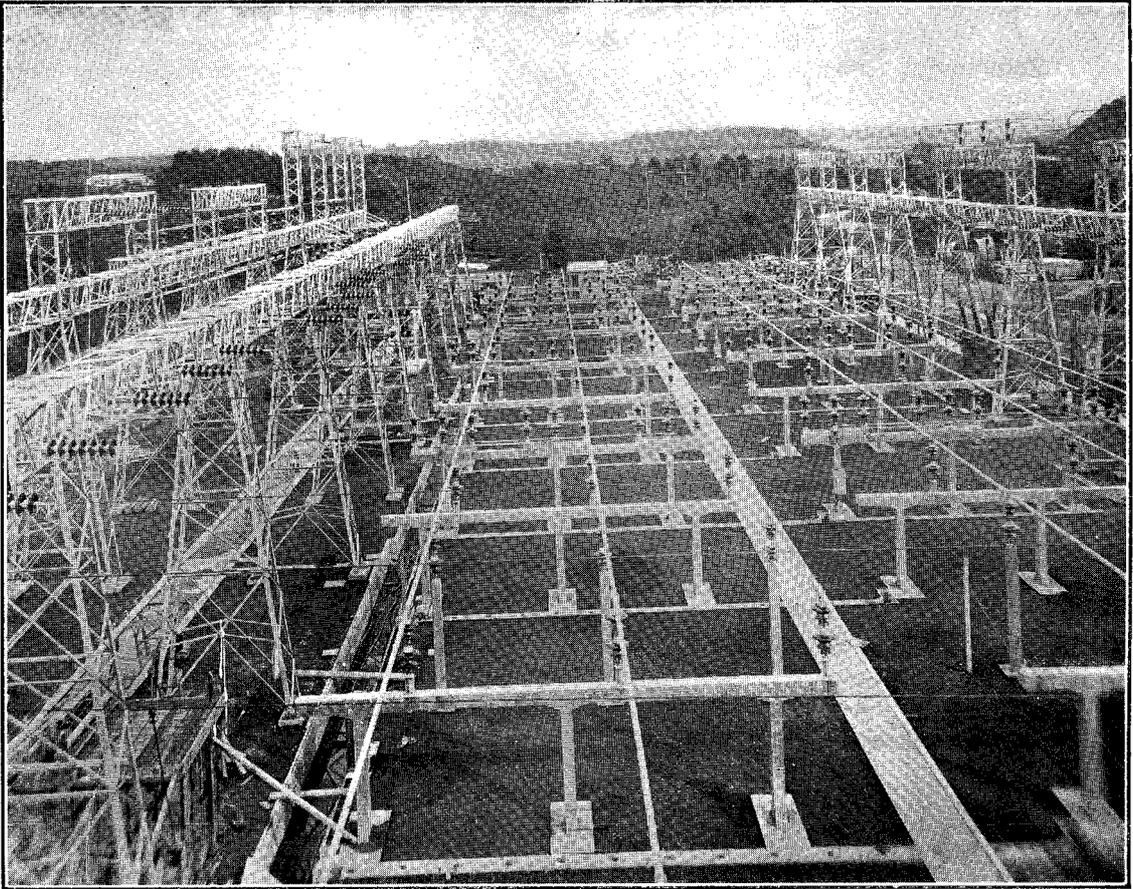
6 FT.-DIAMETER STEEL PIPES READY FOR LINING-UP AND WELDING.



PIPE BEND, SHOWING WELDED CONSTRUCTION.



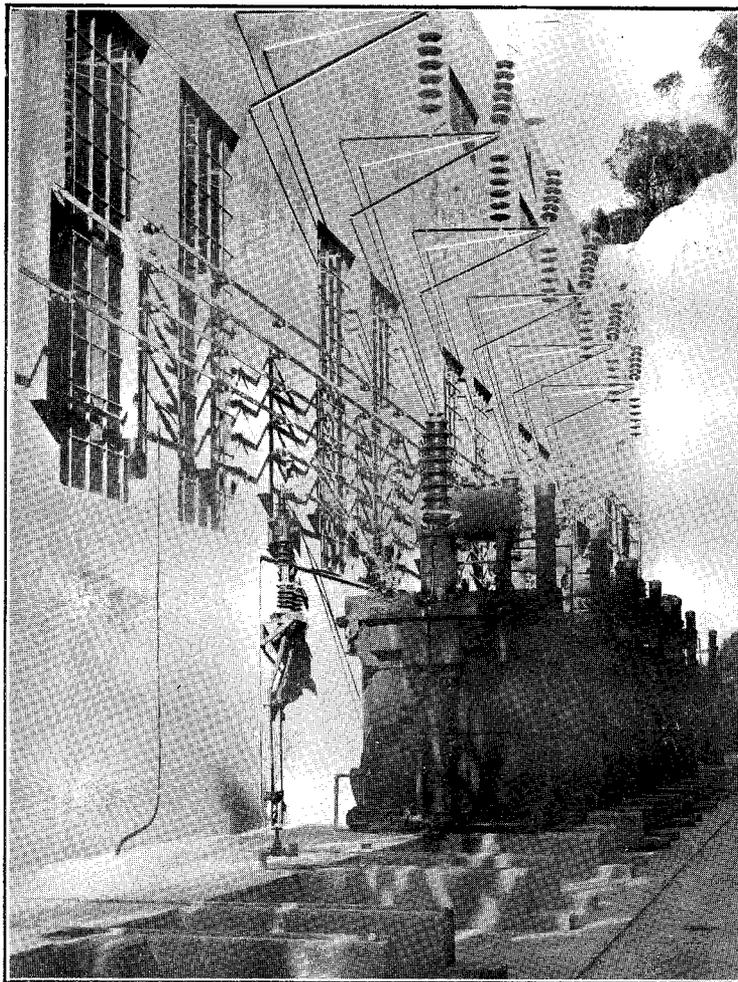
WELDING 6 FT.-DIAMETER STEEL PIPES.
WAIKAREMOANA POWER SCHEME, No. 3
PENSTOCK.



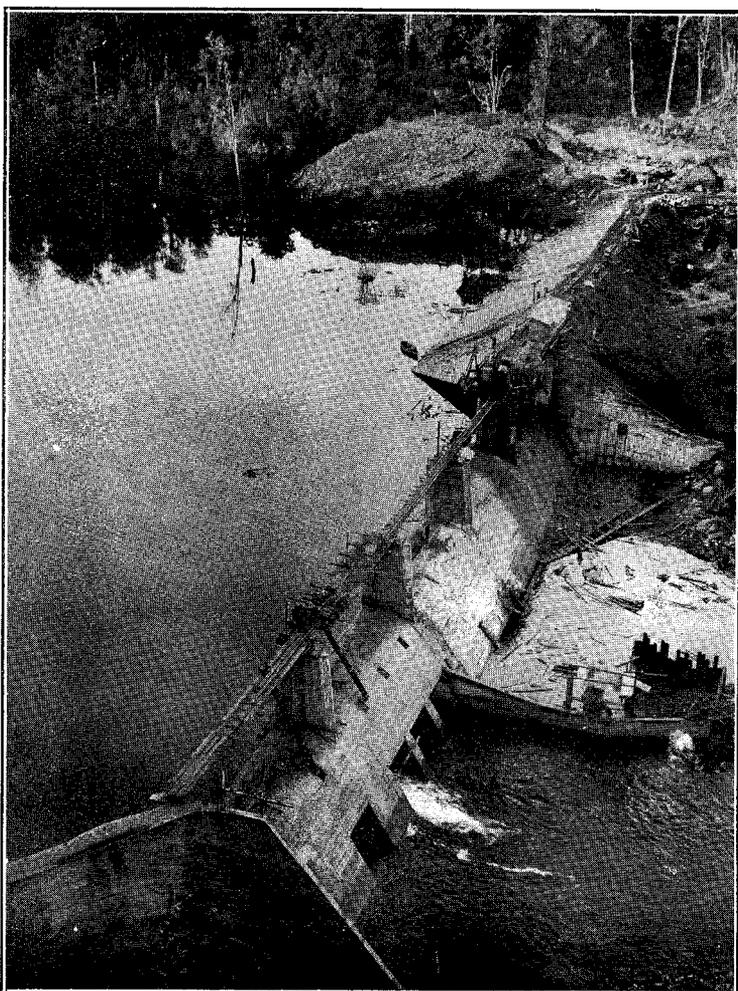
ARAPUNI OUTDOOR SWITCHING-STATION.



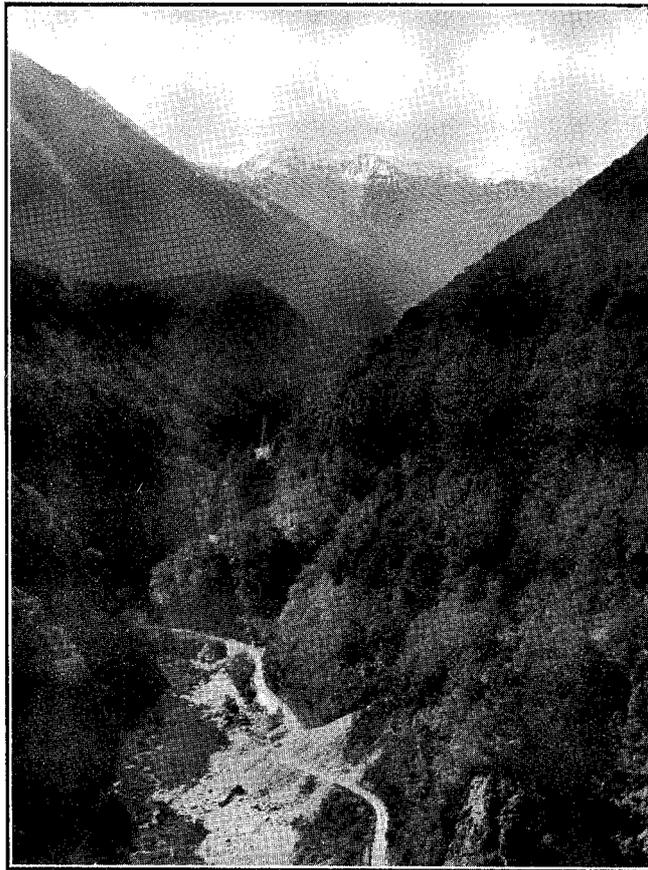
CONTROL-ROOM, ARAPUNI. VIEW SHOWING OLD AND NEW EQUIPMENT.
NORTH ISLAND ELECTRIC-POWER SYSTEM.



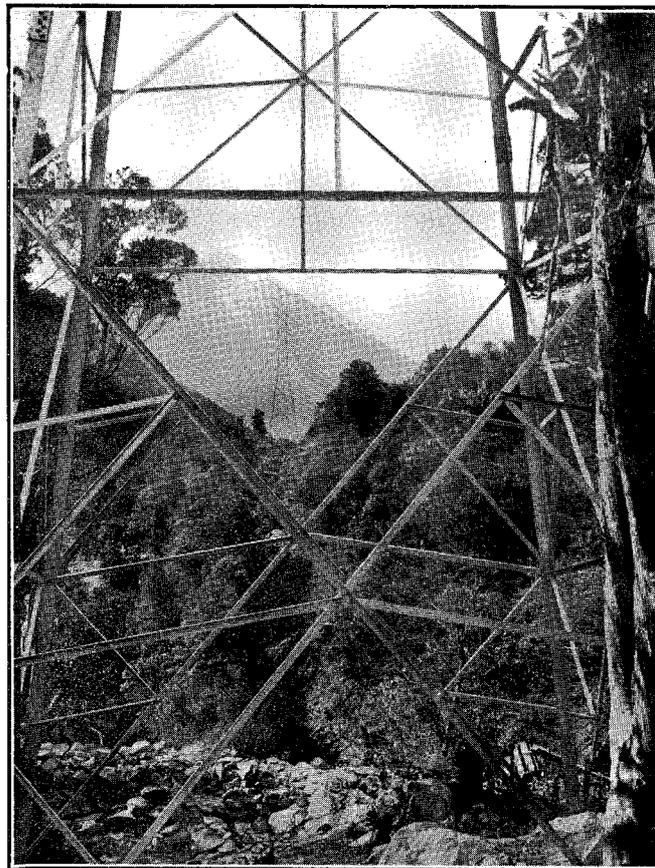
110kV. TRANSFORMERS AND WEST WALL OF POWER-
HOUSE EXTENSION AT ARAPUNI.
NORTH ISLAND ELECTRIC-POWER SYSTEM.



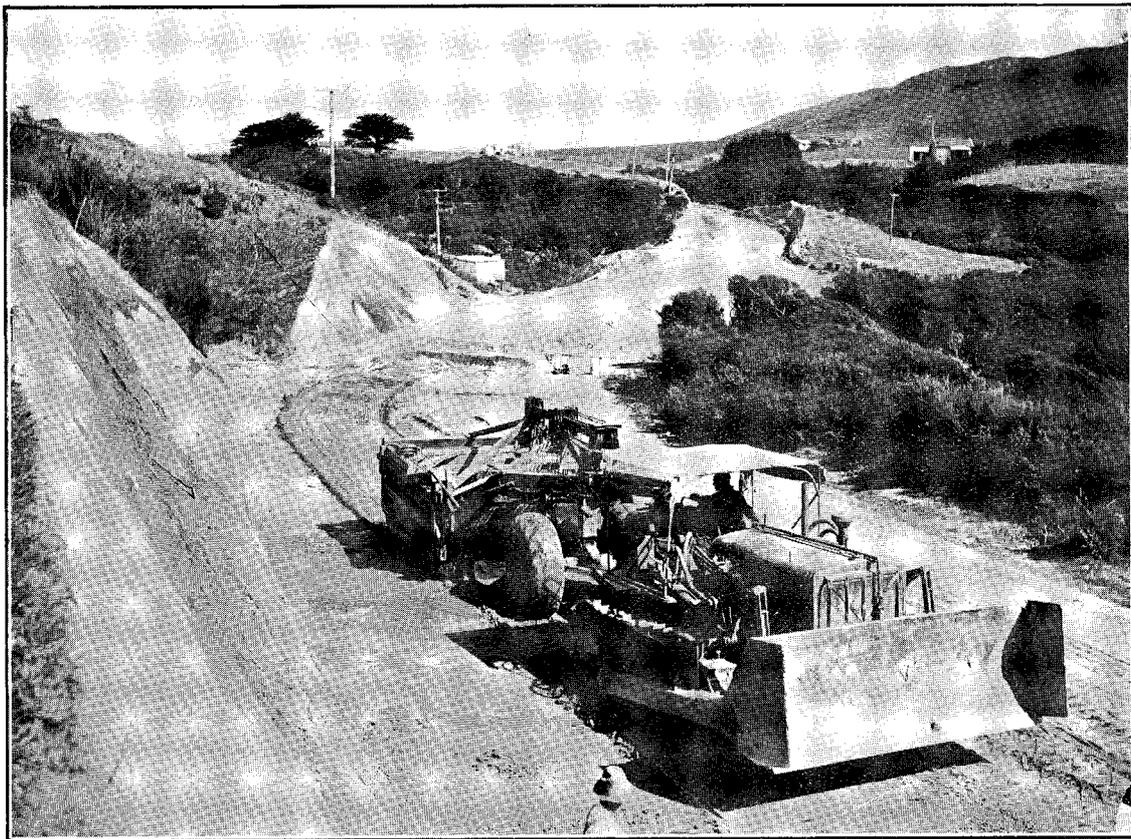
ARNOLD RIVER DAM.
SOUTH ISLAND ELECTRIC-POWER SYSTEM.



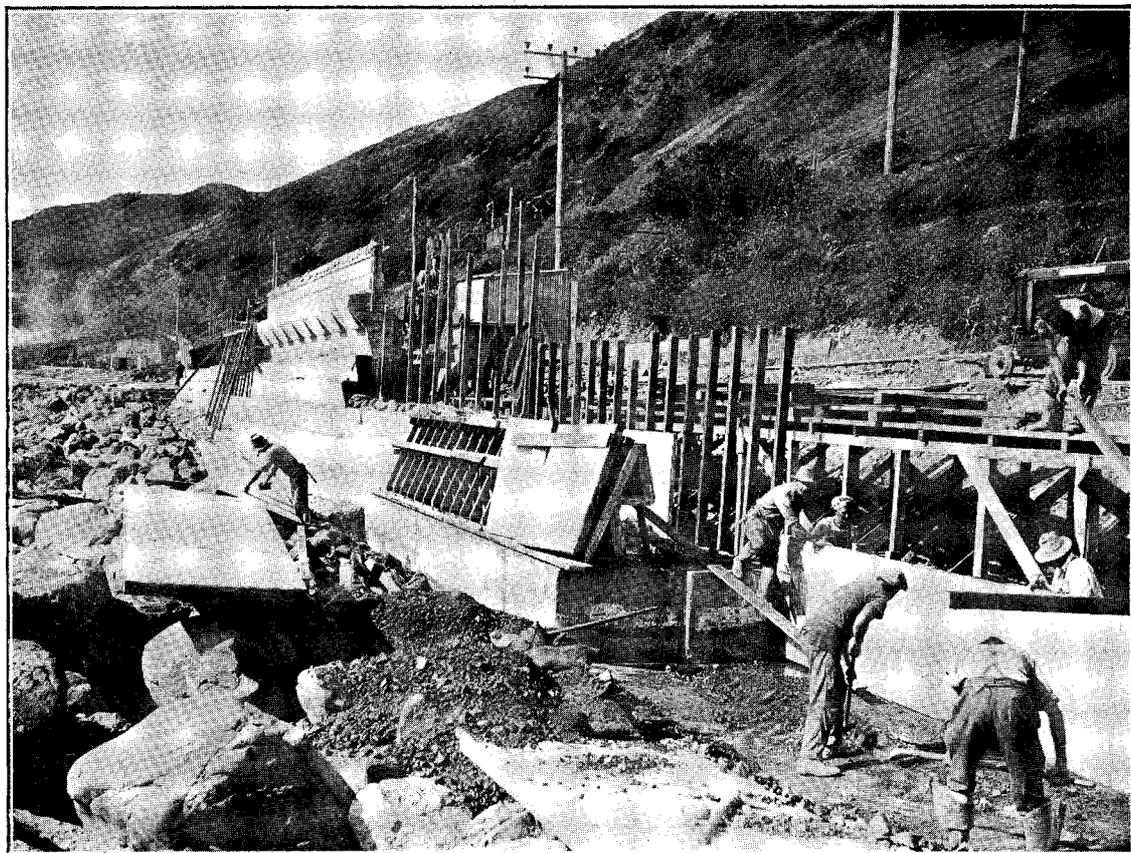
LAKE COLERIDGE-ARAHURA TRANSMISSION LINE,
CARRYING POWER ACROSS THE SOUTHERN ALPS.
VIEW IN OTIRA GORGE.



LAKE COLERIDGE-ARAHURA TRANSMISSION LINE,
OTIRA GORGE.
SOUTH ISLAND ELECTRIC-POWER
SYSTEM.



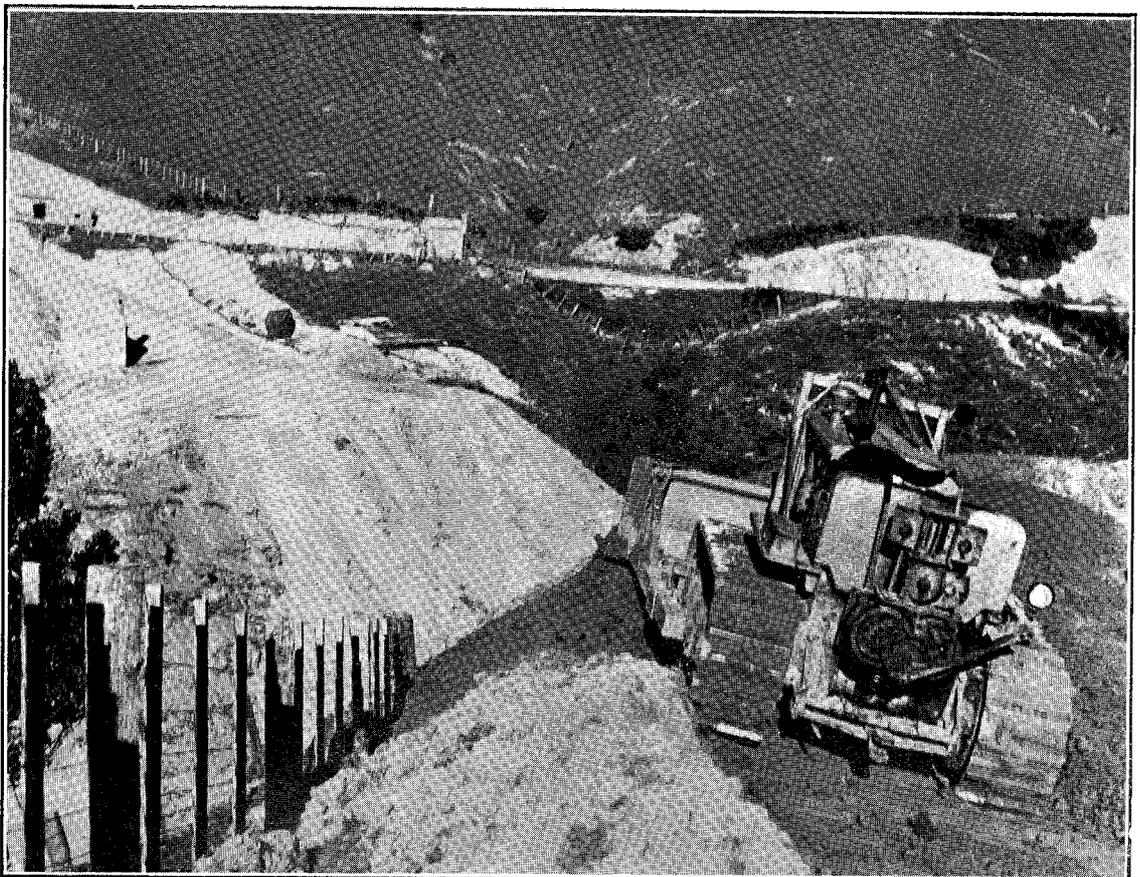
ROAD-FORMATION AND MATERIALS TRANSPORT WITH "CARRYALL," NEAR PUKERUA BAY. NOTE BULL-DOZER HEAD ON TRACTOR.



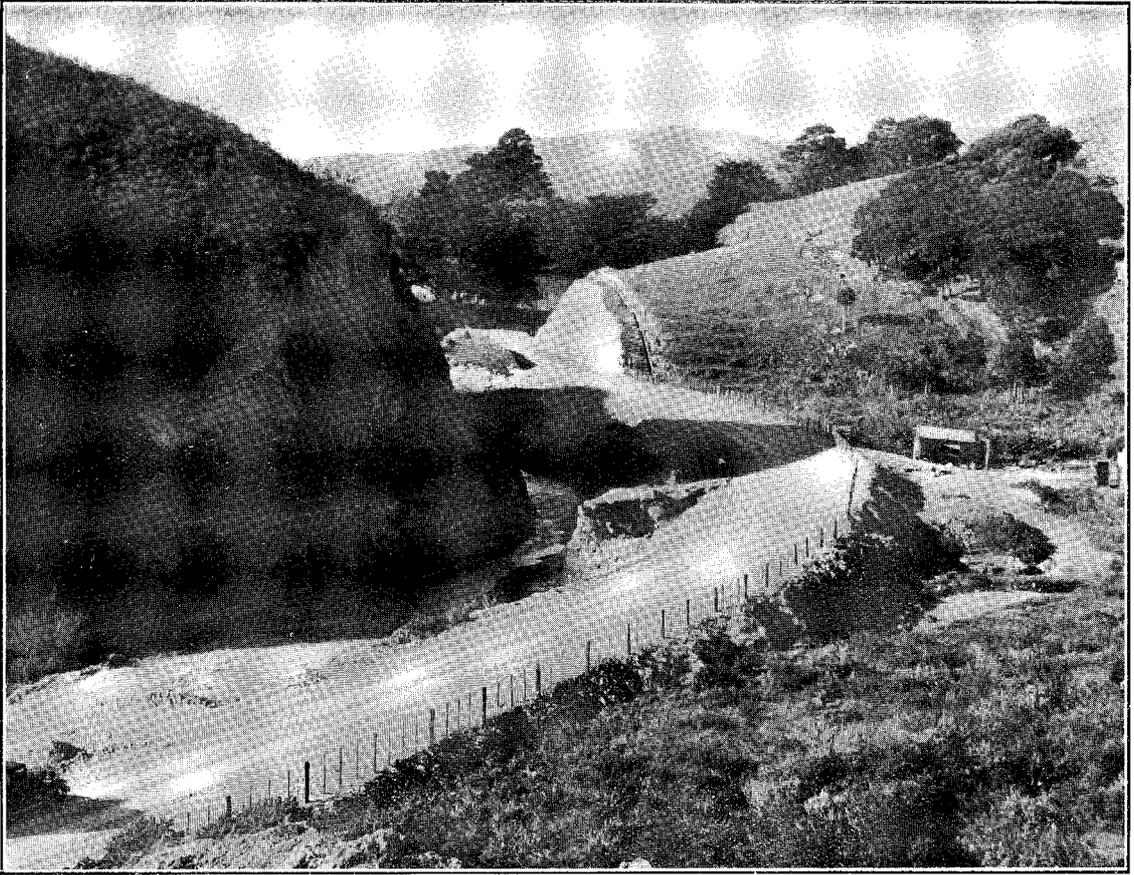
SEAWALL IN COURSE OF CONSTRUCTION.
PLIMMERTON-PAEKAKARIKI ROAD.



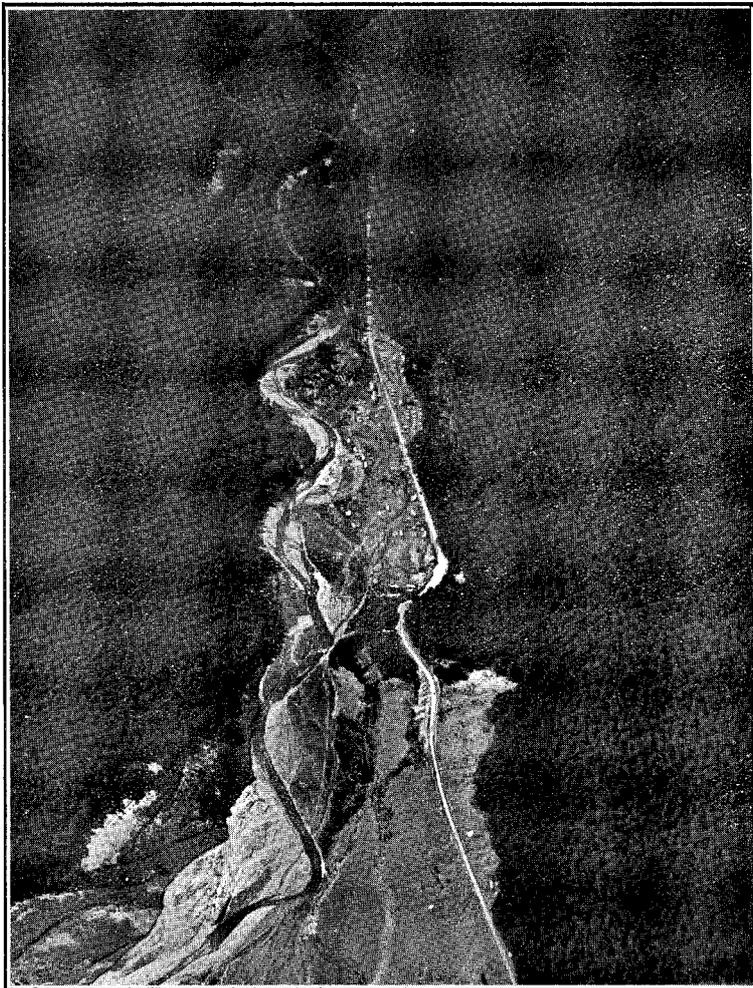
“ ANGLE-DOZER ” OPERATING ON ROAD-FORMATION.



“ ANGLE-DOZER ” OPENING UP A CUTTING AND FORMING A BANK.
HAYWARDS-PAHAUTANUI ROAD.

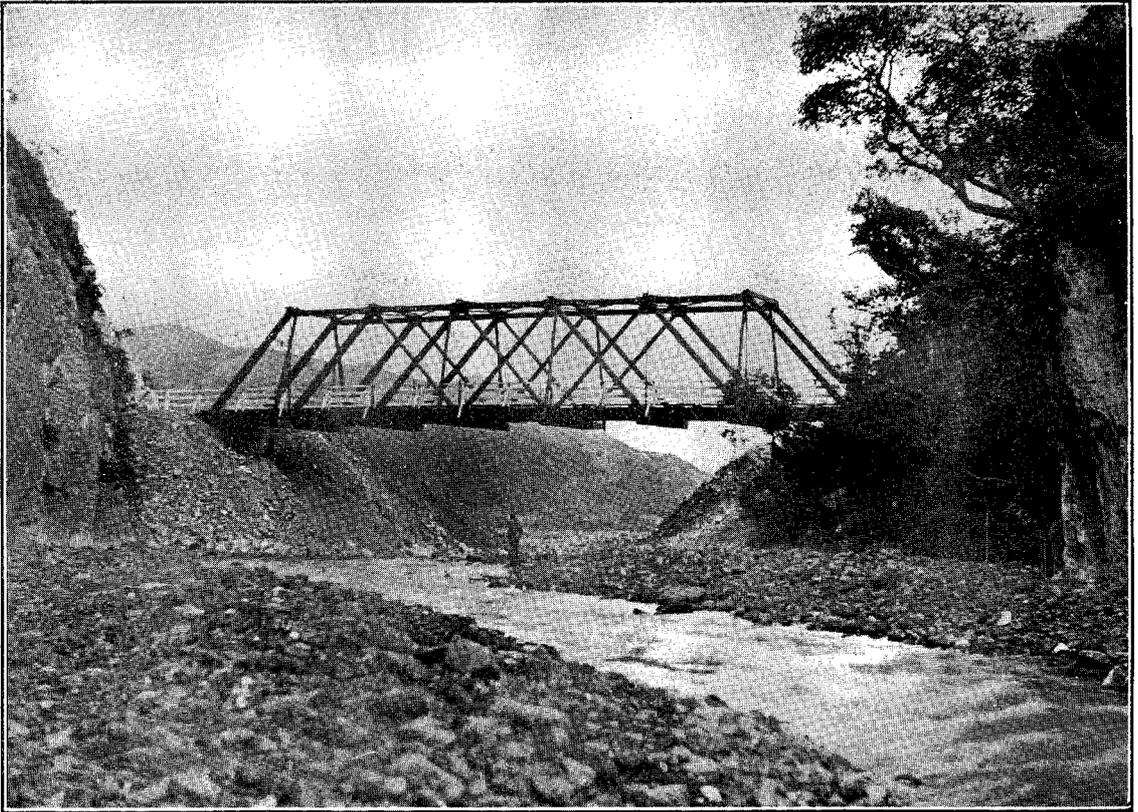


ELIMINATION OF TWO BRIDGES BY STREAM-DIVERSION.
HAYWARDS-PAHAUTANUI ROAD.

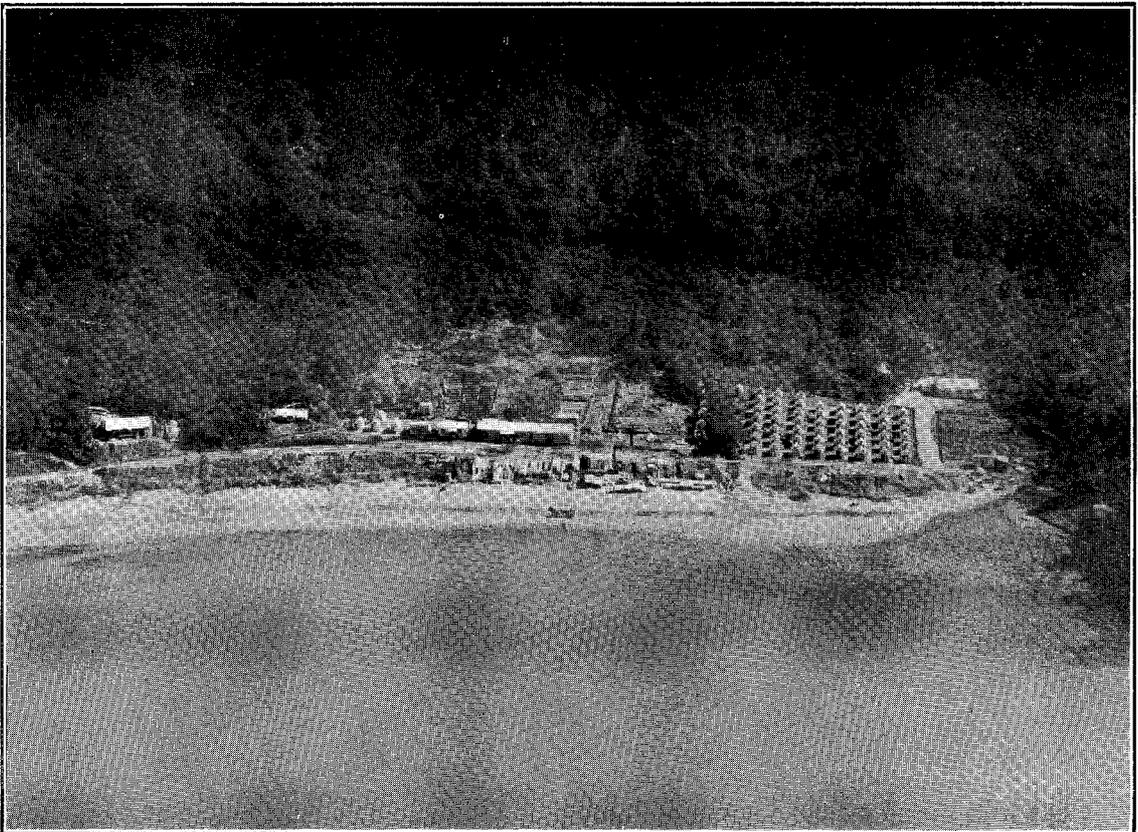


AERIAL VIEW SHOWING MAIN P.W.D. CAMP ON
CANTERBURY SIDE OF LEWIS PASS.
LEWIS PASS ROAD.

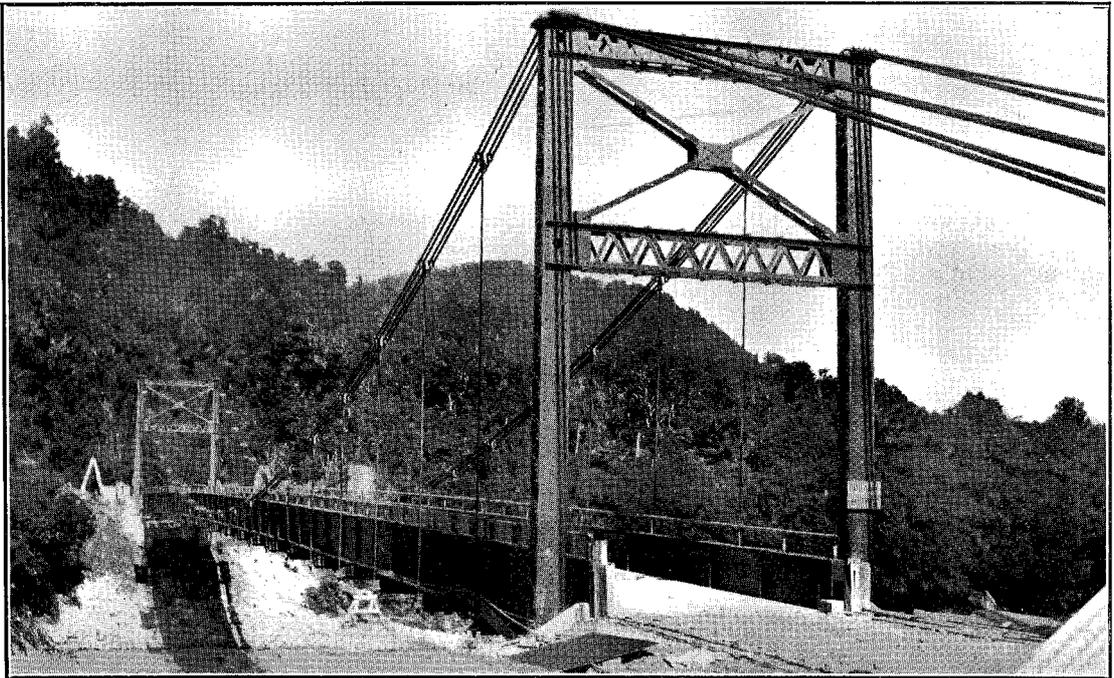
D.—1.



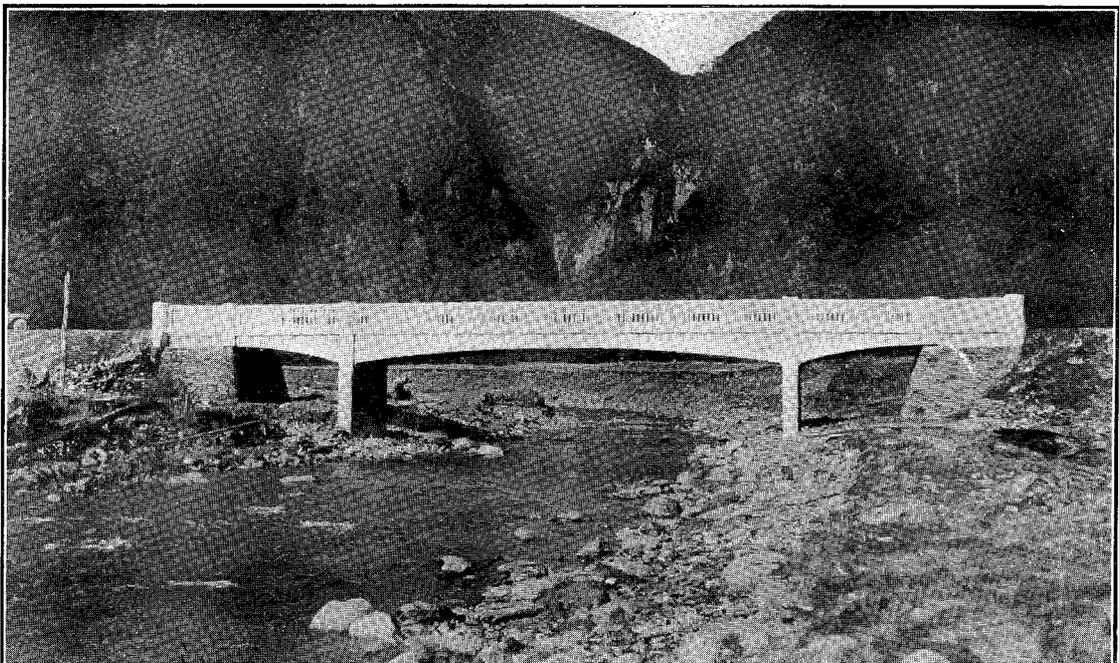
PUHIPUHI RIVER ROAD BRIDGE, 110 FT. TIMBER TRUSS SPAN, 10 FT. 6 IN. ROADWAY.
KAIKOURA COUNTY.



AERIAL VIEW SHOWING CAMP-SITE, AND MATERIALS STACKED FOR
WHARF-CONSTRUCTION.
JACKSON'S BAY.

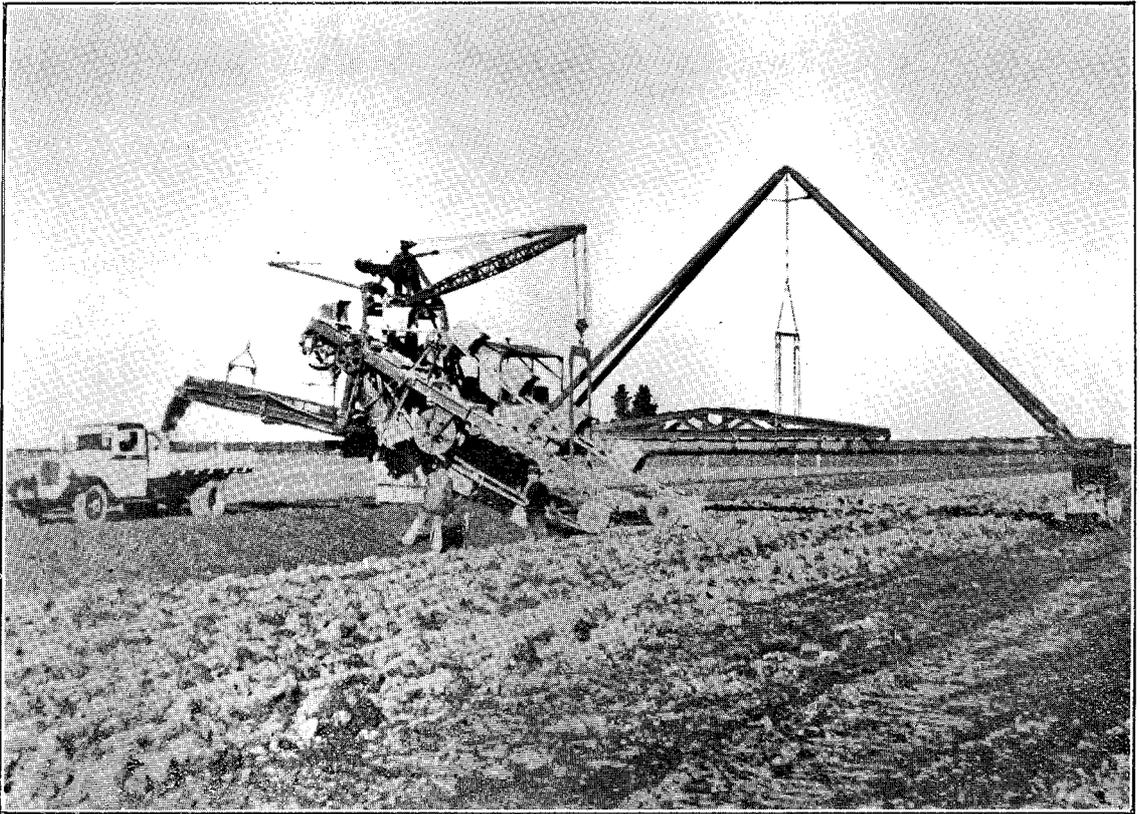


SUSPENSION BRIDGE, 264 FT. SPAN, 10 FT. 6 IN. ROADWAY, CONCRETE DECK.
COOK RIVER BRIDGE. MAIN SOUTH ROAD, WESTLAND.



ONE 70 FT. AND TWO 19 FT. SPANS, 12 FT. ROADWAY; CONTINUOUS HOLLOW BOX
GIRDERS OF REINFORCED CONCRETE.

CAMERON'S CREEK BRIDGE, HAAST PASS ROAD.

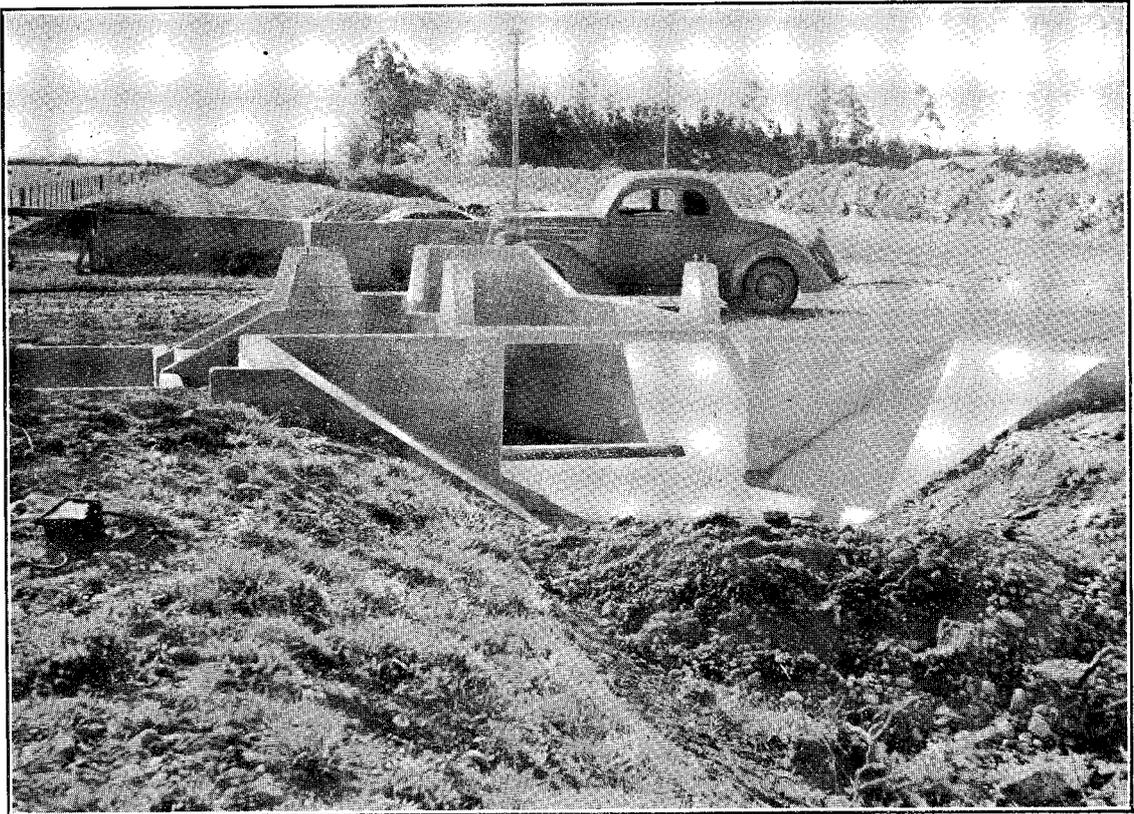


RUTH DREDGER, WITH CONVEYOR ATTACHMENT ON CONSTRUCTION OF WATER-RACE.

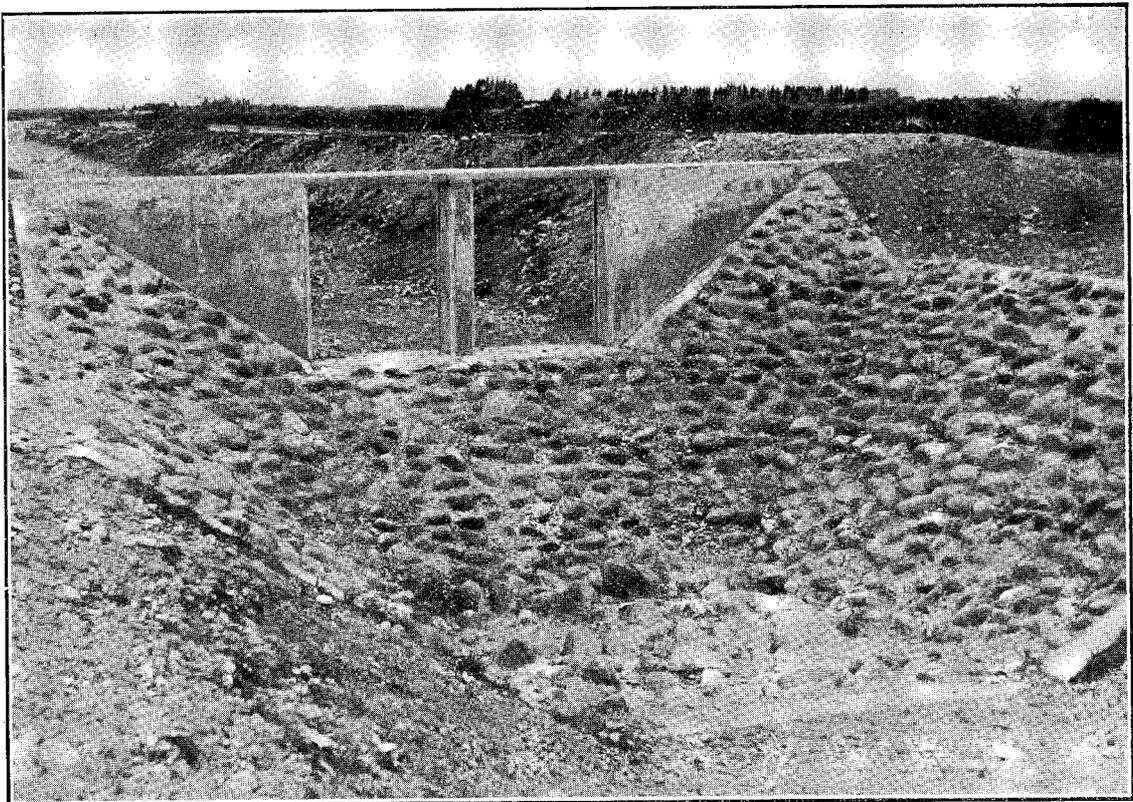


SPEEDER $\frac{3}{8}$ YD. TRACTOR SHOVEL EXCAVATING SITE FOR ROAD-CROSSING SIPHON.

ASHBURTON-LYNDHURST IRRIGATION SCHEME.



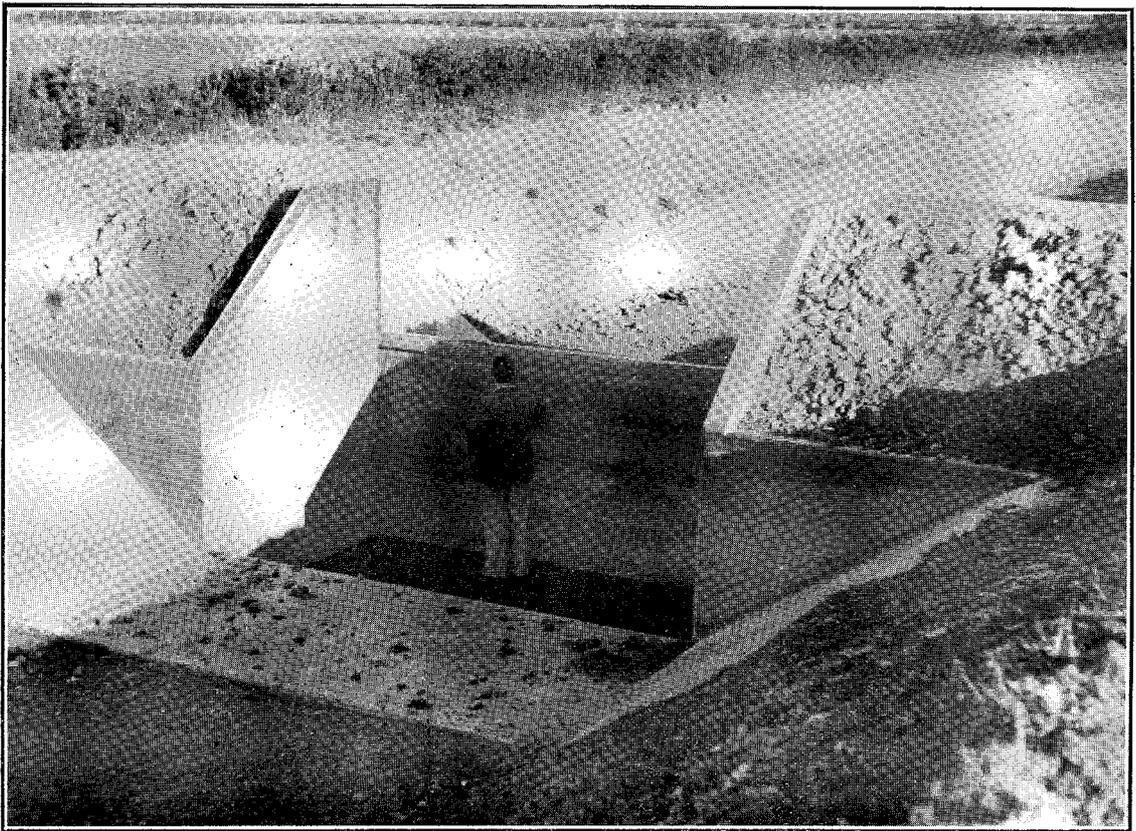
COMBINED ROAD-CROSSING SIPHON AND BIFURCATION-CONTROL STRUCTURE.



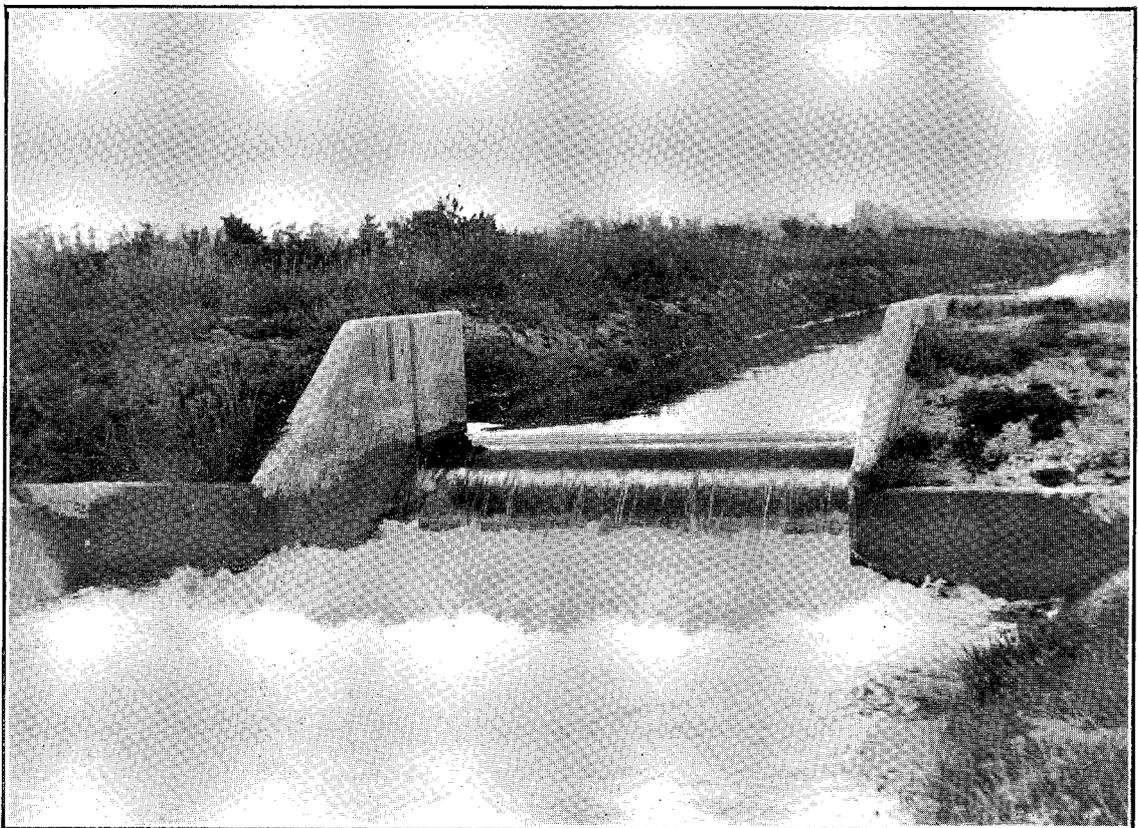
COBBLE-TYPE DROP.

ASHBURTON-LYNDHURST IRRIGATION SCHEME.

D.—1.



WATER-DROP COMPLETED; CAPACITY, 180 CUBIC FEET OF WATER PER SECOND.



WATER-DROP IN OPERATION; CAPACITY, 180 CUBIC FEET PER SECOND.
LEVELS IRRIGATION SCHEME.



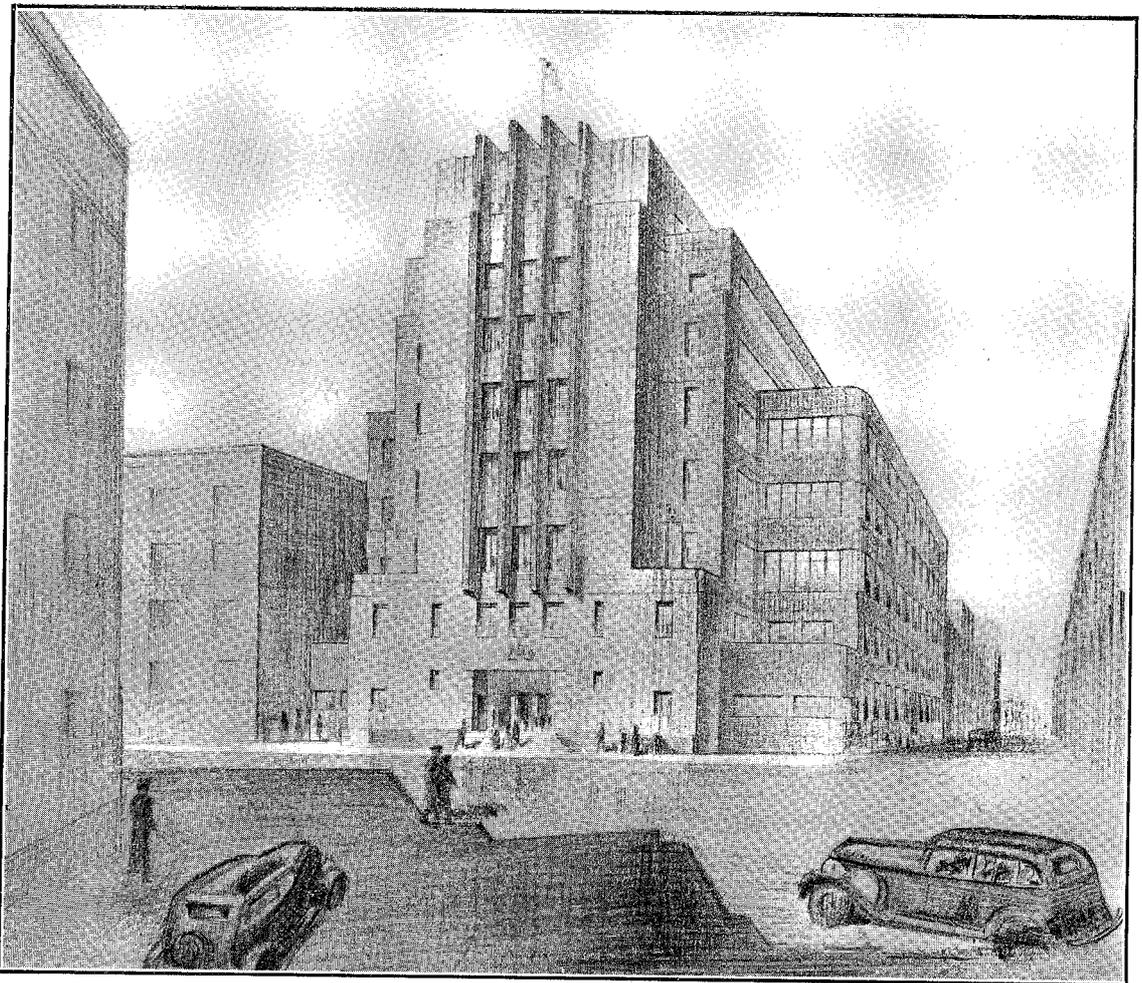
SHEEP GRAZING AT AN AVERAGE FOR YEAR OF SIX EWES TO THE ACRE ON IRRIGATED PASTURE. THIS LAND FORMERLY CARRIED $\frac{3}{4}$ EWE TO THE ACRE.



FORMING FURROWS FOR " BORDER DITCH " WATER-RACES.
LEVELS IRRIGATION SCHEME.



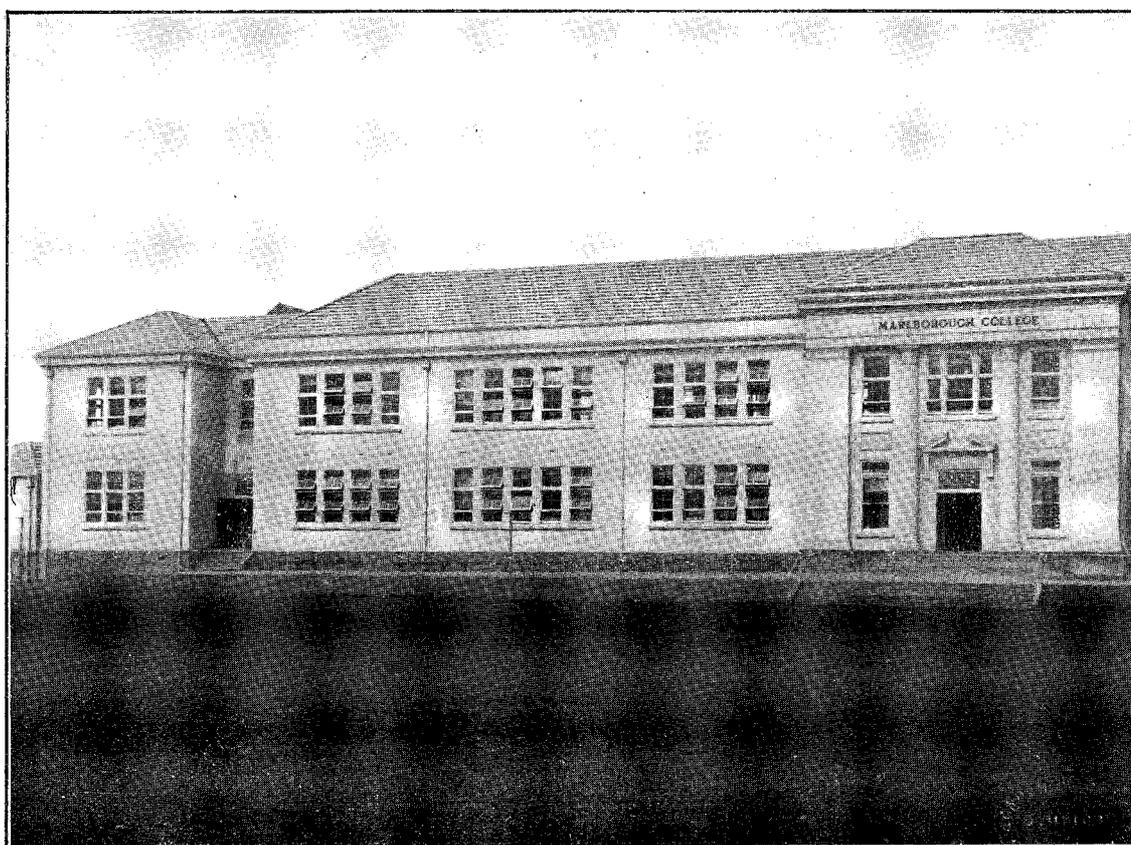
GOVERNMENT LIFE INSURANCE BUILDING, WELLINGTON.



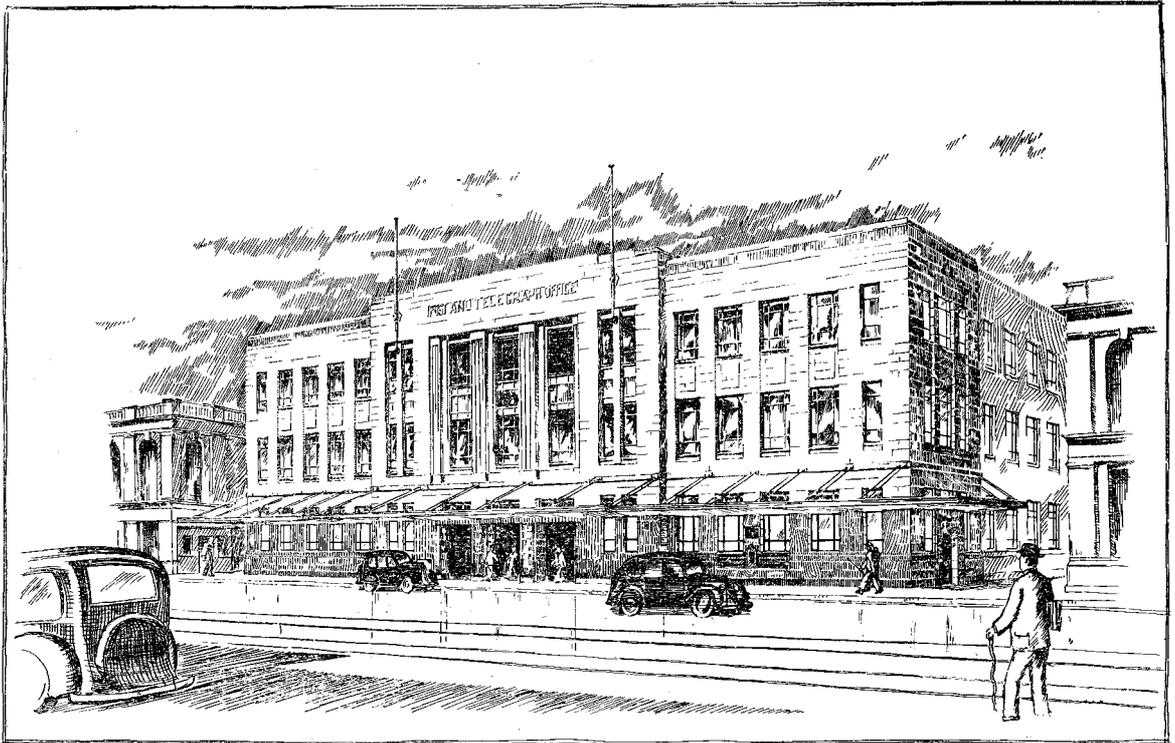
PROPOSED NEW GOVERNMENT PRINTING OFFICE, WELLINGTON.



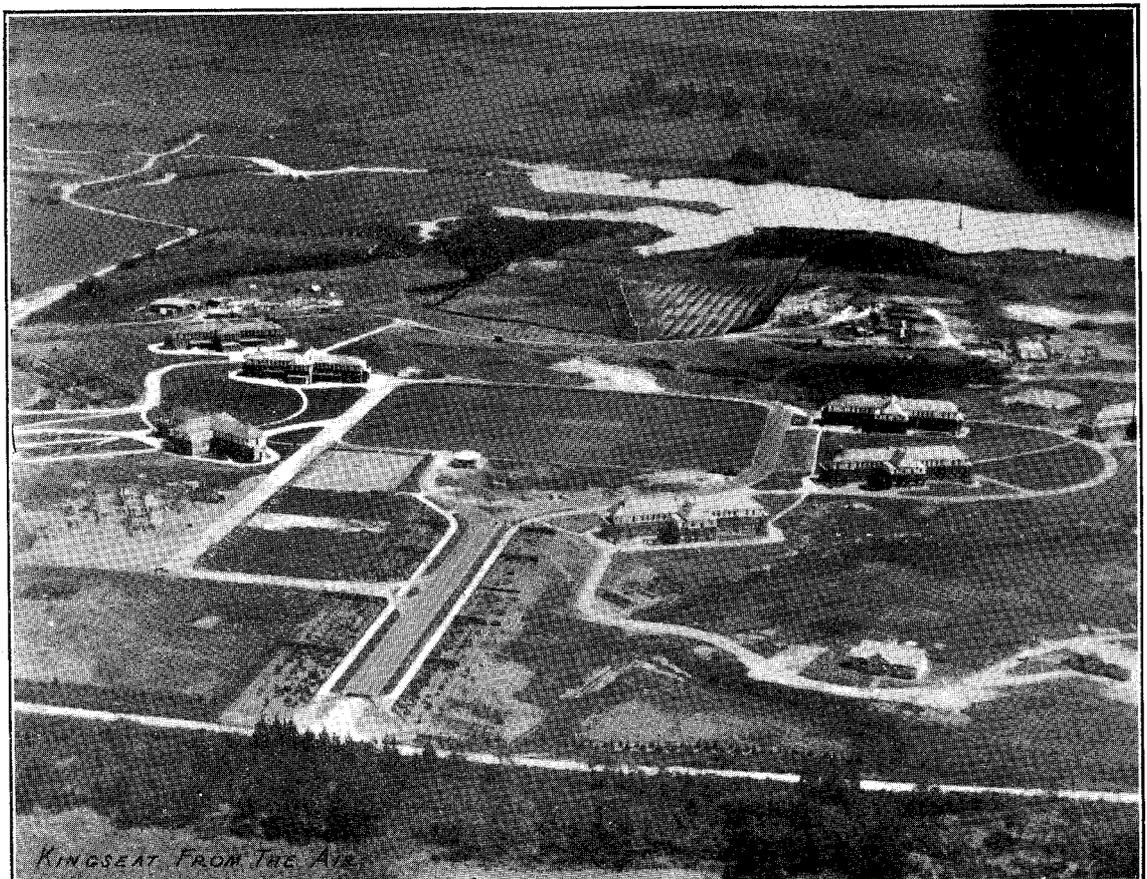
COURT HOUSE, BLENHEIM.



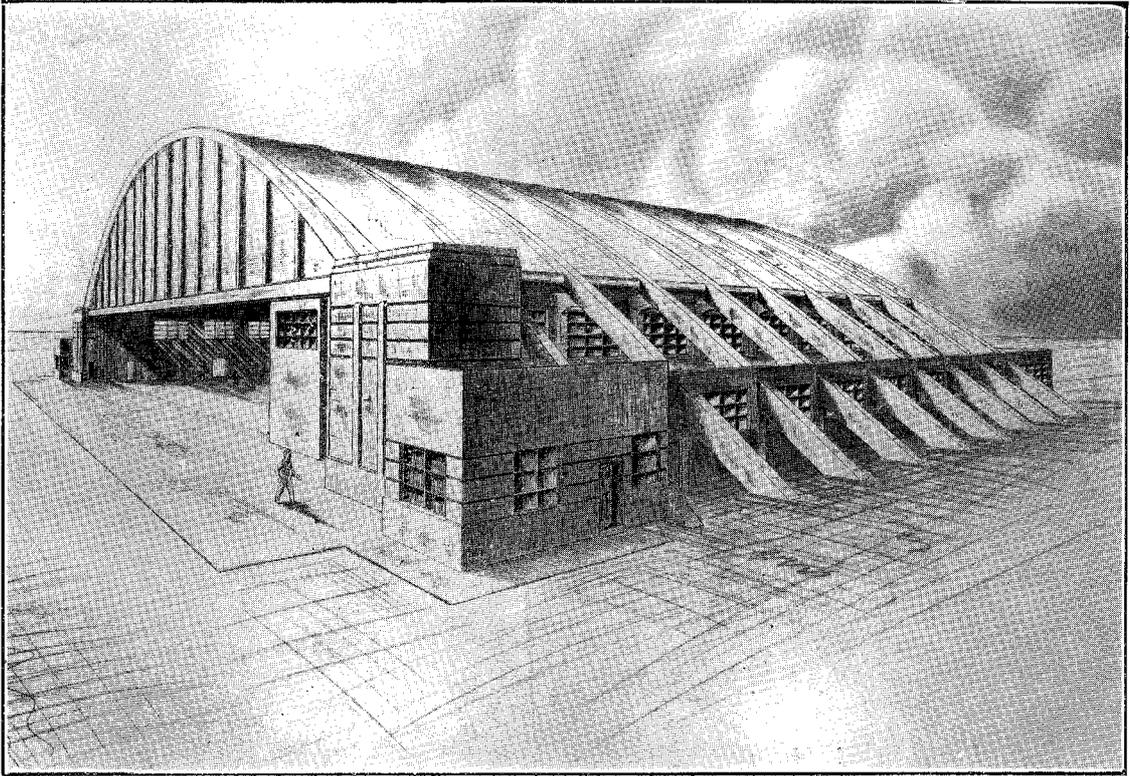
MARLBOROUGH COLLEGE, BLENHEIM.



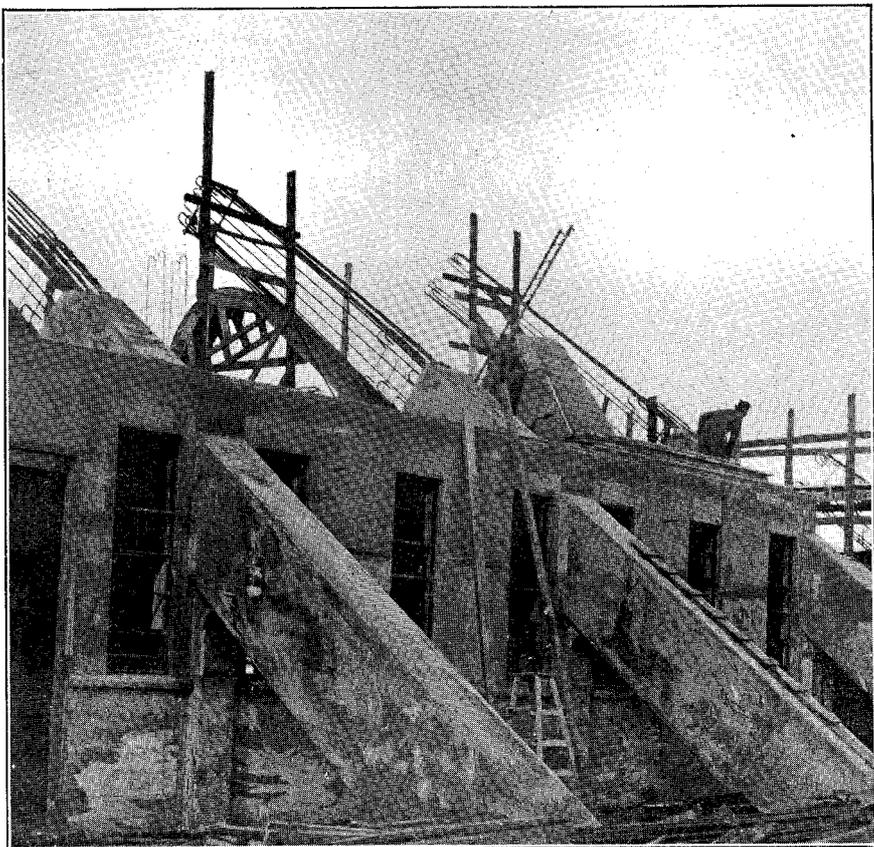
PROPOSED POST AND TELEGRAPH OFFICE, INVERCARGILL.



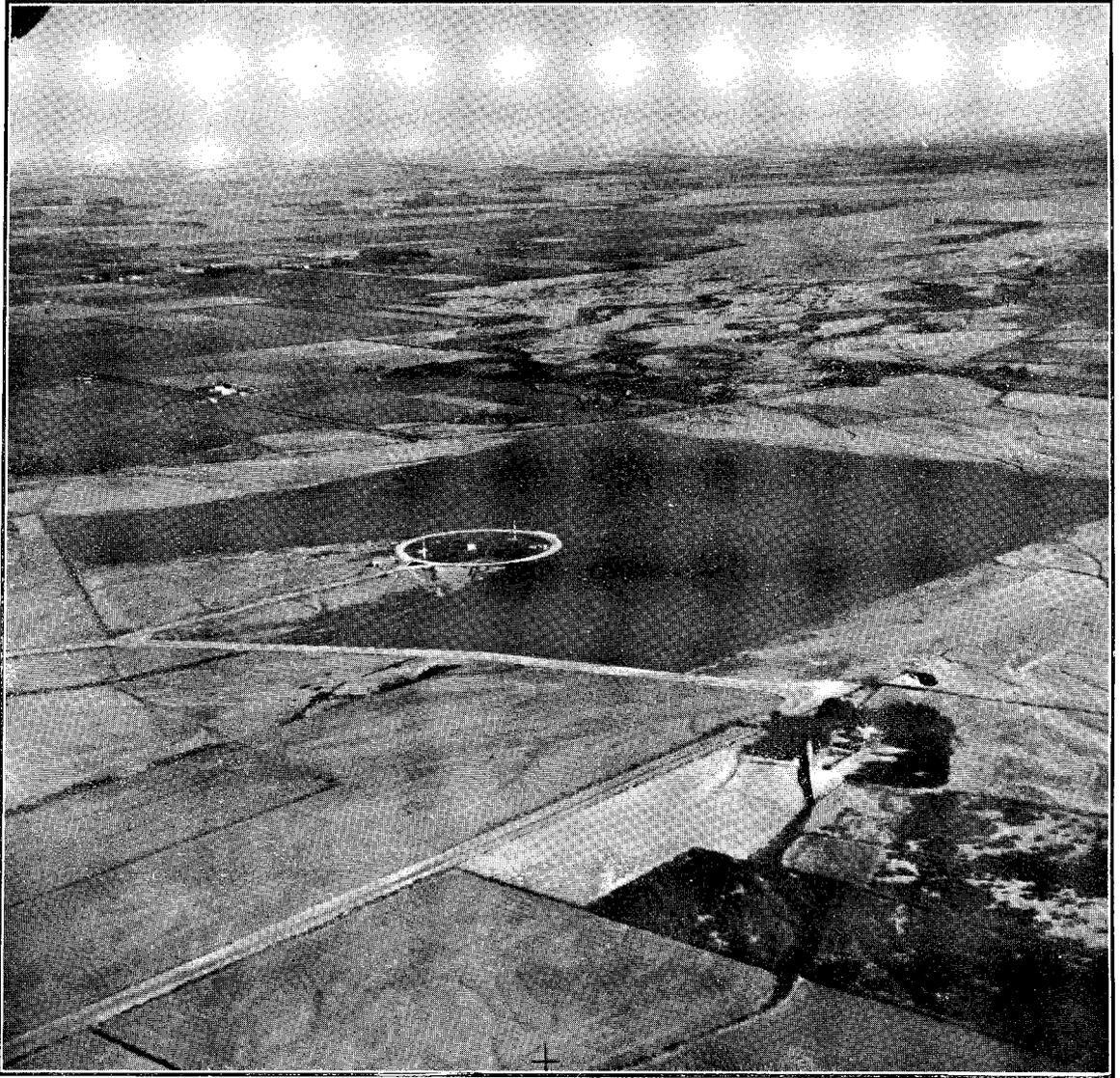
AERIAL VIEW OF LAY-OUT OF BUILDINGS AND GROUNDS.
KINGSEAT MENTAL HOSPITAL, AUCKLAND.



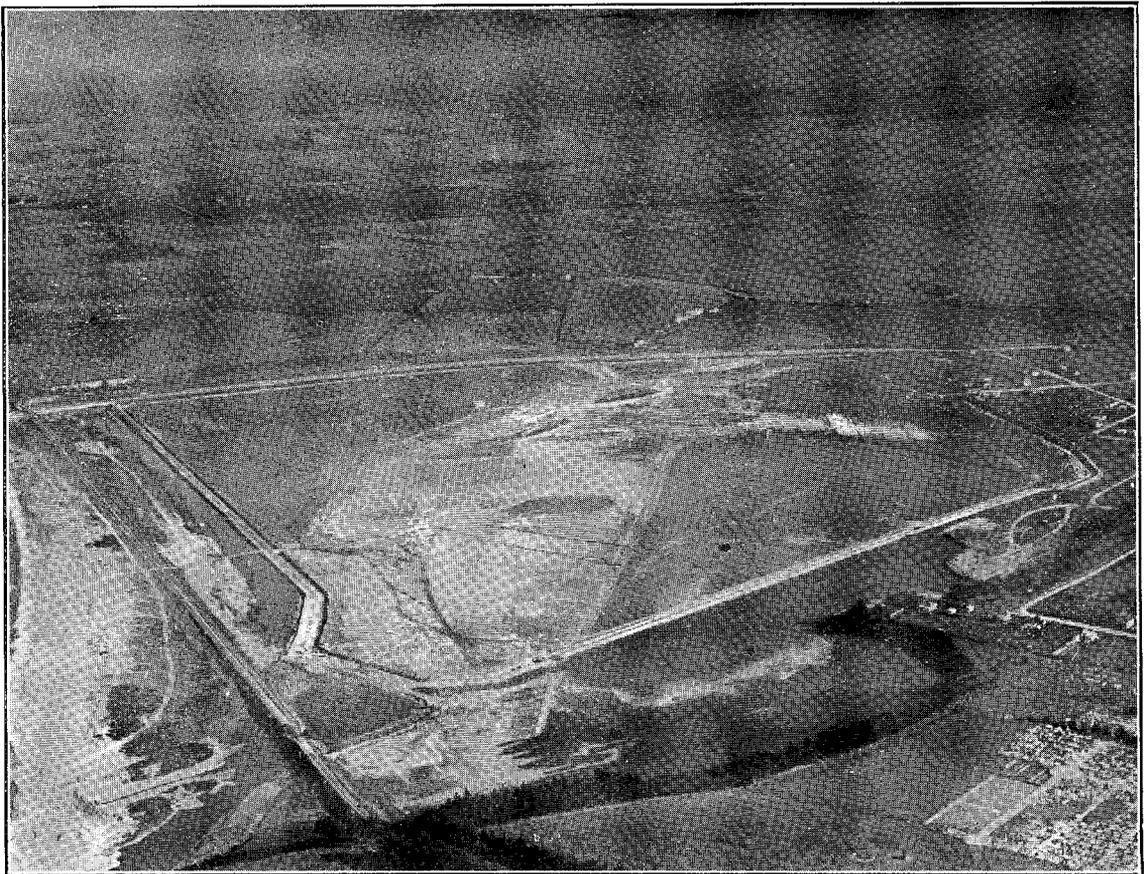
PERSPECTIVE SKETCH OF PROPOSED HANGAR.



VIEW SHOWING CONSTRUCTION.
OHAKEA AERODROME.



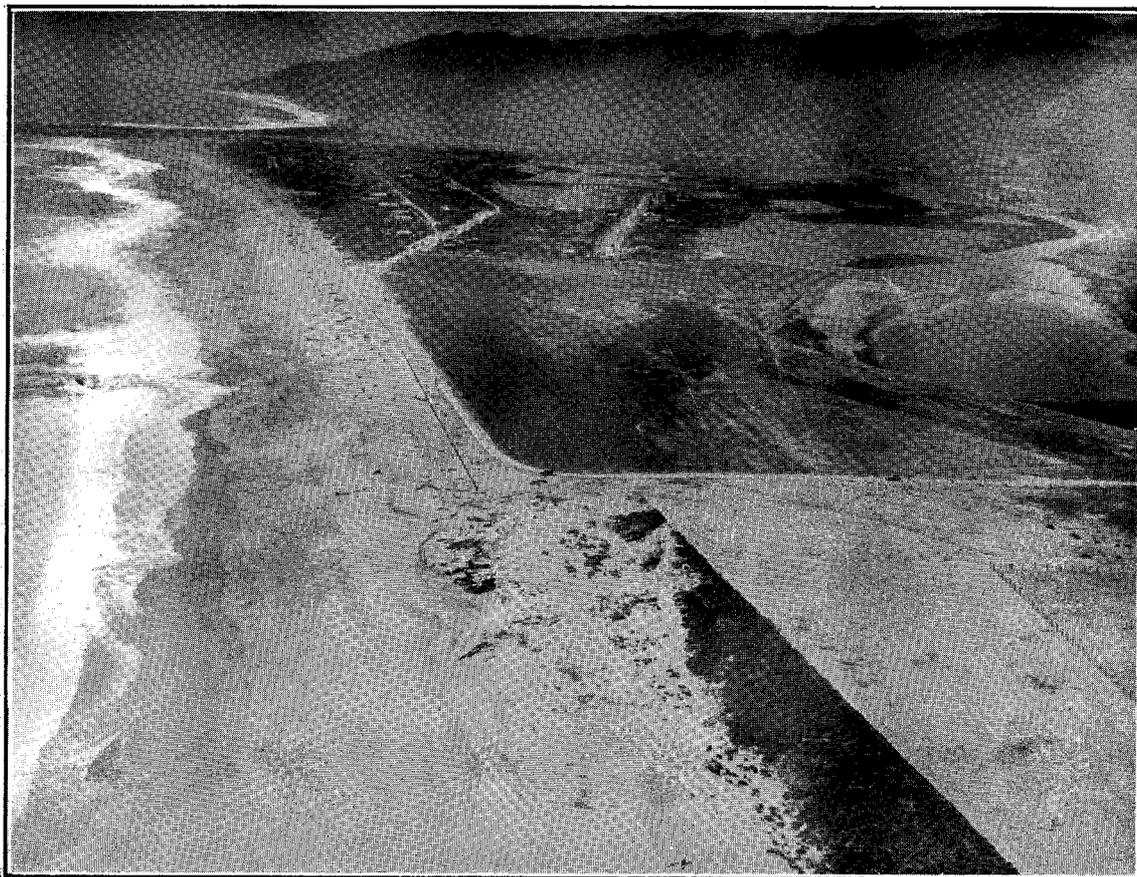
MUNICIPAL AERODROME, HAREWOOD (UNDER CONSTRUCTION).



AERIAL VIEW SHOWING DRAINAGE AND RE-GRADING IN PROGRESS.
SALTWATER CREEK AERODROME, TIMARU.



NELSON AERODROME (UNDER CONSTRUCTION). AERADIO STATION ON LEFT.



GREYMOUTH AERODROME (UNDER CONSTRUCTION).

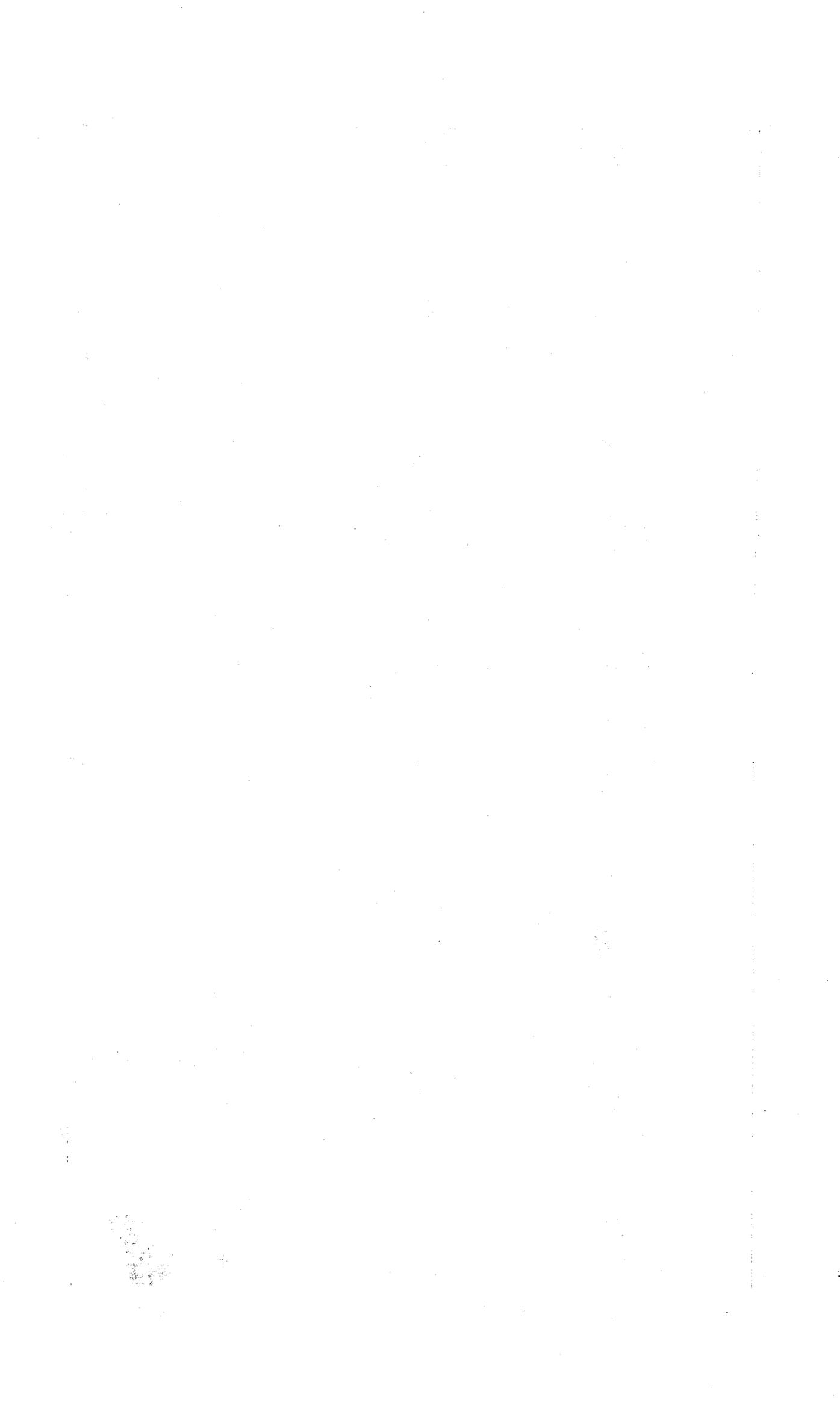


TABLE NO. 1.

SUMMARY SHOWING THE TOTAL EXPENDITURE ON PUBLIC WORKS AND OTHER SERVICES OUT OF PUBLIC WORKS FUND (GENERAL PURPOSES ACCOUNT) TO 31ST MARCH, 1938¹ AND THE LIABILITIES ON THAT DATE.

Number of Table containing Details.	Works.	Total Expenditure to 31st March, 1937.	Expenditure during Twelve Months ended 31st March, 1938.	Recoveries on Account of Previous Years.	Total Net Expenditure to 31st March, 1938.	Liabilities on 31st March, 1938.	Total Net Expenditure and Liabilities.	Works.
3	Railways* ..	57,600,966	2,412,990	£ 700	60,013,256	94,672	60,107,928	Railways.*
..	Roads† ..	23,899,855	1,126,757	253	25,026,559	116,971	25,143,330	Roads.†
4	Public buildings‡ ..	12,781,988	1,234,779	38,237	13,978,530	80,116	14,058,646	Public buildings.‡
..	Telegraphs ..	11,988,430	312,260	..	12,300,690	1,235	12,301,925	Telegraphs.
..	Departmental ..	3,211,990	188,040	19,489	3,380,541	8,861	3,389,402	Departmental.
..	Charges and expenses of raising loans	3,828,307	..	..	3,828,307	..	3,828,307	Charges and expenses of raising loans.
..	Lighthouses, harbour-works, and harbour defences	1,323,345	11,677	200	1,334,822	914	1,335,736	Lighthouses, harbour-works, and harbour defences.
..	Irrigation and water-supply§ ..	1,314,241	71,659	..	1,385,900	13,722	1,399,622	Irrigation and water-supply.§
..	Lands improvement|| ..	980,343	147,436	10,699	1,117,080	12,478	1,129,558	Lands improvement.||
..	Tourist and health resorts ..	733,925	23,159	..	757,084	499	757,583	Tourist and health resorts.
..	Settlement of unemployed workers¶ ..	756,502	310,665	..	1,067,167	4,574	1,071,741	Settlement of unemployed workers.¶
..	Swamp land drainage ..	80,881	19,402	..	100,283	2,211	102,494	Swamp land drainage.
..	Native land settlement ..	466,866	254,869	25,018	696,717	29,928	726,645	Native land settlement.
..	Dairy industry loans ..	41,260	4,565	..	45,825	..	45,825	Dairy industry loans.
..		119,008,899	6,118,258	94,596	125,032,561	366,181	125,398,742	
..	Closed accounts:—							
..	Immigration ..	3,312,913	..	144	3,312,769	..	3,312,769	Immigration.
..	Purchase of Native lands ..	2,054,024	..	..	2,054,024	..	2,054,024	Purchase of Native lands.
..	Defence ..	1,401,080	..	40	1,401,040	..	1,401,040	Defence.
..	Development of mining ..	830,855	..	..	830,855	..	830,855	Development of mining.
II of 1877	Aiding works on Thames goldfields ..	50,000	..	1,141	48,859	..	48,859	Aiding works on Thames goldfields.
..	Plant, material, and services ..	139,344	..	..	139,344	..	139,344	Plant, material, and services.
..	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.
..	Motor transport services ..	33,635	..	..	33,635	..	33,635	Motor transport services.
..	Thermal springs ..	14,600	..	..	14,600	..	14,600	Thermal springs.
10 of 1878	Coal-exploration and mine-development	10,835	..	..	10,835	..	10,835	Coal-exploration and mine-development.
..		8,134,458	..	1,325	8,133,133	..	8,133,133	
..	Transfer to Main Highways Account, Construction Fund	1,226,000	..	..	1,226,000	..	1,226,000	Transfer to Main Highways Account, Construction Fund.
..	Totals ..	128,369,357	..	95,921	134,391,694	366,181	134,757,875	Totals.

* Does not include expenditure on Hutt Railway and Road Improvement, Wellington-Manawatu Purchase, and Railways Improvement Accounts. † Includes £4,500 expended under section 16 (1), Native Land Amendment and Native Land Claims Adjustment Act, 1923. ‡ Includes £150,000 paid to Midland Railway bondholders. § Includes £60,263 expended under Reserves and other Lands Disposal Act, 1936, section 32. ¶ 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. || £6,727 previously expended on irrigation under this item now transferred to Irrigation and Water-supply; does not include £300,990 expended and included under Roads Class. ¶ Includes £4,865 expended under Finance Act, 1932 (No. 2), section 6.

TABLE NO. 2.
GENERAL SUMMARY.

Showing NET YEARLY EXPENDITURE out of PUBLIC WORKS FUND (GENERAL PURPOSES ACCOUNT), 1916-17 to 1937-38.
N.B.—The figures in italics, prefixed by "Cr.," are either recoveries on account of services or receipts-in-aid applied in reduction of expenditure.

Description of Services.	Expenditure.											
	Total Net Expenditure to 31st March, 1916.	1916-17.	1917-18.	1918-19.	1919-20.	1920-21.	1921-22.	1922-23.	1923-24.	1924-25.	1925-26.	1926-27.
Immigration	£ 2,331,742	£ 6,533	£ 3,856	£ 12,018	£ 62,561	£ 7,806	£ 247,528	£ 90,611	£ 92,600	£ 136,353	£ 107,521	£ 184,918
			<i>Cr. 2,662</i>	<i>Cr. 4,119</i>	<i>Cr. 62,561</i>	<i>Cr. 7,806</i>	<i>Cr. 140</i>	<i>Cr. 140</i>	<i>Cr. 1,267</i>	<i>Cr. 16</i>	<i>Cr. 443</i>	
Public Works, Departmental	£ 1,062,954	£ 131,701	£ 127,962	£ 115,419	£ 121,677	£ 143,280	£ 128,002	£ 111,367	£ 110,445	£ 127,556	£ 126,596	£ 115,866
			<i>Cr. 2,662</i>	<i>Cr. 4,119</i>		<i>Cr. 6,280</i>	<i>Cr. 525</i>	<i>Cr. 131</i>	<i>Cr. 69</i>	<i>Cr. 19</i>	<i>Cr. 129</i>	<i>Cr. 35,948</i>
Irrigation and Water-supply	£ 131,828	£ 28,754	£ 11,650	£ 22,919	£ 34,115	£ 55,345	£ 83,313	£ 58,131	£ 95,467	£ 127,995	£ 56,237	£ 56,937
			<i>Cr. 18,451</i>			<i>Cr. 9,854</i>					<i>Cr. 31</i>	
Railways	£ 33,099,899	£ 620,947	£ 495,771	£ 387,923	£ 743,649	£ 1,365,466	£ 3,133,200	£ 2,110,859	£ 1,776,413	£ 1,878,739	£ 1,988,614	£ 1,480,807
		<i>Cr. 4,845</i>	<i>Cr. 110</i>	<i>Cr. 4,924</i>	<i>Cr. 105,196</i>	<i>Cr. 388</i>	<i>Cr. 751</i>	<i>Cr. 3,171</i>	<i>Cr. 1,167</i>	<i>Cr. 37,924</i>	<i>Cr. 16,875</i>	<i>Cr. 96,647</i>
Payment to Midland Railway Bondholders	£ 150,000	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..
Roads:—												
Miscellaneous Roads and Bridges	£ 9,671,554	£ 203,746	£ 128,730	£ 221,887	£ 376,097	£ 527,854	£ 552,895	£ 643,156	£ 751,370	£ 603,968	£ 564,694	£ 575,898
			<i>Cr. 600</i>	<i>Cr. 997</i>	<i>Cr. 603</i>	<i>Cr. 81</i>	<i>Cr. 197</i>	<i>Cr. 244</i>	<i>Cr. 188</i>	<i>Cr. 237</i>	<i>Cr. 4,870</i>	<i>Cr. 2,981</i>
Roads on Goldfields.. .. .	£ 1,051,748	£ 17,099	£ 6,912	£ 4,186	£ 12,465	£ 11,050	£ 11,264	£ 4,850	£ 2,867	£ 2,755	£ 3,934	£ 2,230
Development of Thermal Springs and Natural Scenery	£ 16,023	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..
Lands Improvement Account*	£ 300,930	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..
Total, Roads	£ 11,040,255	£ 220,845	£ 135,042	£ 225,076	£ 387,959	£ 538,823	£ 563,962	£ 647,762	£ 754,049	£ 606,492	£ 563,818	£ 577,147
Development of Mining	£ 891,422	£ 4,592	£ 27	£ 518	£ 1,173	£ 2,153	£ 2,130	£ 98	£ 1,363	£ ..	£ ..	£ ..
		<i>Cr. 868</i>	<i>Cr. 6,545</i>	<i>Cr. 1,000</i>	<i>Cr. 7,008</i>	<i>Cr. 1,606</i>	<i>Cr. 51</i>	<i>Cr. 1,785</i>	<i>Cr. 2,310</i>			
Purchase of Native Lands	£ 1,570,851	£ ..	£ 57	£ ..	£ 57	£ 59	£ 52	£ ..	£ ..	£ ..	£ ..	£ 535
Native Lands Purchase Account	£ 491,980	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..
Total, Land Purchases	£ 2,062,831	£ 868	£ 57	£ ..	£ 57	£ 59	£ 52	£ ..	£ ..	£ ..	£ ..	£ 535
Telegraph Extension	£ 3,207,720	£ 203,311	£ 213,955	£ 198,611	£ 249,379	£ 336,468	£ 590,981	£ 512,657	£ 717,409	£ 957,294	£ 931,661	£ 558,042
							<i>Cr. 11,082</i>					

* Excludes expenditure subsequent to 1900 included under separate class "Lands Improvement."

TABLE NO. 2—continued.

GENERAL SUMMARY—continued.

Showing NET YEARLY EXPENDITURE out of PUBLIC WORKS FUND (GENERAL PURPOSES ACCOUNT), 1916-17 to 1937-38—continued.

Description of Services.	Expenditure.											Total Net Expenditure to 31st March, 1938.
	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.	
Immigration	£ 67,157	£ 50,266 Cr. 283	£ 41,756	£ 33,544	£ 5,265 Cr. 210	£ 583 Cr. 583	£ 532 Cr. 532	£ 370 Cr. 370	£ 362 Cr. 362	£ 146 Cr. 146	£ .. Cr. 144	£ 3,312,769
Public Works, Departmental	£ 130,951 Cr. 13,328	£ 142,252 Cr. 38,499	£ 132,783 Cr. 51,671	£ 131,816 Cr. 16,381	£ 151,377 Cr. 33,947	£ 104,904 Cr. 52,639	£ 98,703 Cr. 33,872	£ 76,486 Cr. 31,154	£ 99,384 Cr. 28,178	£ 137,769 Cr. 17,709	£ 188,040 Cr. 19,489	£ 3,380,541
Irrigation and Water-supply*	£ 49,735 Cr. 2,798	£ 55,198 Cr. 8	£ 69,657	£ 62,614	£ 37,749	£ 53,290 Cr. 96	£ 66,838	£ 91,241	£ 85,414	£ 11,062	£ 71,659	£ 1,385,900
Railways	£ 1,141,822 Cr. 1,699	£ 1,216,277 Cr. 2,595	£ 1,812,521 Cr. 1,296	£ 1,987,196 Cr. 792	£ 952,388 Cr. 20,568	£ 160,853 Cr. 9,056	£ 132,111 Cr. 20	£ 125,600	£ 258,011 Cr. 134,696	£ 1,019,094 Cr. 464	£ 2,412,990 Cr. 700	£ 59,863,256
Payment to Midland Railway Bondholders	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ 150,000
Roads:—												
Miscellaneous Roads and Bridges	£ 669,833 Cr. 540	£ 780,990 Cr. 330	£ 1,005,330 Cr. 415	£ 1,379,810 Cr. 472	£ 1,078,270 Cr. 564	£ 396,559 Cr. 1,171	£ 359,671 Cr. 445	£ 371,573 Cr. 471	£ 444,377 Cr. 250	£ 913,720 Cr. 172	£ 1,126,757 Cr. 253	£ 23,334,724
Roads to give access to Outlying Districts	£ 33,642	£ 51,582	£ 53,693	£ 91,126	£ 3,940	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ 233,983
Roads on Goldfields	£ 2,330 Cr. 467	£ 1,005	£ 1,885	£ 4,586	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ 1,140,699
Development of Thermal Springs and Natural Scenery	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ 16,023
Lands Improvement Account	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ 300,930
Total, Roads	£ 704,798	£ 833,247	£ 1,060,493	£ 1,475,050	£ 1,081,646	£ 395,388	£ 359,226	£ 371,102	£ 444,127	£ 913,548	£ 1,126,504	£ 25,026,359
Development of Mining	£ 1,130 Cr. 1,130	£ 260 Cr. 260	£ 260 Cr. 260	£ 260 Cr. 260	£ ..	£ 50 Cr. 50	£ ..	£ ..	£ 143 Cr. 143	£ 17 Cr. 17	£ 1,141 Cr. 1,141	£ 879,714
Purchase of Native Lands	£ 56 Cr. 56	£ ..	£ ..	£ ..	£ ..	£ ..	£ 7,123 Cr. 7,123	£ ..	£ ..	£ ..	£ ..	£ 1,562,044
Native Lands Purchase Account	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ 491,980
Total, Land Purchases	£ 56	£ ..	£ ..	£ ..	£ ..	£ ..	£ 7,123 Cr. 7,123	£ ..	£ ..	£ ..	£ ..	£ 2,054,024
Settlement of Unemployed Workers	£ ..	£ ..	£ ..	£ ..	£ ..	£ 118,723	£ 172,109	£ 222,309	£ 151,345	£ 92,016	£ 310,665	£ 1,067,167
Telegraph Extension	£ 625,540	£ 624,414	£ 594,383	£ 419,756	£ 249,978 Cr. 32	£ 99,999	£ 144,160	£ 135,933	£ 195,380	£ 232,513	£ 312,260	£ 12,300,690

* Includes £6,727 previously included under Lands Improvement class.

TABLE No. 2—continued.

GENERAL SUMMARY—continued.

Showing NET YEARLY EXPENDITURE out of PUBLIC WORKS FUND (GENERAL PURPOSES ACCOUNT), 1916-17 to 1937-38—continued.

Description of Services.	Expenditure.										Total Net Expenditure to 31st March, 1938.	
	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.		1937-38.
Public Buildings :—												
General (including Miscellaneous)	£ 42,553 Cr. 1,065	£ 4,272 Cr. 420	£ 14,106* Cr. 3,156	£ 85,204 Cr. 55	£ 33,189 Cr. 4,231	£ 2,107 Cr. 2,067	£ 594 Cr. 1,075	£ 30,713 Cr. 14,087	£ 39,447 Cr. 125,964	£ 57,668 Cr. 27	£ 258,978 Cr. 201	£ 1,331,599
Parliamentary	..	..	..	..	..	..	..	..	..	..	..	..
Courthouses	..	..	..	..	..	..	..	..	..	..	..	..
Judicial	..	..	..	..	..	..	..	..	..	..	..	..
Prisons	..	..	..	..	..	..	..	..	..	..	..	..
Police-stations	..	..	..	..	..	..	..	..	..	..	..	..
Post and Telegraph	..	..	..	..	..	..	..	..	..	..	..	..
Customs	..	..	..	..	..	..	..	..	..	..	..	..
Quarantine Stations	..	..	..	..	..	..	..	..	..	..	..	..
Mental Hospitals	..	..	..	..	..	..	..	..	..	..	..	..
Public Health	..	..	..	..	..	..	..	..	..	..	..	..
Health and Hospital Institutions	..	..	..	..	..	..	..	..	..	..	..	..
School Buildings	..	..	..	..	..	..	..	..	..	..	..	..
Agricultural	..	..	..	..	..	..	..	..	..	..	..	..
Workers' Dwellings†	..	..	..	..	..	..	..	..	..	..	..	..
Total, Public Buildings	£ 216,237	£ 205,262	£ 354,429	£ 403,680	£ 443,878	£ 81,657	£ 145,089	£ Cr. 48,241	£ 347,394	£ 712,316	£ 1,196,542	£ 13,978,530
Lighthouses, Harbour-works, and Harbour-defences :—												
Lighthouses	..	..	..	..	..	..	..	..	..	..	..	..
Harbour-works	..	..	..	..	..	..	..	..	..	..	..	..
Harbour-defences	..	..	..	..	..	..	..	..	..	..	..	..
Total, Lighthouses, &c.	£ 7,979	£ 2,637	£ 4,460	£ 4,103	£ 5,046	£ 688	£ 1,276	£ 4,021	£ 3,320	£ 630	£ 8,260	£ 288,155
Rates on Native Lands	..	..	..	..	..	..	..	..	..	..	..	..
Total, Lighthouses, &c.	£ 28,705	£ 17,062	£ 14,696	£ 10,845	£ 12,033	£ Cr. 4,539	£ 13,264	£ 6,602	£ 2,921	£ 1,297	£ 11,477	£ 1,334,822
Rates on Native Lands	..	..	..	..	..	..	..	..	..	..	..	£ 68,672

* Includes £12,500 expended under Finance Act, 1929, section 32.

† Transferred to State Advances Account.

‡ Includes £60,263 expended under Reserves and other Lands Disposal Act, 1936, section 32 (Flock House purchase).

TABLE NO. 2—continued.
GENERAL SUMMARY—continued.
Showing NET YEARLY EXPENDITURE out of PUBLIC WORKS FUND (GENERAL PURPOSES ACCOUNT), 1916-17 to 1937-38—continued.

Description of Services.	Total Net Expenditure to 31st March, 1916.	Expenditure.											
		1916-17.	1917-18.	1918-19.	1919-20.	1920-21.	1921-22.	1922-23.	1923-24.	1924-25.	1925-26.	1926-27.	
Contingent Defence	£ 1,027,235	£ 9,742	£ 6,714	£ 8,809 Cr. 922	£ 10,187	£ 8,701	£ 15,586	£ 1,702 Cr. 463	£ 4,931 Cr. 280	£ 27,133 Cr. 580	£ 89,670 Cr. 33	£ 34,014 Cr. 751	
Tourist and Health Resorts	257,415	1,094	931	1,620	6,194	19,041	17,996 Cr. 110	5,435	27,264	12,343 Cr. 81	43,486	31,981	
Lands Improvement*	133,774	Cr. 2,731	1,838	Cr. 4,268	2,964	2,064	17,478	26,204	18,182	34,172	70,493 Cr. 19	56,267 Cr. 135	
Charges and Expenses of raising Loans	1,253,040	35	1	..	..	184	174,280	62,399	311,905	241,930	297,180	155,373
Interest and Sinking Funds	218,500	..	..	..	..	..	..	..	..	..	..	..
Coal-exploration and Mine-development	10,835	..	..	..	..	..	..	..	..	..	..	..
Thermal Springs	14,600	..	..	..	..	..	..	..	..	..	..	..
Plant, Material, and Services	74,417	9,778	6,811	20,638 Cr. 31	47,682	169,910	122,801	Cr. 4,983	Cr. 49,159 Cr. 16	Cr. 30,956 Cr. 1	36,930 Cr. 855	Cr. 9,334 Cr. 1,992	
Motor Transport Service .. .. .	..	..	..	..	..	..	..	22,679	962	5,000	4,994	..
Transfer to Main Highways Account :— Construction Fund .. .. .	..	..	..	..	..	..	..	..	..	226,000	..	400,000
<i>Total Ways and Means Credits</i> .. .. .	..	5,713	43,492	11,993	112,864	19,628	11,616	20,127	9,142	40,793	27,474	146,933
Grand Total—Net Expenditure	64,797,996	1,488,786	1,193,930	1,195,489	1,907,850	3,121,132	5,449,351	3,892,320	4,056,423	4,558,570	4,588,111	3,841,126	

* Expenditure prior to 1901 (totalling £300,930) included under separate class "Roads."

[Continued on page 7.]

TABLE NO. 2—continued.
GENERAL SUMMARY—continued.

Showing NET YEARLY EXPENDITURE out of PUBLIC WORKS FUND (GENERAL PURPOSES ACCOUNT), 1916-17 to 1937-38—continued.

Description of Services.	Expenditure.											Total Net Expenditure to 31st March, 1938.
	1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.	
Contingent Defence	£ 39,986 Cr. 465	£ 67,652 Cr. 648	£ 46,766 Cr. 1,325	£ 13,812 Cr. 586	£ 4,039 Cr. 85	£ 624 Cr. 877	£ 76 Cr. 21	£ ..	£ 704 Cr. 20	£ 64 Cr. 16,789	£ 40 Cr. 23,159	£ 1,401,040
Tourist and Health Resorts	£ 36,673 Cr. 516	£ 39,254 Cr. 440	£ 20,547 Cr. 1,213	£ 60,288 Cr. 2,494	£ 87,609 Cr. 85	£ 14,454 Cr. 877	£ 13,510 Cr. 21	£ 12,880 Cr. 705	£ 13,683 Cr. 20	£ 16,789 Cr. 20	£ 23,159 Cr. 20	£ 757,084
Lands Improvement*	£ 72,898 Cr. 2,574	£ 85,861 Cr. 87	£ 79,454 Cr. 112	£ 70,534 Cr. 1,041	£ 38,899 Cr. 506	£ 38,906 Cr. 248	£ 71,825 Cr. 329	£ 82,092 Cr. 722	£ 37,909 Cr. 1,006	£ 62,673 Cr. 10,366	£ 147,436 Cr. 10,699	£ 1,117,080
Swamp Land Drainage	£ ..	£ ..	£ ..	£ ..	£ ..	£ 14,807	£ 13,959 Cr. 297	£ 15,019 Cr. 231	£ 12,922 Cr. 263	£ 24,965	£ 19,402	£ 100,283
Dairy Industry Loans.. .. .	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ 10,750	£ 30,510	£ 4,565	£ 45,825
Charges and Expenses of raising Loans	£ 100,297	£ 438,238 Cr. 3,811	£ 518,158	£ 164,535	£ 98,098	£ 15,851	£ 14	£ 600	£ ..	£ ..	£ ..	£ 3,828,307
Interest and Sinking Funds	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ 218,500
Coal-exploration and Mine-development	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ 10,835
Thermal Springs	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ 14,600
Plant, Material, and Services	£ Cr. 17,610 Cr. 8,985	£ Cr. 6,551 Cr. 1,224	£ Cr. 35,092 Cr. 360	£ Cr. 42,824 Cr. 216	£ Cr. 103,571 Cr. 1,338	£ Cr. 45,463 Cr. 161	£ 1,421 Cr. 22	£ Cr. 10,513 Cr. 165	£ 22,438 Cr. 418	£ Cr. 1,642	£ ..	£ 139,344
Native Land Settlement	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ 179,485 Cr. 52	£ 125,790 Cr. 9,662	£ 71,901 Cr. 9,491	£ 112,318 Cr. 3,423	£ 254,869 Cr. 25,018	£ 696,717
Motor Transport Service	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ 33,635
Transfer to Main Highways Account:— Construction Fund	£ 200,000	£ 200,000	£ 200,000	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ ..	£ 1,226,000
<i>Total Ways and Means Credits</i> Grand Total—Net Expenditure	£ 40,026 Cr. 8,638	£ 106,429 Cr. 3,870,577	£ 62,859 Cr. 4,894,314	£ 41,583 Cr. 4,769,076	£ 72,214 Cr. 2,994,624	£ 74,416 Cr. 984,446	£ 47,092 Cr. 1,369,370	£ 378,689 Cr. 1,163,891	£ 309,501 Cr. 1,578,298	£ 36,630 Cr. 3,333,039	£ 95,921 Cr. 6,022,337	£ 134,391,694

* 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. † Includes £12,500 expended under Finance Act, 1929, section 32.
‡ Now provided for under Consolidated Fund.

TABLE NO. 3.
EXPENDITURE ON RAILWAYS TO 31ST MARCH, 1938.

Lines of Railway.	Mileage opened for Traffic.	Total Expenditure by General Government to 31st March, 1937.		Recoveries on Account of Expenditure of Previous Years.		Expenditure out of Public Works Fund during Year 1937-38: New Works.		Total Expenditure by General Government to 31st March, 1938.		Valuation of Works constructed by Provinces and Midland Railway Company.	
		£	s. d.	£	s. d.	£	s. d.	£	s. d.	£	s. d.
Kaihu Valley ..	24 32	179,143	14 9	..	..	..	..	179,143	14 9	..	..
Opua Wharf to Whangarei and Onerahi ..	58 06	605,186	11 8	..	..	4,057	18 8	609,244	10 4	..	..
Otiria to Ngapuhi ..	13 45	127,445	15 6	..	..	..	2 12 6	127,448	8 0	..	..
Whangarei Branch (Kioreroa to Waioira) ..	19 79	420,483	1 0	..	..	..	399 0 0	420,882	1 0	..	..
North Auckland Main Trunk—											
Ngapuhi Northwards ..	11 00	881,406	11 3	700 0 0	932 12 3	Cr.	..	879,773	19 0	..	..
Helensville Northwards ..	83 39	2,989,052	4 0	..	..	4,629 19 3	..	2,993,682	3 3	..	..
North Auckland Main Trunk to Dargaville ..	..	450,132	17 7	..	13,244 10 11	..	..	463,377	8 6	..	..
Helensville to Awamutu ..	148 67	5,941,158	0 7	..	..	Cr.	568 17 10	5,940,589	2 9	..	..
Waikou Branch (Paerata to Waikou) ..	12 69	208,909	9 6	..	..	..	3 0 0	208,912	9 6	..	..
Huntly to Awaroa ..	8 75	184,379	5 0	..	..	..	..	184,379	5 0	..	..
Waikokowai Branch ..	..	3,442	0 0	..	..	..	..	3,442	0 0	..	..
Frankton to Thames ..	62 58	506,021	3 7	..	..	440 12 2	..	506,461	15 9	..	..
Cambridge Branch (Ruakura Junction to Cambridge) ..	12 02	61,831	17 3	..	..	..	1 0 0	61,832	17 3	..	..
Morrinsville to Rotorua ..	69 33	433,600	5 1	..	..	9,093 12 10	..	442,693	17 11	..	..
Marton to Te Awamutu ..	209 69	3,122,657	13 5	..	..	17,234 13 5	..	3,139,892	6 0	..	..
Waipa Gravel Access Branch ..	..	114	0 0	..	..	..	..	114	0 0	..	..
Raetihi Branch ..	8 50	89,452	2 1	..	..	..	..	89,452	2 1	..	..
Rotorua to Taupo ..	..	37,862	13 11	..	..	..	..	37,862	13 11	..	..
Paeroa to Pokeno ..	..	22,890	1 8	..	6,290 11 2	..	..	29,180	12 10	..	..
Paeroa to Tauranga ..	50 65	1,250,594	2 7	..	..	901 1 5	..	1,251,495	4 0	..	..
Tauranga to Taneatua, including Te Maunga to Maungarui Branch ..	59 17	1,497,428	2 0	..	..	..	..	1,497,428	2 0	..	..
Gisborne to Motu ..	49 32	625,075	6 9	..	..	1,728 18 1	..	626,804	4 10	..	..
Gisborne to Ormond Tramway ..	..	4,975	1 7	..	..	..	..	4,975	1 7	..	..
Napier to Gisborne—											
Gisborne Southwards ..	11 51	284,846	10 1	..	Cr.	220 16 8	..	284,625	13 5	..	..
Waikokopu Northwards ..	..	795,328	7 0	..	410,101 10 6	..	..	1,205,429	17 6	..	..
Wairoa Northwards ..	..	20,681	12 6	..	..	..	..	20,681	12 6	..	..
Napier Northwards ..	38 62	2,449,815	7 6	..	79,058 11 6	..	..	2,528,873	19 0	..	..
Waikokopu Branch ..	..	630,049	17 2	..	20,616 19 3	..	..	650,666	16 5	..	..
Wellington to Napier—											
Napier to Woodville and Palmerston North ..	114 06	1,166,526	11 8	..	..	5,417 7 7	..	1,171,943	19 3	..	..
Wellington to Woodville, including Te Aro Extension ..	129 30	3,257,471	2 1	..	..	28,043 2 3	..	3,285,514	4 4	..	..
Featherston to Martinborough ..	..	399	0 0	..	..	..	..	399	0 0	..	..
Wellington to Waitara—											
Wellington to Longburn ..	83 37	3,879,250	15 2	..	..	305,958 3 6	..	4,185,208	18 8	..	..
Foxton to Waitara and Moturoa ..	196 22	2,139,936	11 1	..	..	135,421 10 0	..	2,275,358	1 1	..	..
Mount Egmont Branch ..	6 00	70,536	1 6	..	..	..	..	70,536	1 6	..	..
Moturoa to Opunake ..	..	3,105	0 0	..	..	..	..	3,105	0 0	..	..
Opunake Branch (Te Roti to Opunake) ..	22 63	447,862	16 7	..	..	..	..	447,862	16 7	..	..
Manaiia Branch (Kapuni to Manaiia) ..	..	9,483	6 0	..	..	..	..	9,483	6 0	..	..
Rangitikei River Quarry Line ..	..	206	0 0	..	..	..	..	206	0 0	..	..

TABLE NO. 3—continued.
EXPENDITURE ON RAILWAYS TO 31ST MARCH, 1938—continued.

Lines of Railway.	M. ch.	Total Expenditure by General Government to 31st March, 1937.	Recoveries on Account of Expenditure of Previous Years.	Expenditure out of Public Works Fund during Year 1937-38: New Works.		Total Expenditure by General Government to 31st March, 1938.	Valuation of Works constructed by Provinces and Midland Railway Company.	
				Construction and Surveys.				Railways Improvement and Works on Open Lines.
				£	s. d.				£	s. d.
Stratford to Okahukura ..	89 00	3,072,723 12 9	..	Cr. 1,557 2 0	22,183 6 4	3,093,349 17 1	..	
Nelson to Greymouth—	..	..	..	..	..	..	..
Nelson to Inangahua ..	64 47	718,260 19 0	..	2,297 12 2	1,334 2 10	721,892 14 0	78,307 0 0	
Stillwater to Inangahua ..	57 32	226,593 15 11	..	..	3,683 14 11	230,277 10 10	279,685 0 0
Ngahere to Blackball ..	3 40	147,881 12 11	..	..	..	147,881 12 11	..
Westport to Ngakawau ..	19 56	209,904 14 2	..	..	2,131 0 0	212,035 14 2	..
Ngakawau to Mokihini ..	7 12	*	..	..	33 9 6	212,035 14 2	..
Mokihini to Colliery Line ..	3 69	†	..	..	..	33 9 6	..
Westport to Cape Foulwind ..	7 00	†	..	..	..	..	..
Westport to Inangahua ..	5 74	706,077 4 8	..	149,308 16 3	794 4 1	856,180 5 0	..	
Greymouth to Rewanui ..	2 44	259,815 10 2	..	..	4,831 3 9	264,646 13 11	..
Point Elizabeth Branch ..	8 70	74,363 10 11	..	..	..	74,363 10 11	..
Greymouth to Ross and Mikonui ..	38 68	431,416 9 3	..	..	5,516 5 6	436,932 14 9	..
Picton to Waipara—	..	..	..	..	..	..	..
Picton Southwards ..	56 06	1,038,330 13 10	..	202,309 18 10	1,993 15 1	1,242,634 7 9	..	
Waipara Northwards ..	44 14	729,005 1 9	..	276,468 4 2	..	1,005,473 5 11	..	
Christchurch to Greymouth—	..	..	..	..	..	..	..
Rolleston to Bealey ..	73 07	1,012,029 5 11	..	..	..	1,012,029 5 11	61,579 0 0
Whitecliffs Branch ..	11 38	25,021 0 0	..	..	..	25,021 0 0	..
Greymouth to Bealey ..	58 12	1,980,663 17 9	..	..	10,473 8 1	1,991,137 5 10	263,889 0 0
Hurunui to Waitaki—	..	..	..	..	..	..	..
Main Line (Waiau to Waitaki) ..	219 07	2,711,467 15 2	..	..	8,372 19 11	2,719,840 15 1	316,135 0 0
Oxford Branch (Rangiora to Oxford West) ..	21 76	49,697 17 2	..	..	..	49,697 17 2	..
Etreton Branch (Kaiapoi to Bennett's) ..	20 07	44,257 0 0	..	..	..	44,257 0 0	..
Lyttelton Branch ..	6 26	230,493 18 4	..	..	215 0 0	230,708 18 4	340,500 0 0
Southbridge Branch (Hornby to Southbridge) ..	25 31	92,181 4 8	..	..	81 18 8	92,263 3 4	..
Little River Branch (Lincoln to Little River) ..	22 46	112,290 7 9	..	..	1 16 9	112,292 4 6	..
Rakaia to Methven ..	22 20	77,090 19 2	..	..	..	77,090 19 2	..
Ashburton to Springburn ..	27 29	64,025 11 3	..	..	..	64,025 11 3	..
Orari to Geraldine ..	..	321 0 0	..	..	..	321 0 0	..
Fairlie Branch (Washdyke Junction to Fairlie) ..	36 05	70,502 15 5	..	..	..	70,502 15 5	75,124 0 0
Waimate Branch ..	12 63	80,862 4 6	..	..	..	80,862 4 6	..
Canterbury Interior Main Line—	..	..	..	..	..	..	..
Oxford to Malvern ..	11 44	46,248 0 0	..	..	..	46,248 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 ..	252 71	4,192,082 19 6	..	..	94,300 17 4	4,286,383 16 10	82,259 0 0
Dunroan Branch (Pukeuri to Kurow) ..	37 33	86,265 8 6	..	..	..	86,265 8 6	37,500 0 0
Ngapara Branch (Waiareka Junction to Ngapara) ..	14 76	25,238 2 0	..	..	..	25,238 2 0	58,009 0 0

* The funds for this extension—namely, £35,501 2s. 11d.—were provided by the Westport Harbour Board.
† The funds for this line—namely, £93,450—were provided by the Westport Harbour Board.

† The funds for purchase of this line—namely, £15,745—were provided by the Harbour Board.

TABLE NO. 3—continued.
EXPENDITURE ON RAILWAYS TO 31ST MARCH, 1938—continued.

Lines of Railway.	Mileage opened for Traffic.	Total Expenditure by General Government to 31st March, 1937.		Recoveries on Account of Expenditure of Previous Years.		Expenditure out of Public Works Fund during Year 1937-38: New Works.		Total Expenditure by General Government to 31st March, 1938.		Valuation of Works constructed by Provinces and Midland Railway Company.	
		£	s. d.	£	s. d.	£	s. d.	£	s. d.	£	s. d.
Waitaki to Bluff—continued.											
Livingstone Branch (Windsor to Tokarahi)	11 75	75,382	7 4	..	..	..	..	75,380	15 4	..	..
Waikato Branch (Palmerston to Dunback)	8 55	32,906	8 11	..	..	..	..	32,961	8 11	..	..
Ferruhill Railway	1 60	1,330	0 0	..	..	..	..	1,330	0 0	..	..
Brighton Road Branch	..	6,474	0 0	..	..	..	..	6,474	0 0	12,829	0 0
Outram Branch (Mosgiel to Outram)	8 78	12,051	0 7	..	..	..	..	12,051	0 7	29,691	0 0
Lawrence Branch	58 67	718,258	17 1	..	..	..	..	719,348	5 9	..	..
Balclutha to Tuapeka Mouth	..	2,489	0 0	..	..	..	..	2,489	0 0	..	..
Catlin's River Branch (Balclutha to Tahakopa)	42 67	463,709	6 3	..	..	..	..	463,709	6 3	..	..
Heriotburn Branch (Waipahi to Edievale)	26 23	124,808	4 5	..	..	..	..	124,808	4 5	..	..
Waikaka Branch (McNab to Waikaka)	12 65	68,423	0 0	..	..	..	..	68,423	0 0	..	..
Gore to Lumsden	36 39	112,385	14 8	..	..	..	..	112,857	18 2	..	..
Edendale to Glenham	9 36	50,490	13 11	..	..	..	..	50,490	13 11	..	..
Riversdale to Switzers	13 70	82,285	4 0	..	..	..	..	82,285	4 0	..	..
Seaward Bush to Catlin's (Appleby to Tokanui)	32 79	185,229	5 5	..	..	..	..	185,229	5 5	..	..
Otago Central (Wingatui to Cromwell)	147 27	1,453,717	10 1	..	..	..	..	1,454,692	16 5	..	..
Invercargill to Kingston—											
Main Line	87 04	369,244	14 9	..	..	..	..	372,768	9 7	91,937	0 0
Mararoa Branch (Lumsden to Mossburn)	10 40	27,508	4 4	..	..	..	..	27,508	4 4	..	..
Winton to Heddon Bush	..	140	0 0	..	..	..	..	140	0 0	..	..
Makarewa to Orepuki and Waiau	56 34	360,075	18 5	..	..	..	..	361,049	12 4	37,097	0 0
Thornbury to Wairoa	22 15	103,790	15 10	..	..	..	..	103,790	0 0	23,200	0 0
Forest Hill (Winton to Hedgehope)	12 40	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	..	31,235	10 1	..	..	..	..	31,235	10 1	..	..
South Island	..	5,763	0 0	..	..	..	..	5,763	0 0	..	..
Rolling-stock	..	11,977,319	17 11	..	..	..	..	12,671,131	18 11	..	..
Motor-omnibus Service, Wellington	..	60,571	1 11	..	..	..	..	60,571	1 11	..	..
General	..	14,076	12 9	..	..	..	..	17,658	2 7	..	..
Depreciation provided for out of Railway Revenue and actually repaid to Public Works Fund	..	Cr. 762,612	9 4	..	..	..	..	Cr. 762,612	9 4	..	..
Stock of Permanent-way Materials	..	8,942	15 9	..	..	..	..	8,942	15 9	..	..
Totals	..	68,939,218	6 7*	700	0 0	1,160,567	13 8	71,468,696	13 1*	1,787,741	0 0†

* The £10,400,000 accrued depreciation of assets referred to in section 23 (2), Government Railways Amendment Act, 1931, not deducted. † Includes value for £150,000 paid to debenture holders under the Midland Railway Petitions Settlement Act Amendment Act, 1903.

TABLE No. 4.
EXPENDITURE ON PUBLIC BUILDINGS OUT OF PUBLIC WORKS FUND TO THE 31ST MARCH, 1938,
AND THE LIABILITIES ON THAT DATE.

—	Total Expenditure to 31st March, 1937.	Expenditure for Year ended 31st March, 1938.	Total Expenditure to 31st March, 1938.	Liabilities on Authorities, Contracts, &c., to 31st March, 1938.	Total Expenditure and Liabilities.
General—	£	£	£	£	£
Alexandra Depot, Wellington*	8,084	..	8,084	..	8,084
Government House, Wellington (land and new building)	74,247	2,444	76,691	..	76,691
Offices for public Departments†	826,760	209,250	1,036,010	10,525	1,046,535
Air Defence .. ..	..	28,157	28,157	20,518	48,675
Miscellaneous	163,707	18,680	182,387	2,048	184,435
Parliament Buildings—					
Old buildings	76,553	..	76,553	..	76,553
New buildings	393,652	246	393,898	20	393,918
Alterations to streets surrounding grounds and purchase of land	57,089	..	57,089	..	57,089
Judicial‡	1,520,840	36,219	1,557,059	6,638	1,563,697
Postal and telegraph|| .. ..	2,982,064	211,301	3,193,365	15,235	3,208,600
Customs	49,441	..	49,441	..	49,441
Quarantine-stations	62,464	..	62,464	..	62,464
Mental hospitals	2,101,128	125,829	2,226,957	9,206	2,236,163
Health and hospital institutions§	416,475	15,747	432,222	2,239	434,461
School buildings	3,890,616	546,434	4,437,050	13,244	4,450,294
Agricultural	158,868	2,235	161,103¶	443	161,546
Totals	12,781,988	1,196,542	13,978,530	80,116	14,058,646

* Expenditure *vs* Defence requirements only. Other expenditure included in "Judicial" class. † Includes £12,500 expended under Finance Act, 1929, section 32. ‡ Includes Courthouses, prisons, and police-stations. ‡ Includes £134,485 for land transferred from Railway Department. § Includes £32,754 previously shown under "Public Health." ¶ Includes £60,268 expended under Reserves and other Lands Disposal Act, 1936, section 32 (Flock House purchase).

TABLE No. 5—continued.
ELECTRIC SUPPLY ACCOUNT.—STATEMENT OF ACCOUNTS AT THE 31ST MARCH, 1938—continued.
GENERAL BALANCE-SHEET
AT 31ST MARCH, 1938, AS COMPARED WITH POSITION AT 31ST MARCH, 1937—continued.

Liabilities.	1937-38.			1936-37.			Assets.			1937-38.			1936-37.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Brought forward	14,129,864	4	6	14,114,983	14	11	Brought forward .. .. .	..	..	16,352,779	14	1
Sundry Creditors—	85,432	1	2	Balance in Electric Supply Account at the end of year—	..	..	44,198	7	10
North Island scheme	15,786	14	2	Cash in Public Account .. .. .	..	..	18,856	18	2
South Island scheme	13	16	2	Imprests outstanding .. .. .	..	..	63,055	6	0
Surveys and general	127,204	3	7	101,232	11	6	Suspense Account .. .. .	..	..	266	11	9
Charges paid in advance—	1,756	0	2	Stocks—Surveys and General .. .. .	..	..	104	9	8
North Island scheme	1,662	12	4	..	0	2	Sundry debtors for interest due but unpaid	..	..	787	5	10
South Island scheme	1,756	0	2	Total .. .. .	..	..	£16,416,993	7	4
Depreciation Reserve—	1,016,184	7	5	949,888	3	11	Arrears due to Sinking Fund .. .. .	..	..	£16,223,013	9	1
North Island scheme	552,104	19	1	471,083	6	11						
South Island scheme	1,420,971	10	10						
Sinking Fund—	315,364	8	4	313,614	7	4						
Amount utilized for redemption of loans	191,321	2	3	13,429	16	1						
Available for further redemptions	506,685	10	7	327,044	3	5						
Writings-off in Suspense—	9	18	7					
North Island scheme	9	18	7					
South Island scheme	886	2	8	9	18	7						
General Reserve—	82,399	5	8	257,015	9	8						
South Island scheme	£16,416,993	7	4						
Total						
Contingent Liability.						
Arrears due to Sinking Fund	£942,756	19	1	..	..	..			

NOTES.—(a) No charge for cost of exchange on interest payments made in London is included. (b) Owing to the interconnection of the various schemes, it has not been found practicable to show separately the accounts of these schemes as required by the State Supply of Electrical Energy Act, 1917.

J. W. SCOTT, A.R.A.N.Z., Chief Accountant, Public Works Department.

I hereby certify that the General Balance-sheet has been duly compared with the relative books and documents submitted for audit, and correctly states the position as disclosed thereby, subject to the departmental notes enclosed thereon—J. H. FOWLER, Controller and Auditor-General.

TABLE NO. 5—continued.
NORTH ISLAND HYDRO-ELECTRIC-POWER SUPPLY.

PROFIT AND LOSS ACCOUNT

FOR YEAR ENDED 31ST MARCH, 1938, COMPARED WITH YEAR ENDED 31ST MARCH, 1937.

Gross Revenue Account.

	1937-38.			1936-37.			1937-38.			1936-37.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
To Generating-expenses, headworks, and power-house—												
Arapuni	17,232	13	4	12,924	19	0	..	..	..	876,215	13	3
Horahora	4,315	5	7	5,799	16	4	..	..	..	1,929	12	8
Mangahao	10,172	11	3	13,065	13	7	..	..	..	878,145	5	11
Waikaremoana	14,138	6	2	9,821	5	5	..	..	..	7,294	17	7
Standby stations	13,468	18	4	7,189	18	11	..	..	..	985	0	1
Transmission-lines—				48,801	13	3	..	..	..	9,085	0	11
Patrol, maintenance, &c. .. .. .	..	..	..	30,490	8	0	..	..	..	..	..	..
Substations—				23,869	7	0	..	..	..	..	..	..
Operation and maintenance .. .. .	..	..	..	..	..	..	..	..	..	..	..	..
Management and general—				55,500	6	3	..	..	..	..	..	..
Salaries, office expenses, accident, sick, and holiday pay, testing, &c. .. .. .	..	..	..	41,153	17	8	..	..	..	677	4	9
Balance to Net Revenue Account .. .. .	..	..	..	177,544	10	2	..	..	..	..	..	..
				800,947	15	10	..	..	..	..	..	..
				£978,492	6	0	..	..	..	£978,492	6	0
				£887,409	10	7	..	..	..	£887,409	10	7

Net Revenue Account.

	1937-38.			1936-37.			1937-38.			1936-37.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
To Interest for year ended 31st March, 1938	391,241	5	10	..	..	..	..	..	..
Depreciation on completed works	10,463	14	7	..	..	..	..	..	..
King's Wharf Station, half annual charges on capital costs thereon	38,119	11	9	..	..	..	..	..	..
Cost of raising loans and expenses	59,130	0	1	..	..	..	..	..	..
Balance to Profit and Loss Appropriation Account	244,139	12	5	..	..	..	..	..	..
				£800,947	15	10	..	..	..	£800,947	15	10
				£743,094	4	8	..	..	..	£743,094	4	8

TABLE No. 5—continued.
SOUTH ISLAND HYDRO-ELECTRIC-POWER SUPPLY.

PROFIT AND LOSS ACCOUNT

FOR YEAR ENDED 31ST MARCH, 1938, COMPARED WITH YEAR ENDED 31ST MARCH, 1937.

Gross Revenue Account.

	1937-38.			1936-37.			1937-38.			1936-37.		
	£	s. d.	£	s. d.	£	s. d.	£	s. d.	£	s. d.	£	s. d.
To Generating-expenses, headworks, power-houses, and auxiliary plant—												
Lake Coleridge	9,954	4 9	14,246	3 1	..	..	387,057	15 11	283,631	7 6	322,988	2 7
Waitaki	9,164	8 1	8,618	2 5	..	..	92,555	9 0	39,356	15 1	..	..
Kaimata	329	5 8	..	..	..	..	..	..	..	..	..	..
Dobson	3,456	10 11	..	..	..	..	..	..	..	..	..	..
Lyttelton Diesel station	1,217	14 0	824	0 6	..	..	..	..	192	10 10	..	..
Southland	11,198	6 8	4,256	18 8	..	..	..	..	23	3 0	..	..
Transmission and distribution—												
Primary distribution	11,484	1 1	27,945	4 8	..	..	2,637	11 9	4,363	6 9	2,460	2 9
Secondary distribution	9,043	6 4	11,040	14 4	..	..	1,725	15 0	480	17 8	2,941	0 5
Substations .. .. .	..	..	17,530	12 2	..	..	..	..	1,945	17 9	1,031	17 1
Plant, tools, testing, &c. .. .. .	..	..	15,667	18 7	..	..	..	..	..	..	..	..
Electrical testing .. .. .	..	..	252	1 0	..	..	..	..	..	..	..	..
Trunk telephone system .. .. .	..	..	254	14 3	..	..	..	..	..	..	..	..
Management and general expenses .. .. .	..	..	557	1 11	..	..	..	..	..	..	..	..
Balance, to Net Revenue Account .. .. .	..	..	23,439	15 3	..	..	..	..	5,290	12 4	1,825	11 11
			126,641	16 11	85,647	7 10			£491,428	15 7	£328,921	4 8
			364,786	18 8	243,273	16 10						
			£491,428	15 7	£328,921	4 8						

Net Revenue Account.

To Interest for year ended 31st March, 1938	£	s. d.	£	s. d.	£	s. d.
Depreciation on completed works	220,111	11 6	212,640	4 4	364,786	18 8
Cost of raising loans	112,374	15 3	112,274	19 5	122	1 11
Commission, collecting rates, &c.	1,362	12 11	26,420	9 0	..	..
Balance to Profit and Loss Appropriation Account	73	5 0	181	10 5	..	..
	30,986	15 11	..	..	..	..
	£364,909	0 7	£351,517	3 2	£364,909	0 7
By Balance from Gross Revenue Account .. .. .	..	..	..	..	..	..
Revenue from rates, &c. .. .. .	..	..	..	..	..	..
Balance to Profit and Loss Appropriation Account .. .. .	..	..	..	..	..	..
	£	s. d.	£	s. d.	£	s. d.
	243,273	16 10	243,273	16 10	243,273	16 10
	137	10 7	137	10 7	137	10 7
	108,105	15 9	108,105	15 9	108,105	15 9
	£351,517	3 2	£351,517	3 2	£351,517	3 2

TABLE No. 6.
IRRIGATION AND WATER-SUPPLY.

SCHEDULE OF SCHEMES COMPLETED OR UNDER CONSTRUCTION.

Scheme.	Source of Supply.	River Discharge (Minimum).	Main Canal Discharge (Maximum).		Average Rainfall from Records available.	Rainfall, 1937.	Area commanded (Gross).	Area for which Irrigation Water is available.	Works authorized.		Works completed.		Expenditure to 31st March, 1938.	Remarks.
			As per Design.	During 1937-38.					Main Canals.	Distributaries.	Main Canals.	Distributaries.		
Canterbury—Ashburton	Rangitata River ..	Cusecs. 1,300	Cusecs. 1,000	Cusecs. ..	Inches. ..	Inches. ..	Acres. 315,000†	Acres. ..	M. ch. 42 0	M. ch. ..	M. ch. 10 0	M. ch. ..	£ 32,347	Under construction. Diversion race only for supplying main races of schemes marked * and also supply of electric energy.
Ashburton—Lyndhurst Levels ..	Rangitata River ..	1,300	450	..	23.00	24.77	68,000*	..	55 0	80 0	10 31	51 27	96,643	Under construction.
Mayfield—Hinds ..	Ophi River ..	180	180	120	22.00	32.87	20,000	11,500	6 61	50 60	6 61	50 60	83,531	Completed.
Redcliff ..	Rangitata River ..	1,300	450	..	23.00	29.10	110,000*	..	..	..	..	..	3,565	Work commenced.
Otago North—Otekaike	Waitaki River ..	3,000	55	55	21.00	26.47	7,000	4,603	3 69	13 76	3 69	13 76	25,821	Completed.
Steward Settlement	Otekaike River ..	9	15	..	20.96 (Dunroon)	21.20	1,500	800	14 37	3 47	14 37	3 47	3,631	Completed. Used only on west side of river.
Otago Central—Ardgour	Waitaki River ..	..	110	..	20.00 (Steward Settlement)	14.93	18,000	..	14 60	50 31	14 60	50 31	12,115	Completed.
Arrow River ..	Lindis River ..	35	20	20	19.46 (Tarras)	16.87	2,000	1,364	13 0	2 40	13 0	2 40	33,700	Completed.
Bengerburn ..	Arrow River ..	40	50	35	27.64 (Arrowtown and Frankton)	24.18	6,536	2,936	..	..	9 18	27 60	143,028	Completed.
Earnsclough (Fraser River)	Bengerburn ..	1	4	4	..	..	1,000	144	2 6	..	2 6	..	755	Completed.
Hawkdun (formerly Mount Ida)	Fraser River and storage dam	10	47 (all races)	62	15.58 (Earnsclough)	16.35	2,743	2,247	11 30	17 60	11 30	17 60	65,454	Completed.
Idaburn ..	Tributaries of Manuherikia River and Eweburn Reservoir	..	60	36	23.94 (Naseby and Naseby Plantation)	21.70	10,000	8,818	66 0	101 0	66 0	90 12	71,871	Completed.
	Idaburn Dam ..	3	8	6	23.21 (Moa Creek, Blackstone Hill)	24.26	2,500	565	10 0	0 40	7 26	0 40	6,739	Main scheme completed.

† Includes schemes marked *.

TABLE NO. 6—continued.
IRRIGATION AND WATER-SUPPLY—continued.

SCHEDULE OF SCHEMES COMPLETED OR UNDER CONSTRUCTION—continued.

Scheme.	Source of Supply.	River Discharge (Minimum).	Main Canal Discharge (Maximum).		Average Rainfall from Records available.	Rainfall, 1937.	Area commanded (Gross).	Area for which Irrigation Water is available.	Works authorized.		Works completed.		Expenditure to 31st March, 1938.	Remarks.	
			As per Design.	During 1937-38.					Main Canals.	Distributaries.	Main Canals.	Distributaries.			
Otago Central—old. Ida Valley and Galloway— Ida Valley ..	Manorburn, Poolburn, Moa Creek, and Totorara Creek. (Storage Manorburn Dam)	..	110	90	16.79 (Moa Creek)	16.45	14,000	11,729	M. ch. 73 0	M. ch. 54 0	M. ch. 73 0	M. ch. 29 50	£ 304,568	Completed. Additional storage furnished by Poolburn and Lower Manorburn Dams. Hope's Creek Dam to be constructed will command additional area.	
Galloway ..	Manorburn Dam	30	27	14.35 (Galloway)	15.17	3,450	2,642	M. ch. 10 50	M. ch. 10 7	M. ch. 10 50	M. ch. 10 7			
Lower Manorburn Dam	Manorburn Creek	4	7	6.5	..	..	..	..	M. ch. ..	M. ch. 2 0	M. ch. ..	M. ch. 2 0		
Last Chance (Fruitlands and Earnsclough Tops)	Shingle, Coal Gorge, Butcher's Creek, and Conroy's Creek	8	20	16	16.92 (Earnsclough and Roxburgh East)	18.88	4,300	2,313	M. ch. 22 0	M. ch. 5 70	M. ch. 20 78	M. ch. 5 70	63,840	Butcher's Creek Dam now completed will augment existing supply and serve an additional area.	
Manuherikia-Alexandra - Clyde No. 1	Manuherikia River	77	100	89	14.99 (Alexandra, Ophir, and Clyde)	14.95	7,000	4,941	M. ch. 23 0	M. ch. 46 20	M. ch. 23 0	M. ch. 46 20	258,081	Completed. Portion of present race is being replaced by a tunnel approximately one mile in length.	
Omakau ..	Manuherikia River and Storage Dam, Thompson's Creek, and Dunstan Creek	36 } 7 }	65 } 7 }	53 } 11 }	20.37 (Clyde, Ophir, and Blackstone Hill)	21.47	10,800 (irrigable)	13,400	M. ch. 42 0	M. ch. 50 0	M. ch. 44 10	M. ch. 49 36	307,512	Completed.	
Tarras ..	Lindis River ..	35	70	35	19.46 (Tarras)	16.87	6,000	2,675	M. ch. 21 70	M. ch. 17 55	M. ch. 21 70	M. ch. 17 55	136,804	Completed.	
Teviot River ..	Teviot River and Lake Onslow Dam ..	40	80	54	18.06 (Roxburgh East)	21.41	5,300	3,791	M. ch. 20 48	M. ch. 14 57	M. ch. 20 48	M. ch. 14 57	79,135	Completed and serving all land requiring water.	
General investigations, and surveys, &c.	..	..	..	..	..	..	..	..	M. ch. ..	M. ch. ..	M. ch. ..	M. ch. ..	14,527	
Total: Schemes completed or under construction ..								437,129	74,468	M. ch. 452 31	M. ch. 521 3	M. ch. 383 34	M. ch. 484 28	1,743,667	

TABLE NO. 6—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, 1937.	Area commanded (Gross).	Length of Main Canal.	Length of Distributaries.	Expenditure to 31st March, 1938.*	Remarks.
		Cusecs.	Cusecs.	Inches.	Inches.	Acres.	Miles.	Miles.	£	
<i>Canterbury</i> —										
Barrhill ..	Rangitata River	1,300	250	23.00	24.77	53,000*	..	..	23,754	Investigations into the feasibility of irrigation in the Canterbury Province have been in hand since January, 1934. Investigations include the following phenomena, viz.: Soil moisture, mechanical analysis of soil, depth of ground water, evaporation, rainfall, and river-flow.
Orari ..	Rangitata River	1,300	250	22.00	32.87	40,000	..	..
Valetta-Tinwald ..	Rangitata River	1,300	450	23	29.10	84,000*	..	..
Investigations of other proposed schemes	..	..	..	..	..	..	..	..
<i>Marlborough</i> —										
Investigation of proposed schemes	..	..	..	..	16.06	..	..	..	3,385	Comprehensive investigation surveys of schemes for the Wairau Valley and parts of the Wairau Plains are in hand.
<i>Otago Central</i> —										
Cromwell Flat and Lowburn (Roaring Meg)	Hydro-electric development of Roaring Meg and pumping from Clutha and Kawarau Rivers	29 (Roaring Meg)	..	20.65 (Luggate)	19.34	..	..	..	3,774	Hydro-electric scheme under investigation. Power would be available for pumping irrigation supplies to 8,000 acres in Upper Clutha Valley. Portion of this area could be supplied from Hawea River power and pumping scheme.
Maniototo (Upper Taieri)	Taieri River and storage dam	25	500	16.87 (Waipiata)	16.59	100,000	60	..	16,734	Modified scheme for complete irrigation of 5,000 acres is possible without storage, or for reasonable partial irrigation of 15,000 acres. Surveys practically complete for scheme to irrigate 100,000 acres.
Scandinavian	Tributaries of Manuhierikia River	..	20	30.66 (St. Bathans)	..	..	..	..	..	For lands about St. Bathans. To bear £15,000 towards cost of Falls dam, Upper Manuhierikia scheme. Irrigable area, 3,000 acres.
Upper Clutha Valley (including Hawea Flats)	Hawea and Clutha Rivers (pumping) with power-station at outlet of Lake Hawea	580 (Hawea R.) 3,000 (Clutha R.)	..	21.83 (Hawea Flat, Luggate, and Tarras)	19.77	..	..	..	..	Investigations have been made for a hydro-electric power development at the outlet of Lake Hawea. Sufficient power would be available to pump water from the Hawea and Clutha Rivers to 13,700 acres in the Upper Clutha Valley.
Upper Manuhierikia (extension of Omakau Scheme)	Manuhierikia River and storage dam at Manuhierikia Falls	36 (at dam-site)	..	20.37 (Clyde, Ophir, and Blackstone Hill)	21.47	16,000	58	60	6,553	Surveys and investigations have been made for the extension of the Omakau scheme (now under construction) to supply lands between Tiger Hill and Clyde. Irrigable area, 12,000 acres.
Investigation of proposed schemes	..	..	..	..	..	..	..	..	2,145	Includes the reading of river and rain gauges.
Total: Schemes under investigation	..	..	..	..	..	..	..	..	56,345	
Grand total ..	..	..	..	..	..	..	..	..	1,800,012	

* Includes expenditure from Public Works Fund, Consolidated Fund, Unemployment Fund; also administration and loan charges.

APPENDICES

TO THE

PUBLIC WORKS STATEMENT, 1938.

APPENDIX A.

AUDITED STATEMENT OF EXPENDITURE ON PUBLIC WORKS
OUT OF THE PUBLIC WORKS FUND FOR THE YEAR 1937-38.*Prepared in compliance with Section 8 of the Public Works Act, 1928.*

SIR,—

Public Works Department, Wellington, 8th June, 1938.

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.,

The Controller and Auditor-General, Wellington.

R. SEMPLE,
Minister of Public Works.STATEMENT OF NET EXPENDITURE ON ALL WORKS AND SERVICES CHARGEABLE TO THE PUBLIC
WORKS FUND FOR THE YEAR 1937-38.

Vote No.	Summary.	Appropriation.		Gross Expenditure.		Credits in Aid.		Net Expenditure.	
		£	s. d.	£	s. d.	£	s. d.	£	s. d.
	<i>General Purposes Account—</i>								
36	Public Works, Departmental	194,810		447,551	10 9	260,596	17 3	186,954	13 6
37, 38	Railways	3,496,482		2,763,981	17 3	350,991	19 9	2,412,989	17 6
39, 40	Public Buildings	1,781,960		1,335,591	8 9	101,042	15 9	1,234,548	13 0
41, 42	Lighthouses and Harbour-works	37,090		19,532	1 4	7,854	13 0	11,677	8 4
43	Development of Tourist Resorts	45,375		23,534	7 8	375	6 11	23,159	0 9
44	Roads, Bridges, and other Public Works	1,493,360		1,297,780	17 10	171,024	0 0	1,126,756	17 10
45	Telegraph Extension	750,000		531,512	6 11	219,251	14 11	312,260	12 0
46	Lands, Miscellaneous	157,325		282,815	18 4	135,379	18 10	147,435	19 6
47	Irrigation, Water-supply, and Drainage	145,000		174,961	7 5	103,302	2 7	71,659	4 10
48	Swamp Land Drainage	23,000		30,202	16 1	10,801	2 0	19,401	14 1
49	Settlement of Unemployed Workers	302,500		460,264	17 1	149,600	1 2	310,664	15 11
50	Native Land Settlement	250,000		814,135	8 8	559,308	4 4	254,827	4 4
51	Dairy Industry Loans	30,000		4,565	0 7	..		4,565	0 7
	Unauthorized—								
	Services not provided for .. ..	..		1,699	4 3	570	13 9	1,128	10 6
	Totals, General Purposes Account	8,706,902		8,188,129	2 11	2,070,099	10 3	6,118,029	12 8
	<i>Electric Supply Account—</i>								
52	Development of Water-power	1,370,000		1,037,062	4 10	29,096	13 3	1,007,965	11 7
	Totals, Public Works Fund	10,076,902		9,225,191	7 9	2,099,196	3 6	7,125,995	4 3

APPENDIX A—continued.

Vote No.	Name of Vote.	Appropriation.	Gross Expenditure.		Credits in Aid.		Net Expenditure.	
		£	£	s. d.	£	s. d.	£	s. d.
	PUBLIC WORKS FUND.							
	<i>General Purposes Account—</i>							
36	Public Works, Departmental	194,810	447,551	10 9	260,596	17 3	186,954	13 6
	Railways—							
37	Railway-construction	1,293,025	1,202,138	1 0	81,920	7 4	1,120,217	13 8
38	Railways Improvements and Additions to Open Lines	2,203,457	1,561,843	16 3	269,071	12 5	1,292,772	3 10
39	Public Buildings—	1,229,960						
	Subdivision I—Public Buildings, General	..	340,377	16 1	79,360	15 9	261,017	0 4
	Subdivision II—Courthouses .. ..	..	21,463	4 11	5,060	0 0	16,403	4 11
	Subdivision III—Prison Buildings and Works	..	9,506	1 4	30	9 8	9,475	11 8
	Subdivision IV—Police-stations .. ..	..	16,085	12 1	5,000	0 0	11,085	12 1
	Subdivision V—Postal and Telegraph	..	250,896	6 6	2,751	16 5	248,144	10 1
	Subdivision VI—Mental Hospitals .. ..	..	126,631	14 1	802	12 5	125,829	1 8
	Subdivision VII—Health and Hospital Institutions	..	15,871	16 4	124	10 5	15,747	5 11
40	Education Buildings	552,000	554,758	17 5	7,912	11 1	546,846	6 4
41	Lighthouses	32,090	8,264	16 9	4	13 0	8,260	3 9
42	Harbour-works	5,000	11,267	4 7	7,850	0 0	3,417	4 7
43	Development of Tourist Resorts	45,375	23,534	7 8	375	6 11	23,159	0 9
44	Roads, Bridges, and other Public Works	1,493,360	1,297,780	17 10	171,024	0 0	1,126,756	17 10
45	Telegraph Extension	750,000	531,512	6 11	219,251	14 11	312,260	12 0
46	Lands, Miscellaneous	157,325	282,815	18 4	135,379	18 10	147,435	19 6
47	Irrigation, Water-supply, and Drainage ..	145,000	174,961	7 5	103,302	2 7	71,659	4 10
48	Swamp Land Drainage	23,000	30,202	16 1	10,801	2 0	19,401	14 1
49	Settlement of Unemployed Workers	302,500	460,264	17 1	149,600	1 2	310,664	15 11
50	Native Land Settlement	250,000	814,135	8 8	559,308	4 4	254,827	4 4
51	Dairy Industry Loans	30,000	4,565	0 7	..		4,565	0 7
	Unauthorized—							
	Services not provided for .. ..	..	1,699	4 3	570	13 9	1,128	10 6
	Totals, General Purposes Account	8,706,902	8,188,129	2 11	2,070,099	10 3	6,118,029	12 8
52	<i>Electric Supply Account—</i>							
	Development of Water-power	1,370,000	1,037,062	4 10	29,096	13 3	1,007,965	11 7
	Totals, Public Works Fund	10,076,902	9,225,191	7 9	2,099,196	3 6	7,125,995	4 3

NOTE.—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. W. SCOTT, A.R.A.N.Z.

Chief Accountant.

A. J. BAKER,

Acting Engineer-in-Chief and Under-Secretary.

The expenditure charged to the Public Works Fund has been examined and found correct subject to the remark that, as the Appropriation Act, 1937, made no provision for subdivisions in vote, "Public Buildings," the allocation of expenditure to the several subdivisions of that vote has not been checked.—J. H. FOWLER, Controller and Auditor-General.

APPENDIX B.

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

The ENGINEER-IN-CHIEF to the Hon. the 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 1st July, 1937, to 30th June, 1938.

Table No. 3 (pages 9, 10, 11) shows the expenditure on Government Railways in New Zealand up to 31st March, 1938, and also the mileage opened for traffic.

RAILWAYS.

NORTH AUCKLAND MAIN TRUNK RAILWAY.—OKAIHAU NORTHWARDS.

Rangiahua Section.—Since construction was abandoned in 1931 there has been progressive deterioration of the formation, principally through flood-damage and slipping of the very unstable country.

A proposal to complete this railway was investigated, but the conclusion was reached that the high cost of restoration and completion could not be justified, principally because the limited territory to be served can be more efficiently catered for by other forms of transportation services. It was therefore decided to salvage the permanent-way, ballast, building, plant, &c., for use elsewhere. Part of the track was accessible for salvage operations only during the summer, and work was confined to removing only such materials as could be used to immediate advantage on other works. The rails, sleepers, and fastenings were lifted from 25 m. to 35 m. 48 ch. and the material transferred to the Dargaville Branch Railway. Some 18,000 cubic yards of crushed-metal ballast were loaded with a modern powered excavator at very economical cost, and stored at convenient dumps, to be used on State highway reconstruction, for which purpose it is very suitable. Three 30 ft. and two 20 ft. plate-girder spans were dismantled and disposed of to the Railway Department. Platelayers' cottages are being removed to locations where extra accommodation for officers is necessary, and the disposal of other buildings is in hand.

DARGAVILLE BRANCH RAILWAY.

With the object of avoiding the creating of new level-crossings and of eliminating several existing level-crossings of the Kaihu Branch Railway within the Borough of Dargaville, the former route into the town, and the existing railway-station, have been abandoned in favour of a new proposal. On this new route provision is to be made for a more spacious station-yard with facilities more in keeping with the needs of the district than is possible on the present site.

While the question of routes has been under investigation work has been confined to the unopened section between Kirikopuni and Tangowahine, and to the partly-completed section between Tangowahine and Te Wharau, where the new route diverges.

The principal activity on the former section is completion of ballasting. Some 4,800 cubic yards have been placed, and the final lift completed over the major part of the length from 0 m. to 7 m. 19 ch.

Forward of Tangowahine the formation has been restored, and rails laid to Te Wharau (14 m. 56 ch.) and a base-course of quarry dust laid between 11 m. 72 ch. and 13 m. 67 ch.

Other activities include overhaul of fences, plant, bridges, and erection of accommodation. Employees as at June, 1938, numbered 106, and this number may be increased to a maximum of about 130 when formation of the Te Wharau - Dargaville Section is begun shortly.

Since construction work was suspended in December, 1930, a goods and passenger service has been operated by the Public Works Department between Kirikopuni and Tangowahine.

Tauraroa Quarry.—The output of crushed metal for the year was 32,095 cubic yards, as compared with 9,869 cubic yards and 23,570 cubic yards respectively in the two preceding years. The increase is mainly due to the Railway Department's requirements for restoring flood-damage and to the demand for ballast for the Dargaville Railway. The output to date from this quarry now exceeds 600,000 cubic yards, and it still continues to fulfil a most important function in supplying requirements of crushed metal for railways, roads, and highways. Since the taking-over of State highways

the demand for crushed metal for maintenance, reconstruction, and permanent paving has increased, and with a view to ensuring a dependable and economical source of supply the quarry plant has been maintained in first-class order.

The output was distributed as follows: Public Works Department, 10,212 cubic yards; counties, 2,225 cubic yards; New Zealand Railways, 19,140 cubic yards; private purchasers, 518 cubic yards.

PAEROA-POKENO RAILWAY.

A commencement of the preliminary work for the construction of this line was made in October last, and a survey party started on the relocation of the centre-line as pegged thirteen years previously.

Owing mainly to the deviation and reconstruction of the Pokeno-Paeroa State Highway and the Great South Road during the intervening period, and to areas flooding more heavily than previously, it was found necessary to relocate the line over these lengths. As a result, fourteen miles of new survey became necessary.

From the Pokeno end, 14 miles of trial line and 6 miles of permanent line were finished along with plans. Three miles (25-28) were repegged and levelled, and permanent plans completed.

At the Paeroa end the line was repegged from 0 m. to 8 m. and plans prepared for 0 m. to 7 m.

Construction headquarters were established at Pokeno, and the following buildings were erected: Office, store, carpenter's shop, staff bach, five married staff houses, five single staff huts, ten storage huts, sixteen married-men's quarters, and twenty-seven single-men's quarters. At the Paeroa end the office, workshop, six married-men's and twenty-two single-men's quarters were completed.

Actual construction on the route has been commenced at Maramarua, about 15 miles from Pokeno, where clearing, fencing, culverting, draining, and additional camp accommodation are being pushed ahead as fast as possible. At the Paeroa end No. 1 dredge has pumped 12,750 cubic yards to the right bank and 10,276 cubic yards of sand to the left bank approach of the Waihou River.

EAST COAST MAIN TRUNK RAILWAY: EXTENSIONS TO OPOTIKI.

The Government decided recently that the construction of the railway from Taneatua to Opotiki was to be proceeded with, and for the past month or so survey parties have been investigating the question of alternative routes.

It has now been decided to adhere to the route through the Waimana Gorge, and a survey party is proceeding to peg the permanent line.

It will be necessary to carry out a fair amount of survey work before construction can commence, but it is anticipated that the work will be under way before the end of the year.

The construction of the railway necessitated the abandonment of portions of the existing State highway through the Waimana Gorge, and investigations are at present in hand to ascertain the possibility of constructing the State highway on a different route. Even if this is done it will be necessary to construct a new road through the Waimana Gorge also, so as to give farmers the same road access as they have at present.

NAPIER-GISBORNE RAILWAY.

Work on this railway has been considerably disorganized by disastrous floods which have occurred, but in spite of these good progress has been made.

On the night of 19th February phenomenal rainfall in the watersheds of the Kopuawhara and Maraetaha Streams caused unprecedented flooding in these streams, and the single men's quarters at No. 4 Camp in the Kopuawhara Valley were swept away and twenty-two valuable lives were lost. Seven married men's quarters at Boyds Camp on the Maraetaha watershed were also swept away by the flood-waters, but fortunately only one life was lost.

Further heavy flooding in April did a great deal of damage to the railway, and the programme of construction is probably six months behind schedule time.

The section of the railway between Putorino and Wairoa was to have been completed and handed over to the Railway Department in June, but the disastrous flood of April has altered the position completely.

The major portion of the damage to the railway was on the section between Napier and Putorino, which had already been handed over to the Railway Department. It is anticipated that the restoration of this section will take four to five months to complete, so that it will probably be towards the end of the year before the line between Napier and Wairoa is open for regular traffic.

A through-goods service to Wairoa had been inaugurated in August, 1937, and, as can be seen from figures given later in this report, had been well patronized. The closing of the line and the stoppage of goods traffic has been most unfortunate for the people served by it.

The total expenditure on this railway over the period from 1st July, 1937, to 30th June, 1938, was £451,241.

The average number of men employed was 1,100.

Details of the work carried out on the various sections of the railway are as follows:—

Napier-Putorino Section (Length, 38 m. 62 ch.).—The restoration of this section of the railway after the damage of the 1931 earthquake was completed by this Department, and it was opened to regular traffic by the Railway Department.

As mentioned above, however, it was very seriously damaged by the floods of April and will be closed to traffic for four or five months. Restoration of the line is being undertaken by the Railway Department and good progress is being made.

Putorino-Te Kumi Section (Length, 18 m. 10 ch.).—In the past twelve months relatively little formation was done beyond the clearing of minor slips and widening of banks and cuttings,

and fairly extensive work in the Kotemaori and Raupunga Station Yards. In all, some 16,000 cubic yards were handled. This was made up as follows:—

Kotemaori and Raupunga Station Yards	..	..	..	..	Cubic yards	6,000
Reforming weak banks and cuttings	..	..	..	..	..	4,500
Clearing slip material (maintenance)	..	..	..	..	..	5,500
						16,000

In addition, a start has been made in clearing up the April flood-damage, and some 5,000 cubic yards of slip material has been removed and some 3,000 cubic yards of washouts filled.

The south portal of Kotemaori Tunnel was completed by a straight-face wall into solid papa on either side. All tunnels have been ballasted and completed.

The Waikare Viaduct at 38 m. 15 ch. was spot-painted with red lead and given one coat of red-oxide paint.

A 3 ft. flat-top culvert was put in at 42 m. 13·10 ch. leading into side drive.

Painting of Mohaka Viaduct with red lead was completed, and a final coat of red-oxide paint given to the whole structure.

Washout pipes were fitted to the main river legs and connections for a 2 in. hose.

Spot-painting of the Maungaturanga Viaduct with red lead was carried out, and a coat of red-oxide paint was given to the whole structure.

The holding-down bolts to the towers were all withdrawn and painted and restored. These will all be concreted in in the near future.

At the south portal of the Mohaka Tunnel an 18 in. culvert 40 ft. long was placed below the right-hand water-table to drain off all water coming over the tunnel portal. At the north end 90 ft. of 18 in. pipe was similarly placed and a concrete box built at the inlet.

During the period 250 ch. of new fence was erected mainly in station-yards and 657 ch. of repairs carried out. Fencing is now quite complete except for flood-damaged sections and alterations required for private crossing-gates.

Formation for private crossings has been carried out at 38 m. 76·50 ch., 39 m. 66·50 ch., and 46 m. 53 ch., and gates are set out ready for erection. All this work, which was interrupted by the flood, will be shortly completed.

Cattle-stops have been placed at Kotemaori Yard 43 m. 24 ch. and 25 ch. and at Raupunga Yard 50 m. 50 ch. and 51 ch.

The telephone-line was re-aligned and relocated throughout with new material where required by the New Zealand Railway's own gang of linesmen.

Both Kotemaori and Raupunga Yards were considerably enlarged, and the platelaying for these yards was all carried out. These yards now consist of main line, main siding, and two other loops together with a back-shunt at one end and a double back-shunt at the other to work the stock-yards.

Maungaturanga Viaduct was redecked in permanent sleepers and relaid with new rails. Guard-rails were completed on Waikare Viaduct, on the overbridge at 44 m. 32 ch., Mohaka Viaduct, and Maungaturanga Viaduct.

All platelaying was completed in October.

Ballast has been obtained from four sources during the period—viz., Bay View, Mohaka Pit, Narrow River, and Mohaka River—and a total quantity of 33,900 cubic yards was used.

In addition to above ballast, 2,500 cubic yards of red metal was used in both Raupunga and Kotemaori Yards.

This metal was obtained from Kakariki Pit and Raupunga Pit respectively.

The Bay View Ballast (beach shingle) was all used in Kotemaori Yard back-shunt.

Mohaka ballast pit crushed and washed red metal with fines screened out was used exclusively between 41 m. 70 ch. and the Mohaka Viaduct, 39 m. 25 ch.

The Mohaka River ballast (shingle) was used almost exclusively in Kotemaori and Raupunga Station Yards.

The Wairoa River ballast (unscreened) shingle was used principally north of the Mohaka Viaduct, though about 3,000 cubic yards were used to complete the ballasting from Putorino (37 m. 20 ch.) to Kotemaori Tunnel 41 m. 70 ch. All tunnels were blinded and curves built up with Wairoa ballast. All ballast was completed at the end of March.

The third lift throughout was completed in January of this year, but very extensive fettling and general maintenance was required from then on to maintain the track at high standard. This was due to the very heavy traffic the line was carrying and there is no doubt heavy maintenance for six months is necessary to ensure a really good and well-consolidated track. Curves of 7½ ch. radius were particularly difficult, as all traffic was slow and heavy and curves dropped on the inner rail.

At Putorino (37 m. 20 ch.) a new Stationmaster's residence was erected and was practically completed at the end of the period. Also erected at Putorino were an Inspector's quarters and single-men's quarters; these were completed in June of this year.

At Raupunga (50 m. 30 ch.), previously known as Mohaka, single-men's quarters were completed late in June of this year. This completes all accommodation in this area.

Kotemaori Station Yard (43 m. 10 ch.)—This yard has been greatly extended in size during the year, involving 15,000 cubic yards of earthwork and the extending of the side drive on left of 43 m. 2 ch. and cutting of new side drain some 12 ch. long. The main points were shifted farther apart and two loops added to the yard, giving a capacity of forty-five trucks in first loop and twenty-one in each of the second and third loops. Also twenty-five in the south end back-shunt and two twenty-five's and an eight-wagon capacity in the north back-shunt leading past the cattle yards.

A station building was completed, also latrines and a concrete-fronted platform 200 ft. long. A goods-shed, 20 ft. by 14 ft., was erected and a large loading-bank. Stock-yards, with holding-pen alongside, were completed.

An access road to the platform was put in crossing the line alongside the platelayer's cottages at 43 m. 24 ch.

This yard is complete except for repairs made necessary by flood-water damage in the recent heavy rains.

The Raupunga Yard has been completed by adding another back loop and extending the others; it now has a capacity of fifty-seven wagons on the first loop and twenty-eight on the others, otherwise it is the same as Kotemaori Yard.

A platform with a concrete front 200 ft. long was put in here; also an enlarged station building, and latrines with septic tank.

The old goods-shed was shifted back and a new loop added. This shed was completed by adding the sliding doors and veranda.

The old loading-bank was dismantled and a new one provided. The stock-yards are completed except for the holding-paddocks. These cannot be fully completed until the temporary married accommodation is removed.

This yard has been fully fenced off to exclude all wandering stock. It is complete except for the holding-yards, as stated above, and the clearing-away of temporary buildings.

A 40 ft. overbridge with large approach fillings is in hand where the Te Kahu Road crosses the railway at 52 m. 48 ch. This is at present a paper road, but is to be developed by the Native Department.

The number of men on this section has varied between 200 and 120, the general average being about 170.

The weather has been very favourable on the whole right up to the heavy storm of Anzac Day week-end, which was centred around the Putorino area. Ballast washouts were fairly frequent, but in general of a minor nature which could easily be remedied by water-table improvements. There were numerous small slips, but few of great size, and all have tended to greater safety due to releasing overburden.

In general this flood has put back proceedings some five months, due to men being diverted to flood-damage repairs on highways for two months and to an extra two to three months of work correcting flood damage on the railway. Owing to more extensive damage elsewhere on each side of this section no great expedition is called for in making good flood-damage.

Te Kumi—Wairoa Section (Length, 15 m. 22 ch.).—Construction work on this section has been practically completed, the largest work still to be done being erection of fifteen cottages at Wairoa and completion of station buildings at Wairoa.

Track work consisted chiefly of ballasting and fettling and general cleaning-up of cuttings. Platelaying was confined to station-yards, where extensive alterations and additions were carried out.

During the year a total of 48,276 cubic yards of ballast was taken from the Wairoa River under contract. Of this, 32,918 cubic yards was used between the Mohaka Viaduct and Wairoa, the balance of 15,358 cubic yards going to the Wairoa—Waikokopu section.

The whole of the telephone-line has been reconditioned, this work being carried out by the Railway Department.

Particulars of work in station-yards is as follows:—

A shelter-shed, goods-shed, latrines, and bunkhouse have been erected at Waihua. Two concrete-block cottages were strengthened and reconditioned. A platform and loading-bank were constructed and the stock-yards completed. Track work involved one extra siding and extension of passing loop and back-shunts. A total of 30 ch. of new track was laid. The only work still to be done is construction of a cart-dock and provision of buffer-stops.

A shelter-shed, goods-shed, latrines, platform, and loading-bank have been constructed at Ohinepaka Station Yard. Track work involved two extra sidings and extension of passing-loop and back-shunts, 45 ch. of new track having been laid. The only remaining work is construction of cart-dock and buffer-stops.

Sidings to engine-yard facilities were laid at Wairoa Station and, in addition, one extra back-shunt and a connection between the stock-siding and engine-yard was laid. One extra siding was laid the full length of the yard. Greatly increased facilities for stock-loading are being provided at this station, and, except for paving of yards and completion of a small amount of fencing, this has been completed. A contract has been let for engine-shed, rail-car shed, engine-drivers' shed, latrines, and refreshment-rooms, but work on these has not yet been started. A new site within the borough was purchased for twenty-one cottages, and a contract for erection of fifteen cottages, roading, and fencing is being prepared.

Working in conjunction with the Railway Department, a through goods service was put into operation in August, 1937, between Wairoa and Napier. This was well patronized, particularly in regard to stock and manures. Up to April, 1938, when floods caused cessation of this service, the following totals had been carried:—

Outwards from Wairoa: Cattle (head), 8,889; sheep (head), 49,531; other goods (tons), 1,680.
Inwards to Wairoa: Cattle (head), 771; sheep (head), 5,890; timber (superficial feet), 268,990; other goods (tons), 8,679.

A number of special passenger-trains were run and one very large circus train. To handle these goods an office was established by the Railway Department at Wairoa, but all train-running, except the special passenger-trains, were run by this Department.

All flood-damage restoration between Te Kumi and Wairoa has been completed. Restoration work between Mohaka Tunnel and Waihua was carried out from the Wairoa end.

Restoration of the line south of Te Kumi at 55 m. 45 ch. has reached Mohaka Tunnel, 53 m. 25 ch., where a Diesel shovel has been installed to handle the large slip at the north portal. There are still two washouts, one a large one, to be filled in on this section.

Wairoa-Waikokopu Section (Length 24 m. 11 ch.).—Except for station buildings at Tuhara and Whakaki and a small amount of ballasting, construction work on this section is practically completed. Extensions and additions at Whakaki and Nuhaka Station Yards were asked for by the Railway Department, and this work is completed. To replace decayed sleepers 10,000 new and approximately 3,000 good second-hand sleepers were laid in the track, and a considerable amount of extra ballasting and fettling, particularly on the swamp sections was carried out. In this work and for station-yard extensions, 15,358 cubic yards of ballast was used.

The telephone-line was reconstructed throughout by the Railway Department.

Work in station-yards is as follows :—

No extensions were required at Tuhara. A contract has been let for a shelter-shed, and a loading-bank has been constructed. Access roads have been formed and metalled.

A platform has been erected and stock-yards and loading-bank provided at Whakaki. A contract has been let for two cottages, shelter-sheds, goods-shed, latrines, and a bunkhouse, and of these the bunkhouse, shelter-shed, and goods-shed are completed.

Track-extensions involved laying 43 ch. of new track in one extra siding and extension of passing-loop and back-shunts.

A platform, station building, goods-shed, and latrines have been erected at Nuhaka Station Yard, and extensive alterations and additions carried out to the track, involving placing 45 ch. of new track. Access roads have been formed and metalled.

No work has been done in the Waikokopu Yard, and completion of it is being left to be done in conjunction with construction on the Waikokopu-Gisborne section.

Maintenance of the track has this year been dealt with in connection with construction work. The goods service has been run with greater regularity than in past years, particularly since the introduction of a nightly service between Wairoa and Napier.

Kopuawhara Section (Length 11 m. 20 ch.).—During the year the Waikokopu Station Yard was taken over from the Napier District and the section may now be regarded as commencing at 22 m. 52 ch.

The progress of work on this section has been greatly hampered by the phenomenal floods of 19th February and 25th April, so much so that cutting excavation between 27 m. and 33 m. has been practically at a standstill since the former date. All available men have been concentrated on the clearing and reforming of the access road. It was, however, fortunately possible to proceed with work on the south end of the Waiiau-Tikiwhata tunnel, several weeks only being lost in establishing access to this portion of the section.

A length of 116 ch. of permanent fencing has been erected during the year.

During the period a total of 192,500 cubic yards of excavation was completed, almost entirely by co-operative contract parties. A Diesel shovel was engaged on the Waikokopu section in formation of embankment across the estuary and in clearing substantial slips in the vicinity of 24 m. Most of the latter spoil has gone into embankment north of the Opoutama Stream Bridge at 24 m. 13 ch. Another shovel was engaged in cutting at 29 m. 20 ch., completing embankment at 29 m. 30 ch. Since February, however, this machine has been entirely engaged in the access road.

In the light of experience gained during the heavy rains in February and April it is evident that a number of cuttings will require somewhat flatter batters.

A further 584 ft. of sea-wall, containing 690 cubic yards of concrete and stone, were completed, and 270 ft. of coping placed on the wall between 24 m. 50 ch. and 24 m. 11 ch.

The base of pier D of the Waikokopu Stream Bridge (at 23 m. 21 ch.) has been completed and a commencement made on abutment E of this bridge. A total length of 615 ft. of 14 in. square reinforced piles has been constructed and will be available for driving in August.

The Opoutama Stream Bridge (at 24 m. 13 ch.) has been practically completed, the deck system of the final span only remaining to be done. A total of 300 cubic yards of concrete has been placed. Considerable time was taken in excavating for foundations owing to the exposed position of this bridge, southerly storms, with high seas, frequently holding up work on the pier bases.

All the piles for the Kopuawhara Stream Bridge (at 27 m. 47 ch.) have been cast, a total of 1,565 ft. of 16 in. octagonal piles now being available for the job. The northern abutment piles, each 50 ft. long, have now been driven and work on the remainder is in progress.

Four test bores were sunk at the bridge-sites at 30 m. 15 ch. totalling 125 ft. of drilling.

Twelve test bores were put down at the bridge-sites at 33 m. 27 ch. and 33 m. 33 ch., making a total of 328 ft. of drilling at these two sites.

A total of 80 ft. of 18 in., 36 ft. of 24 in., and 42 ft. of 30 in. pipe culverts were installed during the year.

Water Drives : The only work under this heading undertaken during the year was the construction of the intake to water drive at 31 m. 06 ch.

Tunnels—At 30 m. 9-45 ch. The south portal of this tunnel was built and the complete length of 52 yards of the tunnel excavated and lined. Work is in hand on the excavation of the northern approach, preparatory to construction of this portal.

At 33 m. 6-77 ch. : The bottom heading of this tunnel has been completed, a length of 6 ch. Excavation to full section and lining was commenced from the southern end and the south portal constructed. Full excavation extends thence for 200 ft. and lining for 165 ft.

On the Waiau-Tikiwhata Tunnel (south end) excavation and lining has been in progress throughout the year, with the exception of the periods in February and April previously referred to.

A length of 11½ ch. has been excavated and timbered to full section. The portal is complete and lining carried over 7 ch., stub walls and footings having been constructed for a further 3½ ch.

Mucking scraper and loader, concrete-pump, and steel profiling are in use in this tunnel.

During the year the installation of 800-cubic-foot Diesel compressor unit, 25-h.p. ventilating-fan, bins and batching-plant, and track lay-out inside and outside of tunnel were completed.

The clearing of approach cuttings to tunnels at 30 m. 47 ch., and 31 m. 40 ch. was in hand in February. Since then it has not been possible to proceed with work owing to the man-power concerned being diverted to the access road.

Maintenance of the service road from the Kopuawhara Road bridge to the south end of the Waiau-Tikiwhata tunnel, a distance of 9¾ m., has been carried out, and the metalling of the Coast Road to over a length of 4 m. completed.

Very considerable damage occurred to the road during both the February and April floods, and although it should be open for traffic to the Waiau-Tikiwhata tunnel within a month considerable surface trimming and metalling will be required.

The crushing-plant previously installed in the vicinity of 33 m. has been put into operation at Kopuawhara at 29 m. 40 ch.

The two road bridges opposite 30 m. 65 ch. and 31 m. 25 ch. which were destroyed by the February flood will very shortly be replaced. In the meantime the stream can be crossed by fords.

Service repairs were carried out to accommodation, porches for married quarters were added where required, and single-men's tents provided with lining.

Inspection and maintenance of the main 11 kV. line and reticulation was carried out and a voltage regulator installed at Opoutama. Considerable renewals of the main line were necessary in February after the flood, when approximately a mile of new line was erected.

Wharerata Section (Length 9 m. 17 ch.)—Tunnelling and heavy earthworks constitute the major problems on this section. The earthworks are nearing completion, and the tunnels are being vigorously attacked with the help of up-to-date machinery.

With the exception of the smaller culverts on the section between 19 m. and 20 m. 36 ch. and in the Tikiwhata Valley, culverting is completed. These smaller culverts will be constructed when the completion of the formation provides cheaper access. 63 ft. of pipes up to 24 in. diameter were placed during the year.

At 19 m. 71 ch. a 5 ft. by 4 ft. drive was excavated in order to divert a small stream to a suitable culvert site.

Earthworks on this section are nearing completion. In the Waikoura Valley the embankment between 16 m. 5 ch. and 16 m. 30 ch. has still to be formed with spoil from the Waikoura Tunnel at 17 m. 51 ch.

Between 14 m. 50 ch. and 15 m. 18 ch. minor cuttings will not be started until bridge-work in the vicinity is further advanced.

Major cuttings between 18 m. 43 ch. and 20 m. 36 ch., the section along the sea-coast, are completed except for trimming batters and the removal of slips.

In the Tikiwhata Valley the big filling at 35 m. 62 ch., 105 ft. high, is gradually taking shape. The rock cutting between 35 m. 70 ch. and 35 m. 76 ch., together with 356 lineal feet of concrete retaining-wall, has still to be completed.

Two ¾-cubic-yard Diesel excavators were employed on the section, the total earthwork completed amounting to 470,250 cubic yards, or approximately 94 per cent. of the total.

The contractor has started on the construction of a new highway bridge over the Maraetaha Stream at 15 m. 15 ch. This bridge will improve the road-alignment and eliminate a railway overbridge.

The use of modern machinery in the larger tunnels has enabled the work to proceed more rapidly and has reduced to a minimum the heavy manual labour previously associated with such work. Electrically operated muck-scrappers load up to 95 per cent. of the spoil into trucks without handling. The difficulty of exchanging full for empty trucks at the loading-slide is overcome by using a compressed-air hoist to lift the empty trucks clear and lower them at the rear of the rake of trucks hauled by an electric locomotive. A rake of eight or ten trucks can be filled in this way on a single track, no siding being required.

Concrete for lining the tunnel is placed in position behind steel profiling by means of an electrically driven pump. In a period of ten to twelve hours 32 ft. of tunnel can be lined in one operation.

The Waikoura Tunnel (1,576¾ lineal yards) (north end) having the easiest access, is the furthest advanced, and various methods and positions for the machinery were tried here before adoption in the other major tunnels.

Work was delayed by floods, a large slip occurring on the spur above the bins and concrete-mixing plant. The structure was moved on its foundations, and although the bins have been secured the structure housing the mixing-plant had to be rebuilt on a new site.

To date 420 lineal yards of tunnel have been excavated, 244 lineal yards lined with concrete, and an additional 30 lineal yards of concrete butt walls placed.

At the Waikoura Tunnel (south end) the same methods are adopted in this face of the tunnel as at the north end, and good progress has been made. 272 lineal yards of tunnel have been excavated, of which 110 lineal yards are lined with concrete. A further 81 lineal yards of butt walls have been placed ahead of the completed lining.

At the tunnel at 18 m. 70 ch. (101 lineal yards), 29 lineal yards were excavated and 34 lineal yards lined with concrete, completing this tunnel.

At the tunnel at 20 m. 10 ch. (131 lineal yards), 55 yards have been completed, including lining, and a further 14 yards of top heading driven. Progress has not been rapid owing to the heavy nature

of the ground and the difficulty of access. To convey material to the tunnel it was necessary to construct 30 ch. of sledge track and erect a chute 530 ft. long.

At the Coast Tunnel (1,024 lineal yards) the bottom heading was completed, 824 yards being driven during the year. Metal bins and concrete-mixing plant were erected at the south portal, and 5 yards of tunnel excavated to full section.

Good progress was made with the driving of the Waiau-Tikiwhata Tunnel (3,267½ lineal yards) (north end), but concrete lining was delayed pending the arrival of suitable electric and Diesel mine locomotives. One Diesel and two battery locomotives are now in operation, and the party is concentrating on lining the length of tunnel already excavated.

A length of 311 yards was excavated, and 60 yards of tunnel lined with concrete. An additional 32 lineal yards of concrete butt walls are in position.

The machine shop with modern equipment, including electric arc welder, has had difficulty in keeping ahead of the work, which includes plant repairs of all kinds and the fabrication of tunnelling and bridge gear.

The sawmill at Bartletts cuts to size timber for all the tunnels, on massed-production lines, and has effected a considerable saving.

4,730 cubic yards of crushed metal was supplied by the stone-crushing plant for use on highway deviations and access roads.

Major plant in use on this section includes: Two Diesel excavators, two steam-locomotives, two petrol locomotives, one Diesel locomotive, five Diesel mine-type locomotives, five electric-battery locomotives, ten concrete-mixers, four air-compressors (stationary), two air-compressors (portable), three tunnel-mucking scrapers, three concrete pumps, and five air-hoists.

One Y.M.C.A. and twenty married-men's quarters were erected, in addition to various service buildings, all being served with electric light.

Minor damage only was caused on this section by the flood on 19th February. Floods on 25th April and 4th May, however, caused many large slips. Culverts and water-drives were blocked with debris, and in one case the inlet to a water-drive was completely buried under a large slip, and the drive had to be abandoned. The clearing of slips will be undertaken by Diesel excavators when the material is sufficiently dry to handle.

Gisborne Section (Length, 14 m. 7 ch.).—No fewer than sixteen bridges are required on this section, and work has been confined mainly to bridge-construction, platelaying, and ballasting.

Ninety per cent. of the earthwork has been completed, involving the removal of 149,881 cubic yards of material, and formation is ready for platelaying as far as 10 m.

Station-yards at Matawhero, 2 m., and Muriwai, 9 m., were formed, using a Diesel excavator and tractor-drawn carry-all scraper.

Approach banks to the Waipaoa Bridge were completed and withstood floods exceptionally well.

The deviation of the main highway between 8 m. 35 ch. and 8 m. 67 ch. was completed and opened for traffic during the period. This deviation necessitated 11 ch. of new road, and a level-crossing at 8 m. 77.5 ch. to provide access to Muriwai Village.

At 10 m. 33 ch. a diversion of the Wairekaia Stream, 9 ch. long, is being constructed to straighten the stream and improve the sites for the railway bridge and new highway bridge. A Diesel drag-line has half completed this work, the spoil being utilized to form approach ramps to the overbridge at 10 m. 49 ch.

A relocation of the railway from 13 m. 60 ch. to 14 m. 10 ch. was necessitated by the flood of 19th February, which washed out part of the completed formation. The survey and plans for the new location have been completed.

Fifty per cent. of the fencing of the railway reserve is now completed, 567 ch. being erected during the year.

272 lineal feet of culvert, ranging from 18 in. pipe to 4 ft. by 4 ft. reinforced box, were constructed.

Bridge-construction has been pushed ahead as fast as steel-supplies would allow. Floods retarded the work for a period of three months, during which silt and water rendered bridge-sites inaccessible. During part of this period workmen were employed on the erection of temporary bridges on the main highway, where washouts had occurred.

Piers were completed on both bridges at 2 m. 55 ch. and 3 m. 4 ch., and temporary decking erected to enable platelaying to proceed.

Waipaoa Bridge, 5 m. 4 ch. (six 30 ft. and nine 60 ft. spans): All piers on this bridge were completed, and the erection of steel spans is proceeding. The six 30 ft. spans are in position, and two have been riveted. Four 60 ft. spans have been launched, and the riveting of two is completed. The loss of the temporary staging during the floods delayed the erection of the steelwork.

Karaua Stream, 5 m. 37 ch. (three 25 ft. spans): This bridge was completed.

Wherowhero Stream, 5 m. 67 ch. (three 25 ft. spans): Concrete piles have been cast, but will not be driven until the access track dries up.

6 m. 55 ch. (one 25 ft. span): Pile-driving is in progress at this bridge, and the piles for the next bridge at 7 m. 50 ch. are under construction.

Wairekaia Stream Highway Bridge, 10 m. 36 ch.: This bridge will improve the highway alignment, which has been located to suit the railway overbridge at 10 m. 55 ch. The contractor has completed all piers with the exception of the south abutment.

Overbridge, 10 m. 55 ch.: Four 45 ft. spans are being erected by contract. Two piers have completed, together with the reinforced-concrete beams and girders of the north span.

The permanent track was laid to the north abutment of the Waipaoa Bridge at 4 m. 77.85 ch.: The first lift of ballast has been completed over this length, and the second lift as far as 2 m. 4 ch.

At Matawhero Station Yard the first siding was laid and is being used for accumulating a stock of ballast

A very considerable amount of damage was caused by a disastrous flood in the Mangakaiwherangi, Mangakotukutuku, and Maraetaha Streams on 19th February.

A small camp consisting of nine cottages and several single huts, situated on the river terrace at 13 m. 20 ch., was washed away with the loss of one life.

The Mangakotuku Stream changed its course immediately above the bridge-site at 13 m. 17 ch., washing out the railway embankment and endangering two workmen's cottages nearby. Further damage was done to railway formation at 13 m. 57 ch. to 13 m. 65 ch. It is proposed to make a minor deviation of the railway at this locality in order to improve the bridge-site.

Further serious floods occurred over the whole section on 25th April, and again on 4th May, causing much damage, particularly to bridge-works between 5 m. and 6 m.

Owing to these floods the works were somewhat disorganized for a short period. The loss of two highway bridges and numerous slips threatened the food-supplies of the camps, and work on the railways was abandoned until road communication was restored, including the construction of two temporary highway bridges.

The following major plant items are in operation on this section: One Diesel drag-line, one mechanical loader, one Diesel tractor and carry-all scraper, one Diesel pile-driving winch, two Diesel tractors with winch attached, two Diesel locomotives, two portable air compressors, and one sleeper adzing machine.

TURAKINA-OKOIA RAILWAY DEVIATION.

The survey of the deviation was completed and plans prepared.

Very little clearing was necessary owing to the deviation running through open country.

Two small diversions of the Matarawa Stream were carried out, otherwise no other waterways were affected.

Progress over the year has been satisfactory, 340 ch. of formation, cutting, and banks having been completed. Very little difficulty has been experienced, favourable weather conditions having prevailed.

At the northern end of the Fordell Tunnel 16 ch. of excavation has been carried out and 15 ch. has been lined. The southern end has been driven 11 ch. and lined for 10 ch. The driving of the southern heading was delayed by a slip of approximately 2,000 cubic yards. The total length of this tunnel is 72 ch.

At the northern end of the Turakina Tunnel 9½ ch. of excavation has been completed, 9 ch. of this having been lined. The southern end had been driven for 9 ch., 8 ch. of this having been lined. A run of sand delayed progress in this tunnel for a short time, but this trouble was speedily overcome. The total length of this tunnel is 104 ch.

Work has not yet been undertaken on the Wangaehu and Turakina River Bridges, but the sites were surveyed, plans have been prepared and test piles cast preparatory to driving.

During the period 1,533 lineal feet of culverts were laid on concrete foundations.

A water-tunnel at 8 m. 40 ch., of a total length of 280 ft., was driven and lined.

A total length of 846 ch. of standard fence has been erected, thus completing all fencing except for a few isolated sections which have been left open for service purposes.

The formation of the station-yards at Fordell and Wangaehu is well in hand.

Formation and metalling has been carried out on 140 ch. of the Matarawa Road, and the Fordell Station access road has been formed and metalled for 60 ch.

Both these roads are being utilized as service access for the completion of the adjoining sections of the line.

For the transport of material and stores, service roads were formed and metalled for a distance of 175 ch. between the main camp at Reynolds and the north and south entrances to the Turakina Tunnel.

The local workshop has experienced a busy period, four electric locomotives having been assembled, electric compressor installed, and a Mucker scraper installed at one of the tunnels.

Metal bins and concrete-mixers have also been installed at the tunnels.

General repair work has been carried out, including a general overhaul of main-highway graders.

All necessary buildings at each end of the tunnels have been erected. At Denlair Camp fourteen married quarters were built and a Y.M.C.A. building fitted with a post-office. At the Reynolds Camp twenty-six married quarters were erected, three standard houses for staff accommodation, and a Y.M.C.A. building fitted with a post-office. This brought the total accommodation up to ninety married quarters and fifty single quarters.

Bathhouses, complete with drying-rooms and showers, were also erected at the single-men's camps and at both ends of both tunnels.

Temporary telephone-lines were erected from 5 m. to 10 m.

The number of men employed at the 30th June, 1938, was 302.

RAILWAY DUPLICATION.

Plimmerton to Paekakariki.—Good progress during the past year has been made on this work, the fine summer experienced being a contributing factor. The widening for duplication of the track has been completed over a length of 2 m. 42 ch., and a total of 81,100 cubic yards has been excavated during the year.

From 19 m. 25 ch. to 20 m., and 20 m. 31 ch. to 22 m. 60 ch., the widening is in progress.

Existing culverts have been extended as the work proceeds, and a total length of 760 ft. has been laid.

As the work advances fences have been dismantled and re-erected on the new boundaries. To date 81 ch. has been permanently erected and 10 ch. of temporary fencing has been put up to keep stock from the permanent way.

78 chains of batter drains has been constructed to protect all banks.

As it is possible to use the permanent-way, temporary crossings have been put in, thereby allowing for speedy delivery to all parts of the work.

Nine lorries are engaged, and these have practically taken the place of hand trucks for excavation work.

An average of 118 men were employed during the year.

MIDLAND RAILWAY.

No construction work has been carried out on this line during the year.

A trial line survey of the section of line from Murchison to Inangahua Junction was put in hand during February, 1937. The old trial line was picked up at 94 m., and the survey is in hand up to 104 m. 50 ch. Very heavy country is being encountered on this section. Approximately 7 m. remains to be surveyed.

SOUTH ISLAND MAIN TRUNK RAILWAY: NORTH END.

(56 m. to 104 m. 70 ch.).

Clarence Section (56 m. to 76 m. 13 ch.).—The principal formation work on this section during the period has comprised the finalization of the various unfinished portions throughout the section and extensive excavation on the Blue Slip at 61 m. With the exception of the Blue Slip, the formation work on this section is now complete to the north end of the Clarence Station Yard at 75 m. 50 ch. The Blue Slip, which has presented the major difficulty on this section of construction, is now well in hand. It has been tackled very vigorously with Diesel shovels, and although there is still a lot of work to be carried out in the cutting of open drains in the affected area and in draining the sub-grade it may be reasonably anticipated that the main portion has been stabilized and that it should be completed during the next year.

Approximately 132,000 cubic yards of material have been removed from this slip since the reopening of the works.

The sub-structure of all the railway bridges has been completed. The girders are on the site and an erection gang is now starting to assemble and place them. Plans for the overbridges are being prepared, and this work will shortly be put in hand.

Permanent fencing has been completed up to 60 m. 21 ch., and all material for the completion of fencing throughout has been arranged for, and the fencing itself will shortly be completed.

Formation of the station-yards is well in hand, and a start has been made with the completion of platelaying.

All old 55 lb. material has been lifted and replaced with 70 lb. material. The party have been equipped with pneumatic tools, and it is expected that the railhead will be at the Clarence Station Yard by next November.

Reballasting has been carried out over the old section of the line, and the track is completely ballasted to 67 m. 40 ch. The equivalent of 7 m., or 16,000 cubic yards, of ballasting having been placed to date.

A large portion of this section is subject to sand-drift, and this has been successfully dealt with by means of extensive marram-grass planting.

Kaikoura Section (76 m. 13 ch. to 104 m. 70 ch.).—Excavation: The formation work on the length between the Clarence Station Yard (76 m. 13 ch.) and the Hapuka River at 92 m. 48 ch. is well in hand. Approximately 400,000 cubic yards of railway and road excavation have been shifted since the re-opening of the works, of which 260,000 cubic yards have been excavated in the period under review. A commencement has also been made on formation work south of the Hapuka River.

The bulk of the excavation is in difficult country consisting of clay and boulders in talus slopes. This has resulted in very high batters. Much of this work has been done by Diesel shovels, especially where hand-excavation would have been costly, slow, and dangerous. The easier cuttings have been excavated by hand on the co-operative contract system.

Between 87 m. 68 ch. and 89 m. 32 ch., owing to the extremely high and unstable batters involved in the original alignment, it has been found advisable to adopt a new route. The new alignment introduces two additional short tunnels, but results in a much safer and slightly cheaper route.

Road-deviation work is well advanced, and a start has been made on the placing of rock for heavy-sea protection where the railway formation and road deviations are exposed to erosion by heavy seas.

Random rubble walls are in course of erection at the toe of unstable batters.

Tunnels: There are six tunnels on the section, totalling 4,664 lineal feet. One tunnel is complete, another will be finished in two months, and a third is half completed, making a total of 1,876 lineal feet of completed tunnel to date.

Tunnelling has been carried out on the co-operative contract system, three shifts being worked. Except in bad country, where it has been necessary to explore the ground by means of a heading, the full-face method of working with American timber is in vogue. Mechanical equipment is in use wherever the nature of the ground permits. Mucking-scrapers are used for loading the excavated material into trucks, which are hauled out by Diesel locomotives equipped with exhaust-gas purifiers for use underground. The concrete-gun is in use in the two larger tunnels, and the concrete is blown in place behind steel profiles by compressed air. The steel profiles are carried on travelling gantries, which straddle the muck-trucks and which, if necessary, permit of an 8 ft. 6 in. length of lining being

concreted daily. Large shingle and sand bins have been installed at tunnel-portals. The concrete is fed by gravity from the bins to the mixer and thence to the concrete hopper, which is hauled to the concrete-gun in the tunnel by Diesel locomotive.

The Clarence River Bridge (76 m. 40 ch.), will consist of twelve 122 ft. steel trusses with two 30 ft. plate-girder shore spans.

The foundations consist of reinforced concrete caissons for the river piers and piled abutments. The caissons are 17 ft. by 6 ft. 6 in. in section and are sunk 35 ft. into water bearing river shingle and boulders under compressed air.

In spite of the difficult nature of the sinking, it being frequently necessary to blast boulders in the working-chamber, the contractor has made excellent progress and has completed ten of the thirteen river piers. It is expected to have the substructure complete and ready to receive steel by the middle of August.

Groyne-protection at bridge-heads will be completed during next year.

The Hapuku River Bridge at 92 m. 47 ch. is also a work of considerable magnitude, consisting of twenty-three filled spandrel arch spans of 67 ft. each. The erection of this bridge is one of the key-points in the time schedule for the completion of this section of line. Plans have been prepared and tenders for erection will be called very shortly. A start has also been made on some of the smaller bridges south of the Clarence, and good progress is being made.

Culverts are substantially complete as far as 92 m., and work is well in hand up to 96 m.

Portion of the material for laying the permanent line south of Clarence is on the site, but it will be some considerable time before a start can be made with actually laying the rails.

It is proposed to establish a ballast-pit at the Hapuku River, and plans are in course of preparation for a large crushing-plant. The plant will be equipped with a 1-cubic-yard slack-line excavator capable of working on a 700 ft. radius, and it is expected to obtain 120,000 cubic yards of ballast by using this plant.

Four permanent railway cottages have been erected opposite 86 m. 44 ch. at the Ainseed Station Yard.

Approximately four hundred men are employed on the north end, but a considerable amount of plant is also in use to hasten the final date for completion.

SOUTH ISLAND MAIN TRUNK RAILWAY: SOUTH END.

(44 m. to 73 m. 40 ch.: length, 29 m. 40 ch.)

Work has been continued during the year with substantially the same number of men as last year—namely, 500 to 550. Construction has spread out over the whole of the 29½ m. of the section. With the completion of the Hawkswood Cut at 48½ m. in October, 1937, the camp was shifted to Puketa, at 73½ m., and these men concentrated on the northern end of the section. Recreation halls have been erected at the five largest of the sixteen camps, and are being well used by the men on the works. Good water-supplies have been provided to all camps, and the main road has been sealed through the three camps that lie beside it. In another camp a new road, 3¼ m. long, has been built to provide good access.

The largest open cutting on the job through the Hawkswood Saddle was completed towards the end of October. Work was continued with the one Diesel and two steam drag-lines working the centre of the cutting from the top. This was spread by the 12 cubic yard and 8 cubic yard carry-alls and angledozer with R.D.-8 tractors away from the batter lines. This latter work was spread out over several months and done only while suitable weather for using the machines obtained. In addition to the 53,000 cubic yards excavated in 1931, excavation has been 325,313 cubic yards.

With the completion of the work of placing the steel spans on the Leader River Bridge at 44 m. 60 ch. in October, platelaying was started and, although delayed for a time through a batch of inferior sleepers and again for a short time while clearing silt and placing an extra amount of ballast through the Hawkswood Cut, has now reached the Ferniehurst Station Yard at 50 m. 20 ch. Ballast has been placed over the whole length and one lift taken over most of it.

Trouble with foundations on piers P and Q and abutment R on the Conway River Bridge at 50 m. 50 ch., which was overcome by driving piles at these points, caused some delay to this bridge. Concrete work is now completed, and placing of the sixteen 45 ft. steel girders is being started now that the railhead has reached the bridge-site. Opportunity was taken during the delay to build the two reinforced deck-slab concrete bridges across the Matagouri Creek at 49 m. 32 ch. and 49 m. 53 ch., the former being two 30 ft. spans with one abutment and the pier on piles, and the latter two 25 ft. spans on piles.

The Ferniehurst Station Yard formation was completed during the year by borrowing from the Conway River Flat at 50 m. 30 ch. and beside the yard, using a 12-cubic-yard carry-all and tractor, and with spoil from the access road to the station-yard at 50 m. 9 ch., using a ¾-cubic-yard Diesel shovel with a tractor and 10-cubic-yard Caterpillar track dump wagon. Work on the 35 ft. span concrete bridge on the approach road is under way.

From the Ferniehurst Station Yard to Mick's Creek at 53 m. 40 ch., where the substructure of the concrete bridge of three 45 ft. spans is in hand, cleaning up the old cuttings and the blocks between them left in 1931 has been completed with a shovel and dump wagon. Protection work for the Open Creek Bridge at 54 m. is nearing completion and pile-driving has been completed. From here to the Hundalee Station Yard at 55 m. 55 ch. the earthwork and culverts have been completed. Piles have been driven for the subway at 55 m. 47 ch., where the railway crosses the Kaikoura-Christchurch State Highway.

Continuing along the Conway River, work on the cuttings between 56 m. and 58 m. has been continued and is now being speeded up by machinery.

From here to 61 m. 40 ch. formation has been completed with the exception of the bridge at 60 m. 67 ch. and No. 1 tunnel at 61 m. This latter, 286 ft. long, is nearing completion after driving a bottom heading and running the enlargement spoil through it to waste in the sea. No. 2 tunnel at 61 m. 27 ch., 165 ft., was completed during the year. This was also worked with the bottom heading.

The approach cut to the south end of the Amuri Tunnel at 62 m. 25 ch. was completed. Slips from puggy country on to the railway formation which lies along the bottom of the gully will necessitate a lengthening of the tunnel by 5 ch. with a reinforced section.

Work from the northern end was continued by hand methods until a few weeks ago, when a mechanical scraper, steel profiling with concrete gun, and Diesel locomotive were installed. 339 ft. have been lined from this end.

From Oaro northwards earthwork is completed to 67 m., and from there to 73½ m. the section is heavily manned and earthwork is about 50 per cent. completed.

Although culverts and water-drives are almost complete as far as Oaro, there has been little done beyond there, and about twelve large culverts, crossing both road and railway, have yet to be built. Throughout the job pipe culverts are 90 per cent. complete.

The controlling time feature of the undertaking is the tunnel-work, and until well on in the year there was not sufficient air-compressing machinery to ensure maximum progress being made. This difficulty has now been overcome, and only shortage of skilled tunnellers would prevent a good showing during the coming year.

Tunnelling is in hand at 67 m. 65 ch., where 376 ft. of bottom heading and the southern portal have been completed.

A number of tunnels on this end of the line are relatively short, and with a scarcity of compressors and machinery it has been necessary and apparently as economical to drive a bottom heading and work out by hand. The tunnel at 68 m. 35 ch. has been abandoned after striking rubbly slip material, and it is proposed to deviate at this point. The bottom heading, 390 ft. long, has been driven through the tunnel at 72 m. 40 ch. to 72 m. 46 ch., and at 72 m. 50 ch. the tunnel portal has been erected and excavation is proceeding with a mechanical scraper. A central concrete-mixing plant for the three tunnels—72 m. 30 ch., 72 m. 40 ch., and 72 m. 50 ch.—has been erected at 72 m. 35 ch.

Protection of the road from the sea where it has to be deviated outside the railway between 66 m. and 72½ m. is proving a slow process, as the only point of rock suitable for providing durable stone of up to 6 tons in weight is at Goose Bay and runs beside the main highway, which must be kept open, and only small quantities can be quarried at a time and cleared up before any more stone can be brought down. Approximately 10,500 cubic yards of this sized stone have been placed at 66 m. 30 ch. and 69 m. 35 ch. For heavier protection at the toe it will be necessary to resort to concrete blocks.

Permanent fencing has been repaired and completed from Parnassus at 44 m. to Ferniehurst Station Yard at 50 m. 50 ch. On the left, ¾ m. has been erected between 60 m. 40 ch. and 61 m. 40 ch., but northwards of this point only about ¼ m. has been done in short lengths where conditions have been suitable for permanent work.

The temporary telephone-line, with poles where possible in permanent positions, was completed to give telephonic communication with Puketa at 73½ m. The old permanent line is being overhauled and shifted where necessary and this work is completed to 55 m.

WESTPORT-INANGAHUA RAILWAY.

Cascade Section (5 m. 70 ch. to 8 m. 78 ch. ; length, 3 m. 8 ch.)—This section has been maintained ; during the year the track was lifted and packed over the full length of the section.

A daily return service was run by the public-works train between Westport and Cascade Creek (9 m.) for the purpose of transporting workmen from Westport to the Cascade Creek Bridge. The Department continued to handle the coal traffic from the Cascade-Westport Coal Co.'s bins at Cascade Creek to Westport. In addition, large shipments of permanent-way materials were hauled from the Westport Wharf to stacking-places between Westport and Te Kuha. Materials for construction of Cascade Bridge were hauled to the site over the Cascade Section.

Cascade - Inangahua Junction Section (8 m. 78 ch. to 22 m. 62 ch. (Westport chainage), and 62 m. to 58 m. 30 ch. (Stillwater chainage) ; length, 18 m. 34 ch.)—The average number of men employed throughout the year was 330, with a maximum of 350 ; at the present time 300 men are employed.

The erection of accommodation was continued, particular attention being paid to the construction of quarters for married men and their families. A new camp for single men was commenced on the formation near the 20 m. peg in anticipation of work being pushed on in this vicinity.

At Tiroroa and Inangahua Junction Camps electric-lighting sets have been installed.

A large Y.M.C.A. has been built at Inangahua Junction. This hut contains a social hall, billiard-room equipped with two tables, supper-room, post-office, library, and provision for "talkie" pictures.

Except for a distance of 4 m. between the 20 m. and 61 m. 70 ch. pegs, formation work has been well advanced. At 20 m. a large filling is now being constructed with a Diesel shovel tendered by Diesel locomotive and tip-trucks.

Because of the inaccessibility of the balance of this 4 m. length and its suitability for the operation of heavy excavating machinery, its formation will be carried out by power-shovels and large carry-all scrapers and bull-dozing equipment. A carry-all and a tractor and bull-dozer are already on the ground, and a large tractor is due to arrive shortly.

Several sections of the completed formation have been metalled to permit the running of motor-lorries from the cable-ways to various parts of the works.

Four shingle washing and screening plants have been installed at suitable points along the formation to supply aggregates for concrete work.

Since construction in concrete is such an important feature of the railway, the latest equipment has been obtained for its manufacture and placing. Electric, pneumatic, and petrol-driven vibrators are employed to make strong and durable concrete. The use of vibrators and the frequent tests made of concrete and aggregates have resulted in a high-quality product concurrently with a reduction in the quantity of cement that could not have been obtained otherwise.

The major remaining works to be constructed comprise 12 bridges, 170 culverts, and 2 comparatively short tunnels. A number of the bridges will be of reinforced concrete, a new departure for railway bridges.

The chief operations in progress are as follows:—

Cascade Creek Bridge (8 m. 79 ch. to 9 m. 6 ch.): Erection of the five 80 ft. steel-plate girder spans and the 40 ft. span comprising the superstructure is complete. The bridge is of special design because of the sharp curvature of the railway here. Before erection it was necessary to thoroughly sand-blast and paint the steelwork.

Redmond Creek Bridge (11 m. 39 ch. to 11 m. 43 ch.): This is a reinforced-concrete bridge consisting of three 40 ft. girder spans and an 85 ft. arch span with a rise of 48 ft. Abutments, piers, and footings and two girder spans are complete, and falsework has been built for the arch and remaining girder span.

Tunnel at 13 m. 25·8 ch. to 13 m. 28·2 ch. (2·4 ch. long): 1½ ch. of the bottom heading of this tunnel has been excavated.

Tunnel at 13 m. 41 ch. to 13 m. 54 ch. (13 ch. long): The bottom heading and 10½ ch. of the full excavation are finished, and the tunnel has been lined with concrete for a length of 5½ ch.

Stable Creek Bridge (15 m. 47·5 ch. to 15 m. 54 ch.): The bridge is of reinforced-concrete design, comprising ten 40 ft. and one 20 ft. girder spans, with a maximum height of 60 ft. above foundations. One pier has been completed, and two more are under way.

This bridge consists of six 100 ft., one 45 ft., and one 30 ft. steel-plate girder spans with concrete abutments and five reinforced-concrete cylinder piers.

Buller River Bridge (60 m. 16 ch. to 60 m. 27 ch.): Construction of the piers has proceeded during the year. Three piers have been completed, two of them in the river-channel, where the greatest danger from floods was anticipated. The cylinders for two other piers have been sunk to rock bottom, and the cylinders for the two remaining piers will be completed shortly. The first steel-girder span has been delivered at the bridge site from the Hillside Railway Workshops.

Inangahua River Bridge (57 m. 17 ch. to 57 m. 26 ch.): The nine 60 ft. steel-plate girder spans have arrived from the Hutt Railway Workshops. The spans are being riveted-up near the Buller Bridge, where a steel-yard with suitable equipment has been established. After riveting each span, weighing 24 tons, it is loaded on to a motor-lorry and trailer and transported along the completed formation to the bridge-site, where it is hoisted into its final position by means of gantries. The first two spans have been completed and placed on the piers.

Culverts and Water-drives: One 12 ft. by 12 ft., one 9 ft. by 9 ft., one 7 ft. by 7 ft., and eight 3 ft. pipe culverts, and one water-drive are complete; three culverts and two water-drives are in progress.

Work on bridges and culverts has been hampered to some extent through lack of skilled tradesmen, but this difficulty has been overcome, and construction is proceeding more rapidly than in the earlier stages.

IRRIGATION.

CENTRAL OTAGO.

OPERATION AND MAINTENANCE OF IRRIGATION SCHEMES.

During the year a new area of 3,000 acres, known as the Dunstan Scheme, was brought into operation. This scheme will be operated as portion of the Omakau Scheme and the water supplied on the day-head basis on demand.

The total area of schemes operating on the acreage basis under irrigation agreements is 44,165 acres, and the area actually irrigated was 42,264 acres, the balance, 1,901 acres, being the area to which water was refused on account of non-payment of rates.

The area irrigated represents an increase of 2,935 acres over that of the previous season.

In addition, the Omakau Scheme, which commands 13,400 acres over which water is supplied on the demand basis, provided irrigation water to 7,000 acres, or an increase of 1,700 acres over the previous season. The sales of water represented 10,380 acre-feet.

The season was a very dry one, and the sales of water were the highest yet recorded.

The total area commanded by all of the Otago schemes is now 63,000 acres.

The completed schemes in operation are shown in the following table, the second column showing the area that should have been irrigated had all the rates been forthcoming:—

Scheme.	Area Actually irrigated.	Area that should have been irrigated.	Number of irrigators.
Arrow River	2,618	2,936	45
Ardgour	1,364	1,364	12
Bengerburn	114	144	13
Earnsclough	2,191	2,247	49
Galloway	2,636	2,642	21
Hawkdun	7,844	8,818	64
Idaburn	540	565	7
Ida Valley	11,709	11,729	59
Last Chance	2,313	2,313	31
Manuherekia	4,921	4,941	73
Tarras	2,574	2,675	17
Teviot	3,440	3,791	49
	42,264	44,165	440
Omakau and Dunstan	7,000	..	59
Totals	49,264	..	499

The financial result of the year's working operations is as follows: Revenue, £27,190; working-expenses, £27,054; profit on working, £136.

Included in the working-expenses is the sum of £6,725 for replacement of pipe-line on the Teviot Scheme.

The total amount of rates collected during the year was £24,100, being an increase over the preceding year of £4,418.

The cases of forty-eight irrigators who owed arrears of rates were heard either by the Inter-departmental Committee set up for the purpose or by the Mortgage Adjustment Commission, and settlement reached.

SCHEMES UNDER CONSTRUCTION.

Earnsclough Scheme: Fraser River Dam.—This dam, a concrete arch of 175 ft. radius and 102 ft. in height, was completed in the spring of 1937 and put into commission during the irrigation season. This work involved the placing of 12,560 cubic yards of concrete, and the excavations for foundation required the removal of 8,980 cubic yards of rock. The value of this dam was amply demonstrated during the past dry season, as a steady flow of 35 cusecs to 45 cusecs was maintained, whereas the stream-flow had fallen below 12 cusecs for a period of two months.

Remote control-valve gear is being installed shortly to obviate frequent visits of the racemen to regulate the supply.

Manuherekia Scheme: Manuherekia Tunnel.—This tunnel, which is designed to eliminate a very troublesome section of main race, is 78 chains long, and the driving is now completed.

The concrete lining is completed for a length of 1,700 ft., and a further 2,600 ft. is lined on walls and invert, 820 ft. is through solid country and does not require lining, and has been enlarged and trimmed.

The dismantling of existing flumes, superseded by the tunnel, and the erection of a new flume at the tunnel-outlet, is the only remaining work to be done.

Dunstan Creek Scheme.—This scheme, which commands 3,000 acres above the Omakau Main Race, has been completed. The work consists of 7½ miles of main race, 6 miles of distributaries, and the laying of 3,000 ft. of concrete pipe-lines ranging from 9 in. to 24 in. in diameter. Other works at the intake consist of the intake weir, protective works, silt trap, and 20 chains of concrete-lined race.

Ida Valley Scheme: Extension at German Hill and Hope Creek Diversion.—Work was authorized on a 1,500 acre extension of the above scheme at German Hill.

The permanent survey is completed, and the work is to be put in hand. The water-supply is to be obtained by diverting the flow of Hopes Creek into the existing Ida Valley race system.

General.—The usual work of stream-gauging, collection of meteorological data, and lake-level recording were carried out during the year, and several minor investigations of potential irrigation areas were made.

CANTERBURY.

OPERATION AND MAINTENANCE OF IRRIGATION SCHEMES.

Redcliffs Scheme.—This scheme, comprising 4,603 acres, has now been in operation for two years, and approximately 2,300 acres were irrigated last season.

The winter and spring were very dry, and there was a good demand for water up to the middle of December, when exceptionally wet weather set in and persisted throughout the remainder of the season, and consequently the demand for irrigation water ceased.

Levels Irrigation Scheme.—The only remaining work, the No. 7 lateral, 3 miles 34 chains long, was completed during the year.

The scheme was ready for operation during the season, and during the dry weather experienced at the early portion of the season a brisk demand for irrigation water set in which severely taxed the resources of the Department to assist in preparing the land for water. Like the Redcliffs Scheme, this demand ceased on the advent of the wet weather experienced during the latter portion of the season.

The land watered represented 8 per cent. of the total area commanded, which is considered a good start for a new scheme.

Twelve thousand eight hundred acres are commanded by this scheme.

The completed schemes in operation are shown in the following table, the second column showing the area commanded by the scheme:—

Scheme.	Area actually irrigated.	Area for which water is available.	Number of Irrigators.
	Acres.	Acres.	
Redcliffs	2,000	4,603	13
Levels	1,100	12,800	31
	3,100	17,403	44

The financial result of the year's working operations is as follows: Revenue, £266; working-expenses, £771.

The low revenue was due to the short irrigation season and the low rates charged during the initiation of these schemes.

SCHEMES UNDER CONSTRUCTION.

Ashburton-Lyndhurst Scheme.—During the year the net area commanded by this scheme was increased from 25,500 acres to 34,000 acres.

The total length of race-construction completed to date is 44 miles, involving 222,000 cubic yards of excavation, which represents 65.2 per cent. of the total.

The following structures were completed during the year:—

Drops, stone-pitched and reinforced-concrete	117
Bridges, reinforced-concrete	24
Bridges and drops combined, reinforced-concrete	23
Syphons, reinforced-concrete, and pipe	48
Special structures, reinforced-concrete	7
Turnouts, reinforced-concrete	63
Fence crossings, timber	82
Total	364

The total completed structures to date is 470, or about 30 per cent. of the total required.

New types of earth-moving machinery were introduced which have greatly accelerated the excavation work; the principal items being a tractor-operated bull-dozer, grader, and tamper, and a Ruth dredger, which is a Diesel-driven transverse chain-bucket digger. A small Diesel-driven shovel also accelerated the excavation for structures, and a mechanical vibrator screen enabled better concrete aggregates to be procured.

A demonstration area of 36 acres was levelled and sown in pasture in the autumn of 1937. This area has been regularly irrigated, and during last season carried approximately ten ewes and their lambs per acre.

Rangitata Diversion Race.—During the year it was decided to make the capacity of this race 900 cusecs throughout the whole length and to extend it to the bank of the Rakaia River so as to utilize the winter flow of the race for the generation of electricity.

A fall of 320 ft. is available at this point, enabling a maximum of 30,000 h.p. to be generated.

The race will thus serve the dual purpose of irrigation in summer and generation of electricity in winter.

The total length of the race is now 41 miles, requiring approximately 2,900,000 cubic yards of excavation. The progress to date is the completion of 370,000 cubic yards of excavation, the race being completed, or partly completed, over a length of 14 miles.

One heavy-traffic bridge has been completed over the race, and plans are nearing completion for the erection of a number of large structures, syphons, drops, and regulating-gates, which will be commenced shortly.

Modern machinery has been employed, including tractor-operated angle-dozers, scoops, rooters, and elevating-grader. Diesel shovels and drag-lines are also in use.

The race is scheduled for completion by the spring of 1940.

Mayfield-Hinds Irrigation Scheme.—During the year work was authorized on the Mayfield-Hinds Irrigation Scheme.

This scheme embraces an area of approximately 110,000 acres lying between the Rangitata and Hinds Rivers, and the water-supply is designed to irrigate half this total area.

The water will be taken from the Rangitata River and the main race will have a capacity of 450 cusecs.

The work will consist of about 230 miles of races, involving 900,000 cubic yards of excavation, and there will be approximately 2,000 concrete structures for regulating the flow of water and passing traffic over the races.

The work was commenced in January, and up to date the work has been confined to the establishment of construction buildings and camp accommodation.

A camp headquarters is completed, and the following buildings have also been erected: Office, store, garage, carpenter's shop, fitting-shop, cement-shed, and forty-four married men's and ten single men's accommodation.

Machinery and material are coming to hand, and sixty men are now employed. This number will be increased to 145.

Downs Water-supply.—During the year legal and financial arrangements were finalized enabling portions of Levels, Waimate, Mackenzie, and Geraldine Counties to be brought within the scope of the Downs Water-supply Scheme, which will command 153,000 acres requiring 800 miles of pipe-lines to be laid to serve every property within the area with a domestic and stock water-supply.

Work was authorized in March last, and the erection of construction buildings and camp accommodation is well in hand. Camps have been established at Pleasant Point, and at the intake at the Tangawai River, where exploration work for the intake is in hand.

The survey of pipe-lines is in progress, and 41 miles of main line and sub-main lines have been laid out, and a contract has been prepared for the first 16 miles of main pipe-line.

Forty-seven men are employed at present, and construction plant is expected to arrive shortly. Work is expected to take three years to complete.

CANTERBURY IRRIGATION INVESTIGATIONS.

Topographical Survey.—Owing to the shortage of staff it was not possible to extend this work during the current year.

Stream-gaugings.—Continuous records were obtained from all installed stations during the year. Gauge-houses were erected and instruments installed at the following points:—

Hurunui River near Tormore.

North Ashburton River Gorge (including regulating weir).

An instrument-house was partly completed on the Ashley River near the Gorge.

Observations of the depth of ground-water were recorded regularly, and observations continued in regard to rainfall penetration.

Soil Moisture and Rainfall.—Observations of soil moisture and rainfall have been continued as follows: Ashburton County at fifteen stations, Levels County at four stations, Redcliffs Irrigation Scheme at eight stations.

Evaporation.—Records of evaporation, wind, humidity, and temperature were continued at the following stations with the following results:—

Station.	Evaporation to 30th June.	Wind Mileage.	Period.
Temuka	27.82	7364	1/7/37 to 30/6/38.
Blenheim	47.90	14474	.. .. .
Ealing	28.53	13877	.. .. .
Methven	43.80	31905	.. .. .
Pendarves	33.88	12865	.. .. .
Kirwee	40.76	32788	.. .. .

Rainfall Run-off.—The six long-period automatic rain-gauges installed in the North Ashburton River Catchment at elevations up to 6,000 ft. gave good records in all cases.

Sugar-beet Trials.—These trials were continued in collaboration with officers of the Department of Agriculture, and a report will be prepared by that Department.

MARLBOROUGH IRRIGATION INVESTIGATIONS.

Trial lines were run for a distance of 10 miles on the Wairau Plain from the confluence of the Waihopi and Wairau Rivers towards Taylor Stream, near the Blenheim Aerodrome.

Shafts were sunk in the shingle near the mouth of the Waihopi River to determine the suitability of this site for a percolation tunnel.

A stream-gauging station was completed on the Wairau River near Ferry Bridge, and a recorder was installed.

Observations were continued at thirteen soil-moisture and rainfall stations, and evaporation and wind observations were continued at Blenheim.

HYDRO-ELECTRIC DEVELOPMENT.

ARAPUNI SCHEME.

Work on the excavation of the tail-race was completed early in the year, and after tests the water was allowed to rise, the pumps withdrawn, and the needle dam demolished.

In the power-house building the remaining roof trusses and purlins were erected, and concreting of the superstructure was completed in August. The remaining concrete for the two new machines was placed early in the year. A further 123 ft. of 7 ft. by 4 ft. heading was driven and concreted for the pitometer galleries, which are now complete. At the south end of the building the retaining-wall was completed and back-filled and the concrete structures cast for the water rheostat and oil-storage tanks, which were then erected. Construction of the life and cable shaft was completed and part of the steelwork erected, and protective fencing was built along the top of the cliff above the power-house. A new office was built in concrete for the Station Superintendent, and this and other rooms were lined in sound-proofing material suitably tinted. Cement-washing and painting of concrete surfaces and steelwork was continued during the year, the floors only remaining to be treated. Glazing was put in hand and completed throughout the power-house and outdoor station, and drainage and plumbing was completed.

At the outdoor station the construction of the repair-room extension was completed, together with cable trenches and footpaths. Stubs were built for the transmission-line towers between the power-house and the outdoor station, and Nos. 7 and 8 towers were erected. Erection of structural steel and switchgear at the outdoor station was completed and protective fencing erected. Cement washing and painting of concrete surfaces and steelwork was put in hand and completed, and the grounds of the extensions were sown in grass.

Erection of Nos. 7 and 8 generators and associated equipment was completed, the machines going into service on 24th August, 1937, and 7th February, 1938, respectively.

Near the power-house construction was commenced of a blacksmith's shop in concrete, and above the lift-shaft a concrete stairway was built to give access to the steps leading to the outdoor station. Towards the end of the year the defective roofing of the existing building was removed and the whole roof then waterproofed with Neuchatel asphalt. The roads adjacent to the power-house and the outdoor station were regraded during the year and tar-sealed.

Excavation during the year amounted to 2,700 cubic yards, a total of 67,310 cubic yards to date. Concrete placings amounted to 1,491 cubic yards, a total of 19,889 cubic yards to date. Drains laid amounted to 1,970 lineal feet for the year, a total to date of 4,053 lineal feet.

The pumping-equipment, cableway, concreting-plant, tram-lines, and feeders were dismantled during the year, and plant reconditioned and laid up.

Towards the end of the year measures were taken to lower the tail-race water-level by removing sand and rock at the junctions of the tail-race and overflow channel, and some relief was obtained. Maintenance of the inspection drives was put in hand at the end of the year, and 25 per cent. of the work was completed.

WAIKAREMOANA POWER SCHEME.

No. 3 Penstock.—A camp was established in August, 1937, and preparatory work was put in hand immediately. This necessitated the opening of a quarry, the installation of a 16 in. by 10 in. crusher, and conveyor-fed bins to hold 80 cubic yards of metal. A mixing-plant, complete with bins, was built at the foot of the incline, and a $\frac{1}{2}$ -cubic-yard mixer installed. The inside tramway was put in order at relays and the necessary power-lines installed.

The construction of the concrete pedestals was commenced in November, 1937, and completed in April, 1938, some 146 pedestals being constructed at depths varying from a minimum of 5 ft. to a maximum of 16 ft. Simultaneously work was put in hand on the three anchor blocks, and at the end of the period No. 2 was completed, but Nos. 1 and 3 had the foundations only poured, the pipes not being placed.

Meanwhile Hume Steel, Ltd., began to erect their workshop complete with milling, crimping, rolling, and welding machines, and a sand-blasting annexe.

For housing their men, a barracks, cookhouse, and several married quarters were erected.

The pipe-line, which is 3,580 ft. long, consists of pipes varying in diameter from 66 in. to 78 in., and in thickness from $\frac{1}{8}$ in. to $\frac{3}{8}$ in., and extending from elevation 904 ft. to elevation 1,550 ft.

Fabrication of pipes was commenced in February, and by the end of the period the position was as follows:—

Completed in yards: 20 lengths of 24 ft. pipes.

On site at pipe-line: 18 lengths of 24 ft. pipes.

Welded on site: 32 lengths of 24 ft. pipes.

After pipes are welded in place by the contractor, the Department immediately sand-blasts and applies the first coat of the interior painting. This work is kept in step with the placing of the pipes, and to date thirty-one pipes have been sand-blasted and the first coat applied.

In the power-house preparatory work has been put in hand for the installation of No. 3 unit; a temporary wooden floor was removed, original foundations cleaned off, and a concreting layout put in hand.

WAIKAREMOANA LOWER DEVELOPMENT.

The survey for this scheme was commenced in July, 1937, and three boring-machines were used on testing foundations over various parts of the proposed work. As a result of the borings various schemes were tried, and the present layout finally adopted.

The water from the existing scheme, augmented by the flow of the Waikaretaheke River, formed a lake some 80 acres in extent at the 900 ft. level on the flat just below Tuai Village. Water-level regulation for this lake will be provided by automatic gates in the crest of the dam over the existing Kahutangaroa Culvert. From an arm of this lake the water is conveyed through a 16-ft.-diameter

circular concrete-lined tunnel to the surge chamber, 9,600 ft. away, and from here twin 7-ft.-diameter steel penstocks carry the water to the power-house down a head of 360 ft. to the two vertical turbines, which drive 20,000 kVA. generators.

Work on this scheme was authorized in March, and permission to enter on the land was given in May, when work was commenced on clearing for a camp-site and forming of service roads. A temporary road about 41 ch. long was graded and metalled to the first camp, and from there on 20 ch. of permanent road-line was completed and metalled, and the necessary culverts installed.

The building of accommodation was put in hand immediately and foundations for twenty-five married quarters placed. The houses are being supplied in sections from Napier, and three were erected. A temporary cookhouse was built, and ten tents, housing twenty men, were erected. An office, bathhouse, and various service buildings were completed.

At the end of June the total number of employees, including staff, was 94, some of these being employed on No. 3 pipe-line.

Continuous wet weather and the condition of the roads leading to Tuai have held up the work considerably, and it will take till Christmas at least to complete the service roads.

KAIMATA DAM.

This dam, which formed part of the Grey Electric-power Board's power-supply scheme was taken over from that body on 23rd August, 1937, by the Public Works Department to form part of the Westland power-development scheme.

At the time of taking over by the Department work was in progress in connection with increasing the capacity by the erection of a series of automatic weirs and repairs to the apron. This work was in progress by the Department when it was discovered that the apron had collapsed under the hammering of the water, and the complete renewal of same was necessary. The new apron now being constructed is designed to give greater resistance than the former to the fall of water, and this, combined with additions to the face of the dam, is calculated to break up the fall of water and prevent the continual hammering on the apron.

The construction of this new apron is now completed over the two bays farthest from the intake, a distance of approximately 98 ft.

A coffer dam has been completed for the remaining three bays. This coffer dam is divided into two portions in order to provide better access to erosions and scour underneath. These erosions and scours are being repaired as the work proceeds, and any weak portions found are being made good.

Work has been recommenced on the weir-gates on the crest of the dam. This work had been suspended to allow of the urgent replacing of the apron and repairs.

A considerable amount of excavation has been carried out beyond the apron in order to give a good discharge for spill-water.

The work has required extensive use of plant, including pumping-gear, Sauermann excavator, petrol-loco., and winches, and the urgent nature of the repairs necessitated the working of shifts.

LAKE COLERIDGE SCHEME.

Harper Diversion Gates.—The construction of new gates to replace those damaged by water-borne boulders and shingle was completed during the period.

The new structure has been erected in a slightly different position from the old one in order to eliminate, if possible, a repetition of the trouble.

A light suspension bridge has also been erected over the Harper River, adjacent to the gate structure, to provide access to the groynes on the opposite bank of the river during floods.

The suspension bridge across the diversion race at the gauging-station has been repaired, and the road bridge giving access to the outlet structure on the lake has been strengthened with additional piles and cutwater piers.

CONSTRUCTION AND IMPROVEMENT OF ROADS AND BRIDGES.

WHANGAREI DISTRICT.

Kerikeri Inlet Road (Bay of Islands County).—This road, where construction was in hand during the last period, has been taken further, some 54 ch. of additional formation 14 ft. wide having been completed and 70 ch. of base-course metal placed 8 ft. wide. Two bridges, one of reinforced concrete 90 ft. long and the other a 20 ft. span in timber, have been erected. This new road gives vehicular access to a number of settlers on the southern shore of the Kerikeri Inlet who previously had only water access.

Motatau to Kaikou Road (Bay of Islands County).—This road gives access to a large area of Native country where development has been retarded considerably largely on account of the wet nature of the old road. During the period reconstruction and metalling was commenced over the lower length of 1 m., and although it has been necessary to suspend operations until next summer it is clearly apparent from the work which has been done that there will be much improvement showing this winter.

Opuā to Black Bridge Road (Bay of Islands County).—With a view to giving improved access to the port of Opuā, this road has been reconstructed, widened, and metalled in continuation of the programme commenced during the last period. An additional length of 4 m. 43 ch. has been so improved.

Punakitere Valley Road (Bay of Islands County).—This road gives access to a large area of only partly developed country, and during the period under review the formation and metalling programme commenced in previous years has been finalized. This consisted for the past year of 30 ch. of formation 16 ft. wide and 8 m. of metalling 9 ft. wide.

Tutaematai to Rawhiti Road (Bay of Islands County).—The work in hand on this road is new construction adopting a 14-ft.-wide standard and will give access to Native and European lands lying between Parekura Bay and Whangaruru Harbour below the Cape Brett Peninsula. Construction is being commenced at each end, and at the time of preparing this report 90 ch. of formation and culverting with 70 ch. of metalling had been completed. Work is being opened up over a further length of 2 m., the total distance to be constructed being 7 m.

Aratapu to Redhill Road (Hobson County).—Formation work on this road has not yet been properly completed, and with a view to improving the access to some eighteen settlers, and also giving a circuit route for cream-collection, a start was made during the period with improvements to the old formation. A distance of 2 m. 33 ch. was completed out of a total of 7 m. 56 ch. in need of attention.

Redhill to Bassetts Road (Hobson County).—This is a continuation of the road previously mentioned, and during the year metalling was commenced to give all-weather access to eight settlers, some of whom have taken up properties in Bassett's Small Farm Block. During the year 1 m. 55 ch. was completed.

Kaihu to Kai-Iwi (Monteiths) Road (Hobson County).—The total length of this road is 4 m. 10 ch., and up till this year three settlers, who are dairying on their properties, have had no better access than a clay track. A large area of Crown land is also served, and during the period widening to 15 ft., prior to metalling, was commenced. Under a programme of backblock roads improvement 60 ch. of widening work was completed.

Katui to Marlborough Road (Hobson County).—Culverting and metalling over a distance of 60 ch. was completed to provide all-weather access to a Crown settler in the Marlborough Settlement.

Mansbridge's Block Road (Hokianga County).—This road, which gives access to a small farms settlement, had previously been formed and metalled, but was of a comparatively poor standard. During the year 77 ch. was reformed and properly culverted and 55 ch. metalled, while one timber bridge 45 ft. long is partly completed.

Pawarenga Road (Hokianga County).—This road, giving access to a Native settlement in the vicinity of Pawarenga, was severely damaged during the cyclonic storm of February, 1936. Reconditioning of the formation, together with metalling, was necessary to bring the road back into proper repair, and the whole length of 5 m. 40 ch. was completed during the period under review.

Waima Valley Road (Hokianga County).—Three European settlers and a large Native settlement, with adjacent lands, depend on this road for access. The work commenced during previous years was carried on. An additional 1 m. 12 ch. of formation and 1 m. 15 ch. of metalling have been completed during the period.

Awanui to Mangonui Road (Mangonui County).—During the year reconstruction work has been continued on this important road, which connects two northern townships and is the main access to a large area of good agricultural country. Reformation and culverting over a distance of 2 m. 35 ch. and metalling of 3 m. 40 ch. was completed during the period under review. With the exception of the major bridges the improvement work is practically completed to the 18 m. peg, approximately 1 m. from the Mangonui township and port.

Church Road (Mangonui County).—This route is one of the settlement roads branching off from the Awanui to Mangonui Road and gives a connection through to the Township of Kaitaia. During the year a distance of 2 m. 45 ch. was metalled, and as the road passes through good farming land the work which has been completed will give a large measure of relief to many settlers during the winter months.

Epikauri Road (Mangonui County).—This road forms an important connecting link to the Kaitaia-Motukaraka Main Highway near Herekino. It serves one European settler and a considerable area of Native land under occupation and in course of successful and rapid development. With a view to improved access conditions, which were previously not of the best as a result of the low-lying nature of the formation, the road has been raised, culverted, and metalled over a distance of 70 ch.

Fisher's Road (Mangonui County).—This is a settlement road, and during the year widening and metalling over a distance of 80 ch. was carried out to give all-weather access to two additional settlers.

Fryers Road (Mangonui County).—A further length of 1 m. 20 ch. of this road was widened and metalled to give satisfactory and regular access to three settlers.

Lake Ohia to Merita Bay Road (Mangonui County).—Considerable work is being carried out on this road, which is mainly in the interests of a Native development and consolidation scheme. During the period under review a length of 6 m. 66 ch. was formed and culverted.

Parapara to Taumata Road (Mangonui County).—This road runs through a tract of comparatively good country embracing both European and Native farming areas. During the year a distance of 2 m. 10 ch. was metalled, and this completes the road as an all-weather route.

Riley's Road (Mangonui County).—This again is a road giving access to new country under active development, and 1 m. of metalling completed during the year will assist greatly in giving better access to three settlers already on the block.

Ruaroa Road (Mangonui County).—In view of the fact that this road is a convenient through route from the Takahue Valley to Kaitaia and also gives access to nine settlers, it was necessary to consider undertaking improvements during the year. As a result of a grant made in the estimates 2 m. was formed, culverted, and metalled.

Taipā Block Access Road (Mangonui County).—Two settlers on Crown sections made representations during the year concerning the poor condition of this road, and as a result it was decided that metalling should be undertaken to improve the position as much as possible. During the year the whole length of 80 ch. was reformed, culverted, and metalled.

Takahue to Herekino Road (Mangonui County).—Work commenced in previous years was continued during the period under review, and the remaining section of 40 ch. was metalled. Attention was given, where necessary, to other parts of the road.

Te Rore Road (Mangonui County).—This route serves as access for twenty-five settlers, and 1 m. 70 ch. of reformation and metalling was completed during the year. This will be a great improvement as well as a means of through connection from the Takahue Valley to the Victoria Valley.

Wainui to Lake Tangonge Road (Mangonui County).—60 ch. of this road has been formed and metalled to give access to two settlers.

Waipapakauri to Tangoake (Far North) Road (Mangonui County).—This is the main road on the far North Peninsula. The programme commenced in previous years was continued during the period under review, and 13 m. 60 ch. was trimmed and culverted, 3 m. 20 ch. was formed and culverted, and 16 m. 40 ch. was metalled. Although this northern peninsula is sparsely populated just at present, there are reasonable prospects of development, particularly in respect of Native lands, which are being brought under proper cultivation by means of development and consolidation schemes.

Beatson's Access Road (Otamatea County).—Three dairy-farmers on this road were previously without regular and satisfactory access, but as a result of metalling improvements carried out over 1 m. 40 ch. their position has been greatly improved.

Franklin Road (Otamatea County).—This is a loop road serving seven settlers, all of whom are dairying. During the year 2 m. 54 ch. of formation was widened and 1 m. 72 ch. of metal surfacing was carried out. When the programme is completed the new road will be in much better condition to serve its purpose as a circuit route for cream-collection and as access to the interested settlers.

Jeff-Rylands Road (Otamatea County).—This route junctions at each end with two other metalled roads to form part of a through connection. In its previous condition it had a poor-quality limestone surface on narrow formation, but as a result of improvements carried out during the year the position has been bettered very considerably. These comprise widening and culverting formation 4 m. 12 ch., widening and improving existing surfacing 2 m. 12 ch., and top-course metalling 2 m. 12 ch.

Kaiwaka to Oneriri Road (Otamatea County).—The last section of this road, which serves about twenty-five settlers, was surfaced with limestone last year. The first length of 12 m. 20 ch. was in narrow formation along rather bad alignment, and proposals were prepared covering widening and top-course metalling-work. During the year considerable progress was made with the actual improvement work, 3 m. of widening and top-course metalling having been completed.

Mangawai Gorge Road (Otamatea County).—Work has been continued on this road during the year, and when the programme has been completed it will confer greatly improved travelling conditions on a very popular tourist road. Some part of the road lies within Whangarei County, and the completed work for the period under review comprises 1 m. 13 ch. of widening and culverting, 7 m. 8 ch. of improvements to base metal, and 8 m. of top-course metalling.

Russell's Road (Ruarwai), (Otamatea County).—This is another cross-connection between two comparatively important settlement roads in the lower part of the county. The formation was originally of narrow width with soft limestone surfacing, and during the year the whole length of 1 m. 21 ch. has been widened and top-coursed with good-quality crushed metal.

Taipuha to Mangaturoto Road (Otamatea County).—Each resident settler on this road has metalled access, but an unmetalled length of 3 m. 25 ch. is of importance as a potential through connection, and although no work has yet been done proposals have been prepared covering the general improvement and metalling of the remaining clay section.

Brynderwyn to Waipu Road (Whangarei County).—Work in connection with the construction of a major deviation of the highway in the vicinity of the Waipu Gorge has been pushed ahead vigorously during the year. The primary objects of the programme are the eventual shortening of the highway route between Whangarei and Auckland and the elimination of the present tortuous highway through the Waipu Gorge. These improvements will be very noticeable. During the year formation, with culverting, to highway standard was completed over a distance of 3 m. 29 ch., and base-course metal has been laid over the greater part of this length.

Tangihua and Codlins Road (Whangarei County).—Further progress was made during the year with the work previously commenced on these roads, a length of 1 m. 60 ch. having been metalled during the period under review.

Whareora to Patana Road (Whangarei County).—Widening of the formation on this road to 16 ft. over a distance of 2 m. 70 ch. and corresponding improvements in the existing metalled surface were completed during the year. The road was previously narrow and dangerous, but as a result of the work which has been done a large number of settlers are now provided with good all-weather access.

Matawherohia Road (Whangaroa County).—Reformation work on this road to a minimum width of 16 ft. has been completed for 1 m. 62 ch. Metalling over a previously formed section of 65 ch. and over new formation of 58 ch. has been carried out, but operations are now suspended on account of wet weather. The road will give all-weather access to a number of settlers who have previously contended with the difficulties consequent on using a clay road in connection with farming activities.

Omaunu Block Road (Whangaroa County).—Work in the nature of widening, attending to dangerous corners, culverting, improvement of visibility, and widening of the metalled surface was commenced during the year. A length of 8 m. 48 ch. is involved, and so much as has been completed during the period will be of great assistance to the settlers over the winter months and also will raise considerably the safety margin in connection with the school-bus service.

AUCKLAND DISTRICT.

Coromandel to Kennedy Bay Road (Coromandel County).—With a view to improving the road access to Kennedy Bay and surrounding district an engineering survey has been made of a proposed new road on the eastern side of the Tokatea Saddle. However, although a large item was provided in the estimates to cover the cost of construction work, it was not possible to get this in hand on account of difficulties encountered in connection with legalization.

Hot Water Beach Road (Coromandel County).—During the period under review work was commenced on the reformation and metalling of this settlement road in the south-eastern corner of the county. A distance of 3 m. was reformed and graded in preparation for metalling.

Kaimarama Settlement Road (Coromandel County).—The County Council surfaced 50 ch. of this road to give all-weather access to one settler.

Mercury Bay to Hahei Road (Coromandel County).—The improvements commenced during the last period were carried on during the year. The remaining section of 50 ch. has been metalled and one concrete ford installed. As a result a number of settlers who are dairying in this district now have regular and more satisfactory access.

Otakeo Road (Coromandel County).—The County Council has formed 61 ch. of this road to give vehicular access to two settlers who previously had no form of road access whatever.

Port Charles to Sandy Bay and Careys Roads (Coromandel County).—A camp has been established in the Port Charles area to carry out the construction and metalling of a new road between Port Charles and Sandy Bay. During the period under review practically 2 m. of new road was formed in difficult country and a start was made with the lesser work on Careys Road.

Rangihau Road (Coromandel County).—This road gives access to an area of land which was previously for the most part in the Thames County. However, in order to overcome any difficulties in connection with maintenance, the land in question was transferred to Coromandel County, and the road was widened and metalled. During the period under review the improvements have been brought much nearer completion, but, unfortunately, the work was delayed considerably as a result of slips and the necessity for making a number of deviations from the original road-line.

Awhitu Central Road (Maukaka Heads), (Franklin County).—This is a comparatively important settlement road on the Awhitu Peninsula, and during the year metalled access was given to sixteen settlers by the metalling of a distance of 2 m. 21 ch.

Bald Hill Road (Franklin County).—The County Council has provided an all-weather connection between Titi and Waiuku by the metalling of an additional section of 61 ch. of this road.

Bluff Road (Franklin County).—The camp established of previous years was retained to continue with the roading programme authorized in this district. The work completed during the period under review comprised the construction of various access roads involving 97 ch. of formation and 1 m. 24 ch. of metalling. As a result all-weather access has been given to six dairy-farms.

Canoe Bridge (Mangatangi to Miranda Road), (Franklin County).—A reinforced-concrete bridge of one 27 ft. span was completed during the year.

Kohekohe to Waipipi Road (Franklin County).—In addition to the work done of previous years, a length of 50 ch. was formed and metalled during the period under review to give access to two settlers.

McIntosh Road (Franklin County).—A length of 1 m. 3 ch. of this road was metalled to give all-weather access to six settlers and to provide a convenient through connection with the adjacent roading system.

Moumoukai Valley Road (North End), (Franklin County).—The improvements commenced of previous years were continued during the period under review, and as a result an additional length of 2 m. 40 ch. of metalling has been completed to give all-weather access to eight settlers.

Otaua to Maioiro Road (Franklin County).—The County Council has improved this road very considerably by metalling a distance of 68 ch., thus giving all-weather access to a large grazing area.

Pinnacle Hill Road (Franklin County).—The metalling of this road was completed during the year and has given all-weather access to three settlers.

Whangarata to Razorback Road (Franklin County).—A distance of 51 ch. on this road was formed and 30 ch. metalled. This work is a portion of a larger proposal having in view a connection between Whangarata and the Great South Road and the provision of all-weather access to seven settlers.

Tryphena Harbour Road (Great Barrier Island County).—During the year 17 ch. of formation, 7 ch. of sea-wall, and one timber bridge of 25 ft. span were completed to give access to the wharf on No. 1 site.

Tryphena to Kaitoke Road (Great Barrier Island County).—This road gives access to the Kaitoke Aerodrome and is under construction by the Department. During the year 40 ch. of formation, 1 m. 40 ch. of metalling, and 326 ft. of culverting were completed.

Awaiti South Road (Hauraki Plains County).—This is a settlement road on which a length of 40 ch. was formed and metalled during the year.

Torehape Road West (Hauraki Plains County).—The reformation, widening, and metalling of this road has been authorized and will involve a great deal of work. A commencement was made during the year, a distance of 2 m. 40 ch. being cleared and widened by the close of the period.

Clevedon to Maraetai Road (North Road), (Manukau County).—This is a major work involving the re-alignment and regrading of an important connection between Clevedon and Maraetai which passes through an extensive dairying and agricultural area. During the period under review 5 m. of formation, 1 m. 20 ch. of metalling, and 728 ft. of culverting was completed.

Cooper's Road Culvert (Manukau County).—An old wooden bridge has been replaced with 40 ft. of pipe culverts.

Otau Mountain Road (Manukau County).—The reformation and metalling of this settlement road was authorized during the year, and up till the close of the period 2 m. of light formation and 1 m. of metalling had been completed. The improvements will assist considerably in giving satisfactory all-weather access to a large grazing area.

Puketutu Island Road (Manukau County).—This roading work, involving a scoria filling 1 m. 20 ch. long with sea-walling, was carried out during the period to give access to Puketutu Island, where there are three settlers engaged in dairying activities.

Sykes Road (Manukau County).—A length of 60 ch. of this road was surfaced during the year to give all-weather access to four settlers.

Lichfield to Ngatira Road (Matamata County).—This is a work being carried out to give much better access to a number of settlers who have previously had to contend with the difficulties arising from the use of a clay road. During the period under review 2 m. 51 ch. of formation and 2 m. 41 ch. of metalling was completed.

Lichfield to Ngatira Road (Te Whetu Junction to Bartholomew's Siding), (Matamata County).—This is another metalling work being carried out in conjunction with the improvements on the road previously mentioned, and during the year 70 ch. was widened and metalled.

Lichfield to Wootu (Wiltsdown) Road (Matamata County).—A commencement was made with this work during the period under review, and 4 m. 65 ch. was widened and metalled to provide all-weather access to settlers and also a convenient through connection to the main highway.

Mowbray Road Bridge (Matamata County).—A reinforced-concrete bridge of one 27 ft. span 20 ft. wide was erected during the year by the County Council.

Paraonui Road (Matamata County).—Work has been commenced on the reformation and metalling of this road, and during the year a distance of 1 m. 70 ch. was reformed.

Putaruru to Lichfield Road (Matamata County).—With a view to providing all-weather access to ten settlers and giving a through cream route, improvement-work was commenced on this road, and during the year 2 m. 28 ch. was metalled.

Wawa Road (Matamata County).—The balance of the metalling required on this road, 1 m. 34 ch., was completed during the year, together with the erection of one bridge.

Waihi Group Roads (Ohinemuri County).—In the previous period a programme of reformation and metalling improvements was authorized on a group of roads in this vicinity with a view to giving all-weather access to a large area of dairying land close to Waihi. During the year 2 m. 71 ch. of metalling and 53 ch. of formation work was completed.

Waitewheta Stream Bridge (Harris's Road), (Ohinemuri County).—The erection of a bridge to eliminate an unsatisfactory ford in the Waitewheta Stream was completed, and the five settlers on this road are now able to get to and from their properties at all times.

Waitoki Road (Ohinemuri County).—A survey was made of proposals covering the improvement of this road, and during the year formation work was commenced and carried out over a distance of 1 m. 53 ch.

Gallagher's Road (Otorohanga County).—This is a short branch road giving access to a small settled area, and during the year the County Council formed 20 ch. and metalled 36 ch.

Henderson's Block Access Road (Otorohanga County).—Several settlers have been established in this block under the Small Farms Scheme, and arrangements have been made to metal their access road. During the period under review a distance of 1 m. 20 ch. of this work was completed.

Maihihi to Hingia Road (Otorohanga County).—The completion of reformation and metalling work on this road will provide a through connection between Otorohanga and the Wharepunga district. During the year 3 m. 77 ch. was metalled, giving all-weather access to five settlers.

Panetaupu Settlement Roads (Otorohanga County).—The Panetaupu Block was settled by young men under the Flock House Scheme, and the work commenced in previous years with a view to giving all the road access required within the Block was completed.

Puketarata Road (Otorohanga County).—During the year the County Council metalled the remaining clay gap of 70 ch. on this road.

Tapuae Road (Otorohanga County).—This is a settlement road in a district now coming under active development, and the work carried out this year under an approved programme consisted of 44 ch. of widening and 3 m. 50 ch. of metalling. As a result, eight additional settlers have been given all-weather access.

Tauraroa Road (Otorohanga County).—The County Council reformed and metalled 58 ch. of this settlement road.

Turitea Road (Otorohanga County).—This road gives access to nine settlers and also provides a through connection between two main highways. During the period under review 5 m. 10 ch. was metalled.

Mangawika Road (Otorohanga County).—The reformation and metalling of this road with the erection of one 50 ft. span bridge was commenced to give access to one or two particularly good farms, as well as a large area of Native and Crown lands. During the period 61 ch. of reformation work was completed.

King's Road (Piako County).—A length of 1 m. 20 ch. was metalled to give access to one settler and to adjacent areas of good dairying country.

Old Hill Road (Piako County).—During the period under review the County Council completed the metalling of 1 m. of this road to give access to settled areas.

Thompson's Track (Piako County).—As a result of the Government's decision to improve access in outlying areas a grant was made for the betterment of this access, and during the year reconditioning work was carried out over a length of 2 m. 50 ch. A serviceable road will be provided on completion of the programme, thus giving five settlers all-weather access.

Corne's Access Road (Raglan County).—The formation of 1 m. 2 ch. of new road was carried out during the period to give vehicular access to a settler.

Karakariki Settlement Road (Raglan County).—The Karakariki Block in this county is being developed and settled by the Waikato Land Settlement Society, and with a view to assisting as far as possible a Government grant was made to meet the cost of road formation. During the year the internal roading of the block was completed.

Mile Bush Road, Pukekawa (Raglan County).—The metalling of 1 m. 10 ch. of this road has given a through connection for a cream route and will undoubtedly assist materially in the general development of the district.

Pooley's Road (Raglan County).—The formation over a distance of 1 m. 42 ch. has been completed.

Rotongaro to Rangiriri Road (Raglan County).—This settlement road giving access to nine settlers was previously in very poor condition. With a view to alleviating difficulties as much as possible a grant was made to assist with the cost of metalling, and during the period under review 4 m. 30 ch. of base-course metalling was completed. Top-course metalling is in hand.

Waikorea to Naikie via Speedys (Raglan County).—The widening and metalling of this road was commenced during the year to give all-weather access to eleven settlers. Altogether 1 m. 75 ch. of reformation and 1 m. 43 ch. of metalling was completed.

Waingaro Springs to Te Uku Road (Raglan County).—The programme commenced in the previous year was continued. The remaining 60 ch. was metalled, and as a result an all-weather connection is now available to the Waingaro and Te Uku districts.

Wairamarama to Kaawa Road (Bothwell's), (Raglan County).—This road is located in an area of the county now coming under rapid development. The reformation, widening, and metalling of the route was authorized to assist in bringing the country in more quickly, and during the year 6 m. 56 ch. of reformation and 4 m. 59 ch. of metalling was completed.

Waitetuna to Waipa Road (Raglan County).—The widening of 1 m. 67 ch. and metalling of 5 m. 31 ch. has given all-weather access to six settlers on this road. This does not complete the programme, and the work is being continued.

Anderson's Road (Rodney County).—The County Council has completed the metalling of 60 ch. of this road, which will give all-weather access to three settlers.

Cherry's Bridge, Warkworth to Woodcocks Road (Rodney County).—A reinforced-concrete bridge, 125 ft. in length with a 12-ft.-wide roadway, has been completed by the County Council to replace an old timber structure which had served its useful life.

Dills Road (Rodney County).—A top course of metal was laid by the County Council over a length of 75 ch. to improve the metalled surface which existed previously.

Komokoriki Hills and Ahuroa Valley Roads and Group (Rodney County).—Fifteen settlers will be provided with all-weather access, and a considerable area of good farm land will be opened up by the metalling of this group of roads. The total length involved is 7 m. 27 ch., and the formation, culverting, and base-course metalling has been completed. Top-course metal is now being placed.

Mahurangi Heads Road (Rodney County).—During the period 2 m. 10 ch. of top-course metal was placed on this road.

Mangawai Kauri-gum Reserve Roothing (Rodney County).—The roading of this block, which is being developed under the Small Farms Scheme, is being carried out by the Department. In addition to a developmental programme, which is reported upon elsewhere, a further 19 ch. of road formation was completed.

Matakana to Whangaripo Road (Rodney County).—During the year the reformation and metalling of this road over a length of 3 m. 37 ch. was completed. This will be of considerable benefit to the district and will give all-weather access to Wellsford or Matakana for three additional settlers.

McPherson's Bridge, Port Albert to Wellsford Valley Road (Rodney County).—The County Council has replaced a decayed wooden bridge with a reinforced-concrete culvert 58 ft. by 10 ft. by 10 ft.

Omaha Valley Road (Rodney County).—Some good grazing country will be opened up and an outlet provided for one settler by the formation of 95 ch. of this road. The work was done by the County Council.

Pricors Access Road (Rodney County).—The formation and metalling of this road was completed during the period under review. The distance covered was 1 m. 16 ch., and the work included the erection of one wooden bridge.

Takatu Road (Rodney County).—With a view to improving the access to two settlers holding property at Takatu Point the County Council undertook the formation and metalling of 2 m. 24 ch. of this road. Up till the present, however, only the formation has been completed.

Warkworth to Kaipara Flats Old Road (Rodney County).—Work comprising 70 ch. of top-course metalling completed the improvements required on this road, and as a result six settlers have now been given all-weather access to the Kaipara Flats Railway-station.

Hikutara to Whangamata Road (Thames County).—This road has been deviated to avoid the severe flooding which occurred on occasions in the Wentworth Stream. The formation completed last year has been metalled over a distance of 86 ch.

Omahu to Otamakite Road (Thames County).—After a careful investigation it was decided to widen dangerous places on this road and to metal it to give all-weather access to interested settlers. During the period under review 3 m. 45 ch. was metalled and a considerable number of culverts installed.

Gordonton to Motumaoho Road (Waikato County).—This road is an important through route and gives access to a number of settlers farming peat lands. During the year a commencement was made with metalling improvements, and at the time of preparing this report a distance of 50 ch. had been completed.

Pukewhau to Lake Road (Waikato County).—The Department has been working on this road for one or two seasons past, and the year under review saw the completion of the metalling work involved. This covered a distance of 5 m. 76 ch. and has given all-weather access to seven settlers along the eastern shore of Lake Waikare.

Te Miro to Kiwitahi Road (Waikato County).—The formation and metalling of 2 m. 58 ch. of this road has been commenced, and at the close of the period under review some 60 ch. of formation had been completed.

Blackett's Road (Waipa County).—The County Council completed 76 ch. of new formation on this road.

Kairangi Settlement Road (Waipa County).—The Waikato Land Development Society commenced the development of this block of farming land, but the area has now been taken over from the society by the Department of Lands and Survey. A certain amount of the new roading required has not yet been laid off, but during the year it was possible to form and metal 3 m. 36 ch. This roading will assist greatly in bringing the block in quickly, some seventeen settlers having already taken up holdings.

Patterson's Road (Waipa County).—A length of 57 ch. of this road was metalled during the period under review.

St. Ledger's and Back Roads (Waipa County).—The County Council metalled 65 ch. of these roads, and this will greatly improve the access to a number of good farming sections.

Blackbridge Road and Group (Waitemata County).—This work was commenced during the year, 8 m. 23 ch. of road being reformed and metalled with a base course during the period. Besides giving a desirable connecting-link between two main highways, this new work will open up a considerable area of country and will provide all-weather access for eight additional settlers.

Coronation (Waitakere Ridgway) Drive (Waitemata County).—During the year work on this scenic route has progressed well, and its popularity is evidenced by the amount of traffic which passes over the completed length during week-ends and public holidays. The results for the period are—8 m. 74 ch. formed to a width of 24 ft., foundation metal laid over 6 m. 14 ch., metal chips placed over 6 m. 53 ch., and one coat sealing completed over 4 m. 70 ch. In addition, the road-line has been cleared for 7 m. 47 ch., 2,912 lineal feet of concrete culverts, and 2,560 lineal feet of drains being laid. 74 ch. of boundary fence was erected.

Glen Var Road (Waitemata County).—The County Council metalled 75 ch. of this road to give all-weather access to eight settlers.

Huia to Whatipu Road (Waitemata County).—New formation and metalling was completed over a distance of 4 m. 28 ch. on this road. As a result four settlers have been given metalled access, and beaches in the vicinity have been brought within easy reach of tourists and city dwellers.

Ranum's Road and Jordan's Island Access Road (Waitemata County).—During the period 2 m. 44 ch. was formed and metalled and one timber bridge of 44 ft. span constructed on Ranum's Road. These routes will give access to the reclamation scheme at Kukutango Block, and will also provide much better access for six settlers who are dairying on their properties.

McClymonts and Spencers Roads (Waitemata County).—The County Council completed the metalling of these roads, and as a result eight settlers are now provided with metalled access.

Nixon's Road (Waitemata County).—A length of 1 m. 20 ch. was metalled during the period under review to give access to good farming country supporting four settlers.

Schnapper Rock Road (Waitemata County).—The County Council metalled 1 m. 24 ch. of this road, and as a result the thirteen interested settlers now have greatly improved access and will be in a much better position to develop their holdings properly.

Wainui to Tahekeroa Road (Waitemata County).—Top-course metalling over a distance of 2 m. 15 ch. has completed all necessary improvements on this road.

Snellings Road (Waitemata County).—Metalling of 65 ch. of this road was completed during the year to give all-weather access to six settlers.

TAURANGA DISTRICT.

McDonnell's Road (Opotiki County).—This road gives access to three settlers—one European and two Natives—and had previously been in little better condition than a bush track. With a view to improving the position and assisting the settlers as much as possible in the development of their holdings, a grant was made during the year for the purpose of properly forming and metalling the road. In the period 37 ch. of formation and metalling was completed.

Dansev Road (Rotorua County).—This is a settlement road giving access to a number of settlers who had previously been inconvenienced greatly by difficulties in wet weather and during the winter months. Metalling improvements were commenced during the year, and by the end of the period a length of 80 ch. had been completed.

Horo-horo Block Access Roads (Rotorua County).—The Native Department has brought a large area of Native land in this vicinity under a consolidation scheme, but as dairying is to be the main activity of the new settlers consideration had to be given to the question of forming and metalling access roads. During the period under review capital work of this description was carried out over a distance of 3 m.

Maniatutu Road (Rotorua County).—This road gives access to bush country where a mill is operating, and also to a school attended by six pupils. During the period under review a length of 74 ch. was metalled.

Oturoa Road (Rotorua County).—With a view to giving all-weather access to numerous settlers on this road metalling improvements were commenced during the period, and 1 m. 20 ch. of new work was completed.

South Road (Rotorua County).—During the year 50 ch. of formation and 54 ch. of metalling was carried out on this road.

Te Waerenga Road (Rotorua County).—As a result of representations made by numbers of settlers and an appropriate application by the Rotorua County Council, a grant was made for the purpose of assisting with the cost of metalling this settlement road. During the period under review new work of this description was carried out over a distance of 2 m.

Vaughan's Road (Rotorua County).—A length of 1 m. 32 ch. of metalling was completed on this road during the period.

Whirinaki Cross Road (Rotorua County).—This road is used greatly in connection with the settlement and development of a number of Crown sections in the vicinity, and in order to give all-weather access metalling improvements were commenced. A distance of 74 ch. was completed during the year.

Atiamuri to Orakei-Korako Road (Taupo County).—This road has come into prominence as the access to the new thermal district now being developed at Orakei-Korako. Reconstruction work, with surfacing where necessary, was required to give vehicular access, and a length of 10 m. 50 ch. received attention of this description during the period.

Ongaroto Road (Taupo County).—With a view to giving access to new country and to timber-mills, formation and metalling has been carried out over a length of 4 m. on this road.

Reporoa Roads (Taupo County).—The several roads in this block give access to pumice country which was brought in as Crown land settlement some few years ago. In view of the difficulties experienced by the new settlers in getting access during wet weather a start was made with metalling, and by the close of the period 1 m. of this work had been completed.

Taupo Aerodrome Access Road (Taupo County).—With the construction of an aerodrome at Taupo it has been necessary to build a road access, and during the year 2 m. 40 ch. of clearing preparatory to formation work, together with 1 m. of formation, was completed.

Bell's Road (Tauranga County).—This settlement road had been in indifferent condition for some seasons, and in order to improve the access as much as possible a length of 40 ch. was metalled during the period under review.

Esdaile's Road (Tauranga County).—Work was carried out on this road during the year under the Government's programme of backblocks roads improvement. By the close of the period a length of 30 ch. had been metalled.

No. 1 Road, Te Puke (Tauranga County).—This is one of three roads on which the Tauranga County Council is experimenting with a special form of surfacing, 1 m. of the work being completed during the period.

Ohauiti to Waimapu Road (Tauranga County).—In order to give all-weather access to a number of settlers metalling improvements were undertaken on this road, and by the close of the period a distance of 1 m. had been metalled.

Rangiuru Road (Tauranga County).—The metalling of this road is one of the works commenced under the Government's programme of improvements on settlement roads, and during the year a distance of 1 m. was metalled.

Te Tumu Road (Tauranga County).—Reformation, culverting, and metalling work was completed during the period over a length of 1 m. 40 ch. on this settlement road.

Galatea Estate Access Roads (Whakatane County).—In order to give all-weather access to new areas which the Lands Department desired to offer for selection within the Galatea Estate, formation and metalling work has been carried out over a distance of 1 m. 50 ch.

Luttrell's Bridge (Whakatane County).—One timber bridge of three 25 ft. spans was erected over Raroa Creek, approximately 2 m. from Waimana Village, and this will be a decided improvement over the previous means of crossing by a ford.

Murupara Small Farms Access Road (Whakatane County).—As indicated, this is a road giving access to a number of small farms, the development of which has been undertaken by the Department of Lands and Survey. During the period 1 m. 54 ch. of formation and metalling was completed, together with two small bridge culverts.

Murphy's Road (Whakatane County).—This is another road on which metalling has been commenced under the programme of settlement roads improvement. A distance of 60 ch. was completed.

Omeheu Outfall Bridge, Soldiers' Road (Whakatane County).—One bridge in steel joists of 40 ft. span was erected over the Omeheu Outfall Drain on this road.

Rotorua to Waikaremoana Road (Whakatane County).—The major work of reconstructing and metalling this road has progressed steadily, and that completed during the period under review comprises 3 m. 70 ch. of heavy rock formation approximately 24 ft. wide, lighter formation over an additional 1 m. 20 ch. approximately 30 ft. wide, metalling 2 m. 33 ch., and culverting 2,000 lineal feet. During the year heavy rains in the mountain sections caused numerous heavy slips, and rock and rubble totalling over 52,000 cubic yards were removed as a result of these occurrences. An average complement of 150 men have been employed during the period.

Sisley's Road (Whakatane County).—This is a settlement road on which metalling was commenced under the programme of backblocks-roads improvement. 60 ch. of this work was completed.

Tarawera Small Farms Access Road (Whakatane County).—A road was required in this instance to give access to small farms being developed by the Department of Lands and Survey, 1 m. 20 ch. of new formation being completed and surfaced with pumice.

GISBORNE DISTRICT.

Bushy Knoll Road (Cook County).—In the past two seasons a considerable length of this back-country road has been metalled to give all-weather access to a large tract of fertile grazing country. During the period under review 80 ch. was trimmed and metalled and 216 lineal feet of culverts were placed.

Nelson Road (Cook County).—This is an important road in the county carrying more than the usual amount of settlement traffic. The work completed during the past year comprises 1 m. 42 ch. of reconstruction and 122 lineal feet of culverting.

Tokonui to Tarewa Road (Cook County).—An additional length of 40 ch. of this road was metalled as part of the County Council's programme to give all-weather access to the interested settlers.

Waimata to Arakihi Road (Cook County).—Proposals covering metalling work over a distance of 2 m. were authorized, but owing to heavy floods in the late summer it was not possible to commence any actual metalling. Sufficient stone was taken from nearby river-beds and dumped on the roadside.

Waiomoko Road (Seymour's), (Cook County).—The 30 ch. of metalling commenced during the previous year was completed, together with an additional 20 ch. of new work.

Karakatuwhero Road (Matakaoa County).—This road gives access to grazing country in a back-blocks district, and during the year a deviation 20 ch. in length was formed and metalled. One bridge of 25 ft. span was removed from an unsuitable location on to the new deviation.

Kopuapounamu River Bridge (Kopuapounamu Valley Road), (Matakaoa County).—One reinforced-concrete bridge of two spans and totalling 90 ft. in length was completed, together with approaches, and this will assist materially in giving more regular access to a number of back-country settlers.

Main East Coast Road, Potaka to Whangaparaoa Section (Matakaoa County).—A length of 2 m. 40 ch. of this road was top-coursed, and this work has completed all the improvements necessary. The route was subsequently declared a main highway and will be maintained in future from the funds of the Main Highways Board.

Potaka to Waikura Road (Matakaoa County).—During the year a contract was let for the metalling of 1 m. 48 ch. of this road. The work was completed.

Te Araroa to East Cape Road (Matakaoa County).—This road gives access to a considerable area of Native land. 60 ch. of new metalling was completed, together with 470 lineal feet of culverting.

Huanui Road (Uawa County).—An additional length of 40 ch. of this back-country road was metalled to assist towards the provision of all-weather access to a large station.

Tauwhareparae Road (Uawa County).—This road is in the hinterland of the East Coast district, and improvement-work completed during the year comprises 20 ch. of reformation, 40 ch. of metalling, and 66 lineal feet of culverting.

Tolaga to Arakihi Road (Uawa County).—A contract covering metalling of 1 m. 18 ch. of this road was well advanced at the commencement of the year and was completed during the period under review.

Ihungia-Mata-Waitahaia Road (Waiapu County).—During the year 1 m. 66 ch. of new metalling was carried out on this road to complete proposals which had as their object the provision of all-weather access to a number of settlers in a backblocks district.

Jerusalem to Whareponga Road (Waiapu County).—This road gives access to European settlers and also to a large area of Native lands which are now coming under active development. During the period under review a length of 2 m. was metalled.

Marahara East Road (Waiapu County).—Like many other roads in the Waiapu County, this route gives access to a number of European holdings and also to large tracts of undeveloped Native lands. With a view to bringing this country into production a commencement was made with metalling, and during the period under review 2 m. 40 ch. of this work was completed.

Matahia Road (Waiapu County).—This is another settlement road on which 2 m. 32 ch. of new metalling was carried out during the year to give all-weather access to a number of back-country settlers.

Rangitukia to East Cape Road (Waiapu County).—This road was formed of previous years, but provision had not been made at that time for culverting, and with a view to preserving the new formation as much as possible a grant was made during the year for the purpose of placing concrete-pipe culverts. 368 ft. of these were placed.

Tapuwaeroa Valley Road (Waiapu County).—This road sustained damage as a result of a heavy flood in the adjacent river and it became necessary to build protective groynes to withstand erosion. The work was commenced, but owing to difficulties arising from further flooding, it was not possible to complete the proposals by the end of the period.

Te Hue Road (Waiapu County).—This clay road has been in indifferent condition for many seasons past and caused great difficulty to four soldier settlers, together with a number of Native farmers, in transport operations. With a view to assisting the settlers in the development of their holdings a grant was made during the year to cover the cost of metalling the road. By the end of the period a length of 1 m. had been completed.

Fitzgerald's Road (Waikohu County).—This road serves three settlers, and a length of 1 m. 6 ch. was metalled during the year to give all-weather access.

Gisborne to Motu via Whakarau Road (Waikohu County).—This road was at one time the main coach route between Gisborne and Opotiki, but since the construction of a deviation has lapsed to the status of a settlement route. The County Council has prepared proposals covering widening and metalling work, and during the year a length of 1 m. 48 ch. was improved accordingly.

Mangahauia Road (Waikohu County).—A length of 1 m. 19 ch. of this road has been newly metalled to give much improved access to the interested settlers.

Scott's Road (Waikohu County).—Metalling work was completed over a length of 60 ch. on this road.

Taihamiti Road (Waikohu County).—This is a settlement road on which 2 m. was surfaced with gravel to give better access to a number of settlers.

Tarndale Road (Waikohu County).—The work commenced of previous years was continued during the period. 3 m. 9 ch. of new formation was completed, 20 ch. was metalled, and 548 lineal feet of culverts were installed. This new road will give proper access to a large tract of grazing country which previously could be reached only by way of river-bed access involving a number of dangerous fords.

Wharekopae to Tahora Road (Waikohu County).—This is a backblocks road giving access to two large stations and other areas of fair-quality grazing land. It is also a through route for stock travelling between Poverty Bay and the Bay of Plenty. During the period under review improvements comprising 2 m. 4 ch. of reformation and 1 m. 60 ch. of metalling were completed.

TAUMARUNUI DISTRICT.

Waiouru to Tokaanu Road (East Taupo County).—This is a direct road from Waiouru to Tokaanu, passing on the eastern side of the mountains Ruapehu, Tongariro, and Ngauruhoe, and is now undergoing complete reconstruction with general improvements and metalling. During the period under review 10 m. of first-class formation, 10 m. of second-class surfacing, and 80 culverts totalling 2,000 lineal feet in length were completed.

Erua Road (Kaitieke County).—Another section of this backblocks road was metalled during the year to give all-weather access to a number of settlers, the completed work comprising 3 m. of second-class surfacing.

Kouturoa Road East (Kaitieke County).—A length of 4 m. of metalling was carried out on this road to give access to timber-mills and to several back-country settlers.

Hauturu North and Kihi Roads (Kawhia County).—With a view to giving all-weather access to a number of settlers who had been developing their properties under great difficulties for several years a programme of improvements was commenced on these roads. During the period 70 ch. of formation and 3 m. 70 ch. of surfacing was carried out.

Taumataotata West Road (Kawhia County).—This road had been in indifferent condition for many years, but in view of the necessity of giving all-weather access to five resident settlers it was decided to commence metalling improvements, and during the period 3 m. of work of this description was completed.

Tongaporutu to Mangaroa Road (Ohura County).—This is the eastern end of a road leading through to the West Coast at Tongaporutu, the whole of which is being reconstructed and metalled as a necessary through connection. During the year 2 m. of formation, 2 m. of surfacing, and 81 lineal feet of culverting was completed.

Waitaanga North Road (Ohura County).—This is a settlement road giving access to four settlers. During the year 2 m. 24 ch. of metalling was completed to give all-weather access.

Taumarunui to Tokaanu Road (Taumarunui County).—This is one of the Department's major works, and when completed will give direct access between Taumarunui and Tokaanu on the southern shore of Lake Taupo. It opens up new areas of heavily timbered country and will give access to large tracts of Native land capable of profitable development. Work was in hand during the previous period, and that completed during the year under review comprises 3 m. of first-class formation, 5 m. of surfacing, and 1,500 lineal feet of culverting.

Weston's Culvert (Taumarunui County).—As a result of the collapse of an old timber bridge it was necessary to consider the construction of a reinforced-arch culvert 50 ft. in length, 12 ft. wide, and 12 ft. high. The work was completed.

Kaitaringa Road (Waitomo County).—This road has been improved to give access to a small-farms scheme. The work carried out during the period under review comprises 3 m. 30 ch. of formation, 4 m. of surfacing, and 420 lineal feet of culverting.

Taumata Maire Road (Waitomo County).—This road gives access to a large area of occupied land to the north-west of the Awakino Gorge. In order to improve the position of the several settlers a commencement was made with reformation and metalling, and during the period 3 m. of formation improvements and 1 m. of metalling was completed.

Waitomo Valley Road (Waitomo County).—Improvements were commenced on this road with a view to giving all-weather access to settlers who had contended for many years with difficulties arising from the use of a clay road. During the period under review a distance of 2 m. 60 ch. of reformation and surfacing was completed.

STRATFORD DISTRICT.

Okau-Tongaporutu-Mangaroa Road (Clifton County).—Work has been continued during the year on the reformation and metalling of this road, which gives access to a considerable area of settled country in Clifton County and then continues over the boundary to give an access connection through Ohura County to the King-country. In view of the general roading and traffic development it was considered that a direct all-weather connection between the two districts should be made, and in furtherance of the programme authorized some time ago an additional length of 3 m. 8 ch. was metalled during the period under review.

Uruti to Ngatoto Road (Clifton County).—This is a settlement road running up into the hinterland of the county and is being metalled by means of grants made in the annual estimates. During the period 50 ch. was formed, 41 ch. was metalled, and 186 lineal feet of culverts were installed in continuation of the work commenced during previous years.

Parihaka Road (Egmont County).—This road was one of the few remaining unmetalled roads in the county, and with a view to improving the position in accordance with the land-development which has taken place a grant was made to form a small additional length and to metal the whole road. The work completed during the year comprises 22 ch. of formation and 2 m. 72 ch. of metalling.

Makino Road (Patea County).—This route, although maintained comparatively well as a clay road, did not give the regularity of access which is so important to-day in connection with farming

development. As a result of a grant in the estimates it was possible to carry out metalling improvements, and during the period under review 1 m. 60 ch. of this work and 66 lineal feet of culverting was completed.

Weraweraonga Road (Patea County).—As a result of access difficulties arising from the use of a clay road it was decided that the settlers should be given metalled access, and a camp was established to carry out the work. During the year improvements of the description mentioned were completed over a length of 3 m. 20 ch.

Mangahoe Road (Rangitikei County).—This road is situated in a backblocks area, and financial arrangements were made with the Rangitikei County Council in connection with the cost of metalling improvements. Work of this nature completed by the close of the period under review comprised 1 m. 25 ch. of preliminary earthworks and 40 ch. of metalling.

Mangamahoe Road (Rangitikei County).—This is another backblocks road in a productive grazing district and serves a large number of settlers. As a clay road the route had never given satisfaction to the extent necessary to meet present-day farming needs, and under arrangement with the County Council the road is being metalled. A length of 9 m. 59 ch. was completed in continuation of that finished during the previous period.

Murimotu and Watershed Roads (Rangitikei County).—The metalling operations commenced two seasons ago to give metalled access to a large area of good grazing country were continued. The work completed during the year consisted of 3 m. 62 ch. of surfacing.

Ohaumoko Road (Rangitikei County).—In order to give more satisfactory access to settlers a length of 4 m. 40 ch. of this road was metalled during the year.

Ongo Stream Bridge (Rangitikei County).—The erection of one reinforced-concrete bridge of two 40 ft. spans, the installation of 30 lineal feet of culverting, and approach roading of 15 ch. was carried out in the period.

Owhakura Road (Rangitikei County).—This is a settlement road passing over the county boundary into Wanganui County, and during the year a length of 2 m. was metalled to give all-weather access.

Mangahowhi Stream Bridges, Pakihi Valley Road (Waimarino County).—Two bridges, each of 25 ft. span, were erected on this road to give access to lands being developed under the small-farms scheme.

Mangarewa Road (Waimarino County).—This is a backblocks road where difficulties have been experienced for many years during rains and over the wet season. The position has now been improved greatly by metalling. The work completed during the year comprised 1 m. 43 ch. of formation, 1 m. 61 ch. of metalling, and 237 lineal feet of culverting.

Pakihi Valley Road (Waimarino County).—The metalling of 55 ch. of this road was completed during the year along with the renewal of the two bridges over the Mangahowhi Stream, as mentioned above.

Waipuna Ridge Road (Waimarino County).—The metalling of this road was continued during the year to give all-weather access to settlers who have been farming in the area for a very long time. The new work completed over the period comprises 3 m. 42 ch. of metalling and 123 lineal feet of culverting.

Matahiwi to Ohotu Road (Wanganui County).—Formation work was carried out on this road in previous seasons, and during the last period the new formation was metalled over a distance of 2 m. 63 ch.

Owhakura Road (Wanganui County).—This settlement road extends over the county boundary into Rangitikei County, and during the year 60 ch. was metalled in conjunction with the other work being carried out in the latter county.

Wanganui River Road, Left Bank, Operiki Stream Bridge (Wanganui County).—Widening and metalling improvements were undertaken on this road one or two seasons ago, and all-weather access was given up the left bank as far as Pipiriki. One bridge completing the Department's programme of work was erected during the year over the Operiki Stream.

Makahu Road (Whangamomona County).—This settlement road is located in the hinterland of Taranaki and is used by a number of dairy-farmers in taking cream and other dairy-produce to the railway-station. Transport of this description could not be continued regularly in wet weather, and with a view to improving the position as much as possible a camp was established to metal the road. During the period 1 m. 35 ch. of work of this description was completed.

Mangapapa Road (Whangamomona County).—This road branches off the main highway in the Tangarakau Gorge and leads up on to a plateau consisting in parts of very good country having regard to the general topographical features of this district. The settlers using the road have occupied their properties for many years, and their need of a metalled access grew more urgent as additional land was brought into productivity. With a view to giving the convenience and assistance of a metalled road a camp was established, and during the period 1 m. of metalling was completed.

Mangare Road (Whangamomona County).—The lands served by this road were offered for selection as Crown areas about eighteen to twenty years ago and, mainly on account of the clay access, a large proportion of the country was afterwards abandoned. The remaining settlers were experiencing great difficulty in getting access during wet weather and in the winter. In the circumstances arrangements were made to metal so much of the road as was used by existing settlement, and during the year under review a distance of 74 ch. of this work was completed.

Tangarakau Valley Road (Whangamomona County).—A track was formed several years ago to give access to the properties alongside this road. With the increasing development and productivity of the area the settlers were finding it extremely difficult to carry on satisfactorily without a full-width vehicular road. The formation was completed last year, and during the period under review 144 lineal feet of culverts were installed to take the surface and storm water away from the road.

NAPIER DISTRICT.

Mangatoro Stream Bridge (Fourth Crossing), Mangatoro Valley Road (Dannevirke County).—The plans prepared by the County Council in respect of this bridge have been approved, but it was not possible to get the work in hand during the year.

Napier to Taihape Road (Hawke's Bay County).—A length of 2 m. was graded up in preparation for metalling, and a small section of 20 ch. was completed, together with the installation of fifty culverts totalling 400 lineal feet.

Tutira to Pohokura Road (Hawke's Bay County).—120 lineal feet of concrete-pipe culverting, 12 in. in diameter, was installed.

Well's Access, Puketitiri (Hawke's Bay County).—A length of 62 ch. of this access was formed and culverted.

Cook's Tooth, Wangahau Road (Patangata County).—A length of 1 m. on this road was metalled to improve the access to settled areas.

Ireland's Road (Patangata County).—New metalling was carried out over a distance of 55 ch.

Mangatarata Road (Patangata County).—Metalling was completed over a length of 1 m. 25 ch.

Mangatarata to Long Range Road (Patangata County).—This work involves the formation of a road which will be used considerably as a through connection. The proposals were surveyed during the year and a commencement made with the formation and culverting. Formation of 3 m. was completed, and forty-five culverts, totalling 1,150 lineal feet, were installed.

Wallingford to Blackhead Road, Hunter's Access (Patangata County).—Metalling was completed over a length of 2 m. on this settlement road.

Wallingford to Hatuma Road (Patangata County).—During the period under review 1 m. 10 ch. of this road was newly metalled.

Carlyon's Bridge, Kereru to Waipawa Road (Waipawa County).—This structure consists of a reinforced-concrete bridge of one 31 ft. span with a 12 ft. roadway, on abutments, and was completed under contract during the year.

Cook's Road (Waipawa County).—New metalling on this road was commenced during the year, and by the close of the period 40 ch. had been completed.

Eastwood Road (Waipawa County).—Metalling is also in hand on this road, and a distance of 40 ch. has been completed.

Hardy's Road (Waipawa County).—1 m. of metalling was carried out on this road during the year.

McLeod's Bridge, Waratahi Road (Waipawa County).—This structure consists of one 32 ft. 6 in. reinforced-concrete span on abutments and wingwalls, with a 12 ft. roadway, and was completed under contract during the year.

Nicholl's Road (Waipukurau County).—In order to give access to settled areas a length of 1 m. 24 ch. of this road was metalled during the year.

Ardkeen Settlement Road (Wairoa County).—In continuation of the improvements commenced in previous years an additional length of 31 ch. on this road was metalled to give access to settlement.

Mangaone Valley Road (Wairoa County).—The County Council completed the metalling of 22 ch. on this settlement road to give better access to residents in the Valley.

Mohaka River Bridge, Willow Flat Road (Wairoa County).—A suspension bridge, consisting of a span of 181 ft. 6 in., with an 8-ft.-wide deck and capable of carrying a gross load of 6 tons, was completed during the year, together with 35 ch. of approach roading. Floods in April caused extensive slips on the approaches and the waters rose to within a few feet of the deck, so that it was necessary to consider protective measures at the abutments.

Murphy's Access Road (Wairoa County).—A new road is being constructed to give more convenient and direct access to a large grazing-run and, with the exception of culverting, was completed during the year, the distance being 1 m. 27 ch. of entirely new road and 42 ch. of old road.

Ngamotu Road (Wairoa County).—This road is being metalled to give access to a Native settlement, and a length of 76 ch. out of the total distance of approximately 3 m. was completed during the year.

Nuhaka River (Waikatea) Road (Wairoa County).—Protective work was commenced just before the severe floods in April. During the floods a new channel was scoured across the line of the proposed bank, and it not now practicable to carry out the work as originally designed.

Ohuka Branch Road (Wairoa County).—A length of 34 ch. on this back-country road was metalled during the period.

Otara Stream Bridge, Woodlands, Mossman's Access Road (Wairoa County).—Work was in hand on the erection of a suspension bridge of 100 ft. span, but owing to the floods operations have been temporarily suspended.

Rotorua to Waikaremoana Road, Hopuaruahine to Ruatahuna Section (Wairoa County).—With the exception of 2 m. of metalling, the reconstruction of this important scenic road had been completed in previous seasons. However, a number of underslips made it necessary to carry out additional widening operations, and during the year 8,900 cubic yards of spoil was removed from slips and 4,000 cubic yards was removed in the course of widening work. Metalling was completed during the period by using rock from the cuttings for the first course and shingle from the Hopuaruahine Stream for the running coat.

Birch Road East (Weber County).—An additional length of 2 m. 2 ch. of this road was metalled.

Oporae to Waihi Road (Weber County).—New metalling was commenced on this road during the year, and a distance of 60 ch. was completed.

WELLINGTON DISTRICT.

North Range Road (Akitio County).—In continuation of the improvement work which has been carried out on this road of recent years an additional length of 75 ch. was formed and another section of 1 m. 30 ch. was metalled.

Spur Road (Akitio County).—A length of 1 m. 70 ch. of this settlement road was metalled during the year.

Waiowaka Road (Akitio County).—On this settlement road 14 ch. of formation, 1 m. 40 ch. of metalling, and the erection of two small timber bridges has been completed.

Alfredton to Tinui Road (Castlepoint County).—In order to give metalled access to settlers and to improve a road used by a great deal of through traffic, 4 m. 60 ch. of this route was metalled.

Otahome Road (Castlepoint County).—With a view to giving all-weather access to one settler, an additional length of 40 ch. on this road was metalled.

North Road Culvert (Eketahuna County).—One reinforced-concrete culvert, 4 ft. by 6 ft. and 25 ft. long, was completed during the year.

Putara Gorge Road (Eketahuna County).—Widening work on dangerous corners and general improvements over the whole distance of 4 m. was commenced during the year and is still in progress.

Saunders Road (Eketahuna County).—A length of 1 m. 50 ch. was metalled with base-course material and is to be surfaced next season.

Tawhero Road (Eketahuna County).—This is a settlement road on which 1 m. 20 ch. of base-course metalling was completed during the year. The top-course metalling is to follow in the next season.

Tiraumea Road (Eketahuna County).—A length of 1 m. 20 ch. of new metalling was completed on this road.

Waiwera Bridge (Eketahuna County).—One reinforced-concrete bridge of two 35 ft. spans with a roadway 11 ft. wide was completed during the period under review.

Webb's Bridge (Eketahuna County).—A reinforced-concrete bridge of one 24 ft. span with a 12 ft. 6 in. wide roadway was erected during the year.

Ruakokopatu Road (Featherston County).—This is a settlement road in the backblocks part of the county and is to be used by timber-transport lorries very shortly. In order that the road should serve this dual purpose more suitably, dangerous corners have been widened and general improvements in the way of reconstruction carried out over the whole length.

Heights Road (Horowhenua County).—55 ch. of formation and metalling was completed.

Hokio to Waitare Road (Horowhenua County).—A length of 46 ch. of new metalling was carried out during the year.

Muhunua West Stream Bridge (Horowhenua County).—A rolled-steel-joist bridge with timber deck and hardwood piles and consisting of one 40 ft. span was erected.

Waikawa Beach Road (Horowhenua County).—A distance of 1 m. of this road was reconstructed as a result of largely increased traffic using the route for access to a beach settlement.

Haywards to Pahautanui Road (Hutt County).—The work commenced in previous years was continued and that completed during the period comprises 2 m. 19 ch. of formation 24 ft. wide, 3 m. of metalling, 1,110 lineal feet of culverting varying between 9 in. and 48 in. in diameter, three stream-diversions totalling 17 ch., and 160 ch. of fencing. Work is now in progress on an additional length of 2 m. 23 ch. of formation which is to be 24 ft. wide. This road will meet the urgent need for a fast and direct connection from the upper part of the Hutt Valley to the West Coast at Pahautanui and Paremata, where it will join the Main North Highway.

Plateau Bridge (Hutt County).—A reinforced-concrete bridge of one 19 ft. span with a 12 ft. roadway was completed, and this replaces a timber structure which had served for many years.

Plimmerton to Paekakariki Road (Hutt County).—Work has continued steadily on the construction of this new road between Plimmerton and Paekakariki, which will replace the tortuous and steep highway over the Paekakariki Hill. The swamp section between Plimmerton and Pukerua Bay has been excavated and is now being filled with solid material. The length between Pukerua Bay and Paekakariki is well opened up, and the construction of the sea-wall is going ahead rapidly, 2,750 cubic yards of concrete having been placed. Some 205,340 cubic yards of clay and rock have been excavated, 2 m. 30 ch. has been formed and metalled, and construction is in progress over a length of 6 m. 10 ch. Approximately 994 lineal feet of concrete-pipe culverts varying in diameter from 12 in. to 60 in. have been installed. Two overbridges will carry the road over the railway at different points. Contracts for both of these structures have been let, and pile-driving has been commenced.

Western Hutt Road (Hutt County).—The formation of this new outlet along the western side of the Hutt Valley has been completed with the exception of the northern approach to the new reinforced-concrete bridge over the Hutt River at Silverstream. This bridge is now being erected under contract, and up to the present one abutment and six piers have been completed. No difficulty has been experienced with the cylinder-sinking, and the deck and beams of one span have been completed.

Thorndon Overbridge (Wellington City).—The construction of this bridge, which will carry traffic from Aotea Quay over the several railway-lines at the northern end of the main city area, has progressed steadily during the year. With the exception of three spans, all beams, decking, and kerbs have been completed. All fence panels and footway slabs have been cast, but as yet hand-rails have not been completed. The approaches have been practically completed and will require trimming only.

Milner's Bridge (Kairanga County).—A reinforced-concrete bridge of one 12 ft. span and with an 18 ft. roadway has been completed.

Titirangi Road (Kiwitea County).—In order to give all-weather access to settlement, 1 m. 20 ch. of this road was metalled during the period.

Mangaone Stream Bridge (Manawatu County).—A rolled-steel-joist bridge of two 30 ft. spans and with a road 11 ft. 2 in. wide has been completed.

Homewood Road (Masterton County).—A reinforced-concrete culvert, 9 ft. by 9 ft. and 30 ft. long, was completed during the year.

Ruamahanga River Bridge (Masterton County).—The erection of this reinforced-concrete bridge of three 80 ft. spans with a 20 ft. roadway was practically completed last year, and is now out of hand and being used by traffic.

Hall's Bridge (Mauriceville County).—Work was commenced during the year on a reinforced-concrete bridge of one 30 ft. span with a 12-ft.-wide roadway.

Woodville to Ashhurst Road (Oroua and Woodville Counties).—This is a new road being constructed over the ranges immediately north of the present highway through the Manawatu Gorge. Work was continued steadily during the period, 2 m. 20 ch. of formation, involving 56,540 cubic yards of spoil and 2 m. 25 ch. of metalling, having been completed on the new road. Culverts varying in diameter from 9 in. to 24 in. have been installed, the total length being 1,041 lineal feet. With the exception of some little fencing and a reinforced-concrete bridge of nine 40 ft. spans over the Pohangina River, the new work has been practically completed. On the Wairarapa side the old road is being improved, and the work completed comprises 1 m. 20 ch. of reformation, including several major deviations, 50 ch. of new metalling, and 729 lineal feet of concrete-pipe culverting.

Hull's Bridge (Pahiatua County).—Work was commenced during the year on a reinforced-concrete bridge of two 60 ft. and one 90 ft. spans with a 20-ft.-wide roadway.

Harris' Culvert (Pahiatua County).—Work was completed during the period on a reinforced-concrete culvert 8 ft. by 8 ft. by 44 ft. 9 in. long.

Paehuia Stream Culvert (Wairarapa South County).—A reinforced-concrete culvert, 8 ft. by 8 ft. by 76 ft. long, is being built, but was not completed by the close of the period.

NELSON DISTRICT.

Clarence Valley Road, North Bank (Awatere County).—With a view to giving more constant access to three grazing-runs on the south bank of the Clarence River the Department made a detailed investigation of a proposed new road up the northern bank, together with a light traffic bridge over the river. Although it was not possible to start the work in the period under review, financial arrangements were well advanced and it is anticipated that construction will proceed very shortly.

Ure River Road (Awatere County).—The construction of this settlers' access road has been continued during the year, 1 m. 15 ch. of 12 ft. formation, 1 m. 33 ch. of metalling, and 240 lineal feet of culverting having been completed.

Fifteen-mile Creek Bridge (Collingwood County).—The Department undertook the erection of this bridge on behalf of the County Council, and the structure, a three-span cantilever bridge in reinforced concrete, 100 ft. overall, with a 10 ft. wide roadway, is nearing completion.

Pakawau to Mangarakau (Collingwood County).—This new road, the formation of which is now completed, will provide all-weather access to a large area of pastoral, milling, and mining country south of the West Haven Inlet. During the year 70 ch. of formation, 5 m. 60 ch. of metalling, and 707 lineal feet of culverting have been completed. Stone-pitching of the banks across the various tidal arms has been continued by means of a punt specially constructed for the purpose. The bridge at Muddy Creek, consisting of five 20 ft. stringer spans on reinforced-concrete piers and abutments, has been completed.

Paturau Road (Collingwood County).—With a view to removing the difficulties experienced as a result of the low-lying nature of a section of several miles on this road a detailed investigation was made into a possible deviation of 3 m. 52 ch. By the close of the period camps were being erected and a commencement had been made with formation and metalling.

Pomeroy's Road (Collingwood County).—The County Council has completed the formation of 79 ch., and metalling is now proceeding.

Avon Valley Road (Marlborough County).—The County Council has completed 63 ch. of metalling on this road.

Leatham Valley Road (Marlborough County).—A distance of 1 m. 13 ch. of this road was metalled by the County Council to give all-weather access to the settlers in the Valley.

North Bank Road (Bartlett's Creek to Pine Valley Stream), (Marlborough County).—With a view to improving this road and to preventing erosion by the river, proposals involving stop-banking, protective works, and groynes were prepared, and the work was commenced a short while before the close of the period.

Waihopai River Bridge, Maori Ford, Waihopai Valley Road (Marlborough County).—Owing to the silting up of the Marlborough Power Board's dam it became necessary to raise this bridge by 12 ft. 3 in., and this work, which included an extra 20 ft. span in each end of the bridge, together with formation and metalling of 12 ch. of approaches, has been completed by the County Council.

Blackwater Road (Murchison County).—The County Council has completed the formation and metalling of 1 m. 1 ch. of this settlement road. Nine culverts of various sizes totalling 144 lineal feet have been installed.

Glengarry Road, Access to Kelling (Murchison County).—The reconstruction of 78 ch. of this road to give access to country which has been isolated since the Murchison earthquake in 1929 was completed by the County Council.

Hutchings Creek Bridge, Maruia River Road, East Bank (Murchison County).—The erection of this bridge was undertaken by the Department on behalf of the County Council. The structure consists of a reinforced-concrete bridge of two 35 ft. spans with a 10-ft. roadway, and, together with 6 ch. of approach roading, was completed during the period.

Longford to Rait's Road, Access to Win (Murchison County).—The County Council let a contract for the formation of 1 m. 42 ch. of this settler's access road. The work has now been completed, together with the installation of twenty-nine culverts of varying sizes and of a total length of 376 lineal feet.

Matiri River Road, West Bank (Murchison County).—An additional length of 60 ch. of this settlement road was metalled by the County Council.

Pea Soup Creek Bridge, Maruia River Road, East Bank (Murchison County).—The construction of a reinforced-concrete bridge of one 45 ft. span with a 10 ft. roadway, and the formation and metalling of 6 ch. of approach roading, was completed.

Rappahannock Road (Murchison County).—As a result of formation and metalling improvements over a length of 1 m. 43 ch. the access to the several resident settlers in this valley has been greatly improved.

Shenandoah Road (Murchison County).—This new road, which was formed a few seasons ago, was metalled over a distance of 5 m. 16 ch. The route will later form part of the Murchison-Christchurch via Lewis Pass Main Highway.

Hakana Bay to Jerdan's Bay Track, Access to Daken (Sounds County).—A contract was let for the formation of 1 m. 27 ch. of track 4 ft. wide, and the work, which has been completed, gives access to isolated settlers in the Port Underwood district.

Go-ahead Creek Bridge, Old Collingwood Inland Road (Takaka County).—The County Council let a contract for the construction of this bridge of one 35 ft. reinforced-concrete span with a 12-ft.-wide roadway on reinforced-concrete pile abutments. At the close of the period the piles were in place.

Waitui Road (Takaka County).—A length of 45 ch. of this road was metalled to give all-weather access to settlers and to assist the Cobb Hydro-electric Works.

Clarke Valley Road (Waimea County).—New metalling on this road has been completed over a distance of 2 m. 26 ch.

Herring Stream Bridge, Motueka River Road, Left Bank (Waimea County).—This work, which comprised a 35 ft. reinforced-concrete span with a 12-ft.-wide roadway, together with the formation and metalling of 10 ch. of approach roading, has been completed by the County Council.

Little Pokororo River Bridge, Motueka River Road, Left Bank (Waimea County).—The County Council let a contract for the construction of this bridge, which consists of one 30-ft.-reinforced-concrete span with a 12-ft.-wide roadway. The work has been completed, together with the formation and metalling of 6 ch. of approach roading, and is a great improvement over the old means of crossing by a ford, which was often impassable during floods.

Matai River Bridge, Matai Valley Road (Waimea County).—The erection of a reinforced-concrete bridge consisting of two 35 ft spans with a 10-ft.-wide roadway has been completed.

Moutere Clay Road (Waimea County).—New metalling over 64 ch. of this access road has been completed to give all-weather access to residents in the Moutere district.

Riwaka to Sandy Bay Road (Waimea County).—During the year the Department carried out widening operations on various sections of this road over a length of 3 m., and also completed light metalling on several lengths over a total distance of 4 m. Two bridges, totalling 36 ft. in length and 720 lineal feet of culverting, were completed.

Tadmor to Glenhope Road, Kaka to Glenhope Section (Waimea County).—A commencement has been made with metalling work on an additional 2 m. of this settlement road.

Upper Stanley Brook Road Bridge (Waimea County).—The County Council let a contract for this work, which involves the erection of a reinforced-concrete bridge of three 42 ft. spans with a 12 ft. wide roadway, together with the formation and metalling of 11 ch. of approach roading. The work was commenced by the close of the period.

GREYMOUTH DISTRICT.

Access to Pakihi Lands, Sergeant's Hill (Buller County).—The Lands Department, in conjunction with the Cawthron Institute, is experimenting with the development of an area of pakihi lands in the vicinity of Sergeant's Hill. Under arrangement with the Buller County Council access roads are being constructed as new land comes under development. During the period under review 2 m. 9 ch. of formation work was completed, together with the installation of eleven culverts aggregating 224 ft. in length. On Caroline Terrace Road, which gives access to a part of this block, additional work, involving 55 ch. of formation and metalling and 64 lineal feet of culverting, was carried out.

Cascade Road (Buller County).—The construction and metalling of this road to give vehicular access to the Cascade Mine was continued during the year, 54 ch. of formation and 63 ch. of metalling having been completed during the period.

Karamea to Collingwood Road (Buller County).—With the assistance of a grant from the Government, the Buller County Council reconditioned an additional 19½ miles of the track through the Heaphy Valley to Collingwood, making a total distance of 30 m. now reinstated. On the formed section of the road from Oparara to Kohaihai, the Council metalled a length of 1 m. 5 ch. under the backblocks metalling scheme for the purpose of giving all-weather access to resident settlers.

Rough River Bridge, Big River to Rough River Road (Grey and Inangahua Counties).—Work proceeded during the year with the construction of a reinforced-concrete bridge consisting of eleven spans each of 50 ft. Eight spans had been concreted by the close of the period.

Craigieburn Creek Bridge (Grey County).—As a result of observations made during a heavy flood it was considered necessary to add two spans to this bridge, which in its original form was completed during the previous year. The additions were completed by the close of the period.

Crooked River Valley Road (Grey County).—An additional length of 40 ch. has been formed on this road, and a timber bridge of 55 ft. in length erected over Tube Creek at the commencement of the new work.

Mitchell's to Haupiri Junction Road (Grey County).—Formation work was carried out on this road in previous years, but it was found necessary during the period under review to install four additional culverts, aggregating 104 ft. in length.

Moore Creek Bridge, Big River to Rough River Road (Grey County).—A new bridge of one 30 ft. span was erected over this creek during the year.

Waipuna Road (Grey County).—Eleven concrete-pipe culverts totalling 300 ft. in length, were installed on this road during the year.

Alexander Mine Road via Snowy River (Inangahua County).—The construction of this road over a total length of 7 m. 40 ch., commenced during the previous period, was carried on during the year to give access to the Alexander Mine. The work is now nearing completion, about 7 m. of formation and metalling having been carried out, together with culverting and bridging of small streams.

Burke's Creek Bridge, Cannon Road (Inangahua County).—A bridge, consisting of one 30 ft. span in reinforced concrete, was erected over Burke's Creek.

Lewis Pass Road (Inangahua County).—The work commenced on this important connection to the Canterbury Province was completed during the year. Of the total distance of 5 m. 40 ch., on one section 2 m. 58 ch. was carried out during the period under review.

Maruia River Bridge at Williscredits, Matakītaki to Springlands Junction Road (Inangahua County).—The erection of a substantial new bridge in reinforced concrete and consisting of eight 44 ft. spans is nearing completion. The road on which this new structure is situated now gives an important connection with the new road over the Lewis Pass.

Maruia River Road, West Bank (Inangahua County).—A number of Crown settlers on the west bank of the Maruia River will be provided in varying degrees with improved access as the result of the formation of 1 m. of road, together with the erection of a reinforced-concrete bridge over Woolley Creek.

Palmer's Road (Inangahua County).—This road, giving access to backblocks settlers, was previously of a narrow and dangerous nature. Widening work was commenced, and about 40 ch. was completed during the period under review.

Springlands Junction to Hot Springs Road (Inangahua County).—This length of road actually forms part of the main route over the Lewis Pass to Canterbury, and is being brought up to the same standard as the work already completed on the new road over the pass. Work is in progress at various points over the full length of 9 m.

Arahura to Milltown Road (Westland County).—Under arrangement with the County Council a length of 2 m. 20 ch. of this road is being widened and metalled.

Gillespie's Beach Road (Westland County).—The formation and metalling of this road, 7 m. 40 ch. in length, is now practically completed, only some small amount of culverting and two minor bridges yet remaining to be done. The new route will give access to Gillespie's Beach, where extensive gold-dredging operations are in progress, and will also form a tourist access to views on the beach.

Gunn Road, Wataroa (Westland County).—The County Council has practically completed the construction of 60 ch. of this settlement road, which gives access to new country in course of development.

Main South Road (Westland County).—Work has progressed vigorously during the year with the construction of a substantial new road into south Westland. On the section between Weheka and Bruce Bay, about 32 m., a length of 22 m. of formation and metalling has already been completed. Two new suspension bridges, both in steel with reinforced-concrete decking, one over the Fox River of 360 ft. span and the other over the Cook River of 264 ft. span, have been completed. On the entirely new section of the road between Bruce Bay and the Haast River no great amount of work has yet been done, but the survey is well in hand and construction work should be opened up within the coming year. Surveys are already in hand between the Haast River and Jackson's Bay, and construction work is proceeding northwards from the Jackson's Bay end, where camps, store, canteen, post-office, and workshops have been established.

Rotokino Road (Westland County).—The Westland County Council has the construction of 77 ch. of this settlement road well in hand, and also the erection of one small timber bridge.

La Fontaine Road (Westland County).—An additional length of 2 m. 30 ch. of this road is being formed and metalled to give access to heavily timbered white-pine country.

CHRISTCHURCH DISTRICT.

Little Akaroa to Decanter Bay Road (Akaroa County).—Extensive improvements to 65 ch. of this road are in hand to provide better access to the wharf at Decanter Bay.

Lewis Pass Road (Amuri County).—This road, linking Canterbury with the West Coast and Nelson, was officially opened to traffic on the 30th October, 1937. It has been suitably maintained since that date, and work has proceeded with the remainder of the formation work in the way of trimming, &c. The work carried out during the year comprised 2 m. of formation with widening and general improvements; base-course metalling on the final section of 5 m. eastward from the Summit, and the completion of an adjacent length of 5 m.; four reinforced-concrete bridges have been erected over small streams on the road, while one structure is yet in hand. There are five smaller bridges to be built, but the temporary structures over the Hope and the Boyle Rivers, both of considerable proportions, are considered sufficiently serviceable for a number of years.

Hurumui Valley to Blythe Valley Road (Cheviot County).—An additional length of 2 m. of new formation was completed during the year, together with culverting, to give road access to five settlers.

Rapley's Road (Ellesmere County).—This road is being metalled over a distance of 1 m. 35 ch. and was not completed by the close of the period.

Mount Peel Station to Forest Creek Road (Geraldine County).—Originally constructed to provide access to six small grazing-runs in the upper reaches of the Rangitata Valley, this road now bears a

very considerable amount of traffic in winter-time as a result of the establishment of a skating and winter sports area near Mount Harper. A length of 10 m. has been graded and reshaped, while 6 m. 30 ch. was lightly metalled. It is proposed to improve the remaining length of 12 m. and to complete the metalling, together with two concrete fords during the coming year.

Cashmere Stream Bridge, Hoon Hay Road (Halswell County).—A reinforced-concrete bridge has been erected to replace an obsolete wooden structure on this much-used road.

Summit Road, Dyer's Pass to Gebbie's Pass (Halswell, Heathcote, Mount Herbert, and Wairewa Counties).—Additional widening, clearing of slips, and the erection of retaining-walls was carried out on this scenic road during the period. Metalling was deferred pending the completion of adjacent main-highway works, but has since been commenced. A considerable amount of widening by the provision of rock retaining-walls is still necessary and is receiving attention.

Puhipuhi Road Bridge (Kaikoura County).—A timber-truss bridge, 110 ft. long, was erected over the Puhipuhi River to give access to a number of settlers. Formation and metalling of the approaches, 32 ch., was completed.

Rockwood Road (Levels County).—2 m. 5 ch. of re-formation and metalling was carried out during the year.

Jollie Bridge, Mount Cook Station Road (Mackenzie County).—The superstructure of this bridge was renewed during the period.

Wai-a-niwa-niwa River Bridge, Stevenson's Road (Malvern County).—A light traffic bridge, 240 ft. long, was erected over this river in betterment of the access to a number of settlers.

Lake Coleridge to Lake Lyndon Road (Selwyn County).—The remaining length of 4 m. 60 ch. on this road was re-formed and metalled and culverts installed wherever necessary over the whole road. The route is now carrying a large amount of traffic due to the erection of the West Coast transmission lines from Lake Coleridge.

West Boundary Road (Selwyn County).—Formation and metalling improvements were completed over a distance of 3 m. 16 ch. of this settlement road.

Punchbowl Access Bridge (Tawera County).—A footbridge, 100 ft. long, was erected for the Arthur's Pass National Park Board to provide access to the scenic attractions at Arthur's Pass.

Lake Sumner Runs Road (Waipara County).—A converted railway-truss bridge of 60 ft. span was erected on concrete abutments over the Seaward River, and 10 ch. of approach roading was formed, metalled, and culverted.

Waitohi River Bridge, Hurunui, Medbury Road (Waipara County).—A commencement was made with the erection of a new bridge 120 ft. long.

DUNEDIN DISTRICT.

Clutha River Bridge, Clydevale (Bruce County).—The erection of this bridge of seven spans each of 100 ft. was commenced during the year. The structure consists of a reinforced-concrete deck on steel-girder spans supported on concrete piers and piles. The width between wheelguards is 12 ft., except in the centre span, which is being widened to 18 ft. to allow traffic to pass easily in the middle of the bridge. Fair progress was made during the year, four spans being completed, but some delay was experienced in placing the foundations to two piers, which are in rock and required coffer damming. However, these foundations are now completed and the work on the piers is well in hand. Also a contract has been let for the northern approach.

Gray's Road (Bruce County).—New formation over 75 ch. to a width of 16 ft., with culverting where necessary, was completed during the year.

Lakeside to Stirling Road (Bruce County).—A length of 1 m. 42 ch. was formed during the period to widths varying between 16 ft. and 24 ft. Culverts were installed where required.

Lovells Flat to Kaitangata Road (Bruce County).—Widening work was carried out in places on this road over a distance of some 3 m., and generally the proposals, as far as they went, are completed with the exception of a bridge over Currie's Creek. This is a structure of 22 ft. span 20 ft. wide, and is well in hand.

Bagries Road (Clutha County).—New gravelling was completed over a distance of 68 ch. to give access to a number of settlers and to permit of a rural-mail delivery, &c., being organized.

Catlins River Bridge to Tahakopa Beach Road (Clutha County).—Improvements, consisting principally of drain-construction, were carried out on this road. In addition, widening over some 40 ch. was undertaken and 100 cubic yards of metal placed.

Clinton to Purekireki Road (Clutha County).—Metalling-work was completed during the year over a distance of 4 m. 59 ch.

Catlins River Bridge (Clutha County).—A bridge, 121 ft. in length, was erected over the Catlins River near Tawanui, the material being salvaged from the former Balclutha River Bridge. The approaches also were formed and metalled within the period.

Kaihiku Stream Bridge, Clifton Settlement Road (Clutha County).—A new bridge consisting of rolled-steel joists on concrete piers is being erected over this stream.

Middle Road (Clutha County).—New gravelling was carried out on this road over a distance of 1 m. 34 ch.

Maiders Road (Clutha County).—Metalling-work was completed over 60 ch. of this road during the period under review.

Pamahaka Downs to Wairuna Estate Road (Clutha County).—On this settlement road a length of 1 m. 18 ch. was metalled during the year.

Waikoikoi Stream Bridge, Glenshee (Clutha County).—A bridge in reinforced concrete 12 ft. wide between wheelguards and of a total length of 52 ft. 6 in. was erected over this stream.

Rewcastle Road (Clutha County).—One section of 20 ch. on this road was improved and reconditioned, while an additional length of 66 ch. was re-formed and newly metalled to give access to settled areas.

Tahakopa to Wyndham Road (Clutha County).—The formation and metalling of this road was commenced during the year to give an alternative route between the Catlins district and Southland. The formation was substantially completed over a distance of 60 ch., and metalling over a length of 30 ch. was carried out. The total length of the new road will be approximately 11 m.

Eastbourne Station Road (Lake County).—A length of 58 ch. on this settlement road was gravelled during the year.

Mount Nicholas to Von River Road (Lake County).—New metalling was carried out over a distance of 2 m. 6 ch. on this backblocks road.

Lower Shotover to Speargrass Flat Road (Lake County).—A distance of 1 m. 30 ch. was metalled during the year.

Becks to Auripo Road (Maniototo County).—New gravelling was completed over a length of 40 ch. on this settlement road.

Blackball (Linburn) Road (Maniototo County).—A distance of 50 ch. was newly gravelled.

Huddleston Road (Maniototo County).—In order to give all-weather access to settlers a section of 2 m. 20 ch. of this road was gravelled during the period under review.

Maniototo to Patearoa Road (Maniototo County).—A contract covering the gravelling of 80 ch. on this road was well advanced by the close of the period.

Spedderis Bridge, Puketoi to Highfield Road (Maniototo County).—A timber bridge damaged some time ago by a flood was replaced by a new structure of 20 ft. span in reinforced concrete.

Hogburn River Bridge at Inders (Maniototo County).—The construction of a 20-ft.-span-reinforced-concrete bridge with a 10 ft. roadway, together with 7 ch. of approach roading, was completed during the year.

Kyeburn River Bridge (Nobbler), Naseby to Danseys Pass Road (Maniototo County).—A contract was let late in the season for the construction of a reinforced-concrete bridge at Nobbler's Crossing to consist of four 45 ft. spans with a 10 ft. roadway. The actual work is in its early stages.

Otakou to Harrington Point Road (Peninsula County).—Sea-walling over 3½ ch. was erected in rock to protect this road from wave action and erosion during heavy seas.

Nichols Rock to Boyds Road (Taieri County).—This backblocks road was metalled over a distance of 2 m. 36 ch. to give all-weather access to settled areas.

Otokia to Kuri Bush Road (Taieri County).—New gravelling was completed during the year over a distance of 2 m. 37 ch. of this road.

Heriot and Roxburgh Road (Tuapeka County).—A deviation 45 ch. long was formed and gravelled at Tonkins Pinch.

Beaumont to Rongahere Road (Tuapeka County).—On this road, which is used mostly in the summer, a length of 10 m. of formation was widened.

Lake Onslow to Serpentine Road (Tuapeka County).—Improvements by way of trimming were carried out over a total length of 5 m.

Hukarere (Spyllaw) Road (Tuapeka County).—This is a settlement road giving access to a number of settlers and a Crown grazing-run. During the year 2 m. was metalled to give all-weather access.

Willden Runs Road (Tuapeka County).—This is another road giving access to Crown grazing-runs, and during the year new gravelling was carried out over a distance of 3 m. 2 ch.

Waipori to Outram Road (Tuapeka County).—New metalling was completed over a length of 1 m. 70 ch.

Timaburn Road (Tuapeka County).—This road is situated in the Teviot Soldiers' Settlement and was metalled during the year over a length of 1 m. 26 ch. to give all-weather access.

Clutha River Bridge (Lowburn Ferry), (Vincent County).—This new structure consists of eight 47 ft. spans and two 12 ft. cantilever end spans with a 10 ft.-wide roadway in reinforced concrete. The whole work has been completed with the exception of the approach banks and the dwarf abutments. The bridge replaces the vehicular ferry which had been in operation for many years.

Manuherikia River Bridge, Omakau (Vincent County).—A reinforced-concrete bridge 324 ft. in length with a 9 ft. roadway has been completed over the Manuherikia River at Omakau. A road 1 m. long connecting the bridge with the Township of Ophir has also been constructed and metalled.

Crawford's and Jocelyn's Roads (Vincent County).—Gravelling over a distance of 2 m. 68 ch. on these roads was completed during the year.

Meads to Taylors Track (Vincent County).—5 m. of track, 5 ft. wide, has been formed to give access to a large station.

Makarora to Haast Pass Road (Vincent County).—This is one of the major works in hand by the Department and will give a connection between the Otago district and the mouth of the Haast River in South Westland, where it will meet the new road now being constructed southwards from Weheka. During the year 5 m. 50 ch. of formation, 6 m. 60 ch. of base-course, and 1 m. 40 ch. of surface-course metalling, 2 m. 70 ch. of bush-felling and clearing, and the paving with concrete of four creek crossings were completed. A reinforced-concrete bridge, 100 ft. in length with 10 ft. roadway, over Cameron's Creek has also been completed, while the piers and abutments for a reinforced-concrete bridge over the Makarora River have been concreted to beam-level, and the falsework for the deck system is well in hand. The Makarora River Bridge will consist of one 65 ft., two 60 ft., and two 24 ft. spans, and will have a 10 ft. roadway. A temporary timber bridge over Fish River has been erected. Approximately one hundred and sixty men have been engaged on the work during the year, but the intention is to proceed with construction during the coming year with a slightly increased complement of men.

Craig and Switchback Roads (Waihemo County).—With a view to giving improved access to settlers a length of 72 ch. on these two roads was widened.

Middlemarch to Nenthorn Road (Waikouaiti County).—New metalling was carried out over a distance of 1 m. 14 ch.

Cants Road (Waitaki County).—1 m. 45 ch. of this settlement road was gravelled during the period.

Glen Settlement Road (Waitaki County).—Gravelling was completed on this road over a distance of 1 m. 53 ch.

Longslip to Birchwood Road (Waitaki County).—Formation of 4 m., with necessary culverting, together with gravelling, was completed on this settlement road.

Moeraki Native Settlement Roads (Waitaki County).—These roads are within the Moeraki Native Settlement, and with a view to improving access conditions generally a length of 2 m. 16 ch. was re-formed and metalled during the year.

INVERCARGILL DISTRICT.

Bell Road, Dipton (Southland County).—The improvements carried out on this road during the year comprised 32 ch. of formation, 45 ch. of gravelling, and 40 lineal feet of reinforced-concrete culverting.

Clark Road, Wendonside (Southland County).—33 ch. of formation, 31 ch. of gravelling, and 82 lineal feet of culverting was completed.

Cross Road, Titipua (Southland County).—New formation and 288 lineal feet of culverting was completed.

Curio Bay Road (Southland County).—Re-formation and metalling of 72 ch. was completed during the period to assist in giving access to settlers and to the coast at Curio Bay.

Drain Road, Spar Bush (Southland County).—The formation of 1 m. 15 ch., ditching over 16 ch. and gravelling of 74 ch. was completed during the period, together with 224 lineal feet of culverting,

Ellis Road, Five Rivers (Southland County).—New gravelling was carried out over a distance of 51 ch.

Endowment Road, Tisbury (Southland County).—One filling and gravelling of 1 m. 10 ch. was completed.

Gill Road to Springhills (Southland County).—11 ch. of formation work, together with 7,000 cubic yards of excavation and 726 lineal feet of culverting, was commenced during the year and was substantially completed by the close of the period.

Gold Creek and Hedgehope Stream Bridge (Southland County).—A new bridge of two 20 ft. spans was erected and approaches formed.

Gore Aerodrome Access Road (Southland County).—35 ch. of new formation, 16 ft. wide, was completed during the year, together with the erection of one small bridge.

Josephville to St. Patricks Road (Southland County).—Formation over 1 m. 30 ch., gravelling over 55 ch., and 100 lineal feet of culverting was completed.

Kauana to Benmore Road (Southland County).—Re-formation and gravelling was carried out over a distance of 56 ch.

Lora Road (Southland County).—A contract was let for the construction of this road to give access to a number of Crown sections to be opened up by the Department of Lands and Survey. A commencement had been made by the close of the period.

McDonald Road, West Dipton (Southland County).—1 m. 24 ch. of new formation and 54 lineal feet of culverting was completed.

Mill Road, South (Southland County).—New gravelling was carried out over a distance of 47 ch.

Miller Road (Southland County).—1 m. 22 ch. of this road was formed and culverted.

Mokoreta to Waikawa Road (Southland County).—Re-formation and gravelling, with additional culverts where necessary, was carried out over a distance of 55 ch.

Otakarama Stream Bridge, Williams Road (Southland County).—A small reinforced-concrete bridge with a 12 ft. 6 in. roadway was completed, together with 5 ch. of approach roading 20 ft. wide.

Proctor Road, Oreti (Southland County).—A length of 49 ch. was reconstructed and newly gravelled.

Titipua School Road (Southland County).—Re-formation and gravelling was completed over a distance of 1 m. 66 ch.

University Endowment Road (Southland County).—The work completed on this settlement road during the year comprised formation 33 ch., ditching 11 ch., gravelling 1 m. 57 ch., and culverting 100 lineal feet.

Wairikiki Gorge Road (Southland County).—Re-formation and widening was carried out over 33 ch. and metalling over 72 ch. 60 lineal feet of culverts were placed.

Waihopai Embankment (Southland County).—The work completed during the year comprised filling 7,700 cubic yards, turfing 3,885 square yards, fencing 63 ch., and culverting 474 lineal feet.

Waikara to Waikaka Road (Southland County).—Additional work was carried out during the year on this backblocks road, and comprised ditching 14 ch., rock excavation 3,960 cubic yards, clay excavation 2,040 cubic yards, stone-facing 400 square yards, and culverting 474 lineal feet.

Waimea Valley Road, Glenure to Pakihi Section (Southland County).—Gravelling of 1 m. 16 ch. was carried out during the year.

White Road, Kapuka (Southland County).—General re-formation and drainage work was carried out during the year, together with 78 ch. of new gravelling and 48 lineal feet of additional culverting.

Leasks Bay Wharf Road (Stewart Island County).—New formation and gravelling was completed over 3½ ch.

Leonard Street, Paterson Inlet (Stewart Island County).—New formation work was carried out over a distance of 2 ch.

Edginton and Minty Road (Wallace County).—A length of 57 ch. was gravelled during the year.

Fryers Road (Wallace County).—New gravelling was carried out over a distance of 53 ch.

Harrington's Mill Road (Wallace County).—A distance of 2 m. 38 ch. was newly gravelled to give all-weather access.

McCallum Road, Calcium (Wallace County).—Formation and gravelling work over a distance of 41 ch. was completed.

Merrivale to Te Tua Road (Wallace County).—This is a settlement road on which 1 m. 38 ch. of gravelling was carried out.

Mount Nicholas Access Road (Wallace County).—In order to give better access to the large grazing-runs adjacent to this road a new bridge, 67 ft. long, has been erected.

Pahia to Roundhill Road (Wallace County).—Gravelling was carried out over a distance of 2 m. 73 ch.

Sutherland Road (Wallace County)—This is another settlement road where formation and gravelling work was completed over a distance of 1 m. 53 ch. during the year.

Yellow Bluff Road (Wallace County).—New gravelling was completed over a distance of 61 ch.

Hollyford to Okuru Road (Lake County).—Construction work on this new road was carried on steadily during the year, and by the close of the period the following work was completed: Bush-work completed to 4 m. 0 ch.; formation completed to 2 m. 20 ch. and in hand between 2 m. 20 ch. and 2 m. 48 ch.; base-course gravelling completed to 2 m. 18 ch. A camp-site has been selected at 5 m. 14 ch. for work farther ahead, and materials are being taken in. Some one hundred and twenty-three men are now employed.

LANDS IMPROVEMENT.

WHANGAREI DISTRICT.

Mangrove and Harbour Reclamation (Hokianga Harbour).—Omanaia Area: Temporary repairs were made during the year to a 48 in. flood-gate.

Tulloch's Flat No. 11A.: General maintenance-work and restoration of a sea-wall to original dimensions, involving ti-tree fascining and stone protection of exposed portions, was carried out during the year.

Rawene Tidal Flat No. 28: 85 ch. of stop-banking 4 ft. wide on top and 2 ft. 6 in. above the highest spring-tide mark was completed during the year, together with the construction of one 48 in. flood-gate and another 36 in. gate.

Sand-dune Reclamation.—Kaitaia Sand-dune: Considerable areas were planted during the year with marram-grass and tree lupin, and in general the operations and results were greatly assisted by favourable climatic conditions. Weaknesses in existing planted areas were strengthened; marram plantation was extended northwards over an area of 622 acres; additional plantations were established at Te Kao to protect Native farms, and other planting was carried out to protect access roads to the Ninety-mile Beach at Houhora. The total acreage dealt with during the year was 922. Between Waipapakauri - Beach Road and Ahipara, a distance of 4 m., the first stage in dune afforestation was accomplished by planting approximately 27,400 trees of various species in a strip 3 m. long and 1½ ch. wide in the lee of the foredune. Other tree-planting consisted of 8,000 trees mainly in a compact area of 9 acres in sheltered localities on dunes already stabilized as a result of work previously carried out. In order to provide more satisfactorily for future supplies of young plants an area of 18 acres of Crown land was secured for a nursery and was cultivated and stocked during the season.

Te Kopuru Sand-dune: The drifts between Bayly's Beach and a point opposite Tikinui, a length of about 16½ m. of coast-line, have been receiving attention over a period of several years and are now completely stabilized. During the period under review 356 acres of marram-grass and 332 acres of lupin-seed were planted. About two-thirds of the work was in connection with the three most southern drifts, but the general intention of the whole was the strengthening of weaknesses in existing plantations. As at Kaitaia, very good results have been obtained. Tree-planting also received attention in this area, and various species were planted in the most sheltered localities over about 18 acres. The existing nursery was sufficiently stocked for the coming season, after which it is to be abandoned and replaced by one in a more suitable and central locality.

Ruakaka Sand-dune: Not a great deal of new work was done on these dunes during the year, but attention was given to strengthening planted areas over a distance of about 6½ m.

Water-supply Schemes.—Motuti Water-supply: The whole of this scheme, involving the provision of a water-supply in the Motuti Native Settlement, has been completed, together with authorized extensions. The laying of the secondary main from Motuti Road to Guest's Road over a distance of 88 ch., involving 90 ch. of reticulation to Native properties, was also carried out during the year, while the existing reticulation eastwards of the Motuti School and church was extended by 60 ch.

Dargaville Borough and Hobson and Otamatea Counties Water-supply: A detailed engineering survey has been made of a proposal to reticulate water in these areas, comprising the Dargaville Borough and 50,300 acres of rural land, which includes some 24,000 acres of first-class dairying country in and adjacent to the Ruawai Flats. Possible present and future demands were studied and several schemes were examined in detail.

Land Drainage.—Ruawai Flats: An engineering survey has been commenced with a view to the preparation of a comprehensive scheme of drainage improvements on this reclaimed area of some

20,000 acres. A Gurley water-level recorder has been installed on the Wairoa River at Ruawai Wharf for the purpose of collecting data as to the tide-levels, and the preparation of plans and a general study of the scheme will be assisted greatly as a result of an aerial survey which has been made.

AUCKLAND DISTRICT.

Te Kawa Drainage Scheme.—Drainage-work under this scheme was completed in August, 1937, and handed over to the Te Kawa Drainage Board for control. Various factors operated to prolong the duration of the work; a considerable amount of wet weather was experienced, and employees were taken from the job from time to time to supply farm labour at a time when water in the drains was lowest. However, the work has proved satisfactory and, despite some heavy rains experienced, the completed drains were entirely free from flooding. During the period 2 m. 20 ch. of drains were widened and deepened, while the total length attended to from the commencement totalled 17 m. 64½ ch.

Paewhenua Drainage Scheme.—This scheme, which is for the purpose of draining an area of approximately 2,133 acres already under settlement, has been completed, and during the year general attention was given before handing it over to the Otorohanga County Council.

Waihou and Ohinemuri Rivers Improvement (Maintenance).—The flood waterways on both these rivers have been kept clear of obstructions, and the important flood-gates have been overhauled and all necessary repairs carried out. The river-channel near the Puke Wharf was dredged, to its general improvement.

Waitoa River (Clearing).—Satisfactory progress has been made during the year with the pulling and burning of willows and the clearing of berms. Both banks were cleared for 29 m. and the river-channel for 31 m. This work is now nearly finished and has resulted in generally improved conditions during floods.

Waipa River and Tributaries (Clearing).—This is a major work involving the clearing of approximately 200 m. of waterways. Some camp accommodation has been prepared, but no serious work has been undertaken as the scheme has not yet been finalized.

Hoteo River and Tributaries (Willow-clearing).—This scheme was put into operation during the year and consists of the removal of willows over a distance of 40 m. The willow-growth is thickly matted and serious floods occur in the area. Satisfactory progress has been made during the period; topping and clearing of debris has been completed over a length of 6 m., 3 m. 60 ch. has been cleared of stumps and roots, and all trees, &c., removed from the stream burned for a distance of 1 m. 40 ch.

Taupiri Drainage Scheme.—The work outlined in last year's programme has been extended to cover a total length of 132 m. 71 ch. of watercourses, and during the year a further 52 m. 46 ch. was handed over to the Taupiri Drainage Board after final attention. Four machines worked for one month, two for one month, and one for ten months excavating 62,323 cubic yards, or approximately 3,895 cubic yards per machine per month. During the year 11 m. 20 ch. of drains were dealt with, and the remaining work covers a length of 6 m. 26 ch. Other work completed consists of 90 ch. of fencing and 32 ft. of bridging.

Sand-dune Reclamation.—South Kaipara Heads: During the year an area of 660 acres was planted in marram-grass, which is making satisfactory progress. A considerable quantity of lupin-seed was collected and sown, the young lupins showing up well, while the older planting of marram has a good covering of lupin. The area has been well maintained and is in excellent order, the favourable season being conducive to good growth in both marram-grass and lupin.

Woodhill-Muriwai-Helensville: General conditions during the year proved favourable, resulting in a good growth of marram-grass, lupin and trees. The latter, generally, are doing well, although some loss has occurred through the depredations of rabbits. Continual poisoning is necessary to keep this pest in check. During the period 230,000 trees were planted out, while 120,000 seedlings were lined out in the nursery. Caterpillars caused some loss among the seedlings. In addition, 300 acres of new marram-grass were planted and 200 acres replanted, the total area planted to date being 9,000 acres. Six tons of lupin-seed were gathered during the season, of which 3 tons have been sown. 3 m. 43 ch. of standard fencing was erected and 2 m. of fore-dune fencing rebuilt. The condition of the planted area is, generally, very satisfactory.

Pakiri and Te Arai Areas: The nurseries already established have been well maintained and are in good order. Thirty acres of extensions have been planted and 25 acres of existing nurseries replanted. The marram-grass is bunching out well and there are good prospects of obtaining future supplies of plants.

North Waikato Heads and Kariotahi: Reclamation work has been further extended by a vigorous programme of operations during the past year. Five hundred and two acres of marram-grass and 131 acres mixed species of pine-trees were planted, and 600 acres sown with lupin-seed. Two hundred miles of new lines were cleared through the lupins ready for tree-planting, and 800 miles of lines already planted were gone over and excess growth cut back. Sixty-two chains of boundary fences, 18 ch. of sand-arresting fence, and 45 ch. of brush fences around the nurseries were completed. At No. 1 camp twenty-two tents and a cookhouse, at No. 3 camp a cookhouse, meeting-room, washhouse, and conveniences (with septic tank), twenty huts, water-supply, and 15 ch. access road, and at No. 2 camp a house for the officer in charge, a hutment for the Foreman, and two workmen's huts, were all completed during the year. Reclamation work to date totals 4,040 acres of marram-grass, 1,680 acres in lupins, and 406 acres in trees, whilst 92 ch. of sand-arresting and 172 ch. boundary fences have been erected.

TAUMARUNUI DISTRICT.

Mokau River (Willow-clearing).—The ring-barking and poisoning of willows on the Mokau River has now been completed from the Mapiu Stream for a further distance of 3 m., leaving 2 m. still to be completed. Poisoned willows will be cut and hauled this coming season.

Mokauiti Willow-clearing.—Four miles of willows previously poisoned on the Mangawhero and Huiteko Streams have been cut, hauled, and stacked. A distance of 1 m. 40 ch. has been similarly treated on the Mokauiti Stream, leaving 1 m. to be undertaken to complete the programme.

Wanganui River (Willow-clearing).—Over a length of 1 m. all willows on the banks and on the islands between, across the proposed width of flood channels, have been cut; of this distance, 75 ch. has been stripped and poisoned.

Ohura River (Willow-clearing).—Over a length of 5 m. retreatment of willows and poisoning of seedlings was carried out. Mixtures of varying strengths were applied at different periods of the year for experimental purposes, the result of which will not be known until next summer.

NAPIER DISTRICT.

Kumeti Drain.—Thorburn's Bridge and Protective Works: The decking, which is of hardwood, and the hand-rails were added to complete Thorburn's Bridge which spans the new concrete chute. It has a length of 29 ft. and a deck width of 12 ft. In Section 7, upstream from Thorburn's Bridge, 1,712 cubic yards (loose measurement) of spoil was excavated from the creek-bed to complete a stop-bank 10 ch. on the south side of the creek and another 8 ch. long on the north side. These stop-banks are up to 6 ft. in height and converge on a stone-and-netting weir $6\frac{1}{2}$ ch. above Thorburn's Bridge. Three hundred cubic yards of spoil was excavated for the second weir above Thorburn's Bridge at a distance of $6\frac{1}{2}$ ch. upstream from the bridge. Two hundred and twenty-two cubic yards of stone and netting gabion work was used to construct this weir, which is 35 ft. wide on the crest and 5 ft. high from the top of the mat to the crest. The crest steps and mat of the weir were concreted to protect the wire from wear. Two groynes requiring 75 cubic yards of stone and netting work were put in below Thorburn's Bridge to prevent lateral erosion. Six hundred poplar-trees were planted along the toes of the stop-banks in Section 7. Ordinary maintenance-work on the system of stone-and-netting weirs in Kumeti Drain proper involved the addition of a mat 10 ft. wide to No. 1 weir at the lower end of the drain and the extending and raising of the end contraction gabions of a number of other weirs.

Ngaruroro River-control Scheme.—This scheme was continued and work proceeded without interruption until 25th January, 1938, when a heavy flood occurred and was followed by others on 19th February, 25th April, and 2nd May. Wet conditions prevailed over this period and little progress could be made. Flood damage was confined to short lengths of newly built levee on which no grass or vegetation had grown, but the aggregate loss was comparatively heavy. The channel of the river was widened and generally improved by the floods, but in places erosion threatened the levees, and protection work had to be done. The work completed during the period comprised 9 m. 40 ch. of levees built to grade height, 4 m. 60 ch. on each side of the river. On the overflow 4 m. of levees have been built to a reduced level. 4 m. 40 ch. of drains have been excavated in the Puninga Swamp Area, the total quantity of earth removed was 379,116 cubic yards, of which 249,057 yards were put on the river levees, 8,232 yards excavated from drains and not put on levees, and 50,943 yards replaced in repairs following the floods. Fencing has been completed on both sides of the levees, an eight-wire fence on the boundary and a three-wire fence on the river side of the protective belt; altogether 5 m. 20 ch. of eight-wire and 7 m. 40 ch. of three-wire fence has been erected. Four miles of protective belts have been planted.

Tutaekuri River-control Scheme.—As reported last year, this work was nearing completion and little new work has been carried out in the period under review. In July, 1937, the gap where the river flowed into the Waitangi Stream and out to sea was closed and the new outlet under the Waitangi Washout Bridge was made, work at this stage being difficult and at times carried out in the water and generally under very wet conditions. The scheme has been a complete success so far, the banks having withstood all floods and the outlet proving satisfactory. Two heavy floods—one at the end of January and the other at the end of February—did no damage, but scoured a very good channel straight out to sea. The estimated discharge in the January flood was 60,000 cusecs, but the channel was not overtaxed after the mouth opened, and the flood-waters were rapidly discharged. Later, on 25th April, an exceptionally heavy flood was experienced, and over a period of three days the rainfall in the Tutaekuri Drainage Area was: Mangaone Valley, 17.1 in.; Te Pohue, 19.45 in.; Puketitiri, 39.4 in.; Rissington, 19.30 in. This flood is considered to be the heaviest which has occurred since 1897, and rose to within 3 ft. 6 in. of the levees near the Waitangi Washout Bridge. At this point the bed of the river scoured down 40 ft. from the original level over a width of some 50 ft. to 60 ft. and caused serious damage to three piers. The Mangaone River, a tributary of the Tutaekuri River, was measured at Rissington, and for a drainage area of 81 square miles the run-off was 39,200 cusecs. The estimated discharge near the mouth of the Tutaekuri River for this great flood was 74,000 cusecs. During the year the groyne on the north bank at the mouth was completed and has acted in a very efficient manner. The Bay City excavator has widened and deepened the channel above the bridge, with the result that the water-level in the channel higher up was lowered 1 ft.

WELLINGTON DISTRICT.

Hokio-Manawatu Rivers (Sand-dunes Reclamation).—The reclamation work in this vicinity has progressed satisfactorily during the period. The main activities consisted of planting marram-grass over 170 acres and sowing lupin-seed and planting out trees over an additional area of 200 acres. Additional land, totalling 325 acres, has been acquired and is to be reclaimed similarly.

Hutt River Estuary (Reclamation).—An additional 485,894 cubic yards of spoil has been excavated and dumped on the reclamation, giving an area of 48.5 acres of new land. With the work carried out last year the reclaimed area now covers 74.5 acres.

Paraparaumu Camp, Beach Road.—The workmen who have been retained in this camp since the last period have made further satisfactory progress with the drainage, clearing, and stumping of farm lands in the vicinity.

NELSON DISTRICT.

Awatere Water-supply to Seddon District.—Proposals prepared by the Awatere County Council in connection with a water-supply for Seddon and the adjacent district were approved, and work commenced during the year under a contract let by the County Council.

Picton Foreshore (Reclamation).—The Picton Borough Council submitted proposals having as their object the reclamation of approximately 1 acre on the foreshore of Picton Harbour. These were approved, and the work was completed during the period. This scheme was designed to beautify the foreshore and to provide increased recreational facilities for visitors to this popular summer resort.

Wai-iti River (Protective Works).—During the year repairs to the Wai-iti River stop-bank in Waimea West were carried out by the farmers concerned with the assistance of Government grants made to the Waimea County Council. The work which has been done will assist in protecting the Waimea West Road as well as the adjacent farm lands, and will ultimately form part of a major scheme of stop-banking which is now being fully investigated.

Wairoa River, Brightwater (Protective Works).—During the year a detailed investigation and survey was made in connection with protective measures in this river. Most of the plans have been completed and the necessary stop-banking located.

GREYMOUTH DISTRICT.

Karamea River (Flood-control).—Good progress was made during the year with the large flood-control scheme which has been about half completed. The operations carried out during the period comprised: Trestle work, 4,800 lineal feet; stone training-wall, 27,711 tons; stop-banking, 134 ch., containing 37,000 cubic yards; and fencing, 141 ch. The following plant was obtained during the year to facilitate progress: One 3-ton crane, one Diesel locomotive, one tractor, one Diesel excavator, and one Diesel winch.

Oparara River (Control).—The control and improvement of this river is to be undertaken in conjunction with the Karamea River control works, and it is proposed to construct a timber training-wall and stop-bank early in the coming period.

Ngakawau River, Hector Township.—A large stone groyne was constructed at the mouth of the Ngakawau River to prevent sea erosion, which was endangering the Hector Township, together with nearby road and rail communications.

CHRISTCHURCH DISTRICT.

Ashburton and Hinds Rivers.—Additional survey information was obtained during the year in connection with proposed flood-control measures in these two rivers.

Ashley River Trust (Flood-control Works).—Construction work on this river-improvement scheme has now been almost completed. The work carried out during the period under review comprised:—

Excavation: On the north bank 28 ch. of groynes and stop-banks have been built or raised, representing a quantity of 24,670 cubic yards. On the south bank 5 m. 60 ch. of groynes and stop-banks have been built or raised, representing a quantity of 109,556 cubic yards. Total quantity excavated is therefore 134,226 cubic yards.

Gabion Heads: A total of 1,898 cubic yards of stone gabion work has been placed at the channel ends of groynes as protection against erosion.

Willow-planting: A further 80 acres have been planted with willows, which are all showing good growth. Cuttings are now all planted in holes or trenches, which have been sunk right down to permanent moisture. Only 18 in. or 2 ft. in the bottom of the hole is filled in again. While this method takes longer than shallow planting, it has been found by experience to be the only one which will ensure a reasonable number of newly-planted cuttings surviving the dry autumns usually experienced in this district.

Clearing of Control Channel: Traction engines are employed to remove all trees from the control channel and thus ensure an effective waterway. The trees are uprooted bodily. The useful portions are corded for firewood and the remainder is burnt. By this means 263 acres have been cleared.

Sowing of Grass-seed: All banks and groynes are sown with a good mixture of grass-seed to assist consolidation and reduce lateral erosion. In practically every case a very good strike has been obtained. During the period 20 acres have been sown.

Culverts: Three concrete-pipe culverts have been installed with flood gates or valves to carry surface water from adjoining country under the bank.

Stony Stream: During flood-time this stream has always carried a large amount of shingle and debris. Formerly this was trapped by a lagoon. In the process of time, however, this lagoon had filled and the floods were diverted on to adjoining farm land, which was threatened with ruination on account of swamping and the deposition of shingle. To prevent this the channel and stop-bank system was extended 4 ch., involving an excavation of 561 cubic yards.

Avon River Protection, Bexley.—A stone wall was built on the Avon River at Bexley to prevent the erosion of the river-banks.

Little Rakaia Culverts.—The first of two culverts has been constructed to allow the banked-up waters from the Little Rakaia Creek to pass through the shingle bank to the sea.

Little River Township.—A flood-control survey of the rivers for 4 m. above the township has been carried out, and the design of a comprehensive scheme is being prepared.

McKenzie Estate, Woodbury.—100 ch. of drains have been excavated.

North New Brighton Sand-dune Reclamation.—The Christchurch City Council is erecting scrub fences and planting marram-grass to reclaim a large area of sand-dune country with a view to extension of the Council's afforestation work.

SMALL-FARMS SCHEMES.

WHANGAREI DISTRICT.

Otaneroa Block.—Considerable development work was carried out on this block during the year, and comprised bush clearing, burning, and grassing of 40 acres, 60 ch. of fencing, and the application of 26 tons of fertilizer. Two new cottages were erected and one was completely renovated, while one new dairy is being built. Live-stock, consisting of 150 head of cattle and 400 ewes, were grazed during the year.

Onekura Block.—Repairs and renovations to the original homestead were carried out during the period. Additions and alterations were completed on one cottage and commenced on another, while repairs in the water-supply main have been given attention.

Tutamoe Block.—During the year settlers erected 51 ch. of boundary fencing, and repairs and renovations were carried out on three new cottages, and two new dwellings were erected. One standard two-bail dairy has been built.

AUCKLAND DISTRICT.

Mangawai Kauri-gum Reserve.—Good progress has been made during the year with the continued development of this block. In addition to roading, which has been reported elsewhere, 263 acres were cleared of scrub; gum-holes were filled in and moulds levelled over an area of approximately 100 acres; 100 acres were ploughed, and this area is now in permanent pasture; 105 acres were worked up and sown in grass. The main drain through the block, which is 18 ft. by 15 ft., has been deepened 6 ft. over a length of 1 m. 13 ch.; 3 m. 36 ch. of interior drains, averaging 3 ft. by 3 ft. 6 in., were excavated, and 6 m. 18 ch. of standard and 3 m. of temporary fencing erected. Two hundred and two head of stock are now on the block.

Kaipara Harbour Mangrove Reclamation (Glorit Section), (Peterson's Block).—The reclamation of this block, embracing 730 acres, has been continued during the year. 1 m. 30 ch. of road was formed and metalled, and one 25-ft.-span timber bridge constructed, this work completing the roading of the block. The stop-bank has been planted with buffalo-grass, which is now well established. Four hundred acres have been cleared and stumped, and of this area 300 acres have been burnt off ready for cultivation. All boundary and lateral drains are in good order and are functioning well.

Kaipara Harbour Mangrove Flat Reclamation (Kukutango Block).—The de-watering of this block has been in progress during the period. The main drain has been excavated and the necessary stop-banking almost finished. De-watering is expected to be completed shortly. Seventy-eight chains of access road have been formed and metalled.

Blocks V, VI, and IX, Maungatautari Survey District (Ellicott's Block).—The development of this block of 2,900 acres was continued until the end of January last, after which the Lands and Survey Department took over control. In addition to maintaining the farming operations of the area previously developed and stocked, a further 40 acres were ploughed and 10 acres reploughed, 130 acres were permanently grassed, 1,060 acres harrowed and top-dressed, 151 acres cleared of scrub and fern, and ragwort dealt with over 66 acres; 8 m. 3 ch. of new fences erected; 25 acres sown in swedes and rape; 337 acres cultivated; 82 acres of hay cut and harvested; 60 acres of ensilage cut; 4,000 pine-trees planted and 5,000 planted in nursery. Fencing materials were cut and split as follows: Posts, 18,275; strainers, 2,335; stays, 2,029; battens, 124,250; stock-yard rails, 104; houseblocks, 5,161 1 ft. to 2 ft.; survey pegs, 2,120. One permanent cattle-yard was erected during the period.

Section 25s, Blocks XI and XV, Maungatautari Survey District (late Property of W. L. Foss).—This block was also taken over by the Lands and Survey Department at the end of January last, and previous to that date good progress was made with the development of the property of 438 acres. During the period 66 acres of ragwort were dealt with, 16 acres of scrub cut and cleared, 15 acres ploughed, 38 acres reploughed, 150 acres cultivated, 38 acres sown in swedes and rape, and 9 acres in permanent grass; 1 m. 53½ ch. of permanent fences were erected, 54 acres of pastures harrowed and top-dressed, 14 acres of hay harvested; boring for water-supply was carried 67 ft. to 307 ft., 80 ch. of pipes were laid, and tanks erected. One permanent sheep-yard was constructed.

Lot 2 of Section 1, Block XV, Maungatautari Survey District (late L. S. Langdon's Property).—The work of developing this block of 456 acres was continued until the end of September, 1937, when it was handed over to the Lands and Survey Department. Prior to that date 42 acres of ragwort were dealt with, 14 acres of scrub cleared and stumped, 18½ acres ploughed, 23 acres reploughed, 160 acres cultivated, 37½ acres sown in swedes and rape, 1 m. 67½ ch. of rabbit-proof fences erected, 27 acres permanently grassed, 49 acres of pastures harrowed and top-dressed, and 15 acres of hay harvested. In addition, 272 ft. of boring for water-supply was carried out, 73 ft. of pipes laid and tanks erected, and one permanent sheep-yard constructed.

Section 8, Block VII, Wharepapa Survey District (late P. Anderson's Property).—The Lands and Survey Department took over this block at the end of September, 1937, and, in addition to that previously undertaken, the following development work was carried out during the period: 9½ acres of scrub cut and lightly stumped, 2 acres ploughed, 4 acres reploughed, 11 ch. of permanent fences erected, 55 ch. of fences renewed and repaired, and 8 acres of pastures harrowed and top-dressed. In addition, two farm bridges were constructed.

TAUMARUNUI DISTRICT.

Ngatamahine Block.—The developmental work carried out during the season comprised 24 m. 70 ch. of fencing, 600 acres laid down in permanent pasture, 127 acres ploughed, 60 acres of scrub cleared, and 67 ch. of shelter-belts planted. Drainage work was continued, and a distance of 9 m. 6 ch. was completed.

Pururu Block.—Developmental work on this block has now reached an advanced stage, the main items for the year being 126 acres of cropping and 218 acres cleared and sown down in new grass. The access road was extended a distance of 15 ch., while permanent fencing was erected over 7 m. 40 ch., and main drains excavated over 68 ch.

Piu Block.—Work on this scheme has been continued during the year, and the results for the period comprised 6 m. 17 ch. of permanent fencing; 260 acres cleared, of which 182 acres has been sown in grass; and 150 acres of land under cultivation. 2 m. 40 ch. of main drains, 2 m. 35 ch. of road formation, and 1 m. 35 ch. of road metalling has also been completed. Some 20,000 battens were split on this block for use in fencing.

General.—In the Waitomo County Lees Block, Owen Block, Waitanguru Block, O'Keefe's Block, Puketutu Block, and Patoto, and in the Otorohanga County Larsen's Block, Cruickshank's Block, and Hill's Block were handed over to the Lands and Survey Department, Lands Development Branch, for future administration and management.

NAPIER DISTRICT.

Ahuriri Lagoon Reclamation and Small Farms Scheme.—The reclamation of the Ahuriri Lagoon, comprising an area of some 7,500 acres, was continued during the year on behalf of the Small Farms Board. As reported in previous years, this lagoon was formerly a shallow arm of the sea which was raised considerably and partly drained by the severe and disastrous earthquake in 1931. As a result of the opportunity taken to bring this land under cultivation some 6,000 acres will be brought into productivity practically alongside the progressive Borough of Napier, and it is evident that in this respect the block possesses a very great potential value.

The work was commenced in 1934 and, as far as engineering and construction operations are concerned, is now nearing completion. The main items yet to receive attention are the topping of the contour stop-bank and the metalling of necessary access roads, and these will be disposed of during the coming year.

The actual completion of the scheme will be considerably delayed by reason of the disastrous flood which occurred in the district on the 23rd April, 1938. In places where they had not been brought up to full height the stop-banks were breached by water from the contour channels, and the overflow from the Esk River also helped to flood the block to a width of from 4 ft. to 5 ft. Damage to drains and roads was comparatively slight, and the worst effect of the flood is the delay which will be caused by the inundation of the land. On the other hand, the elimination of the surplus salt from the soil will be assisted considerably by the large volume of fresh water which lay on the area for some few days, and in this respect the flood cannot be considered to have been of an entirely damaging nature so far as this scheme is concerned.

IMPROVEMENTS TO SCHOOL-SITES.

Considerable progress was made during the last financial year in carrying out improvements to school-sites. The preparation of schemes and the supervision of the works are in the hands of officers of this Department. The cost of labour is provided by the Labour Department out of the Unemployment Promotion Fund, and the cost of materials is met by the Education Department. During the period September, 1937, to March, 1938, some five hundred men were engaged in this work.

Early this year Education Boards and secondary and technical School Boards were asked to submit particulars of further proposals considered desirable for the improvement of school playing areas. These were referred to this Department for the preparation of estimates, and are being put in hand as rapidly as the necessary arrangements can be made. Approximately six hundred men were engaged in work that will result in a permanent improvement to many school-sites previously regarded as unsuitable for recreation purposes.

The expenditure on this work, including labour and material, has been as follows:—

	£
Year ended 31st March, 1937	18,463
Year ended 31st March, 1938	82,268
Quarter ended 30th June, 1938	38,675

HARBOUR-WORKS.

Awanui Harbour.—Siltation of the upper tidal reaches of the Awanui River was seriously interfering with navigation, and to enable shallow-draught vessels to regularly work the tides dredging-work was carried out with a Sauermann slack-line cableway excavator. Altogether some 13,500 cubic yards of silt was removed, and this improvement enables vessels to maintain regular sailings without difficulty.

Mangonui Wharf.—The contract for this reinforced-concrete structure was almost completed during the year, the principal unfinished item being the wharf shed. The wharf is L shaped, the approach being 100 ft. long and the wharf 45 ft. wide by 100 ft. long. The wharf shed is approximately 60 ft. by 30 ft., with cool-store 20 ft. by 10 ft. in one corner and a small office in the other corner.

Whangaparapara Wharf.—This wharf, consisting of a jetty 80 ft. long and a tee 15 ft. by 53 ft. with a shed 12 ft. by 18 ft., crane and landing-steps, has been completed. The depth of water at face of tee at low water is 8 ft.

Waikopu Harbour.—The operations at this harbour have been carried out by the Wairoa Harbour Board on behalf of this Department.

During the year 102 vessels worked the port and handled 5,376 tons of general cargo, 91,749 square feet of timber, 9,142 sleepers, and 124 hardwood poles. In addition, eleven overseas vessels worked the port and lifted 4,481 quarters of beef, 134,040 carcasses of mutton and lamb, 4,369 carcasses of pork, 6,972 packages of sundries, 886 bales of wool, 199 bags of hides, 20 casks pelts, 3,161 carcasses of boneless beef, and 187 tons of general cargo.

Ordinary maintenance has been carried out to wharf and buildings. An examination of the wharf-piles has been carried out, and several piles were found due for replacement. New piles are to be driven as soon as the necessary equipment is available.

Waitaria Bay Wharf.—General repairs were carried out to this wharf during the year.

Portage Wharf.—General repairs were carried out during the period.

Hicks Bay.—A report has been prepared on a proposal to extend this wharf.

Little Wanganui Harbour.—The decking of the wharf was entirely renewed and, in addition, some snagging was done on the river fairway. Plans have also been prepared for wharf-extension.

Karamea Harbour.—Renovations and repairs were carried out to the Harbourmaster's cottage. The river-control works are well in hand and are likely to ultimately reopen the harbour.

Hokitika Harbour.—A scheme was prepared after survey for renewal of portion of the south training-wall, using concrete blocks, but no work was carried out.

Okarito Harbour.—The lagoon-mouth has been diverted to the designed position south of the newly-constructed training-wall, but the channel has not been workable to the wharf owing to shoaling. Repairs have been carried out to the wharf, and skidways to hold 220,000 superficial feet of timber have been constructed.

Jackson's Bay.—During the year a survey and preparations for a wharf and access thereto were carried out.

Bruce Bay Landing.—The enlargement of the goods-shed at the Flower Pot Landing is in hand.

Westport Harbour.—Generally speaking, the working draught of vessels using the Port of Westport is governed by the minimum depths which from time to time obtain at the entrance, or, in other words, on the bar at the mouth of the Buller River.

At the end of the previous financial year the mean depth over the usually reckoned area of 1,100 ft. by 600 ft. was 15 ft. at L.W.O.S.T., which was a little better than at the commencement of the year. The least or minimum depth at the close of the same year was 10 ft. 9 in. also at L.W.O.S.T., which also was a little better than at the beginning of the year.

During the first month in this past year, although at one stage better bar-depths were recorded, the extreme least depth and the average of mean depths for the month fell a little from those existing at the close of the previous year (as quoted above), being 10 ft. 6 in. and 14 ft. 2 in. respectively.

For the next six months the depths fluctuated, but by December an excellent state at the entrance was gained, with a least depth of 14 ft. 6 in. and a mean depth of 16 ft. 3 in. Unfortunately, this good state was not maintained, and at the close of the period the poorest depths during the year, both least and average, were recorded—viz., 9 ft. 3 in. and 12 ft. 8 in. respectively.

During the last year the average working depth on the bar at high water was 22 ft. 3 in., which is not as good as the 22 ft. 8 in. for the preceding year, yet still much better than the 20 ft. 10 in. and 20 ft. recorded for the respective years previous again.

The average working depth over the year in the river—i.e., from the wharves to the bar—at high water was 23 ft. 10 in., as against 24 ft. 6 in. for 1936–37, 23 ft. 6 in. for 1935–36, and 24 ft. for 1934–35. At the close of the year the average was 22 ft. 5 in., as against 24 ft. 9 in. at the beginning of the year. Comparative soundings taken in October and March indicate that from the lower beacon to the old flagstaff the river has shoaled about 9 in., but that from the latter point to past the gauge clock the shoaling was about 4 ft. Some 63,000 cubic yards of dredgings were lifted from the river by the "Eileen Ward," mainly between June and November, as against some 216,000 during 1936–37.

Dredging operations were again confined to the drag-suction dredger "Eileen Ward," though, due to overhaul and repairs, the vessel worked during seven months of the year only. During such seven months, however, the dredging performance was relatively good, some 240,000 cubic yards of material being lifted from the bar, as against 268,000 cubic yards during the previous year.

The dredger went to Wellington in May on annual overhaul and did not recommence dredging until late in June. The vessel went out of commission again on the occasion of the Christmas and New Year holidays, and was then subject to annual survey again, when, as a result of defective rivets being found in the boilers, the vessel was towed to Wellington for major repairs, and at the close of the year the "Ruby Seddon," a smaller dredger of similar type which had been laid up for some years, was being prepared for recommissioning.

Owing to the length of time which the "Eileen Ward" was out of commission due to repairs and overhaul generally, the total amount of dredging of all classes carried out was only 384,320 cubic yards, as against 535,105 cubic yards during the previous year, but I would point out that the dredger was not docked during last year and consequently more extensive work had to be carried out during this period, which accounts for the somewhat unfavourable comparison in dredging returns.

The trade of the port shows a considerable improvement over the last period, the total inward tonnage being 288,621, as against 257,506 for 1936-37, while the export of coal increased from 345,507 tons to 425,778 tons.

All plant and buildings have been well maintained during the period.

Rain fell on 168 days, and 68.35 in. were recorded on the harbour gauge, figures which are well below the average for the previous six years.

Installation of electric light at the main beacons, signal-stations, and the two signalmen's cottages, reticulation for which was in hand at the close of the previous year, was completed early in the year. The work involved erection of 3½ miles of transmission line, nearly three miles of which is high tension line. Later in the year the gas flashing Port light at the signal station was replaced with an electric flashing light. Also electric morse signalling lamp was installed which is usable during the day for signalling to ships off the port in lieu of the old system of flag-signalling. Electric lights were also installed in the Harbourmaster's Office.

The railway-line to the Cape and the branch line from the Te Kuha main line into Organ's Island has been thoroughly overhauled in readiness for the conveyance of stone from the Cape Foulwind Quarry to the west breakwater and Organ's Island protective work, a large number of the old sleepers having to be renewed and a considerable amount of work having to be carried out to bring the line into suitable condition again.

The reconstruction of the bridge across to Organ's Island was almost complete at the close of the period. In this work the existing piers of nine old spans were strengthened with two extra piles per pier and old hardwood stringers placed. Fifteen new 22 ft. spans were erected.

At the quarry itself thirty trucks were reconditioned, the cranes overhauled, and the plant generally is now in readiness for an immediate start, and the quarry-face has been cleaned up.

LIGHTHOUSES.

Cape Maria Van Diemen.—The reconditioning and improving of the tram-line access, together with the installation of two power-operated winches, has been completed. Timber and ironwork for a new landing-crane has been delivered and is being fabricated in Auckland, and this will be erected shortly. Material is also being delivered in connection with the reconditioning of the ropeway connecting the island with the mainland.

Investigations were carried out in connection with the removal of the lighthouse to an alternative site. This was considered in conjunction with a proposal to provide for a radio-beacon station, and preliminary surveys for this purpose were carried out on the mainland at Cape Reinga. The proposals provide for the complete reconstruction of the watched light at Reinga, together with the provision of an automatic light on the mainland adjacent to Cape Maria. The provision of a new station would involve the construction of a new tower, power-house accommodation, water-supply, together with approximately 10 miles of access road from Te Paki.

North Cape.—A platform was constructed at the top of the cable-way for the purpose of improving the operation of the cable-way equipment.

Cuvier Island.—The tram-lines were reconditioned during the year and a power-operated winch was installed. Investigations were carried out in connection with the proposal to electrify the light and provide a radio beacon. Plans are in hand in connection with the power-house, and the electrical equipment is on order.

Ponui.—Plans for the renewal of the lighthouse have been finalized. The new tower has been fabricated, and the erection of the structure will be undertaken as soon as the remainder of the material is delivered.

Moko Hinau.—During the year repairs were carried out to the tram-line and a power-winch was installed. Investigations were carried out in connection with the proposal to electrify the light and install a radio beacon. Plans of the power-station are in hand, and electrical equipment is on order.

Tiri Tiri.—Investigations have been carried out in connection with the proposal to connect the electrical apparatus with the system on the mainland.

Flat Rock.—Hand-rail guards were erected during the year.

Chicken Island.—The installation of the cable-way, together with the installation of a power-winch, was completed during the period.

Baring Head.—The radio-beacon towers have been erected. The radio equipment has been installed by the Post and Telegraph Department, and the beacon put into operation.

Alterations to the keepers' cottages are in hand.

Stephens Island.—An engineering survey has been made for the purpose of installing a new power-house and radio beacon. The power-house has been designed, and all machinery and steel masts ordered. The necessary building will proceed immediately.

Cape Campbell.—The erection of power-house, 24 ft. by 25 ft., comprising power-house, fuel-store, and battery-room, has been completed. The building is a wooden-frame structure with corrugated-iron roof and exterior walls, and is located close to the Cape Campbell Lighthouse.

Arrangements are well forward for the installation of the machinery.

Separation Point.—A survey in connection with the installation of a light at Separation Point and access from the foreshore has been carried out. Action to purchase the light equipment is in hand.

Cape Saunders.—The painting of the lighthouse was completed during the year.

Moeraki.—Renovations and repairs were carried out during the period.

Centre Island.—Plans and specifications for the erection of three new dwellings have been completed.

Akaroa.—A new steel staircase for the landing-stage was erected during the year.

GENERAL.

A number of applications were received from local bodies and private people for approval of works involving marine interests. Among the various applications were the following:—

Foreshore Licenses.—Clevedon, Wairoa River; Pakatoa Island; Mangawhau, Northern Wairoa River; Dargaville; Kaihu Creek; Coromandel Harbour; Whangaroa Harbour; Waikawa Harbour; Bon Accord Harbour; Kawau Island; Oparau; Awanui River; Kohukohu, Hokianga Harbour; Motukaraka, Hokianga Harbour; Motuparapara Island; Auckland Harbour; Duddings Creek, Kaipara Harbour; Matiatia Bay, Waiheke Island; Mangawhau, Kaipara Harbour; Matakatia Bay, Whangaparaoa; Te Kopuru, Kaipara Harbour; Day's Bay, Waiheke Island; Rawene, Hokianga Harbour; Manaroa, Pelorus Sound; Terakohe, Golden Bay; Tory Channel; Rotoroa Island; Golden Bay.

Wharves and Jetties.—Pakatoa Island; Whangaparapara, Great Barrier; Calliope Dock Wharf, Auckland; Onerahi, Whangarei Harbour; Opuia, Bay of Islands; Opotiki Wharf; Port Charles, Coromandel; Albany, Auckland Harbour; Coromandel Harbour; Waikawa Harbour; Whareroa, Tauranga Harbour; Te Kopuru, Northern Wairoa River; Jacksons Bay; Port Fitzroy; Lyttelton Harbour.

Boatsheds, Skids, Slipways, &c.—Otago Harbour; Broad Bay, Otago Harbour; Carey's Bay, Otago Harbour; Auckland Harbour; Edwards Bay, Otago Harbour; Whakatakataka Bay, Auckland Harbour; Titirangi Bay, Manukau Harbour; Karitane; Lowry Bay; Waverley Bay, Otago Harbour; Duddings Creek, Port Albert; Picton.

Breastworks and Retaining-walls.—Wellington Harbour; Evans Bay, Wellington Harbour; New Plymouth; Rotoroa Island.

Reclamation.—Freemans Bay; Greymouth Harbour.

General.—Water-supply intakes, Whakatane River; boat-pound, Auckland Harbour; widening Leith Canal and lengthening railway bridge over Canal; bridge, Taipa River, Doubtless Bay; sewerage outfall, Motutapu Island; bathing-sheds, Evan's Bay; club house, Tauranga Yacht and Power Boat Club; bridge, Pourakino River, Longwood; shop, Mangawhare, Kaipara Harbour; culvert and bridge, McCormack's Bay, Sumner Estuary.

ESTABLISHMENT OF AERODROMES AND LANDING-GROUNDS AND AIR-ROUTE FACILITIES.

Considerable progress has been achieved during the year in the development of aerodromes, landing-grounds, and facilities relating to air routes and air transport. A policy has been adopted that concentrates on the development and extension of existing main-trunk routes and new routes in contemplation, but the possibility of feeder services and odd fields to serve particular localities has not been lost sight of. As a result rapid and continuous development of aerodromes and landing-grounds is proceeding all over the Dominion.

At June, 1938, a total of fifty-three aerodromes and landing-grounds were licensed for regular operation. On twenty-seven of these, enlargement or improvement work was in hand during the year, while an additional fourteen new fields were under construction with a view to licensing. In addition, nine fields, of which improvement work is in hand on seven, are maintained and available as Government emergency-landing grounds, and four additional fields are to be developed immediately. Investigations, detailed surveys, and construction proposals for many other fields have been considered with a view to their development in the future, either as licensed aerodromes to augment the network serving air-transport needs or as emergency-landing grounds.

The changes in constructional methods initiated in the previous year have been still further developed during the past year, and now every possible phase of work is undertaken with modern mechanical equipment. Most of the larger works are carried out by private contractors under the Department's supervision and to its designs, following the calling of public tenders. This procedure has resulted in the maximum results being achieved for the money expended, and has at the same time brought fields into use at a much earlier date than would have resulted from the old, laborious, and expensive hand methods.

As a result of operations over the past three years, much-improved flying-fields are now available throughout the country from all viewpoints—larger available area, improved surface condition and drainage, access, the removal of surrounding obstructions, and the provision of radio and other facilities to make for safer and more regular operation of aircraft. Much work still remains to be done, however, as the demands of modern air transport require larger fields, improved surfaces, and clearer approaches to all landing-grounds.

Royal New Zealand Air Force Establishment.—Close co-operation has been maintained between this Department and the Air Department in the design and development of Air Force stations. Following the decision to expand this arm of the Defence Forces of the Dominion, heavy and urgent demands have been made for designs and construction in connection with these stations, and a large expansion in this side of the Department's activities has resulted. Hobsonville Aerodrome, Auckland, is being developed as an aircraft-repair-depot, and Wigram Aerodrome, Christchurch, as a flying training school, while two entirely new fields are being constructed as squadron operation stations at Whenuapai (near Auckland) and at Ohakea (near Bulls). Such work entails the design and construction of flying-fields, hangars, buildings (both technical and residential), and all roads, services, facilities, and amenities connected with the particular type of station.

Radio Aids to Air Transport and Navigation.—Under the guidance of the Aeradio Committee and in co-operation with the Radio Section of the Post and Telegraph Department much progress has been made in the installation of radio facilities to assist the safe and efficient operation of air services. During the year the number of radio-transmitting stations in operation was brought up to thirteen. In addition, radio-receiving stations are being provided on eleven aerodromes, and the first of these will be in operation at an early date. The development of radio aids to navigation and blind-flying approaching and landing in over-seas countries is being closely watched, and arrangements are already in hand for installing the first radio-approach beacon at Taieri Aerodrome.

Removal of Obstructions Surrounding Aerodromes.—Some progress has been made in the removal of surrounding obstructions to existing aerodromes, but much yet remains to be done. Advantage has been taken of legislation brought in for the purpose, while much has been effected by direct negotiations. Steps have also been taken under the same legislation to protect the approaches to aerodromes and prevent the erection or growth of new obstructions.

“Air Pilot” and “Notices to Airmen.”—The Department has continued its service to airmen in compiling amendments and additions to the *Air Pilot* at regular six-monthly intervals and, in addition, by means of “Notices to Airmen” issued by the Air Department, keeps all interested notified as to the condition of all aerodromes and any changes relating thereto.

Strip Maps.—Owing to pressure of work in the Government Printing Office poor progress has been made in the issue of these maps. To date two maps have been issued, and a further one will be available shortly. All other maps have been drawn by the Lands and Survey Department and now await printing.

Aerial Surveys.—The Department supervises and places orders for all aerial survey work on behalf of all Government Departments, and during the year many square miles of country were photographed for purposes of irrigation, drainage, river-control, road-location, forestry, soil survey, and mapping.

Meteorological and Aeradio Station, Raoul Island, Kermadecs.—During the year a temporary aeradio station was established on the island, and investigations and surveys undertaken with the view to further development. A permanent radio meteorological reporting and radio direction-finding station is to be established and landing facilities provided to allow ships to serve the island. Several miles of roads are required to join the landing points with the radio station and to give access round the island. Preliminary work has already been commenced.

Details of aerodrome works in hand during the year are set out in the following list:—

ROYAL NEW ZEALAND AIR FORCE ESTABLISHMENT.

R.N.Z.A.F. Aircraft Repair Depot, Hobsonville.—The flying-field has been extended, improved, and drained, and now covers 101 acres. 20,500 cubic yards of spoil were excavated, making a total to date of 237,500 cubic yards. An additional 5 miles 50 chains of subsoil drains were placed.

A new highway access to the station has been constructed and attention given to internal roading. Two additional wings and extensions to the kitchen and mess accommodation at the airmen's barracks have been provided, while improvements to the grounds and surroundings have been effected.

Plans and proposals for a revised layout and additional technical accommodation and facilities for the station to suit its particular function as an aircraft-repair depot have been proceeded with, and definite construction proposals for bomb storage, main stores, and an aircraft-repair shop have been framed, and construction will be undertaken early in the coming year.

R.N.Z.A.F. Operations Station, Whenuapai.—Further investigations and surveys were undertaken over several sites until the site at Whenuapai was decided upon. Detailed engineering surveys were completed over an area of approximately 600 acres, and negotiations for the purchase are well forward.

Layout plans for the station, including the flying-field and technical and residential accommodation, have been prepared and adopted, while construction proposals for the grading, drainage, and surfacing of the flying-field, hangars, and other technical buildings are now in the course of preparation.

R.N.Z.A.F. Operations Station, Ohakea.—An area of 492 acres has been acquired for the purpose of the above station, and the development of the station has been commenced. Detailed engineering surveys were undertaken during the year, and lay-out plans and definite development proposals prepared.

At the end of the period work had already been commenced on two large reinforced concrete arch roofed hangars, while contracts had been let for roading, the grading and levelling of the flying-field, and the supply of field tiles for subsoil drainage and ring drainage. Construction proposals have been prepared and tenders are in the process of being called for the airmen's barracks, officers' mess and quarters, headquarters building, and for residences for the married personnel. Designs have been prepared for such services as sewerages, water-supply, electrical supply, and storm-water drainage.

R.N.Z.A.F. Flying Training School, Wigram.—Extensive development to fit this station as a flying training school has been undertaken during the period, and the whole work is now well forward.

The following buildings have been completed during the year: Two additional dormitory wings and additions to the mess and kitchen block, temporary cubicle and mess accommodation for officers, a motor-transport block, and temporary alterations to existing buildings for instructional purposes. A new machine-gun range has been constructed, and an air firing and bombing range at Lake Ellesmere. A sewerage system with pumping and disposal plant has been provided.

The following buildings are in course of erection: Ten residences for airmen, all of which are nearing completion; thirteen residences for Non-commissioned Officers; seven residences for officers; administration and headquarters building; main store; small oil-store; guard-house, water-tower and standby set house; sergeants' mess and quarters; ration store; sick quarters and instructional building; while construction proposals are nearing completion for the officers' mess and quarters, lubricant and inflammable store, extensions to the workshop block, and for several other buildings.

Proposals are receiving consideration for alterations and extensions to electrical-power reticulation water-supply, sewerage, and roading for the whole station.

CIVIL AERODROMES AND LANDING-GROUNDS.

Whangarei—North Auckland District.—Engineering surveys and investigations have been carried out at the following sites: Waipapakauri, Kerikeri, Dargaville, Whangarei, Kaikohe, and Waipu. Construction work has been undertaken as follows:—

Waipapakauri: Contract work is 50-per-cent. completed on levelling work over a 35-acre extension and on 22 acres of the original flying-field. Stumping, ring drainage, and subsoil drainage are being undertaken by the Department.

Kerikeri: Clearing has been completed, and ploughing and levelling is in hand by the Department over 45 acres. A contract has been let for the heavier excavation on the landing-strips, and work has been commenced.

Rawene: A limited area of tidal flat is being reclaimed by stop-banking, utilizing unemployed Native labour. The work is now approximately 40 per cent. completed.

Whangarei: Proposals are completed for the formation and levelling of the field in the coming spring. Road-deviations required to release the site have been commenced, and to date 47 chains of formation have been completed. Clearing of the aerodrome-site has been commenced utilizing unemployed labour.

Auckland District.—Development-work has been in hand as follows:—

Great Barrier Island (Kaitoke): This aerodrome has been levelled, surfaced with soil, grassed, top-dressed, and rolled during the current year, and is now available as an emergency-landing ground. Levelling operations entailed shifting by tractors and scoops, 68,406 cubic yards of sand. 22,367 cubic yards of soil were carted and spread to form a surface for the sowing of grass-seed. The total area levelled and sown is 50 acres. To stop sand-drift 180 chains of brush fences were erected and 10 acres of kikuya and 30 acres of marram-grass planted. 120 chains of boundary fence were erected, and 25 chains of access road constructed. Drains completed total 40 chains 10 ft. wide, 6 chains 3 ft., and 70 chains 2 ft. Two windsocks have been erected.

Mangere: Enlarging and regrading has been carried out over a further 14 acres, making a total area of 97 acres, and the whole field has now been completed. During the year the work involved excavating 3,554 cubic yards, and making the total to date 180,554 cubic yards; 24 acres have been returned and 14 acres sown in grass, making totals of 77 acres of turfing and 20 acres of grassing to date; tile and scoria subsoil drainage involved the placing of 22,800 ft. of 4 in. to 15 in. pipe tiles and 1,733 cubic yards of scoria; the construction in concrete of boundary and limit markers, circle and name, and the erection of a radio-transmitting station has been completed. The aerodrome was handed over to the Auckland Aero Club for maintenance purposes in April of this year.

Ngaruawahia Emergency-landing ground: This field has been maintained as a Government emergency-landing field.

Thames: During the year 368 chains of subsoil tile drains were laid with 4 in. to 6 in. tiles, and refilled to surface with shell. A further scheme is in hand on part of the aerodrome to supplement the system by laying new drains, and of this, some 30 chains have been completed. Repairs were effected to the stop-banks and ring drains constructed last year and damaged by flooding.

Waikato Airport: An obstructing transmission line has been removed and attention given to obstructing trees.

Tauranga—Bay of Plenty District.—Engineering surveys and investigations have been carried out at Rotorua, Whakatane, and Tauranga. Possible sites were investigated at Te Puke and Te Kaha.

Development-work is in hand as follows:—

Atiamuri (Emergency-landing Ground): Levelling has been partially completed, but is now suspended until next summer.

Galatea (Emergency-landing Ground): Surface improvements have been effected and the field has been maintained as a Government ground.

Tauranga: An area of 54 acres has been levelled, smoothed off, and sown in grass. 65,000 cubic yards of material were shifted and 50 chains of open drain excavated. 62 chains of road and a wharf were provided to give access. All work on the initial scheme has been completed. An adjacent area is being cleared and stumped to permit of extensions next summer.

Opotiki: 109 acres have been levelled, smoothed off, and sown in grass, involving the handling of 33,000 cubic yards of material. A comprehensive subsoil drainage system was installed, requiring the placing of 49,000 ft. of tiled and shingle drains. Stop-banks, and drain outfalls were provided to prevent flooding. All work is now completed.

Rotorua: The initial development has been completed over 110 acres. Work during the year consisted mainly of top-dressing the surface with loam and manures. The field has not been opened to traffic in order to allow for consolidation. Proposals are being considered for additional extensions.

Taupo: The whole field has been treated with manures and grass-seed. An access road from Taupo Township is under construction.

Gisborne District.—Sites have been investigated in the following localities: Ruatoria, Motuhora, Te Araroa, Orete Point.

Engineering surveys have been undertaken at Gisborne, Motuhora, and Opoutama.

Development-work has been undertaken as follows:—

Gisborne: An extension of 30 acres to the south of the existing field was levelled, topsoiled, and sown in grass. An additional extension to the south of 51 acres, is now in hand by the contractor. Thirty-two chains of transmission line have been buried underground. A temporary radio-transmission station has been installed.

Opoutama: An area of 21 acres has been under development to provide an emergency-landing field. Approximately 45,000 square yards of turf were stripped and relaid after levelling, and 10,400 yards of spoil excavated and placed in low areas. The disastrous flood of April caused the temporary suspension of work and placed the field out of use.

Napier - Hawke's Bay District.—Preliminary investigations were undertaken at Wairoa. Engineering surveys were carried out at Waipukurau. Development-work has been undertaken as follows:—

Napier Airport: The field was top-dressed with manure and seed. The field is not yet in use, and its future is doubtful.

Westshore (Beaches): A wireless-transmission station has been provided, and the erection of a building to house the receiving and direction finding station is in hand. Minor maintenance-work has been attended to.

Hastings: The only work carried out was the top-dressing of the whole flying-field with manure and seed and the spreading of topsoil over a small portion of the rough area.

Waipukurau: Out of the total of 105 acres, 101 acres have been completed, but at present only 30 acres are available for use.

Dannevirke: No work has been carried out during the year.

Mohaka: This field has been maintained as a Government emergency-landing ground. An additional 24 acres were sown in grass.

Taumarunui District.—Development-work has been carried out as follows:—

Te Kuiti: A new landing strip 880 yards long has been completed and the existing main landing strip extended by 220 yards. 25,000 cubic yards of spoil were excavated and placed during the year. The field available now covers 40 acres.

Stratford-Taranaki District.—Investigations for a site at Ratana were undertaken. Development-work has been undertaken as follows:—

New Plymouth: Work has been in hand on extensions to the existing field. An additional area of 83 acres for flying-field purposes has been levelled, topsoiled, smoothed off, and partly sown in grass, while 44 acres of the existing field have been regraded to conform with it. Approximately 220,000 cubic yards of spoil, including the handling of topsoil, have been excavated and placed, and the work is nearing completion. An area of 16 acres for building and administration purposes is being cleared and levelled. 90 chains of road deviation and 15 chains of access road have been formed, and metalling is in hand. A radio-transmission station has been provided and is in operation, while a building to house the receiving and radio direction-finding station is in course of erection.

Stratford: Maintenance-work and the top-dressing of the field with manures has been the only work carried out during the year, and the field is in use.

Hawera: No work has been undertaken except the removal of some surrounding obstructions. The field is in use.

Wanganui: Extensions and improvements to the field undertaken by the Wanganui City Council with assistance from the employment funds have been completed.

Karioi: This field has been developed as a Government emergency-landing ground. 48 acres were ploughed, levelled, and sown down in grass.

Wellington District.—Preliminary investigations for sites were carried out at Pahiatua and Eketahuna.

Development-work was carried out as follows:—

Milson (Palmerston North): The levelling, turfing, and drainage of this field were completed during the year. 1,980 cubic yards of spoil, 210 square chains of turfing, and 4,100 ft. of tile and shingle drains were involved. In addition, 9 acres were mole-drained and approximately 50 acres were top-dressed with manures. The bituminous apron was repaired and resealed and a concrete landing circle and name placed. A radio-transmission station was provided and is in operation.

Hood (Masterton): No further development was undertaken, and the field is in use.

Feilding: No further development was undertaken, and the field is in use.

Rongotai (Wellington): This field has been maintained by the Wellington City Council. The Government is erecting a large wooden hangar, and this work is nearing completion.

Paraparaumu: Construction proposals were prepared, but work has not yet been put in hand.

Nelson District.—Engineering surveys were carried out on a site at Lake Station (Tophouse).

Development-work was undertaken as follows:—

Nelson Airport: The development of this field is well forward. Approximately 400,000 cubic yards of material were shifted during the year, making a total to date of over 600,000 cubic yards. Approximately 120 acres have been levelled, 81 acres topsoiled, and 63 acres sown down in grass. The stream diversion cut with its stabilizing weirs has been completed, and 52 chains of the access road formed and metalled. Approximately 15 chains of stone-pitching have been completed on the estuarial boundary of the field, and levelling for two radio stations has been carried out. A radio-transmission station has been provided and is in operation, while the building to house the receiving and direction-finding station is already erected.

Stoke (Nelson): This field has been maintained by the Department pending the completion of Nelson Airport.

Blenheim : This field has been maintained by the Department during the year, and minor improvements to the administration area carried out. A temporary radio-transmission station has been provided, and a contract has been let for a building to house the radio-receiving and direction-finding station.

Motueka : No development was proceeded with during the year except for the erection of fences, top-dressing of the surface, and the removal of obstructing power and telephone lines.

Takaka : The function of this field has been changed from a purely emergency field to a fully-developed aerodrome and, consequently, a better system of grading was adopted. Construction work is nearing completion and, to date, approximately 107,000 cubic yards of spoil, including topsoil, have been excavated and replaced. 72 acres have been levelled and graded and 42 acres sown in grass. The fencing of the field has been completed.

Grassmere : This field has been maintained as a Government emergency-landing ground. Work has been in hand placing stop-banks to isolate the field from Lake Grassmere, and the work is well forward. Fencing was completed.

Kekerangu : This field has been maintained as a Government emergency-landing ground. Obstructing telephone-lines have been removed and repairs effected to the surface.

Clarence : A contract has been let for the levelling, grading, and grassing of this field, but work has not yet been commenced.

Christchurch—Canterbury District.—Development-work has been undertaken as follows :—

Conway : This field has been maintained as a Government emergency field.

Harewood (Christchurch) : 160 acres have been levelled, graded, and sown down in grass. 1,500 ft. of water-pipe, a well, and electric pump have been provided to allow for watering the heavy-traffic areas. Access roads and a concrete landing circle have been constructed. A building and aerial towers for a radio-transmission station have been erected, and tenders have been called for the building to house the radio-receiving and direction-finding apparatus.

Wigram (Christchurch) : This field has been maintained and used as a commercial aerodrome, as well as functioning as an Air Force flying training school.

Ashburton : Minor improvements to the surface have been carried out.

Timaru : Development-work is nearing completion, and to date, approximately 192,600 cubic yards have been excavated and replaced from all sources. Otipua Stream has been diverted and stop-banked, and a large hardwood outlet culvert provided through the beach. The flying-field has been stop-banked and ring-drained to isolate it from surrounding land, and a comprehensive subsoil drainage system is nearing completion. A pumping-station to deal with surface water on the aerodrome is being placed. Approximately 50 acres have been levelled and sown in grass and are available for use, while additional areas have been levelled and will be sown down in grass next spring.

Mount Cook (Birch Hill) : This field has been maintained by the Department as an aerodrome in a remote locality. Boundary markings were placed during the year.

Greymouth—Westland District.—Investigations for suitable sites were undertaken at Jackson's Bay and Westport. Engineering surveys were carried out at Jackson's Bay, Greymouth, Westport (South Buller), and Weheka.

Development-work has been undertaken as follows :—

Westport (North Buller Site) : The south-west to north-east landing-strip was widened to 150 yards, and maintenance of the whole area continued throughout the year.

Greymouth : No work has been undertaken to the existing field during the year, but a contract has now been let for the reclamation of an area in Karoro Lagoon to increase the available area of flying-field. A temporary radio-station has been established.

Inchbonnie : This field has been maintained by the Department as an aerodrome in a remote locality. Improvements to the surface and drainage have been carried out and two windsocks provided.

Hokitika : Extensions on the south side of the field have been carried out and improvements effected to the whole surface. Subsoil tile drains have been placed over portion of the field and a pumping-station installed to de-water the aerodrome after heavy rains. Exceptional floods breached the stop-banks and damaged the field. Repairs are now practically completed. A temporary radio-station is in operation, while a permanent radio-transmission station is nearing completion, and a contract has been let for the building to house the radio-receiving and direction-finding apparatus.

Ross : The field was ploughed and sown down in grass, but still requires attention to the surface before a license for use is issued.

Wataroa : The top-dressing of the field with fine gravel was completed during the year, and the field is in use. Top-dressing with soil and grassing is still required.

Waiho : This field has been maintained as an aerodrome in a remote locality. Windsocks were provided.

Weheka : Minor improvements to this field were effected, but the field is very restricted in usable area.

Karangarua : A temporary field was provided for immediate use by roughly levelling a restricted area of natural surface.

Mahitahi (Bruce Bay) : A temporary landing-strip was provided by clearing and roughly levelling a restricted area in the river-bed.

Haast : A contractor has been engaged with plant regrading and levelling this field. Poor progress has been achieved because of wet ground conditions and plant breakdowns.

Upper Okuru : The main landing-strip has been regraded, crowned, and lightly shingled to provide a drier surface. The cross-landing strip still requires attention.

Mussel Point : The regrading, levelling, and grassing of this field was completed during the year. Further attentions to grassing and top-dressing will be required next spring.

Jackson's Bay: Work has been commenced on the provision of a landing-strip near Neil's Beach on the western bank of the Arawata River. A temporary radio-station is in operation.

Dunedin-Otago District.—Waitaki: An emergency-landing ground has been constructed over an area of 53 acres by ploughing, grading, and resowing in grass.

Waianakarua: An emergency-landing ground is being constructed on this site. Sixty-seven acres were subjected to levelling operations, involving the shifting of approximately 70,000 cubic yards of spoil. All development is completed except grassing. The field is not yet available.

Waikouaiti: A commencement has been made to stabilize the sand on this site by the planting of marram-grass.

Taieri: The only development has been the establishment of a radio-transmission station and repairs to the tarmac apron.

Frankton (Queenstown): A contract has been let for the levelling and grading of this field, and the work is approximately half completed.

Gore: The regrading and grassing of this field was completed during the year. Subsoil drainage was carried out over the wetter portions of the field, and an access road and bridge provided.

Invercargill: This field was extended, and development now covers 78 acres. It has been left to consolidate and is not yet in use. Top-dressing has been commenced in order to improve the surface. A pumping-station has been provided.

PLANT AND MECHANICAL EQUIPMENT.

Further construction programmes were initiated during the year, and the scope of work already in progress was extended, and in conformity with the Government's directions all suitable projects were mechanized as far as possible by the provision of modern plant, the expenditure approximating £450,000 for plant items recently purchased.

The Department has now had considerable further experience in the operation of this plant and in the purchasing of requirements for the year; the specifications were prepared in the light of this experience enabling only those machines suitable for New Zealand conditions to be selected from competitive tenders received from both British and foreign manufacturers, the plant purchased including Diesel crawler-type excavators and drag-lines, Diesel crawler-type tractors and road-building equipment, Diesel locomotives, winches, and graders and pneumatic-tired scrapers.

Plant in Use.—The following works in New Zealand in varying degrees are equipped with suitable plant, which was maintained in good order during the year:—

- (1) Roads and highway construction and maintenance under Public Works and Highways vote.
- (2) Irrigation schemes: Excavating irrigation-ditches, construction of dams.
- (3) Railway-construction works, including tunnelling and formation.
- (4) Aerodromes: Construction of Defence and civil aerodrome and flying-grounds.
- (5) Swamp-drainage and reclamation schemes.
- (6) Harbour and river improvement and control works.
- (7) Bridges and level-crossing excavations: Construction on highways, roads, and railways.
- (8) Quarrying: Supply of road-metal.
- (9) Electric-power supply schemes: Construction and maintenance.
- (10) Transmission lines: Construction of new extensions.
- (11) Naval Defence: Construction of Kauri Point and Devonport Base extensions.
- (12) Launch and barge transport.

A large amount of plant has already been in service for a considerable time and is still giving excellent service at a low cost for maintenance repairs. This has been brought about by preparing very thorough specifications of the plant required when calling for tenders from local and overseas manufacturers and in making recommendations only for machines which had been proved to be efficient and economical to operate under the conditions prevailing on construction works in New Zealand.

Public Works Designed Plant.—The modern high-speed Diesel road-graders designed by the Department and manufactured in New Zealand, have continued to give highly efficient and economical service, and compare favourably with similar imported machines. The Department has recently let a further contract for the supply of an additional twenty-nine graders, the power unit now used being a modern British-made Diesel engine. This engine has given every satisfaction in these graders already in use, and it is intended to replace all petrol-engines in these Public Works Department standard graders of earlier design with this Diesel unit. The total number of New-Zealand-built graders in operation will shortly reach eighty-two machines.

Sales of Plant.—Any obsolete or worn-out plant items are disposed of by public tender. The Department's policy is to immediately withdraw from service any plant items whose continued operation becomes an uneconomic proposition and to replace with modern equipment.

Local Bodies.—Numbers of County Councils throughout New Zealand have purchased modern road machinery through the Main Highways Board, and these machines have been purchased on specifications and recommendations made by the Department.

Motor-vehicle Operations.—The increase in construction and maintenance works throughout New Zealand has necessitated a further increase in the number of motor-vehicles required to successfully supervise the large number of undertakings now in hand.

The following statements outline the operations of the Public Works and Main Highways Board motor-vehicle fleet for the year.

Table 1.

	Motor-vehicles.			
	At 1st July, 1937.	Sold.	Purchased.	At 31st March, 1938.
Cars	216	6	2	212
Light deliveries .. .	230	10	76	296
Trucks (30 cwt. and over) .. .	112	3	47	156
	558	19	125	664

OPERATING-COSTS FOR YEAR.

The costs shown include—

Receiving charges: Petrol, oil, grease, tires, tubes, repairs, and maintenance.

Standing charges: Interest at $4\frac{1}{2}$ per cent. per annum and depreciation ranging from a minimum of 20 per cent. to a maximum of 40 per cent. per annum on capital cost, this variation being governed by the type and mechanical condition of each vehicle and the conditions under which it operates; garage rent (5s per week); registration and annual license fees.

Table 2.

Type of Vehicle.	Total Cost.	Total Mileage.	Cost per Mile.
Year 1935-36—	£		d.
Cars and light deliveries (10 cwt. to 15 cwt.)	39,724	3,058,246	3.12
Trucks (1 ton and over)	14,681	660,390	5.34
	54,405	3,718,636	3.51
Year 1936-37—			
Cars and light deliveries (10 cwt. to 15 cwt.)	53,159	4,032,349	3.16
Trucks (1 ton and over)	17,570	770,353	5.47
	70,729	4,802,702	3.53
Year 1937-38—			
Cars and light deliveries (10 cwt. to 15 cwt.)	76,887	5,399,170	3.42
Trucks (1 ton and over)	28,867	1,196,196	5.79
	105,754	6,595,366	3.85

Table 3.—Analysis of Table 2, showing Operating-costs in various Districts (Motor-vehicle Operations, 1937-38.)

District.	Cars and Light Deliveries.				Trucks (1 Ton and over).			
	Number of Vehicles.	Mileage.	Total Cost.	Cost per Mile.	Number of Vehicles.	Mileage.	Total Cost.	Cost per Mile.
			£	d.			£	d.
Whangarei	22	314,475	4,760	3.63	8	70,966	1,441	4.87
Auckland	55	654,369	8,091	2.97	7	54,044	1,181	5.24
Tauranga	22	270,100	3,390	3.01	9	100,283	1,975	4.73
Gisborne	18	210,963	3,114	3.54	11	88,007	2,239	6.10
Taumarunui	12	153,345	2,551	3.99	10	100,775	2,449	5.83
Stratford	30	359,842	4,766	3.18	9	71,133	1,304	4.40
Napier	16	206,618	3,049	3.54	5	49,327	1,180	5.74
Wellington	37	369,892	4,972	3.23	12	65,114	1,742	6.42
Nelson	26	290,493	4,004	3.31	9	69,336	1,267	4.39
Greymouth	27	341,424	4,199	2.95	14	132,525	2,627	4.76
Christchurch	33	518,624	6,237	2.89	12	134,330	2,441	4.36
Dunedin	27	313,968	4,431	3.39	16	86,678	2,433	6.74
Total, general districts	325	4,004,113	53,564	3.21	122	1,022,518	22,279	5.23
Hamilton Electrical	55	355,148	5,514	3.73	8	24,479	1,052	10.31
Palmerston North Electrical	34	270,539	5,334	4.73	8	45,637	1,790	9.41
Christchurch Electrical	32	268,253	5,297	4.73	15	74,629	2,798	9.00
Southland Electrical	60	501,117	7,178	3.44	5	28,933	948	7.86
Total, electrical districts	181	1,395,057	23,323	4.01	36	173,678	6,588	9.10
Grand total, all districts	506	5,399,170	76,887	3.42	158	1,196,196	28,867	5.79

NOTE.—All vehicles that have operated for any part of the year are included—i.e., vehicles purchased and sold during the period.

Total cost includes—

Running cost: Tires, tubes, fuel, lubricants, repairs, and maintenance.

Standing charges: Interest, depreciation, garaging (5s. per week), registration, and license fees.

Motor-vehicle Allowances.—The total amount paid to departmental officers at scale rates for use of their own motor-vehicles upon Government business comprises a large number of comparatively small sums for mileages run for the convenience of the Department where the transfer or purchase of a departmental vehicle was not warranted and the arrangement of hire was inexpedient :—

Year.	Total Allowances.		
	£	s.	d.
1935-36	1,160	17	5
1936-37	2,497	8	5
1937-38	4,563	15	11

Plant Repair Depots.—Repair depots at Whangarei, Auckland, Helensville, Rotorua, Taumarunui, Gisborne, Napier, Wellington, Nelson, Greymouth, Dunedin, Invercargill, and also those on each of the major construction works have been equipped with facilities for handling maintenance and repairs to plant. The volume of maintenance has considerably increased, and this has been successfully handled by the Department's staff.

Services: Other Departments.—During the year a number of other Government Departments consulted the Public Works Department on mechanical matters resulting in the Department executing a considerable amount of mechanical work for these Departments, including installation of refrigeration plant, domestic mechanical services, electric lifts, water-supply schemes, pumping-schemes, heating and ventilating schemes, equipment for aerodromes, supply of machine tools and workshops equipment, special motor-vehicles, electrical installations, lighthouse generating-sets, and tractors. The Departments concerned included Defence, Naval, Mental Hospitals, Cook Islands, Transport, Lands, Forestry, Native, Mines, Marine, State Housing, Tourist and Publicity, Prisons, and Agriculture.

Inspection and Supervision.—With the volume of work undertaken by the Department and the large amount of machinery now employed the inspection and supervision of machines in the field is an important phase of the Department's activities to ensure that all plant items are operating with the maximum of efficiency, and this has been successfully carried out during the year by the field officers and inspecting staff.

General.—The Department has been successfully organized to deal with all problems arising from the operation of plant throughout New Zealand and no serious breakdowns occurred during the year, the plant being in excellent order for continued economic and efficient operation.

NAVAL AND DEFENCE DEPARTMENTAL WORKS.

During the period covered by this report a construction programme has been in hand at Motutapu, Kauri Point, Fort Dorset, and Trentham, and also at Naval Base, Devonport.

TRAMWAYS.

Auckland.—During the year two new cars, Nos. 247 and 248, were built and placed in service after being tested by the Department. One car, No. 184, was rebuilt and also passed for passenger traffic.

New Plymouth.—The Liardet Street branch together with the short siding in Gilbert Street have been removed except for the triangle junction at the Devon Street, which is periodically used for turning cars. The rails have been used for reconditioning the main line at Fitzroy and also towards Moturoa. About 60 chains of track have been reconditioned, and the loop opposite the Moturoa Cool Stores has been altered to turn out on the left instead of the right of the single track.

Wellington.—Track-extensions in Stout Street and Bunny Street to serve the new railway-station and curved track to connect the northern ends of Lambton Quay and Featherston Street have been completed and put into use.

Car No. 233 was inspected and certificate issued.

Christchurch.—Riccarton Route: The single track between Clyde Road and Curlett's Road is being lifted and relaid in the centre of the roadway, being a continuation of the work done last year.

New Brighton Route: Similar work has been done on about 25 chains of this route, including a new loop siding and incidental alterations.

Cathedral Square, Worcester Street West, and Oxford Terrace: Sundry alterations have been made to conform with the widening of the last-mentioned street and the gyratory system of traffic in the Square.

Dunedin.—New controllers were fitted to tram-cars Nos. 64 and 65. One tram-car was inspected and found in satisfactory condition.

DESIGNING OFFICE.

The heavy programme of work has continued and the Designing Engineer's staff has been working at high pressure throughout the year in an endeavour to keep pace with the more urgent proposals.

In addition to the usual work covering the design of major bridges for main highways and bridges for railway-lines under construction, a considerable amount of design in connection with other major activities has been undertaken. Under this heading is included work for the Royal New Zealand Air Force. A major work undertaken on their behalf was a design for large reinforced-concrete hangars

for the Ohakea Aerodrome. These structures were designed entirely in reinforced-concrete due to the difficulty of obtaining structural steel, and they presented a number of unique problems.

In connection with railway-crossing elimination, design work has been carried out to a greater extent by district offices than was the case last year, but eighteen working plans of overbridges have been prepared in the Office.

Fifteen designs for highway bridges over waterways were prepared, the majority being in reinforced concrete.

Some large steel structures, including the Karangarua River Suspension Bridge of 425 ft. span, were also drawn.

The designing and drawing of railway bridges has comprised a large proportion of the work of the Office, and an innovation so far as this country is concerned was the adoption of reinforced concrete for many of these. While the shortage of structural steel was the primary factor influencing this choice, costs are expected to compare favourably with construction in that material. Both arch and girder types have been used, the total number of complete designs being twenty-two.

A good deal of work was done for the broadcasting organizations. Radio-towers were designed and erected for the National Commercial Broadcasting Service at Christchurch, Dunedin, and Auckland, the tallest being 225 ft. in height. Due to a necessity for electrical continuity, these structures were completely welded and hoisted into position as complete units. Radio-towers for the National Broadcasting Service were inspected during erection at Dacre, Southland.

The checking of the designs of bridges for roads and highways prepared in district offices and by consulting engineers, checking of proposals for the Local Government Loans Board, the Marine and other Departments, was carried out as usual, 330 proposals being handled, compared with 250 last year.

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 the 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 the hydro-electric enterprises, please see separate reports by the Government Architect and the Chief Electrical Engineer.

J. Wood, M.Inst.C.E.,
Engineer-in-Chief.

APPENDIX C.

ANNUAL REPORT OF 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 for the year ended 30th June, 1938.

During the period plans were prepared for buildings of an estimated total value of £1,091,500, of which one hundred and fifty-six contracts, totalling £444,100, have been let. Thirty-six other contracts to the value of £805,290, for buildings designed prior to 30th June, 1937, have also been let, making the total building contracts let during the year £1,249,390. In addition, contracts for mechanical equipment totalling £63,234 have been let.

In addition to the above totals for buildings designed by this branch, a large amount of minor additions, alterations and repairs, and general maintenance of public buildings has been carried out by District Offices, and a considerable quantity of furniture and fittings has been manufactured in the Public Works Workshops for various Government Departments.

The work of this Branch has shown a steady increase, but the inability to obtain draughtsmen with the necessary qualifications still proves a handicap, applications having been called as far afield as Australia.

New materials are continually coming on the market, many of local manufacture, and use is made of them wherever circumstances permit after thorough consideration and careful investigation. Competition continues to be keen, and builders and merchants generally show a willingness in co-operating with the Department to produce a high standard of work.

Work in connection with the development of the Air Force occupies the full time of a considerable section of the staff.

Appended is a schedule of works, which includes maintenance work and minor contracts prepared in the various District Offices.

VICE-REGAL.

Auckland.—Repairs, renovations, and general maintenance were carried out.

Wellington.—A new residence was erected for the Official Secretary, the old residence being demolished to make way. Extensive renovations and repairs and sundry alterations were effected.

POST-OFFICES.

Whangarei.—A Postmaster's residence was erected, and repairs, renovations, alterations, &c., to thirteen buildings were attended to.

Auckland.—The new post-office at Thames was completed; a residence was built at Kaipara Flats; garages and stores were built at Te Awamutu and Pokeno. Extensive alterations and additions were made to ten post-offices.

Taumarunui.—Repairs and renovations were undertaken at two buildings.

Tauranga.—Repairs and renovations were carried out to five buildings, including additions and alterations to the post-office at Rotorua. A new post-office was erected at Waimana.

Gisborne.—A workshop, garage, and linemen's building has been built at Gisborne, and the erection of an automatic telephone exchange there was commenced. Additions and alterations were made to two buildings.

Stratford.—A new post-office and residence was erected at Mangaweka. Repairs and renovations, alterations, and additions were carried out at six buildings.

Napier.—Additions, renovations, and repairs were carried out to three buildings.

Wellington.—A repeater-station was built at Lyall Bay, additions were made to the Kilbirnie Post-office, new garages and stores were built at Levin and Eketahuna, a radio-transmitting hall was built at Tinakori, and extensive additions to the Palmerston North Post-office are in hand.

Nelson.—A repeater-station at Blind River was completed. Alterations and additions were made to one building and repairs and renovations carried out at two.

Christchurch.—New post-offices were built at Belfast and Little River, new buildings in course of erection at Mayfield and Waikari were completed, a new telephone-exchange was erected at Geraldine, and new garages and stores at the latter place and at Amberley are in course of erection. A new residence at Waiatu is nearing completion, and extensive additions, alterations, and improvements were undertaken at Duvauchelle and Waimate. In addition, repairs and renovations were carried out at fifteen other buildings.

Dunedin.—A new post-office is under construction at Invercargill, extensive additions are being made to the Oamaru Post-office, a new store was built at Clyde, and additions made to North Dunedin Post-office. Additions, repairs, and renovations were effected at six other buildings.

Greymouth.—A building containing battery and power rooms was built at Greymouth, and alterations and renovations made at the post-office.

COURTHOUSES.

Whangarei.—A new courthouse was erected at Kaeo, and maintenance, repairs, &c., were effected at eight buildings. The old courthouse at Whangaroa was sold by tender.

Auckland.—Additions were made to the Supreme Court building at Auckland, and extensive renovations and alterations were carried out to the Magistrates' Court. Repairs and renovations were attended to at ten buildings.

Taumarunui.—Two buildings were renovated.

Tauranga.—Repairs and renovations were effected at three courthouses.

Gisborne.—The Gisborne Courthouse was renovated.

Stratford.—Five buildings were repaired and renovated.

Napier.—Minor maintenance-work was effected at six buildings.

Wellington.—Additions and alterations were made to the Levin Courthouse.

Nelson.—The new courthouse at Blenheim is approaching completion.

Christchurch.—The new courthouse at Ashburton was completed, extensive repairs and renovations were made to the Waimate Courthouse, and renovations and repairs effected at six other buildings. The foundation-stone of the new Law Courts at Christchurch was laid, but work on the structure has not yet commenced.

Dunedin.—A start has been made to erect a new courthouse at Invercargill. Repairs and renovations were carried out at seven other buildings.

Greymouth.—Acoustical correction was undertaken at the Greymouth Courthouse, and repairs and renovations effected at three other buildings.

POLICE STATIONS AND GAOLS.

Whangarei.—A new residence and lock-up was erected at Kaeo, maintenance repairs were attended to at nine buildings, and electricity installed in two.

Auckland.—A new police-station was erected at Newmarket, and staff cottage, laundry, coal-store and garage were built at the Waikeria Borstal Institution. New garages were built at Hamilton and Te Awamutu, extensive alterations and renovations were carried out at Manurewa, and general maintenance and repairs attended to at thirty-two other buildings.

Taumarunui.—A new police-station is approaching completion at Manunui, and repairs and renovations were executed to four other buildings.

Tauranga.—New police-stations were erected at Tauranga and Te Whaiti, and repairs and renovations were effected at seven other buildings.

Gisborne.—Five buildings were repaired and renovated.

Stratford.—Repairs and renovations were carried out at twelve buildings.

Napier.—Repairs and renovations were made to nine buildings.

Wellington.—A new police-station at Palmerston North is in course of erection, a new police-station was built at Moera, and additions and alterations were made to Tinui Police-station. Extensive alterations were made to the central police-station in Wellington.

Nelson.—Repairs and renovations, general maintenance, &c., were attended to at twelve buildings.

Christchurch.—Repairs and renovations and alterations to thirty-three buildings were carried out, and four new cottages erected at Paparua Prison.

Dunedin.—Repairs, renovations, and general maintenance at thirty-four buildings were attended to, and improvements made at the Invercargill Borstal Institution.

Greymouth.—Eighteen buildings were renovated and repaired.

MENTAL HOSPITALS.

Avondale.—Extensive additions were made to the Nurses' Home, and repairs and renovations generally were attended to.

Kingsseat.—An engineer's residence, new oil-store, bakery, and butchery were erected, and a large hospital block, a mortuary, and a Medical Officer's residence are approaching completion. Repairs and renovations were carried out to Villas 1, 2, 3, and 4.

Tokanui.—A residence for the Assistant Medical Officer, a mortuary, a stable, and manure-shed were erected. Maintenance, additions, and renovations generally were carried out.

Porirua.—A new store building, boiler-house, and workshops were erected. Miscellaneous repairs and renovations were attended to.

Ngawhatu.—A commencement was made with the erection of the Nurses' Home.

Sunnyside.—The bakehouse was completed, and various extensions, renovations, and additions were effected.

Templeton.—A new laundry was erected.

Seacliff and Waitati.—Repairs and renovations were undertaken.

Hokitika.—No. 1 unit, which was extensively damaged by fire, was restored, and sundry additions and maintenance repairs were effected.

EDUCATION.

Whangarei.—Additions and renovations were carried out at Whangarei High School.

Auckland.—General maintenance and renovations were carried out at three homes.

Gisborne.—General repairs and renovations were attended to.

Napier.—Additions to the Dannevirke High School are in hand.

Wellington.—An assembly hall was erected at the Wellington East Girls' College, and a hostel and additional class-rooms at Feilding Technical High School are approaching completion.

Nelson.—Additions were carried out at the Marlborough High School, and a new stable and apple-shed were built at the Richmond Special School. At Nelson College a cottage and class-room were taken down and re-erected. Repairs and renovations generally were attended to.

Christchurch.—Additions, repairs, renovations and alterations to several buildings were effected.

Dunedin.—Two buildings were repaired and renovated.

HEALTH DEPARTMENT.

Auckland.—Repairs and renovations were effected at St. Helens Hospital and Motuihi Island Quarantine Station.

Tauranga.—A new dwelling for the District Nurse at Murapara was erected.

Gisborne.—Twelve huts for T.B. patients were erected, and twelve more are in course of erection.

Stratford.—A nurse's residence is in course of erection at Pipiriki.

Wellington.—Good progress is being made with the erection of the new Dental Clinic.

Christchurch.—A start has been made to erect a new male pavilion at the Queen Mary Hospital, Hanmer, and a doctor's residence was built there. Additions, alterations, and comprehensive renovations were made to the Medical Superintendent's residence.

Greymouth.—A large annexe to the Nurses' Home at Grey River Hospital is approaching completion, and a new medical and maternity wing is under construction. Four rooms were added to the maternity hospital at Reefton.

ARMY AND NAVAL DEFENCE DEPARTMENTS.

Whangarei.—Repairs and renovations were carried out at the Whangarei Drill-hall.

Auckland.—At Motutapu Island the administration block, guard-room, mess-room, bathhouse, lavatories, and store were completed. At Kauri Point eleven magazines and various miscellaneous buildings were practically completed. At the Naval Base, Devonport, No. 1 boiler-shop was completed, the valve-house extended, the old machine-shop was demolished, and a start made with a new machine-shop, and temporary lavatories were provided. Repairs and renovations generally were attended to.

Napier.—Two buildings were repaired and renovated.

Wellington.—An observation post was built at Fort Dorset. A new lavatory block is being built at Trentham.

Christchurch.—Four houses for married officers and an ordnance store are in course of erection. Repairs and renovations generally were attended to.

Dunedin.—Five buildings were repaired and renovated.

Greymouth.—Repairs and renovations were effected at three buildings.

AIR DEPARTMENT.

Auckland.—At the R.N.Z.A.F. Base, Hobsonville, the main west wing of the single men's barracks extensions was completed, and the small west wing and east wing are under construction. A temporary store is nearly completed. Repairs and alterations generally were carried out.

Gisborne.—A hut was erected at the Gisborne Aerodrome for a temporary radio transmitter.

Napier.—A radio-transmitting station and a radio-receiving station were erected at the Westshore Aerodrome.

Wellington.—A large storage shed on the Rongotai Aerodrome is approaching completion.

Nelson.—A radio-receiving station was built at the Nelson Aerodrome.

Christchurch.—Wigram Aerodrome: Two new extensions to the dining-rooms of the single-men's quarters are in course of erection. A considerable amount of fittings, partitions, &c., were erected in the workshops to form temporary instructional accommodation and stores. Housing contract No. 1, comprising thirteen houses for married warrant officers and non-commissioned officers, is approaching completion; housing contract No. 2, comprising eight single and one double unit for married airmen, is well in hand; housing contract No. 3, comprising five single-storied and two two-storied residences, is ready for roofing. The administration building and the main store are approaching completion, the water-tower and standby set house, the guard-house, ration-store, and sergeants' mess are in hand, and the erection of the instructional block is about to commence.

DEPARTMENT OF AGRICULTURE.

Whangarei.—An instructor's house was erected.

Auckland.—Two cottages were erected at the Ruakura Instructional Farm. Repairs and renovations generally were attended to.

Stratford.—New dining and staff quarters are being erected at Flock House. Repairs and renovations were carried out at two other buildings.

Wellington.—A plant research station was built at the Massey Agricultural College, Palmerston North.

Nelson.—A tobacco-redrying-plant building at Motueka is approaching completion. General renovations were carried out.

Christchurch.—A seed-drying shed was erected at Lincoln College. Repairs and renovations to five buildings were effected.

Dunedin.—Repairs and renovations were executed at eight buildings.

TOURIST DEPARTMENT.

Taumarunui.—General renovations were undertaken at the Chateau. New quarters for the chief guide were erected at Waitomo Caves, additions to the staff quarters are in hand, and general renovations were carried out.

Napier.—Considerable additions, alterations, and improvements were effected to the Lake House, Waikaremoana. Extension to the accommodation at Morere Hot Springs were made, and a pair of ornamental gates fabricated and erected. These gates are a noteworthy piece of craftsmanship.

Dunedin.—Fifteen bedrooms, together with bathrooms and other conveniences, were added to the Te Anau Hotel.

NATIONAL BROADCASTING AND COMMERCIAL BROADCASTING SERVICES.

Auckland.—A transmitting-station was erected and additional office accommodation provided for 1ZB, and extensive interior renovations carried out at 1YA.

Napier.—A new transmitting-station is in course of erection, and a staff residence was erected in connection therewith.

Wellington.—The fitting-up of studios for 2ZB, 3ZB, and 4ZB was undertaken, and all furniture made by the workshops staff.

Nelson.—Alterations were undertaken and furniture supplied to 2YN.

Christchurch.—Consequent to the fire at 3ZB, temporary accommodation was fitted up. A transmitting-station was provided at New Brighton.

Dunedin.—A new station was provided at Highcliff for 4ZB, and studios were fitted up in the new chief post-office building. Furniture and fittings were installed at 4YA. A new transmitting-station at Dacre, near Invercargill, is nearly finished, and the staff residence is completed. A brick building was purchased in Invercargill for a studio, and the necessary alterations are approaching completion.

NATIVE DEPARTMENT.

Whangarei.—Fifty-six cottages, fifteen huts, and one store shed were erected, and one hundred and thirty-four additional buildings are in hand.

Auckland.—Eleven cottages were built, and eighteen cottages and fifteen huts are in course of erection.

Taumarunui.—Seven houses were erected, and alterations and repairs to one cottage were carried out.

Tauranga.—Eighty-two cottages, sixty-nine cow-sheds, two shearing-sheds, twenty-eight implement-sheds, and one hundred and nine huts were erected, and, in addition, alterations and additions were carried out to thirty-eight cow-sheds and forty-two cottages.

Gisborne.—Four houses were erected.

Stratford.—Repairs and renovations were undertaken at the Native Hostel, New Plymouth; alterations, additions, and renovations were made to the Wanganui Native Land Court; and improvements were made to two Maori houses.

Christchurch.—One house was built at Akaroa.

Greymouth.—One cottage was erected.

MISCELLANEOUS.

Whangarei.—Four departmental buildings were removed and re-erected for staff quarters, the garage and depot at Whangarei was extended, and a new depot established at Maungaturoto.

Auckland.—A commencement has been made with the new departmental building at Jean Batten Place, and a new building is in course of erection for the Scientific Industrial Research Station. Six cottages were erected for the Lands and Survey Department and six are in course of erection. A large amount of work has been involved in providing additional accommodation for Government Departments, repairs and renovations generally have been attended to, and the workshops have been occupied to capacity.

Taumarunui.—Repairs, renovations, and additions were made to three buildings, and two staff cottages are being erected at Taumarunui. Additions and renovations were carried out to the Manager's residence and staff quarters at the Turangi Fish Hatcheries.

Tauranga.—Buildings were erected at the Rotorua Fish Hatchery, and various farm buildings erected at the Ngongotaha Game Farm. Four cottages were built for State highway accommodation, and six are in hand. The departmental garage at Rotorua has been extended and a new store erected.

Gisborne.—A mechanics' workshop and a five-stall garage were built, two cottages erected, sixteen portable huts were fabricated, and one portable cottage is being made. Repairs and renovations generally were carried out.

Stratford.—Extensive repairs and renovations were made to two buildings, and alterations and renovations were made to two other buildings.

Napier.—The new Government Building is approaching completion. In connection with the Ahuriri Development Scheme, a manager's cottage, shepherd's cottage, wool-shed, and implement-shed were erected. The restoration of buildings damaged by floods is well in hand.

Wellington.—Steady progress has been made with the Government Life Insurance Building, the structural work and external finish being almost completed, and the fitting-up of the interior is now under way. Two suites of offices on the ground floor are already in occupation. The foundations of the new Departmental building in Stout Street were completed, and a start has been made with the steel frame. The Customs Building is being strengthened, and the Ministerial residence in Tinakori Road was converted into two flats. A temporary building in Aitken Street for Government offices has been commenced by the Department's staff, but delay has been experienced in getting the necessary timber, including hardwood, from Australia; this has a striking parallel in the difficulties associated with the erection of the original Government Buildings in 1875. Alterations to the old Railway Head Offices are in hand to provide accommodation for the Army, Navy, and Air Force Departments. A new plant depot is under construction at Pipitea, and a new meteorological office is being erected at Kelburn. A new office building for this Department was erected at Palmerston North. Repairs and renovations were undertaken at the Parliamentary Buildings. The workshops have been exceptionally busy, part of their output being all the furniture for stations 2ZB, 3ZB, and 4ZB.

Nelson.—A new building is in course of erection in Nelson for the Government Life Insurance Department.

Christchurch.—A three-storied building has been purchased and is being adapted for use as Government offices. In addition, a considerable amount of work has been involved in providing extra accommodation for various Departments.

The Sign of the Takaha.—This building is actually one of a series of roadhouses for the rest and refreshment of travellers. It is part of the scheme originated many years ago by the late Mr. H. G. Ell for the development of the Port Hills Summit Road, and carried on under the direction of the Summit Road Trust. Changing conditions have modified the scheme from time to time, and lack of funds has prevented the completion of this building, besides which a good deal of the work done in the early stages was found to be defective and is being replaced.

The original conception of the "Sign of the Takaha" was to provide a building reminiscent of mediæval English architecture, and was probably suggested by the fact that Canterbury, more than other provinces of New Zealand, was founded by men who were steeped in English traditions. It is of Gothic architecture, as practised in England in the thirteenth, fourteenth, and fifteenth centuries, each period being represented. The building is being constructed of stone and other materials of such a durable nature that it should have a life of hundreds of years. The interior decorations in colour are being carried out faithfully to the traditions of mediæval heraldry, and the whole building, when completed, should be a permanent record of the strong ties existing between Great Britain and New Zealand. Already, although far from finished, the "Sign of the Takaha" is one of the show places of Christchurch.

After many vicissitudes it was decided in 1936 to provide labour for the completion of the building as a charge against the Employment Promotion Fund, and since then about thirty tradesmen have been employed on a full-time basis under the control of this Department, working to the designs of Mr. J. Collins, honorary architect, the interior decorations being supervised by Mr. J. A. Thomson. As the whole work includes an immense amount of fine detail, and everything is being done by hand, progress appears to be slow, and it will be a long time yet before the building is completed; but the work has proceeded satisfactorily during the year, and, when finished, will provide an example of architecture and craftsmanship unique in this country.

Dunedin.—The new State Fire Insurance Building at Invercargill is approaching completion, and repairs and renovations were effected to ten departmental buildings generally.

Greymouth.—Additions were made to the School of Mines, Westport. Repairs and renovations generally were carried out.

Generally.—The provision and fitting-up of accommodation for expanding departmental offices generally still keeps the workshops staffs fully occupied.

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. 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 :—

GENERATING-SCHEMES IN OPERATION.

NORTH ISLAND ELECTRIC-POWER SYSTEM.

1. Capital Outlay.

At the close of the year 1937-38 the total capital outlay was £9,095,787, representing assets in operation, and £120,627, representing assets not in operation, giving a total capital outlay of £9,216,414, and Table II gives an analysis of this amount.

2. Financial Results.

The total revenue for the year amounted to £978,492 and working-expenses £177,545, which resulted in a gross profit of £800,947, equal to a return of 9.03 per cent. on the average capital in operation (£8,861,213).

After paying interest (£349,816), depreciation (£50,725), the departmental proportion of the capital charges on King's Wharf Station (£37,593) and cost of raising loans, &c., amounting to £2,151, there was a net profit of £360,662.

Comparative figures for the year ending 31st March, 1937, are as follows : Revenue, £887,410 ; working-expenses, £144,315 ; interest, £391,241 ; depreciation, £10,464 ; and King's Wharf charges, £38,120—with a net profit of £244,140.

The accumulated Depreciation Reserve and Sinking Funds as at 31st March, 1938, amounted to £1,227,053. Table I gives full particulars of financial results as well as other relevant statistical information.

3. General.

The units generated totalled 798,354,000 for the system. Units actually sold totalled 720,490,034 and units used for station auxiliaries, &c., total 6,637,589.

The balance of 71,226,377 units represents transmission and distribution losses amounting to 8.91 per cent. of the total output.

The maximum load on the system was 143,240 kW. and the annual load factor 63.6 per cent. The total connected load was 1,064,571 kW., and the demand factor or ratio of maximum load to connected load was 13.46 per cent.

4. Construction, Operation, and Maintenance.

A. HAMILTON DISTRICT.

(1) CONSTRUCTION.

(a) POWER-STATIONS.

Arapuni.—Extension work at Arapuni to provide for two additional generating-units was practically completed during the year.

Excavation of the tailrace was completed, and after tests the water was allowed to rise, the pumps were withdrawn, and the needle dam was removed.

The extension of the power-house building to its final dimensions, providing for two future generating-units, was practically completed during the year. A new office was built in concrete for the Station Superintendent, and other rooms lined with sound-proofing material. At the south end of the building the retaining-wall was completed and back-filled and concrete structures cast for the water rheostat and oil-storage tanks, which were then erected. Concrete-work for the lift and cable shaft was completed and part of the interior steelwork erected. A protective fence was built along the top of the cliff above the power-house.

At the outdoor station the construction of the repair-room extension was completed, together with cable trenches and footpaths.

The erection of structural steelwork and switchgear was completed, and the whole of the extensions were enclosed in a protective fence and the ground sown down in grass.

Near the power-house the construction of a permanent blacksmiths' shop was commenced, and a concrete stairway was provided to give access from the road at the top of the lift-shaft to the outdoor station.

Towards the end of the year the old waterproofing of the powerhouse roof, which had become defective, was removed, and the whole roof was then waterproofed with Neuchatel asphalt. Roads adjacent to the power-house and outdoor station were re-graded, and sealed to eliminate dust nuisance.

Work was practically completed on the installation of Nos. 7 and 8 generating units each of 21,000 kW. capacity, and two 24,000 kVA. transformer banks for same, together with the necessary 11 kV. and 110 kV. switchgear and control equipment. By the end of the year the chief work remaining to complete the present programme was the installation of an inclined lift, and two 110 kV. O.C.B.'s for future lines.

No. 7 unit was placed on commercial load on 24th August, 1937, and No. 8 unit on 7th February, 1938. Official tests for turbine efficiency were carried out in March. The addition of these two units has brought the installed generating-capacity of the station up to a total of 102,300 kW.

(b) SUBSTATIONS.

Penrose.—A second 5,000 kVA. bank of 22/50 kV. transformers was put into service on 20th May, 1937, and a fourth 110/22 kV. bank, of 30,000 kVA. capacity, was put into service on 7th April, 1938.

The 110 kV. capacitors on the three Arapuni-Penrose transmission lines were replaced in October by 110 kV. potential transformers. Two new 110 kV. O.C.B.'s have been assembled for the replacement of the existing O.C.B.'s.

A telephone exchange was installed in July, and a new cottage was completed in January.

Bombay.—A second 5,000 kVA. bank of 110/50 kV. transformers was put into service on 12th October, 1937, and a new 50 kV. O.C.B., 110-volt control battery and charging equipment were installed in the same month. Work is in progress on the installation of six new 110 kV. O.C.B.'s, five being for the replacement of the original O.C.B.'s and one for the second 5,000 kVA. bank.

Two new cottages were completed in December.

Hamilton.—The two 1,500 kVA. banks of 50/11 kV. transformers were replaced by two 3,000 kVA. banks, the first bank being changed on 12th October, 1937, and the second on 2nd November, 1937.

A new cottage was completed in January.

Takapuna.—A second 2,250 kVA. bank of 50/11 kV. transformers was put into service on 11th June, 1937, and a bach for the relieving operator was completed in January.

Henderson.—The extension of the 50 kV. steel structure for the take-off of the North Auckland transmission-line was completed, and the line O.C.B. was put into service on 29th September, 1937. The two 50/11 kV. transformer banks were moved to a new position, and two new 50 kV. transformer O.C.B.'s were put into service on 3rd February, 1938.

Three new cottages were completed in January.

Tahekerua.—The substation building, garage, and three cottages were completed early in the year. The temporary 11 kV. switchgear was replaced by the permanent switchgear on 9th May, 1937, and the two 50 kV. O.C.B.'s were put into service on 21st September, 1937.

Mareretu.—The substation building, garage, and three cottages were completed early in the year. The 50 kV. line O.C.B. was put into service on 15th July, 1937, and the temporary equipment was replaced by the permanent 11 kV. switchgear and 50 kV. transformer O.C.B. on 8th August, 1937.

Maungatapere.—The substation building and cottage, and the installation of a 2,250 kVA. bank of 50/11 kV. transformers together with the necessary switchgear were completed, and the substation was put into service as a second supply point for the North Auckland Electric-power Board on 26th September, 1937.

A bach for the relieving operator was completed in March.

Ngongotaha.—A second 750 kVA. bank of 50/6.6 kV. transformers, which was removed from Hangatiki in January, 1937, was put into service on 27th September, 1937.

Edgecumbe.—The 750 kVA. bank of 50/11 kV. transformers was replaced by a 1,500 kVA. bank from Hamilton on 5th January, 1938.

Waiotahi.—The 750 kVA. bank of 50/11 kV. transformers was replaced by a 1,500 kVA. bank from Hamilton on 11th March, 1938. A new transformer was purchased as a spare.

Kerepehi, Waihou, and Te Awamutu.—A bach for the relieving operator was completed at each of these substations in March.

N.Z. Dairy Co., Frankton (11 kV.).—The substation layout was rearranged, and the outdoor 300 kVA. transformer was replaced by an indoor 400 kVA. transformer on 16th July, 1937.

(c) TRANSMISSION AND DISTRIBUTION LINES.

Arapuni-Edgecumbe 110 kV. Line.—Structure sites were pegged and material ordered. A start was made on the cartage of poles to sites in March, 1938. It is expected that this line will be completed early in 1939.

Arapuni-Penrose 110 kV. Tower Line, No. 2.—Structure sites have been pegged and material ordered.

Penrose-Henderson 110 kV. Line.—An aerial survey was made in October, and alternative routes were investigated.

North Auckland 50 kV. Line.—The third section of this line from Mareretu to Maungatapere was completed in May, 1937, and the section was livened in the following month, but the Power Board was not ready for supply until the end of September.

A detailed survey of the Maungatapere-Kaikohe section was carried out, and a general route was selected for the line from Kaikohe to Kaitaia.

Horahora-Hamilton 50 kV. Line.—A deviation to avoid the aerodrome at Rukuhia was completed in December.

Ongarue-Taumarunui 11 kV. Line.—Pole sites were pegged and material ordered, but construction work has not yet commenced.

Hamilton-Frankton 11 kV. Line.—A deviation was made at Nortons Road in December to suit the Department of Housing Construction.

(2) OPERATION AND MAINTENANCE.

(a) POWER-STATIONS.

Arapuni.—A total interruption to 110 kV. supply occurred in April, when a workman made accidental contact with a 110 kV. lead at the outdoor station. Two 11 kV. bus faults were caused by rats, one in August, which tripped out No. 1 generator, and the other in October, which tripped out No. 2 generator, but station supply was not interrupted.

Owing to low river-level the whole of the river flow was taken by the turbines during certain periods in October.

Horahora.—New chains and pins were fitted to the sealing-pipes, and six new rollers were fitted to the roller-trains on the non-automatic gate in the weir.

Penrose Diesels.—The plant was given a short maintenance run each week.

(b) SUBSTATIONS.

Penrose.—To enable the existing transformers of the 22/50 kV. bank to be interchangeable with the new transformers, the 22 kV. cable boxes attached to the bushings on the old transformers were removed, and the cables were terminated on a new cable structure adjacent to the 22 kV. bushings. New 22 kV. and 50 kV. leads and new Merz Price bushing type C.T.'s were fitted to the transformers.

Two 110 kV. bushings were replaced, on account of causing excessive radio interference.

Bombay.—An 11 kV. C.T. on a Power Board feeder O.C.B. broke down in August, and a 50 kV. bushing on the Kerepeehi line O.C.B. broke down in January. The tap-changing switch on one of the 50/11 kV. transformers was damaged in December by arcing caused by a defective contact.

Hamilton.—Two 11 kV. C.T. failures occurred in January. Two more failures occurred in February, and another in March. The old C.T.'s were replaced by tested C.T.'s from stock, and an undamaged but corroded coil was submitted to the Dominion Analyst for examination. It was found that the corrosion was due to nitric acid formed by the hydrolysis of nitrocellulose in the varnish used on the coil by the manufacturers, the action being accelerated by the warm, humid conditions which prevailed at the time of the C.T. failures.

Henderson.—Four defective 50 kV. insulators were replaced.

Tahekeroa.—A 1,000 kVA. 3-phase transformer was transferred from Huntly in February for use as a spare.

Mareretu.—A temporary 11 kV. local service transformer was damaged by lightning in May, and flashovers on a 50 kV. transformer bushing and a 50 kV. insulator were caused by lightning in September.

Maungatapere.—The 50/11 kV. transformer bank was livened on 15th July to give supply to a local service transformer during construction. Supply was not required by the Power Board until 26th September.

Kerepeehi.—Two 11 kV. C.T. failures occurred on a Power Board feeder O.C.B., one in June and the other in November. Lightning caused a flashover in the 11 kV. sealing bell of one of the 50/11 kV. transformers in February, but no material damage was done.

Waikino.—An 11 kV. C.T. broke down in November, and Power Board supply was interrupted by a rat on the 11 kV. bus in March.

Waihou.—An 11 kV. single core, outdoor cable-box on the incoming feeder broke down in November, and a flashover was caused in December by the cap of an insulator on a 50 kV. A.B.S. breaking off when the switch was opened.

Matamata.—An 11 kV. C.T. failure occurred on a Power Board feeder O.C.B. in June.

Te Awamutu.—A 50 kV. bushing broke down in January and damaged three other bushings.

Hangatiki.—A cracked 50 kV. transformer bushing was replaced.

Ngongotaha.—Three cracked 50 kV. bushings were replaced.

Rotoiti.—The 100 kVA. 47.5/6.6 kV. transformer broke down during a thunderstorm on 17th February. A spare transformer was installed, and new coils were ordered for the damaged transformer.

Edgecumbe and Waiotahi.—The 11 kV. earthing reactors, which were taken out of service when the 750 kVA. transformer banks were replaced by 1,500 kVA. banks from Hamilton, are being reconditioned in readiness for service at Ngongotaha.

Huntly, Takapuna and 11 kV. Substations.—No trouble was experienced at any of these substations.

General.—New forty-hour-week rosters were adopted for substation operators in January.

This has necessitated the provision of additional quarters for relieving operators at twelve substations.

(c) TRANSMISSION AND DISTRIBUTION LINES.

(i) 110 kV.

Arapuni-Penrose.—No trouble was experienced on either the wood-pole or tower-line circuits. The work of removing the earth wire from the wood-pole line was carried out as opportunity permitted, but the work is not yet completed. Earthing points were installed at seventeen poles.

Arapuni-Stratford.—The legs on a number of towers were inspected for signs of rusting at and below the ground-line, and were cleaned and painted as required. A large amount of work was done on the clearing of slips from access tracks. A conductor and an insulator unit on tower 95 and two insulator units on tower 150 were damaged by lightning during two storms in January.

(ii) 50 kV.

Penrose-Takapuna.—The work of replacing the 7/13 galvanized-iron earth wire on the steel-tower portion of the line by 7/14 copper, on account of corrosion, was completed.

An outage was caused in April by a flashover in a transposition span between tower 278 and pole 279.

Henderson-Maungatapere.—A large number of flashovers occurred between the 50 kV. line and the telephone line during storms in April and May before the installation of additional span breakers, and the resagging of the telephone-line in places was completed. The Mareretu-Maungatapere section was livened in July, and two further outages of the whole line occurred in February, due apparently to the same trouble, although no evidence of the fault was found. A third outage in February was caused by lightning.

Bombay-Waikino.—A 50 kV. insulator on the Paeroa A.B.S. structure was shattered by lightning in November, and two conductors were damaged by lightning in February.

Horahora-Waihou.—Flashovers occurred between the 50 kV. line and the telephone-line on the tower section during severe gales in May, when the telephone-line was burned through in three spans, and in February when the telephone-line was burned through in two spans.

Waihou-Paeroa.—Flashovers occurred between the 50kV. line and the telephone-line during a gale in February, when a telephone insulator came adrift from the insulator pin and allowed the telephone-line to be blown into the vicinity of the 50 kV. line.

Horahora-Hamilton.—Four insulators were damaged by lightning during a storm in February.

Mystery Creek - Te Awamutu.—Portion of a hedge was uprooted and blown across the telephone-line during a storm in May. The telephone-line fouled a 50 kV. conductor in an adjacent span and both the phase wire and the telephone-line were burned through.

Arapuni-Ngongotaha.—An outage was caused by a piece of wire being thrown across a 50 kV. conductor and cross-arm in October; the cross-arm and pole were badly damaged by burning. An insulator and a jumper on a 50 kV. A.B.S. were damaged by lightning during a storm in February.

Ngongotaha-Waiotahi.—A length of copperweld wire was replaced on account of the copper covering of the wire splitting. The specially treated wire in the sulphur area at Tikitere was examined from time to time, and apart from the binders, which were repainted, and a section of the telephone-line, which was replaced on account of corrosion, the condition of the line was satisfactory.

Waikino-Aongatete, Hamilton-Huntly, Te Awamutu - Hangatiki.—Routine patrol and maintenance work was carried out on each line.

(iii) 11 kV.

Horahora-Hautapu.—Two conductors were burned through when a whirlwind struck the line in August, and both feeders were dislodged from the insulators on a pole which was struck by a motor-lorry in February.

Hamilton-Frankton.—A flashover was caused by a skipping-rope being thrown across the line in October.

Waikino-Waihi.—The phosphor-bronze telephone-wire was replaced by No. 8 galvanized-iron in a number of spans, and several corroded members of the steel towers were replaced by reconditioned parts obtained from towers on the old Waiorongomai line.

A flashover occurred between the 11 kV. line and the telephone-line during a storm in February.

Grand Junction Tap and Arapuni Village.—No trouble was experienced on these lines.

(iv) General.

Maintenance.—Regular patrol and maintenance work was carried out on the various lines and access tracks, and the routine testing of poles and insulators was carried out according to schedule.

Insulator Replacements.—Two hundred and seventy-seven defective insulators, consisting of four 110 kV. insulator units, two hundred and sixty-nine 50 kV. pin insulators, and four 11 kV. pin insulators, were replaced. Of this number, 244 were found defective by live-line testing and thirty-two by inspection; one failed in service through being shattered by lightning.

Fifty-eight defective 50 kV. insulators were replaced with the use of live-line tools.

Pole Replacements.—Fifty-one defective poles, consisting of three 52 ft., thirty-four 48 ft., three 35 ft., and eight 25 ft. poles, were replaced. Of this number, fourteen poles (ten I.B. and four M.A.H.) had defective heartwood, eight poles (I.B.) had decayed or extensive knot holes, twenty-five poles (twenty-three I.B. and two M.A.H.) had both defective heartwood and decayed or extensive knot holes, three poles (I.B.) were undersized, and one pole (I.B.) was damaged by fire.

(d) TESTING.

Routine maintenance tests were carried out on instruments, meters, relays, &c., throughout the system, and installation tests were carried out on the various items of new equipment. Installation tests were made on both the Power Board and Departmental switchgear, meters, relays, &c., at Tahekeroa, Mareretu, and Maungatapere substations. The new generators, transformers, switchgear, &c., at Arapuni were tested, and efficiency tests on No. 7 turbine were carried out.

(e) GENERAL.

System Operation.—Arapuni Power-station was run in parallel with the Mangahao-Waikaremoana system throughout the year. Horahora Power-station was run for two load shifts daily, except Sundays,

until 18th October, after which date it was found possible to reduce the station running-time to one load shift daily, five days a week.

Assistance was obtained from the standby plants over the evening peak load period five days a week during the winter months, the Penrose Diesel station being run from the end of April to 10th May, and King's Wharf station from 11th May to 19th August.

Owing to lack of rain in the southern district the loading at Arapuni was considerably increased in the second half of June and the first half of July in order to conserve water at Mangahao and Waikaremoana, and additional assistance was obtained from King's Wharf station. From 2nd to 13th July, Arapuni supplied between 20,000 and 30,000 kW. over the Stratford tie line for sixteen hours a day and King's Wharf ran on a block loading of approximately 10,000 kW. for two load shifts daily.

Supply was given to the Tauranga Borough Council for eight days in January on account of a shortage of water at McLaren's Falls Power-station.

Load.—The units generated totalled 547,911,002, an increase of 25·7 per cent. over the total output in the previous year. Units actually sold (within the district) totalled 398,105,446; net supply to the southern system totalled 108,677,209 units; and units used free of charge totalled 3,377,754. The balance of 37,750,593 units represents transmission and distribution losses, amounting to 6·89 per cent. of the total output.

The maximum load on the generating-plant was 96,856 kW., compared with 80,000 kW. in the previous year; and the maximum load, excluding supply to the southern system, was 84,140 kW., compared with 71,060 kW. in the previous year. The average load factor was 64·58 per cent.

The total connected load increased from 425,829 kW. to 500,795 kW., and the demand factor or ratio of maximum load to connected load, excluding supply to the southern system, was 16·79 per cent.

Troubles on Department's System.—The following table gives an analysis of the troubles which originated on the Department's system in each of the last three years:—

Description.	Year ending 31st March,		
	1936.	1937.	1938.
6·6 or 11 kV. lines—			
(1) Defects .. .. .	..	..	1
(2) External causes	1	1	3
33, 50, or 66 kV. lines—			
(3) Defects	5	3	5
(4) External causes	6	4	2
110 kV. lines—			
(5) Defects	1	..	..
(6) External causes	6	3	..
(7) Lightning	7	20	11
(8) Storms, nature of trouble not discovered	4	1	2
(9) 5, 6·6, 11, or 22 kV. apparatus	4	8	12
(10) 33, 50, or 66 kV. apparatus	3	3	6
(11) 110 kV. apparatus	6	1	3
(12) Generators or synchronous motors	1	..	..
(13) Relays	1	..	..
(14) Control circuits and batteries	1	3	..
Operation—			
(15) Mistakes	5	4	3
(16) Accidents	2	2	3
(17) Other causes	3	1	..
(18) Cause unknown	4	2	..
Totals	60	56	51

Circuit miles of transmission lines in operation: 11 kV., 49·18; 33 kV., nil; 50 kV., 431·74; 66 kV., nil; 110 kV., 421·88.

Number of substations in service: 11 kV., 3; 33 kV., nil; 50 kV., 17; 66 kV., nil; 110 kV., 3.

Number of consumers: Bulk, 12; wholesale, 6.

Of the fifty-one troubles which occurred in the last year, forty-three caused interruptions to consumers' supply. Excluding outages of the new North Auckland 50 kV. line during severe storms in April and May before the installation of additional span-breakers in the telephone-line had been completed (these separate outages are not included in the above list), and an interruption of nearly two days and a half to Rotoiti supply in February when the 100 kVA. transformer was damaged by lightning, the average number of accidental interruptions to supply was 5·4 per supply point, the average duration being 34·3 minutes.

B. PALMERSTON NORTH DISTRICT.

1. CONSTRUCTION.

(a) POWER-STATIONS.

Mangahao Power-house and Headworks.—A start has been made on the construction of six new cottages for the staff, and a 12 ft. wide access road to the site, complete with culverts, was laid down.

Waikaremoana Power-house and Headworks.—The construction of the pipe-line for No. 3 unit is well under way.

The survey of the headworks, tunnel, and pipe-line for the lower development, which was started early in the year, is proceeding.

Eight new cottages and additional single men's quarters, together with the requisite roading and footpaths were completed during the year.

(b) SUBSTATIONS.

Khandallah.—Two banks of 110 kV. potential transformers, complete with limiting resistances, switches, fuses, and auxiliary transformers, were put into service.

The requirements of additional transformers, 110 kV. switchgear, and steelwork were investigated, and the work of replacing the existing 11 kV. switchgear with equipment of increased rupturing capacity was put under way.

Paraparauumu.—The building of the single men's quarters was completed during the year.

Bunmythorpe.—One staff cottage and also single men's quarters were erected during the year. An 110 kV. lightning-arrester to protect the east transformer bank, and two banks of 110 kV. potential transformers, complete with limiting resistances, fuses, and switches, were put into service.

Wanganui.—An 110 kV. lightning-arrester was erected to protect the west transformer bank. A deep well was bored and a pump installed to augment the cottage water-supply.

Two additional staff cottages were built.

Hawera.—A surge counter was put into service on the 110 kV. lightning-arrester.

An additional cottage was erected.

Stratford.—An additional staff cottage was built, and the single men's quarters was shifted to a new site.

Masterton.—The requirements of further 110 kV. switchgear and steelwork to be used in connection with the Masterton-Melling line were investigated.

Melling.—The requirements of further 110 kV. switchgear and steelwork to be used in connection with the Masterton-Melling line were investigated.

Mangamaire.—A new well was dug and the pump shifted to the new site. A new cable and 11 kV. switch cubicle for use with an additional transformer bank were installed during the year.

Woodville.—New single men's quarters were built, a new well dug and the pump shifted to the new site.

Dannevirke.—One new staff cottage was built.

Levelling of the ground for the new steelwork bay is proceeding.

Waipawa.—Two additional staff cottages were built, and a new well was dug.

Napier.—Two banks of 110 kV. potential transformers, complete with limiting resistances, fuses, and switches, were put into service, the 110 kV. capacitors being dismantled.

Two new staff cottages were built.

Wairoa.—A local service transformer and station oil-tanks were installed.

Gisborne.—An 11 kV. earthing-resistance has been installed in the neutral of the earthing-transformer to limit the fault current.

(c) TRANSMISSION-LINES.

Khandallah-Masterton.—The survey of this line was practically completed during the year. Several parts of the line were repegged for deviations on account of the geological aspect of the country, earthquake faults, &c. The question of snow-loading was investigated and titles were searched for wayleaves.

Sites for the proposed depot at Akatarawa were investigated.

Woodville-Napier Duplication.—The survey of this line is proceeding.

(d) GENERAL.

Accommodation.—Owing to lack of accommodation and in order to replace temporary buildings, an extensive building programme has been carried on throughout the year at various power-stations and substations. This work has been mentioned above in most cases under the individual substations and power-stations.

Palmerston North Office.—A considerable amount of construction was completed during the year. The new wing of the office was completed and was largely occupied by the General Branch. The section of the original building which was thus vacated was modified to provide more room for the typistes and Stores Branch office. The ground floor of the new wing consisted of an extension to the existing store and an additional store and test-room for the General Branch.

In the yard a fourteen-stall garage, complete with workshop, &c., a pole-stacking site, a plant-shed and a loading-bank were completed, and an extension was made to the railway siding.

2. OPERATION AND MAINTENANCE.

(a) POWER-STATIONS.

Waikaremoana.

Headworks.—The lake-level has not varied much during the year, the level at 31st March, 1937, being 2010.60 and the level at 31st March, 1938, was 2011.20. The highest recorded level was 2014.10 and the lowest 2007.90. The rainfall for the year was 73.39 in. and the evaporation 25.63 in.

In order to provide extra storage for peak capacity, the level of Lake Kaitawa was raised 18 in. by a timber bulkhead on the weir, and stone pitching was laid down at various places to protect the shore-line. The various stop-logs have been overhauled, replaced where necessary, and new fittings and ropes put on. The stop-log house was rebuilt and the surge-chamber gates were examined and new ropes fitted.

On two occasions the pipe-lines were emptied and the insides of the top sections of the pipes examined and found to be in good order.

Power-house.—New charging-equipment of the copper-oxide-rectifier type was installed for the new battery, and the old booster apparatus dismantled. After the old battery was discarded the battery-room was subdivided and is now ready for occupation as an electrician's workshop.

An air-compressor was installed for a supply of air to the governors, garage, &c.

The 11,000/400 volt transformer which burnt out last year was reconditioned, and all 11 kV. trifurcating-boxes throughout the station were refilled. Several original 110 kV. post-insulator units which broke off under the caps were replaced by a more recent type, and an investigation was made into the thermal properties of the broken insulators.

Reliability of Generating-units.—With the exception of a small amount of governor trouble, the operation during the year has been very satisfactory.

Mangahao.

Headworks.—No floods of any importance occurred during the year, a few freshes only being recorded. Numbers of minor slips occurred at various places in the catchment area, particularly in places where the vegetation was damaged during the storm of February, 1936. One heavy slip brought down large masses of rock and timber, completely blocking the access road near No. 2 dam.

The total rainfall at No. 1 dam for the year was 104.86 in., rain being recorded on 198 days. The total amount of waste water recorded at No. 2 dam was 4,536,000,000 cubic feet.

Power-house.—No trouble of any consequence was experienced in the power-house during the year. The switchboard-gallery lighting was remodelled and converted to a totally indirect system. A start was made with the reconstruction and rewiring of the main control board.

(b) SUBSTATIONS.

Khandallah.—There were no periods of total interruption to this substation during the year.

The core of one of the 4,000 kVA. transformers was lifted and examined.

Paraparauumu.—This substation operated satisfactorily throughout the year.

Bunnythorpe.—The 110 kV. bushings on the east transformer bank were reconditioned.

A considerable number of cracked 110 kV. post insulators were changed during the year.

Marton.—Owing to the rapid increase of load on this substation during the year it was found necessary to replace the current-transformers on the Department's metering equipment.

Wanganui.—During the year the 110 kV. bushings on the east transformer bank and the 11 kV. switch hoods were reconditioned. The three cores of the east transformer bank were lifted and the windings examined.

The local service-transformer capacity was raised to 25 kVA.

110 kV. co-ordination gaps were erected on the lightning-arresters.

Hawera.—All the 110 kV. bushings on the transformer banks were reconditioned.

The local service-transformer capacity was raised to 25 kVA.

Stratford.—The 110 kV. bushings on the 110/11 kV. transformer bank and on the 110 kV. potential transformers were reconditioned, and the cores of the 110/50 kV. transformer bank were lifted and the windings examined.

New Plymouth.—One 11 kV. bushing was replaced.

Okato.—During the year this substation was put on full automatic operation, and has given satisfactory service.

Melling.—Repairs were carried out on a 5,000 kVA. transformer which was damaged by lightning.

Masterton.—This substation gave satisfactory service during the year.

Mangamaire.—During the year the substation phasing was altered to conform with the standard arrangement.

The core of the west transformer bank was lifted and the windings examined.

The capacity of the local-service transformer was raised to 25 kVA.

Woodville.—This switching-station gave satisfactory service throughout the year.

Dannevirke.—The 110 kV. bushings on both transformer banks were reconditioned.

The 110 kV. potential transformers were disconnected and transferred to Mangahao.

The local-service transformer capacity was raised to 25 kVA.

Waipawa.—The cores of both 110 kV. transformer banks were lifted and examined, and the 110 kV. potential transformers were disconnected and transferred to Mangahao.

The local-service transformer capacity was raised to 25 kVA.

Napier.—The 15 kVA. local service transformer was replaced by one of 25 kVA. capacity to cope with the demand of two extra cottages.

Wairoa.—The 50 kV. bus-bars were reconstructed so as to enable the spare transformer to be placed in service, if required, without delay. A new gantry was erected for handling the transformers.

Gisborne.—Due to a drop in insulation-resistance test-values, the voltage regulator was taken out of service and dried out; new coils have been ordered.

(c) TRANSMISSION-LINES.

(i) 110 kV.

Mangahao-Khandallah Duplicate Lines.—These lines operated satisfactorily during the year.

Alterations were carried out to the telephone-line across the Otaki River bed where several piled poles were erected.

Khandallah-Melling.—One interruption, caused by a flashover due to lightning, was experienced on this line during the year.

Mangahao-Bunnythorpe Duplicate Lines.—One interruption was experienced on this line during the year due to a lightning flashover.

Two-thirds of this line was given a thorough overhaul by the special maintenance gangs; several poles were replaced and extensive river-protection works were built at the Manawatu River crossing, where 6 chains of willow and chain mesh net matting and two piled open-type groynes (one 30 ft. and one 62 ft. long) were placed in position.

Preparatory work was carried out on the telephone-line for the rewiring of the section from Whitmore Road to Bunnythorpe.

Bunnythorpe-Marton-Wanganui.—This line operated satisfactorily during the year, and was given a thorough overhaul by the "live-line" gang, a fair proportion of the work being done under live-line conditions. The work of fitting vibration dampers at all suspension clamps is well under way.

On the telephone-line further small deviations were carried out at the Rangitikei River on account of new road and railway-works.

Wanganui-Hawera-Stratford.—One interruption was experienced on this line during the year due to lightning, no damage being caused.

On the telephone-line there were several interruptions, due principally to the following causes: hay-stacker fouling line, dynamic induced currents (both from Power Board and departmental lines), Power Board power-line fouling, slack span, cracked bobbin insulator, insulator off pin, faulty extension bell, faulty sectionalizing-switch, short piece of fencing-wire thrown across line, and insulators broken by stones. A pole was burnt near Wanganui; no interruption, however, was caused.

Stratford-Pohokura.—This section of line operated satisfactorily during the year.

The operation of the telephone-line was satisfactory.

Bunnythorpe-Woodville.—This line gave satisfactory service throughout the year. A thorough overhaul of the Bunnythorpe-Pohangina section is in the process of being carried out by the "live-line" gang. On tower 19 on the Ruahine Range the insulators were changed from suspension to strain type to give the necessary clearance to a new road between towers 19 and 20.

On the telephone-line one interruption was caused by the wires twisting together.

Woodville-Mangamaire-Masterton.—This line gave satisfactory service during the year.

Several insulators were blackened by a fire which burnt down a house close to the line.

On the telephone-line two huts were shifted and a pole which was burnt by a gorse fire was replaced. Two interruptions to the telephone-line were caused by twisted wires.

Woodville-Dannevirke-Waipawa-Napier.—Two interruptions occurred on this line during the year, one being caused by a flashover due to bird deposit on insulators, and the other by lightning. Due to the River Board's protective work in the Ngaruro River bed, a tower was replaced by another tower on a piled foundation. An additional strain pole was also erected as part of this alteration.

On the telephone-line several interruptions occurred, among the causes being a Power Board line fouling, insulator working off pin, wire off insulator, and a drop of water across the gap of a lightning-arrester.

Napier-Waikaremoana Duplicate Lines.—Two interruptions occurred to this line during the year, one caused by a flashover due to a scrub fire and the other due to the breaking of a sectionalizing-switch insulator, the resulting arc involving both lines.

Festoon vibration dampers were fitted to this line with excellent results.

On the telephone-line there was one interruption.

(ii) 50 kV.

Stratford-New Plymouth.—One interruption occurred on this line during the year due to lightning.

At certain positions where vibration breaks at binders have been reported previously, a number of experimental vibration dampers of the festoon type have been installed.

On the telephone-line one interruption was caused by lightning, the wire being burned through in two places.

Waikaremoana-Gisborne.—This line operated satisfactorily during the year.

The telephone-line was satisfactory.

Waikaremoana-Wairoa.—One interruption occurred on this line during the year, due to a tree being felled across it. Intensive work has been carried out by a "live-line" gang during the year. Twelve-foot cross-arms have been fitted and the line moved out on most poles to facilitate live-line work. A check survey of this line was also made.

(iii) 11 kV.

Mangaore-Shannon.—This line was maintained in good condition by the Horowhenua Electric-power Board. One fault occurred, due to a broken wire near Shannon.

Khandallah-Petone.—This line operated satisfactorily throughout the year, no trouble being experienced.

Tuairi 11 kV. Lines.—A complete overhaul was carried out on the Lake House line and the line to Thomas Bros. mill, the latter being deviated to clear houses in Valley Road.

(iv) General.

(1) *Lightning-storms.*—Sixteen storms were reported during the year, but only five caused disturbances on the system. One on the Melling-Khandallah line caused a flashover of the line insulators and also a flashover inside one of the transformers at Melling Substation, and one on the

Wanganui-Hawera line caused an interruption, but no signs of damage could be found. One of the co-ordination gaps at Wanganui flashed over. Three other storms caused flashovers on the Stratford-New Plymouth Waipawa-Dannevirke, and Mangahao-Bunnythorpe lines respectively.

(2) *Special Maintenance*.—During the year the "live-line" gang completed the overhaul of the Bunnythorpe-Wanganui line. Latterly this gang has been working on the Mangahao-Bunnythorpe lines and the section of the Bunnythorpe-Woodville line from Bunnythorpe to Pohangina River crossing. The "live-line" gang has been encamped at Bunnythorpe, while the other special-maintenance gang, which has been located at Mangaore, has co-operated on the Mangahao-Bunnythorpe line overhaul. A third maintenance gang was engaged on the overhaul of the lines radiating from Tuai Power-station.

In addition to special maintenance, changing poles and insulators, and refitting poles, &c., under live-line conditions, assistance was given by these gangs with the usual maintenance on various lines and substation structures.

An overhaul of the Porirua Mental Hospital L.T. overhead lines was also carried out.

The 11 kV. feeder lines for the Railway Department traction supply were completed and tested, and have now been made available to that Department.

Experimental work was carried out with the oxy-acetylene pole burning outfit, it being found that after winter rains the rot in the poles had too much moisture for successful burning. Tests on an automatic line-splicing device were also made, but further work was delayed on account of the manufacturer's failure to reply to a query regarding the ability of the device to withstand conductor vibration.

(3) *Khandallah High-tension Testing-set*.—The usual retests were made of insulators found defective by live-line testing. In addition to this work, several tests (including porosity tests) were made for the Post and Telegraph Department. Porosity, puncture, and flashover tests were made on some sample foreign insulator units.

(4) *Insulator Deterioration*.—Live-line testing of all insulators in service was carried out with the following results.—

	Strain.	Suspension.
Total number tested—		
110 kV.	24,041	99,977
50 kV.	1,812	1,194
Number defective—		
110 kV.	19	153
50 kV.	2	Nil
Total number tested		127,024
Total defective		174
Per cent. defective		0.137

The above table does not include 50 kV. pin type insulators.

(5) *Guy Insulators*.—A series of careful measurements was made throughout the year to determine the slippage of the end connections of the new (wedge) type of wooden guy insulators. Slippage was found to be entirely negligible.

(d) TELEPHONE LINES.

An investigation was carried out into the "blistering" of copper-weld telephone wire which is commencing to give trouble owing to resulting breaks.

Initial indications of the trouble, as well as being shown by breaks in the wire, were shown by rust patches or "blisters," where the inner steel had become exposed and commenced to rust.

In view of the importance of this problem (there are approximately 2,240 miles of various sizes of this wire in use by the Department and Supply Authorities throughout the Dominion), a thorough investigation was made. Wire in use and in stock was examined for blisters, and various cross-sections were mounted, polished, and photomicrographs prepared.

The outcome of this was that the basic cause appeared to be due to the dissymetry of the steel core, rendering the outer copper unduly thin in places. It also appears that this trouble has been overcome in material of recent manufacture.

Sections of wire showing evidence of "blistering" are at present being replaced.

(e) COMMUNICATION SYSTEM.

The terminal equipment was maintained in good order throughout the year, and tests, which included investigations on acoustic shock absorbers and portable telephones, were made on various types of new instruments.

Several systems of communication between the generating-rooms and the control rooms of the power-houses were tried, and a design was made for a system which it is considered will be a satisfactory solution of this problem.

Crystal control was installed on the transmitters of the experimental radio-telephone between Mangahao and Tuai, and a large amount of data was collected on the operation of this equipment. This is at present being analysed, but the indications are that with the present power of 100 watts at the transmitters the service is entirely satisfactory, except for approximately two hours either side of midday, when results are erratic.

(f) TESTING.

Maintenance tests on all relays, meters, and instruments at the respective power-stations and substations have been kept up to date and results recorded. In addition, maintenance tests on relays and instruments involving modifications to panel circuits have been made on behalf of several Power Boards.

A considerable amount of electrical testing-work involving recoverable charges has been done in the Testing Laboratory on behalf of outside Supply Authorities.

Acceptance and installation tests were made on all new equipment prior to the placing in service of such equipment at power-stations and substations.

Special investigation tests have been carried out in the field as required in connection with system interruptions, and consideration has been given to the increase in loading from some points of supply, necessitating the installation of larger ratio current transformers and rescaling of certain indicating-instruments.

The system apparatus six-monthly megger tests have been graphed and analysed and further action taken, where necessary.

(g) GENERAL.

(1) *Load*.—The maximum load on the system was 61,120 kW. as compared with 55,160 kW. last year. However, if the output of Evans Bay Power-station is included, this year's maximum demand was 71,730 kW., as compared with 63,100 kW. last year, an increase of 13.7 per cent. The total output was 359,120,207 units, or 362,275,540 units including Evans Bay output, an increase of 17.8 per cent. on last year's total of 307,580,890 units, the annual load factor being 57.7 per cent., as against 55.6 per cent. last year.

The Mangahao-Waikaremoana system was operated in parallel with the Arapuni system throughout the year, and the following are the details of the interchange of power between the two systems (last year's figures are given in brackets):—

From Arapuni—					
Maximum demand	.. .. .	..	..	..	27,190 kW. (20,840 kW.)
Units supplied	.. .. .	..	..	..	108,677,209 (52,858,752)
To Arapuni—					
Maximum demand	.. .. .	..	..	..	13,920 kW. (6,620 kW.)
Units supplied	.. .. .	..	..	..	53,727 (98,788)

(2) *Reliability of Supply*.—During the year there were twenty-eight faults on the Department's system, causing interruptions to consumers. There were also eleven faults on the Department's system, which were cleared without interruption to consumers.

The average number of accidental interruptions to each of the seventeen consumers was 2.53 and the average duration 5.8 minutes. The total average duration to each consumer was 14.7 minutes.

No figures are included for Opunake Electric-power Board, as it is difficult to obtain reliable data on interruptions, owing to the fact that this Board is supplied through one of the New Plymouth Borough Council feeders.

With reference to prearranged interruptions, the average number to each consumer was 3.29 and the average duration 2 hours 33 minutes. The total average duration of prearranged interruptions to each consumer was 8 hours 26 minutes.

In many cases Supply Authorities took advantage of the prearranged interruptions to carry out maintenance-work on their own systems; also in most instances both for prearranged interruptions and accidental interruptions, the New Plymouth Borough Council and South Taranaki Electric-power Board were able to carry all or portion of their own respective loads.

Analysis of Troubles on Department's System for the Three Years ending 31st March, 1938.

Reference.	Description.	Year ending 31st March,		
		1936.	1937.	1938.
1	6.6 or 11 kV. lines : Defects	1	3	..
2	6.6 or 11 kV. lines : External causes .. .. .	..	..	..
3	33, 50, or 66 kV. lines : Defects	5	1	1
4	33, 50, or 66 kV. lines : External causes .. .. .	..	..	..
5	110 kV. lines : Defects .. .. .	..	..	..
6	110 kV. lines : External causes	3	6	2
7	Lightning	8	5	7
8	Storms : Nature of trouble not discovered .. .. .	..	..	..
9	5, 6.6, 11, or 22 kV. apparatus .. .. .	..	6	3
10	33, 50, or 66 kV. apparatus	1	1	1
11	110 kV. apparatus	10	4	6
12	Generators or synchronous condensers	3	..	..
13	Relays	3	..	4
14	Control circuits and batteries .. .. .	..	..	1
15	Operation : Mistakes	3	2	4
16	Operation : Accidents	5	2	1
17	Other causes .. .. .	..	..	8
18	Cause unknown	5	4	2
	Totals	47	34	40

Circuit miles of transmission lines in operation at end of year : 11 kV., 28·62 ; 33 kV., Nil ; 50 kV., 106·94 ; 66 kV., Nil ; 110 kV., 581·66.

Number of substations in operation at end of year : 11 kV., 1 ; 33 kV., nil ; 50 kV., 3 ; 66 kV., nil ; 110 kV., 14.

(3) *General*.—The load during the winter months of the year under review was very heavy, calling for careful study of the position and close attention by the operating staffs of the power-stations, whose efforts are to be commended.

The severe floods which occurred in the Hawke's Bay Province just after the close of the financial year necessitated very considerable effort on the part of the staff in that area in the discharge of their duties, and they are to be congratulated on their performances.

SOUTH ISLAND ELECTRIC-POWER SYSTEM.

INTRODUCTORY.

Hitherto the "South Island Electric-power System" referred to the Lake Coleridge and Waitaki plants which are now operating as an interconnected system. In October, 1936, the generating plant at Lake Monowai, together with the whole reticulation system of the Southland Electric-power Board, was acquired by the Government and placed under the control of this Department as an addition to the "South Island Electric-power System," although it is not yet interconnected with the Lake Coleridge-Waitaki section. On 1st February, the Arnold River Hydro-electric Station of the Grey Electric-power Board was acquired by the Government and will in the near future be interconnected with the Lake Coleridge system.

Consequential on these acquisitions the accounts have since been amalgamated, and in future the "South Island Electric-power System" will comprise the Lake Coleridge-Waitaki-Southland-Arnold River plants operating as an interconnected unit.

The capital in operation at 31st March, 1938, was £6,319,615, and included in this amount there is a sum of £337,508 representing assets not yet in operation. In Table II will be found an analysis of the capital outlay. The revenue for the year was £491,551, and working-costs £126,715, which resulted in a gross profit of £364,836, equal to a return of 6·07 per cent. on the capital in operation. After paying interest £220,112, depreciation and other capital charges £113,737, the net result was a profit of £30,987 for the year.

The accumulated Depreciation Reserve, General Reserve, and sinking funds as at 31st March, 1938, amounted to £930,322, and Table I gives full particulars of financial results as well as other relevant statistical information.

Pending completion of the 110 kV. transmission-line to connect up the Southland system, the report of operating results is this year presented under two individual headings—viz., (a) Christchurch District, and (b) Invercargill District.

A. CHRISTCHURCH DISTRICT.

The year ended 31st March, 1938, completed the twenty-third year of operation of the Lake Coleridge undertaking, and the third complete year of operation of the Waitaki Power Scheme.

These two generating-stations have been run in parallel for the period, and operating and financial statistics have been combined with those of Arnold River.

A further marked increase in system loading occurred during the year, and work on the supply and distribution of electric power in the West Coast districts has been proceeded with—the Diesel station being put into service at Dobson on 1st February last to work in conjunction with the Arnold River Power-house to give power supply.

1. Capital Outlay.

The capital outlay at 31st March was £4,798,907, of which assets to the value of £291,296 were not in operation.

2. Financial Results.

The total revenue for the year was £336,385, and working-expenses totalled £67,343, making a gross profit of £269,042, which equals a return of 5·92 per cent. on the average capital outlay in operation (£4,544,070).

The interest charge for the year was £160,483, which, together with depreciation (£82,885) and the cost of raising loans (£971), was met from revenue, leaving an amount of £24,703 available for the sinking fund this year.

The accumulated Depreciation Reserve and sinking funds at the 31st March, 1938, amounted to £790,482, and the General Reserve Fund £87,199.

Table I gives full particulars of the financial results and also statistical returns of operations for the year.

The detailed operating-costs show that the cost per unit generated for the year was 0·066d. (exclusive of capital charges), compared with 0·0823d. for the previous year, a decrease of 19 per cent. This decrease is due to increased load factor consequent on heavy loads.

In Table V are given the gross financial results of the distribution of power from the combined stations, and of the Local Supply Authorities, and other consumers connected to the Government Supply system.

3. General.

The total units generated was 242,391,775, representing an increase of 27·4 per cent. on those of last year. Of these units, 205,579,104 were sold, while 3,147,486 were otherwise accounted for. The balance of 33,665,185 units represents transmission and distribution losses, and amounted to 13·9 per cent. of the units generated.

The maximum system load increased from 44,520 kW. to 51,860 kW., an increase of 16·5 per cent.

The average load factor for the year was 53·40 per cent., an increase on that of last year which was 48·8 per cent.

4. Construction, Operation, and Maintenance.

(1) CONSTRUCTION.

(a) Power-stations.

Lake Coleridge Power-station.—At the power-house work on 66 kV. extensions, in connection with supply of power to the West Coast, was commenced, and two bays of steelwork were completed as an extension to the outdoor structures. The associated air-break switches, busbars, insulators, and connections have also been installed. A steel terminal tower was also erected to terminate the 6·6 kV. line to Murchisons' Homestead, and the telephone and overhead lines to the surge chamber, &c., have been transferred to a new terminal structure to provide space for the two new transmission lines to the Coast.

The new Harper River gates at the intake of the diversion channel were completed by the General Branch during the year; the traffic bridge across the channel was strengthened, and two new suspension bridges were constructed—one across the channel and the other across the river at the gates. The boulder groyne to the west of the gates was extended and a concrete mattress laid on the lake side of the outlet dam.

Waitaki Power-station.—New construction work included the building of stores accommodation at the upper stores floor of the power-house.

A sewerage system for the staff cottages was completed during the year.

(b) Substations.

Addington Substation.—No new construction work was carried out during the year at this substation.

A contract was completed for the extensions to the garage.

Hororata Substation.—No construction work was done at this substation.

Point Substation.—No construction work was done during the year.

Ashburton Substation.—At Ashburton a bank of four 1,767 kVA. transformers was installed to replace the existing bank.

Timaru Substation.—The construction of traverser track and foundations for turntable and new 110 kV. oil-circuit breakers was commenced near the end of the year in preparation for the change over of this station to 110 kV. in place of the existing voltage of 66 kV.

Glenavy Substation.—No construction work was done during the year.

Oamaru Substation.—At Oamaru Substation a fence was erected around the 11 kV. outdoor gear and work on the new cottage was commenced.

Half-way Bush Substation.—In December the switchgear and steelwork for the substation extensions to accommodate the new 110 kV. line to Gore, was received, and in March the work of erection of the extensions was commenced. A contract for excavation and levelling was let and the assembly of the steelwork was started.

Smith's Road Substation.—The erection of a new 33 kV. to 11 kV. substation at Smith's Road for the supply to Springs-Ellesmere Power Board was started, and to date good progress has been made. All the outdoor equipment and transformers have been installed and the indoor switchgear installation is well advanced.

Motukarara Substation.—New pole structures and switchgear were erected to terminate the new 33 kV. line from Stoddarts Corner and give supply to Banks Peninsula Power Board.

(c) Transmission Lines.

The main transmission-line work has been in connection with the lines to the West Coast. This is detailed under Section (g) below.

A 33 kV. line, single circuit 7/14 copper, from Stoddart's Corner to Motukarara Substation (8½ miles) was completed and put into service.

(d) Telephone System.

The trunk telephone system was extended from Lake Coleridge to Hokitika, and the line put into service in November. All sections of the system are now in communication, including Dobson Diesel Station and Arnold River Power-house. A power ringer set was installed at Addington Substation during the year.

(e) Test Department.

The dismantling of the Diesel switchgear and plant and the reinstallation at Dobson, including the necessary testing and adjustment was carried out. Three truck type 11 kV. units were removed from Hororata and installed temporarily at Dobson. The control and relay panels for the 66 kV. substation at Dobson are being constructed. All watertight telephones and test points were installed on the Coleridge-Arahura telephone lines.

Nine telephone test points were built and forwarded to Southland.

The control and relay panels for Arahura Substation are being constructed.

During the year 328 tests and reports were made, and 90 drawings completed.

Six portable telephones of a special light weight were designed and built.

A total of 52 repair and test orders were executed on behalf of other Government Departments and consumers.

An occulting relay was installed to operate a harbour light at Westport.

Resuscitation practice was conducted at all substations and power-houses by a member of the staff.

(f) *Survey.*

The survey of the Lake Coleridge—Arahura 66 kV. transmission line was completed during the year, and also the survey of the Arahura—Dobson 66 kV. line extension. A survey of the Dobson—Blackwater 66 kV. line was practically completed, and has since been finished and construction commenced.

Preliminary location of the route for the new transmission-line from Southbrook to Waipara and Culverden was done during the year, and a start has now been made on the survey, the work having progressed to date as far as Waipara.

Due to possible interference to Post and Telegraph lines, the Dobson—Blackwater line was relocated to the western side of the Grey River, thus giving greater separation from the main communication circuits of the Post and Telegraph Department.

(g) *West Coast Electrification.*

During the year the following progress was made on the construction of the main 66 kV. transmission-line to the West Coast:—

- (i) The Arthurs Pass—Otira tower section (33 towers) was completely erected and partly wired.
- (ii) The Mount Misery tower section was commenced and stubs set for the complete section (20 towers).
- (iii) Piling of footings and erection of structures was completed in the Waimakariri, Mingha, Otira, and Teremakau Rivers.
- (iv) The pole-line was completed from Waimakariri River to Arthurs Pass, from Otira tunnel tower towards Jacksons for approximately six miles.
- (v) Poles were distributed from the Waimakariri River to the Mount Misery towers.
- (vi) Construction was started from Arahura Substation to Jacksons.

The delay in pole deliveries seriously interfered with construction, and to date there still remains approximately 350 poles to be delivered for the Canterbury side of the line.

The Arahura Substation buildings were completed and the synchronous condenser installed, the outdoor structure and equipment erection was well advanced during the year. Access roads and fencing was done. Two staff cottages are being built.

From Arahura Substation to Dobson a section of 66 kV. line was completed by contract, the final connection to the system will be made later.

The Diesel plant at Lyttelton, together with the building, was transferred and erected complete at Dobson, and by the end of the year three of the generating-units were completed for service. The output from Dobson Diesel Station was first coupled to the existing system supplied from Arnold River Power-house on 18th January, and commercial supply was first given on 1st February, when the Department took over the Arnold River Power-house. A 33 kV. line from this Power-house was converted to 66 kV., to form part of the main transmission system.

Work at Dobson is proceeding on the completion of the outdoor substation structures, where in the future Dobson Station and the main distribution system will be tied in with the supply from Coleridge over the main 66 kV. transmission-lines.

Staff accommodation was provided by the erection of four cottages.

Sites for the 66 kV. substations at Blackwater and Ngahere have been selected, and work on the main line to the former substation is in progress of construction.

Distribution lines at 11 kV. are being constructed for the supply to the Arahura and Kanieri dredges near Hokitika.

(h) *Wigram Aerodrome.*

Switchgear and cables have been ordered for the reticulation at Wigram Aerodrome, and a section of the staff cottages has been connected by underground cables to form part of the completed underground system of supply to the main buildings, workshops, and staff accommodation. Work has been commenced on the standby station, where a Diesel generating-set and switchgear will be installed.

(2) OPERATION AND MAINTENANCE.

(a) *Power-stations.*

General.—During the year the Lake Coleridge and Waitaki power-stations operated in parallel satisfactorily. The construction of the Harper River gates was facilitated by drawing additional load from Waitaki as required, and thus enabling the Coleridge water-supply to be conserved. During the period of construction of the Harper gates the level of Lake Coleridge dropped to 1,665.9 ft. by December, but by the end of the period was at 1,671 ft., the gates having been completed and in service by the end of December.

Lake Coleridge Power-station.—The lake-level dropped practically 6 ft., due to the construction of the Harper River gates, but recovered as stated above.

The Acheron diversion works operated satisfactorily throughout the year.

Maintenance-work on the No. 1 tunnel pipe-line gates was carried out, and No. 1 tunnel inspected in February.

Pipe-lines Nos. 1, 2, and 3 were painted on exterior surfaces, and all defective patches were scraped and given one coat of bitumastic black paint. Parts of the interior of No. 2 pipe-line were also painted during the shut-down necessary for work on the gates.

Improved stores accommodation was provided at the power-house.

No. 2 unit was shut down in February for attention to the runner, which was forwarded to Christchurch for repairs to damage caused by cavitation, and a spare runner was fitted.

Routine tests and maintenance-work were carried out on the switchgear and control equipment and village maintenance on cottages and services was done.

Waitaki Power-station.—The permanent sluices were operated in August, and surplus shingle at the downstream end of the apron was scoured down to grade and consolidated by grouting at the foot of the apron.

Main equipment and plant has been in continuous service, and has been given the necessary maintenance as required.

The local post-office was transferred to the power-house on 1st April.

A memorial tablet erected in the generator room to the memory of men who lost their lives during the construction of the works was unveiled by Mr. H. E. Herring, M.P., on the 20th June.

In the village corrugated-iron fences were erected round thirteen sections containing staff cottages, and the usual service-maintenance work was carried out.

(b) Substations.

The Addington switchgear, with one exception, has functioned satisfactorily during the year—the exception being the failure of an 80/5 current transformer on No. 1 steelworks feeder, which caused an explosion of the current transformer chamber on 21st March.

Routine oil filtering, insulator testing, and maintenance-work has been carried out at all substations.

A considerable amount of transformer and switchgear fitting was carried out in connection with extensions:—

Three 66/6.6 kV. 1767 kVA. single-phase transformers were converted for 33 kV. service at Arnold River Power-station.

A 66/3.3 kV. 295 kVA. 3 ph. transformer ex Hororata was altered for service as an earthing transformer at Dobson.

For Smith's Road Substation, four 33 kV. transformers were dried out and four switchgear iron-clad panels prepared for service.

Alterations to taps on transformers for Woods Mill Substation were made, and an 11 kV. 360 kVA. transformer was repaired for the Tramway Board.

Transformers for distribution purposes were overhauled and dried out.

Oil for stock and service has been filtered as required.

Taps and tapping-switches were fitted on four 66/6.6 kV. 1,767 kVA. transformers for Ashburton.

No. 1 condenser has operated satisfactorily during the year, but minor trouble has been experienced with No. 2 condenser, which has yet to be fitted with special equipment to facilitate easy starting.

(c) Transmission Lines.

The condition of the main transmission lines was satisfactorily maintained, the necessary inspection and replacements having been carried out.

During the year there was one total interruption to main supply at Addington of 3½ minutes on the 4th September, caused by a flashover at Hororata at 8.36 a.m., due to switching operations.

On the northern 11 kV. line 70 poles were replaced and all conductors re-regulated where required.

There were no major faults during the year; on the main lines 72 poles and 9 insulators were replaced under live-line methods.

The annual insulator testing was completed and a total of 94,245 insulators were tested, of which 554 were located as defective.

(d) Analysis of Trouble on System.

Reference.	Description.	Number.
1	3.3, 6.6, or 11 kV. lines : Defects	1
2	3.3, 6.6, or 11 kV. lines : External causes	4
3	33, 50, or 66 kV. lines : Defects	2
4	33, 50, or 66 kV. lines : External causes	4
5	110 kV. lines : Defects	4
6	110 kV. lines : External causes .. .. .	..
7	Lightning .. .. .	..
8	Storms : Nature of trouble not discovered	1
9	3.3, 6.6, 11, or 22 kV. apparatus	9
10	33, 50, or 66 kV. apparatus	4
11	110 kV. apparatus	2
12	Generators or synchronous condensers	1
13	Relays .. .. .	..
14	Control circuits or batteries .. .. .	..
15	Operation : Mistakes	1
16	Operation : Accidents .. .. .	..
17	Other causes	1
18	Cause unknown	2
	Total	36

Circuit miles of transmission line in operation at end of year : 11 kV., 91 miles 11.4 ch. ; 33 kV., 82 miles 72 ch. ; 66 kV., 350 miles 65 ch. ; 110 kV., 259 miles 35 ch.

Number of substations in operation at end of year : 11 kV., 25 ; 33 kV., 2 ; 66 kV., 4 ; 110 kV., 3.

(e) Test Department.

The telephone installation on the system has been maintained, all watertight telephones previously installed were overhauled and fitted with breathers.

The usual two-monthly tests of rubber gloves and boots were carried out.

The quarterly tests of 11 kV. switchgear at Timaru and Addington were done.

The annual check of testing standards was done.

The time-clocks of the system were maintained satisfactorily.

Assistance was rendered other branches of the system in testing, adjusting, &c.

Insulator tests were carried out as required.

O.C.B.'s were examined and repaired where required.

(3) Rainfall and Lake Levels.

Maximum flow at Waitaki for the year ended 31st March, 1938, was 50,400 cusecs on 10th January.

Minimum flow at Waitaki for the period was 4,300 cusecs on 18th August.

Lake Coleridge: Rainfall for the year was 31.86 in. Harper: Rainfall for the year was 40.07 in.

Waitaki: Rainfall for the year was 17.83 in. Lake Coleridge: Lake-level at 31st March was 1,670.98 ft.

B. INVERCARGILL DISTRICT.**1. Capital Outlay.**

The capital outlay at 31st March was £1,520,708, of which assets to the value of £46,212 were not in operation.

2. Finance.

The total revenue for the year was £155,166, including a sum of £122, being additional charges in connection with rates levied by the former Southland Electric-power Board. Working expenses for the period were £59,372, including £73 for commission for collecting rates. The interest charge was £59,629. After providing an amount of £29,490 for the Depreciation Reserve and £392 for cost of raising loans there was a net profit of £6,283.

3. Construction, Operation, and Maintenance.**(1) CONSTRUCTION.***(a) Power-station and Village.*

Monowai.—Plans for two cottages and a communal garage are in hand. At the same time alterations to the staff bach are to be undertaken. Owing to shortage of houses, portions of this bach have been used for housing a family. The proposed alterations will allow single men to be catered for as at other generating stations of the Department.

(b) Substations.

The major work in hand is that of extending the Gore Substation in preparation for the linking-up of the Lake Coleridge—Waitaki system with the Southland system.

As a corner of the site is subject to flooding, a certain amount of filling had to be used to raise this corner above flood-level.

Road access has been levelled, a water-tower erected, concrete transformer pads have been placed in position, and a traverser track laid.

The contractor has completed the oil-filter house, oil-tank pads, and workshop foundations, but erection of the workshop itself has been delayed owing to the non-delivery of steel stanchions. These are expected shortly, and the drying-out of the transformers will be commenced as soon as the building is available and the crane is erected. Arrangements are in hand for the erection of the outdoor steelwork as soon as it comes to hand.

Plans are in hand for the erection of additional cottages and single men's quarters to house the substation and line staffs.

Winton Substation.—Plans are in the course of preparation for the erection of additional cottages and single men's quarters. A rearrangement of the outdoor structure is also contemplated.

Invercargill Substation.—Plans are in the course of preparation for the erection of additional cottages and single men's quarters. The layout of additional steel structures, transformers, and control equipment is also under consideration, in order to cope with the growth of load.

Ohai Substation.—The mining load in this area is at present fed from Winton Substation over an 11 kV. line. Owing to the growth of load this line has become overloaded. Arrangements have therefore been made to secure the necessary land and erect a 66/11 kV. substation at Ohai. The necessary equipment has been ordered, and erection will be commenced at an early date.

Faultsmen's Residences.—Faultsmen in outlying areas are finding great difficulty in obtaining houses, and in two instances this was found to be quite impossible. The Department is therefore providing residences at Tuatapere and Waimahaka.

(c) Transmission Lines.

Half-way Bush—Gore 110 kV. Line.—The survey of the section Berwick to Gore has been completed, plans prepared, and poles located for pegging. Schedules of quantities have been made out and contract documents for the layout of material and erection of structures are ready for advertising

when sufficient poles and cross-arms come to hand. Way-leave notices have been sent out for this section. A survey of the Half-way Bush - Berwick section is proceeding, and the preparation of plans, schedules, way-leaves, &c., is being carried out simultaneously in the field.

Aerial photographs have proved of the utmost value in deciding upon the location of the line in this section.

Tenders have been invited for the cartage of material on this section, and it is proposed to commence erection in May. Provided material comes to hand, it is hoped to have this line in service in December.

Owing to the extreme difficulty which is being experienced in obtaining the necessary number of hardwood poles for this line, an investigation of sites suitable for a factory for the manufacture of reinforced concrete poles has been carried out and the necessary reinforcing steel for these poles has been ordered.

All the necessary plant for construction has been ordered and practically all items are to hand with the exception of motor-lorries.

(d) Telephone System.

Steady progress is being made on the sections Wingatui-Crichton and Waipahi-Invercargill by the Railway Department where this Department's line runs on the Railway Department poles.

The section Half-way Bush to Wingatui constructed by the Hydro-Electric Branch, Public Works Department, has been completed for some time, but the commencement of the section Waipahi to Crichton was delayed pending the arrival of poles.

The work was commenced towards the end of February, and good progress has been made as far as the Clutha River. Enough poles are now arriving to keep the job going, but no suitable lorry is yet to hand.

Arrangements have been made with the Post and Telegraph and the General Branch, Public Works Department, *re* the crossing of the Clutha River at the site of the new bridge at Clydevale. It is expected that this work will be completed in two months.

Approximately five miles of telephone-line were constructed from the Monowai Power-house to connect with the Post and Telegraph line to Blackmount. This has already proved its usefulness, as communication can still be maintained with Monowai should a fault on the main transmission-line put out of commission the Department's high-tension telephone-line which is run on the same poles as the transmission-line.

(e) Secondary Distribution.

The duplication of the seventeen-mile 11 kV. feeder to Bluff was completed during the year. Owing to the nature of the load supplied by this feeder the bulk of this work had to be done during the week-ends.

Additions and extensions constructed during the year to serve additional demands have been phenomenal and have severely taxed both erection gangs and transport.

(2) OPERATION AND MAINTENANCE.

(a) Power-station and Headworks.

An extremely dry summer was experienced at Monowai, resulting in a steady fall in the level of Lake Monowai, which at 31st March, was almost 5 ft. below the normal level. This made necessary the bringing into operation of the city steam-plant in Invercargill in order to conserve water, whereas in former years it has been utilized only to assist Monowai over the heavily loaded periods.

During the summer months plastering work at the intake gates and surge chamber was carried out as the frosts of successive winters had caused the top layer of concrete to flake.

An estimate was made of repairs and renovations which it would be necessary to carry out at the residences in the village, and tenders will shortly be called for this work.

A motor capable of operating the gates at the intake to the pipe-line was installed there, and when necessary alterations have been made to the line to the intake gates it will be possible to operate these gates from the power-station.

A complete set of spare stator windings and insulation for each make of machine installed in the power-station was ordered. These have now arrived and are in store at the power-station.

A survey was made of the Waiiau River Bridge, the bridge across the canal at Monowai, and the bridge across the Monowai River. All these bridges were found to be in need of repair. The road from the Waiiau River Bridge to the headworks is also in very bad condition, and estimates were made of the cost of the carrying-out of the necessary repairs. This work will be put in hand at an early date.

(b) Substations.

Routine oil filtering and maintenance-work has been carried out at all substations during the year.

At 12.25 p.m. on 29th July, a transformer bushing broke down at Gore Substation, the transformer was taken out of service and replaced by a spare, and supply restored at 2.10 p.m.

On 18th August, a flashover on the incoming panel at Gore brought out the main line at Winton. The parts affected have since been insulated, and no further trouble from this cause has been experienced.

(c) Transmission-lines.

On 3rd November a heavy wind off the sea caused a flashover due to depositions of salt on the outdoor structure at Invercargill.

On 9th November a pole caught fire on the Winton-Gore section. The fire was apparently caused by the slipping of the U bolt holding the short cross-arm supporting the insulator, thus allowing the insulator to come in contact with the pole-top.

On 1st and 2nd December flashovers occurred on the airbreak switch on the outdoor structure at the Invercargill Substation. An insulator on the switch was found to be cracked, and was replaced.

Owing to the fact that no systematic clearing of gorse and scrub in the neighbourhood of the lines had been undertaken for some time, outages occurred owing to fires under the lines on 11th November on the Monowai-Winton section, on 5th December on the Winton-Gore section, during January on the Winton-Invercargill section, and on 6th February on the Monowai-Winton section. Owing to the dryness of the summer, additional men were engaged, and the work of clearing the growth from under the lines was expedited.

(d) *Distribution-lines.*

Three additional line gangs have been formed with the object of undertaking a systematic overhaul of these lines, but up to date this work has been hampered by the difficulty experienced in obtaining the necessary number of motor-trucks.

Records of interruptions show that by far the greatest number of these are caused by the breakdown of fuse bases, of which there are nearly five thousand throughout the system. Arrangements are in hand for the replacement of these by a more suitable type, and this work will be completed as expeditiously as possible.

Interruptions due to birds contacting with earth-guards are also being eliminated by erecting stranded wire at all Post and Telegraph crossings and eliminating the guard wherever possible.

(e) *Consumers' Installations.*

Owing to the number of applications which were being received for the supply of electrical energy, consumers were experiencing delay in getting their installations inspected and passed after the premises had been wired. This branch of the service was therefore increased in numbers and placed under the control of a Chief Inspector.

(f) *General.*

Assistance was given to the General Branch in erecting the 11 kV. transmission-line and repairing apparatus at the Homer Tunnel damaged by the avalanche.

During the year arrangements were made whereby consumers may make payment of their electricity accounts at any money-order post-office in the Southland Electric-power District. The arrangement means that there are now thirty-three receiving agencies in Southland at which consumers may pay their accounts. The facility is provided free to the consumers.

(g) *Units generated and purchased.*

Generated at Monowai	..	..	..	..	..	31,176,950
Generated by steam (Invercargill)	..	..	..	..	..	726,990
Total	..	..	..	..	..	<u>31,903,940</u>

Of these, 15,606,623 were sold to retail consumers, 7,950,861 to bulk consumers, while 256,971 were accounted for in departmental use. The balance, representing losses, totalled 8,089,485, or 26 per cent. of the units generated.

The number of active consumers on 31st March was 10,886.

DESIGN OFFICE.

A. **Electrical Section.**

During the year under review a large amount of design work was involved in connection with the various hydro-electric systems controlled by the Department.

With the continued growth of load in areas already served, and the extension of the Department's activities into new areas, the need for additional generating-capacity becomes apparent.

In the North Island the peak load for 1937 exceeded the installed generating-capacity then in operation by an amount equal to the output of one of the two new generating-units at Arapuni. Since then both of these units have gone into commercial operation, adding 43,333 kW. of generating-capacity, and there are indications that most, if not all, of this will be required to carry the peak load of the coming winter. With the installation of the third new generating-unit at the Waikaremoana Main Power-station, a further 20,000 kW. of generating-capacity will be made available. It should be noted, however, that this unit is being installed primarily as a much-needed standby to the two existing units at this station. In the absence of any control works at the lake outlet it is possible to utilize only the normal flow of the Waikaretaheke Stream, together with the limited storage at Lake Kaitawa. This is insufficient for the continuous operation of all three generating-units, though it may permit of their operation for peak loads of short duration. The decision to proceed with the lower development of the Waikaremoana Scheme will add a further 40,000 kW., approximately, to the installed generating-capacity.

In the South Island the load in the Southland area has for some time past exceeded the capacity of the Monowai Hydro-electric Station, the output of which has been supplemented by supply from the Invercargill Steam-station.

In the Westland area the South Island Diesel station, which has been transferred from Lyttelton to Dobson, is now operating in parallel with the Arnold River Hydro-electric Station to supply the Grey Power Board, pending the completion of the transmission-lines from Lake Coleridge.

To provide for the increasing load of the main South Island System, and the additional load which will result from the inter-connection with the Southland and Westland Systems in the near future, two additional generating-units are to be installed in Waitaki Power-station, which will add 30,000 kW. to the installed generating-capacity.

To meet the growing load on the main substations the installed transformer-capacity is being increased by 30,000 kVA. at Penrose Substation, 20,000 kVA. at Khandallah Substation, and 40,000 kVA. at Addington Substation.

At a number of the smaller substations the installed transformer-capacity is being increased either by the addition of a second bank of transformers, or by the replacement of existing banks by others of larger capacity where two banks are already installed.

At substations where the voltage is liable to fluctuate appreciably and synchronous condensers or other means of voltage correction are not provided, the new transformer banks are being fitted with automatic on-load tap-changing equipment to maintain constant output voltage. In the Waikato district automatic on-load regulating-transformers are being provided for existing transformer banks to achieve the same result.

Lake Coleridge-Waitaki System.

Waitaki Power-station.—In connection with the extensions to Waitaki Power-station, drawings and specifications were prepared for tendering purposes for main turbines and generators, voltage-regulating equipment, indoor switchgear and control equipment, 11 kV. to 110 kV. transformer banks, and 110 kV. outdoor switchgear and steelwork. Quick-response excitation is being provided to ensure stability in the electrical operation of the system.

Half-way Bush Substation.—Layout and foundation drawings were prepared for the 110 kV. steelwork and switchgear extensions, including controlling oil-circuit breakers for the transmission-lines to Gore and Oamaru.

Drawings and specifications were prepared for control and relay panels for the 110 kV. equipment, together with detail wiring diagrams for these panels.

Timaru Substation.—In view of the projected change-over of this substation from 66 kV. to 110 kV. operation, the existing 66 kV. oil-circuit breakers and step-down transformers are being replaced by 110 kV. equipment. The present equipment will be utilized for extensions in other parts of the system which will operate permanently at 66 kV. In the meantime, part of the equipment will operate at 66 kV., and part at 110 kV., as the interconnecting auto-transformers are remaining at this substation for the present. Foundation drawings have been prepared for the 110 kV. oil-circuit breakers, and preliminary drawings for tendering purposes for the transformer banks which will be fitted with automatic on-load tap-changing equipment.

Palmerston South Substation.—The design work for this substation is being carried out by the Christchurch office. The initial equipment includes a 2,250 kVA. bank of 110 kV to 11 kV. transformers, with automatic on-load tap-changing equipment, a 110 kV. air-break switch for connecting the bank to the transmission-line, and liquid fuses for overload protection.

Addington Substation.—Drawings were prepared for tendering purposes for the two new 20,000 kVA. banks of 66/11 kV. transformers.

Westland Area.

In order to supply power for the Otira Tunnel electrification which is at present supplied from a steam-station nearby, a substation is to be erected at Otira. The equipment at this substation will include 66 kV. switchgear for two through-transmission lines, and one 3,000 kVA. bank of transformers, with provision for a second future bank. A preliminary layout was prepared for the substation and outdoor switchgear.

Arahura Substation.—The design work carried out for this substation included foundation drawings for 5,000 kVA. synchronous condenser, and control equipment, foundation details for 11 kV. indoor switchgear, and cable ducts.

The design work for the 66 kV. switchgear for the Westland substations and all the design work for the remaining substations is being done by Christchurch office.

Southland System.

Gore Substation.—Detail drawings and specifications were prepared for the building contract for workshop building and oil-filter house. Layout and foundation drawings were prepared for the 110 kV. and 66 kV. switchgear, and 110/66 kV. interconnecting auto-transformers.

Drawings and specifications were prepared for the control and relay panels for the above equipment, together with detail wiring diagrams for these panels and associated equipment. The existing 66/11 kV. transformers at this substation will shortly be replaced by a new 5,000 kVA. bank, with automatic on-load tap-changing equipment. Detail drawings and specifications were prepared for a traverser truck for handling the transformers.

Ohai Substation.—A preliminary layout was prepared for the 66 kV. switchgear, and 750 kVA. bank of 66/11 kV. step-down transformers. Initially, this substation will be equipped with air-break switches for supplying the transformers from either transmission-line and liquid fuses for overload protection.

Mangahao-Waikaremoana System.

With the interconnection of the main North Island power-stations, and recent increase in generating-capacity, the 11 kV. oil-circuit breakers at Mangahao Power-station are now inadequate to meet the exacting service under short-circuit conditions, and are being replaced by new equipment of larger rupturing-capacity. For the same reason, the 11 kV. oil-circuit breakers at Khandallah Substation are being replaced with others of larger rupturing-capacity, the displaced switchgear in this case being transferred to Hamilton No. 1 Substation to replace inadequate equipment at that substation.

The decision to proceed with the erection of the 110 kV. transmission-line from Masterton to Melling involves new controlling switchgear and equipment at both substations. The erection of this section will provide an alternative supply-line to Khandallah via Masterton.

The 110 kV. transmission-line from Napier to Woodville, which carries the bulk of the output from Waikaremoana Power-station, has been subject to severe overloading for some years, and the decision to proceed with its duplication will reduce the transmission losses on this section materially. For this line controlling switchgear is being provided at Woodville and Napier substations, and steelwork for terminating the sections thereof at intermediate substations with an air-break sectionalizing switch at Waipawa.

Khandallah Substation.—A layout drawing was prepared for the steelwork, switchgear, transformers, and other outdoor equipment, showing the proposed location of equipment on order.

Drawings and specifications were prepared for the control panels for the outdoor equipment. New equipment being installed at this substation includes 20,000 kVA. bank of 110/11 kV. transformers, 110 kV. switchgear and steelwork for this bank, and for the Khandallah-Melling-Masterton transmission-line, potential transformers for line-relay protection, with combined disconnecting switches and fuses for their isolation and protection, and additional lightning-arresters.

Drawings and specifications were prepared for the 110 kV. switchgear and steelwork. Detail drawings and specifications were prepared for a two-stall reinforced-concrete garage.

Melling Substation.—Drawings and specifications were prepared for 110 kV. switchgear for the Melling-Masterton transmission-line, and an additional bay of steelwork, which also provides for a second transformer bank at a later date.

Masterton Substation.—Drawings and specifications were prepared for tendering purposes for 110 kV. switchgear for Masterton-Melling line, together with a fourth bay of steelwork for mounting. The contract includes also switchgear for duplicate three-phase 110/11 kV. transformers, switchgear for potential transformers for line-relay protection, and for the existing Masterton-Mangamaire line. Some of this switchgear will replace existing equipment, which is nearing the end of its useful life.

Woodville Substation.—Detail drawings and specifications were prepared for tendering purposes for a reinforced-concrete control-room and workshop building.

Drawings and specifications were prepared for 110 kV. switchgear for the second Napier-Woodville line, and two additional bays of steelwork complete with bus-bars and bus-bar sectionalizing switches. The drawings and specifications for this contract include also the steelwork and switchgear for this line at the other substation *en route*, together with other new or replacement equipment required for the switchgear installations thereat.

Dannevirke Substation.—Two new bays of steelwork are included, together with four new air-break switches for existing equipment, bus-bars, and connections for second three-phase 110 kV transformer, and through connections for the second line.

Waipawa Substation.—One new bay of steelwork is being added with connections and sectionalizing air-break switch for second line, and four replacement air-break switches for existing equipment.

Napier Substation.—Switchgear for the new line is being added.

Bunnythorpe Substation.—Drawing was prepared for tendering purposes for 10,000 kVA., 110/11 kV. transformer bank.

Mangahao Power-station and Village.—Drawings and specifications were prepared for tendering purposes for twelve cottages in two contracts together with extensions to water-supply and sewerage systems, and garages for rental for private cars of operating staff, comprising one five-stall communal garage, one two-stall, and two single-car garages. Some of these cottages will replace existing temporary accommodation, and others are required for the extra staff required due to the introduction of the forty-hour week.

Waikaremoana Power-station and Village.—Drawings and specifications were prepared for tendering purposes for 110 kV. switchgear for the third generating-unit, and for a proposed installation of reactors to limit the maximum rupturing duty of the 11 kV. switchgear on short-circuit to its safe rupturing-capacity.

Detail drawings and specifications were prepared for eight five-roomed cottages, together with extensions to roading, water-supply, and drainage; and for a new building for single men's and visitors' accommodation.

Drawings and specifications were prepared for garages for rental for private cars.

Specifications were prepared for air-conditioning equipment for the control-room.

Waikaremoana Lower Development.—A preliminary layout of building and equipment on site was prepared.

Arapuni-Horahora System.

Arapuni Power-station.—The design work for the extensions to the power-station and outdoor station was completed except for a few minor details. A new Superintendent's office in reinforced concrete has been added to the original power-station annexe to free the present office for much-needed stores accommodation. A new blacksmiths' shop in reinforced concrete, and a reinforced-concrete kiosk for housing the distribution switchgear for the outdoor station extensions, have also been built. The installation of control and power cables which involved about four hundred cable runs for

extensions in hand, and provision for additional cables for future units Nos. 5 and 6 called for a large amount of detail design work for layout of cables, and details of cable cleats and supporting steelwork.

With a view to simplifying the layout as much as possible, up to nineteen conductors have been grouped in a single cable in a number of cases. The installation of lighting and auxiliary power circuits and fittings was another item which involved a large amount of detail design work. A feature of this installation is the new system of lighting for the control-room. In any control-room a high intensity of illumination is demanded, and careful planning is necessary to avoid glare and reflection from the instrument glasses. The position of this control-room demands artificial lighting twenty-four hours per day, and it was finally decided to provide a system of lay-lighting.

Penrose Substation.—The new 20,000 kVA., 11 kV. synchronous condenser for this substation is being arranged for semi-automatic operation, and is equipped with closed circuit air-circulating system and quick-response excitation. It is connected to the 22 kV. bus-bars through its own bank of transformers. The cooling water-supply for the circulating-air coolers will be recirculated through the cooling-tower for the adjacent Diesel station. A preliminary layout drawing was prepared for the synchronous condenser and equipment, and a traverser truck for handling the transformers was designed. Foundation drawings were prepared for this bank of transformers, the new 30,000 kVA., 110/22 kV. bank, and for two new oil-circuit breakers which will replace existing equipment.

Hamilton No. 1 Substation.—In connection with the transfer of the 11 kV. oil-circuit breakers from Khandallah Substation, drawings and specifications were prepared for the equipment required to complete the new switchgear installations.

Bombay Substation.—Drawings were prepared for tendering purposes for two new 3,000-kVA. banks of 50/11 kV. transformers with on-load tap-changing equipment. Foundation drawings were prepared for a 5,000 kVA. bank of 110/50 kV. transformers, six 110 kV. oil-circuit breakers, and one 50 kV. oil-circuit breaker.

Ongarue Substation.—Preliminary layout drawing of 110 kV. equipment on site was prepared.

Henderson Substation.—With the increasing load of the North Auckland area, the existing 50 kV. lines from Penrose to this substation are becoming inadequate, and additional 110 kV. lines are being considered. To provide for these lines and for the necessary 110/50 kV. transformer banks a rearrangement and partial replacement of the existing 50 kV. switchgear and steelwork is involved. A layout drawing showing this rearrangement has been prepared. Drawings and specifications were prepared for tendering purposes for the new 50 kV. switchgear and steelwork, and for two new 3,000 kVA. banks of 50/11 kV. transformers with on-load tap-changing equipment.

Maungatapere Substation.—Drawings were prepared for an additional bay of steelwork and 50 kV. switchgear to provide for the extension of the line to proposed substations in Bay of Islands Electric-power District.

Waikato Substations: General.—Drawings and specifications were prepared for switchgear cubicles for isolating and short-circuiting switchgear for the automatic on-load regulating transformers which are being installed at a number of substations.

Wiring diagrams were prepared for 11 kV. outdoor switchgear and metering-cubicles for North Auckland Substations.

Transmission-lines.

West Coast (66 kV. lines):—

- (a) Lake Coleridge to Arahura, via Arthur's Pass and Otira. Double circuit.
- (b) Arahura to Blackwater, via Dobson. Single circuit.

Work on above lines was continued from last year. Charts prepared for locating supports and stringing conductors. On account of late delivery of poles, several alternatives have been investigated.

Dunedin-Gore (110 kV. line).—Work continued from last year. Details of supporting structures supplied for use in the field, and deviations in the route of the line at the Clutha River crossing and the Taiari Aerodrome investigated.

Arapuni-Edgecumbe (110 kV. line).—A resumption of the work on this line, started some years ago, was made. The preliminary location of supports on route plans was completed and material ordered. Special work consists of steel towers for lake and river crossings, steel-cored aluminium conductors for a section near Tikitere Springs where sulphur fumes are injurious to copper, and short poles for about ten miles east of Rotoiti Township on account of difficult access to route of line.

Arapuni-Penrose (110 kV. line).—There is already a single-circuit wood-pole line and a double-circuit steel-tower line between Arapuni and Penrose, but the growth of load requires additional transmission-line capacity, and a second double-circuit steel-tower line is in hand. A specification and outline drawings were prepared and tenders called for the towers. Designs submitted by tenderers were analysed to ascertain their compliance with the specification, and a strength chart made for use on final location of towers on the route.

Melling-Masterton (110 kV. line).—This line has to cross over the Rimutaka Range, and on account of the rough country steel towers are to be employed between Melling and Featherston. The specification for the towers and outline drawings were prepared. Tenders were called for, and designs submitted by tenderers were analysed to see if they complied with the specification. Several matters connected with the route of the line were also investigated. Material was ordered for the wood-pole section, Masterton to Featherston.

Miscellaneous.—Drawing prepared and steelwork ordered for converting existing 66 kV. steel towers at Rangitata River to 110 kV. construction. These towers are on the line between Ashburton and Timaru, the voltage of which is to be raised in the near future. Field data also supplied in connection with restringing part of the river crossing with steel-cored aluminium.

Further work has been done on standard specifications for New South Wales timber poles and cross-arms, with a view to a more uniform inspection. Several other Government Departments have co-operated in this work.

General.

With the modern practice of housing the control equipment for a power-station in a control-room designed to exclude all extraneous noise, the heat from the control apparatus frequently makes conditions unsatisfactory for the operating staff. To remedy this, air-conditioning equipment is being provided for Waikaremoana Power-station control-room, and is under consideration for Arapuni.

Specifications were prepared for rectifier-charging equipments for Bombay, Arahura, Gore, Dobson, and Half-way Bush substations.

With the growing scarcity of suitable supplies of hardwood poles, an investigation of various types of reinforced-concrete poles was undertaken to ascertain the most suitable design for transmission-line work. Preliminary work carried out includes tests of various grades of concrete, trials of types of reinforcement, method of vibratory placing, manufacture of sections of full-size poles, design of moulds, and manufacturing-equipment.

Specifications were prepared, and design work for electrical equipment carried out as required for Mechanical Branch and other Departments.

Registration certificates were prepared and draughting-work carried out as required for the Wiremen's Registration Board.

The plotting of operating data for the various systems, including lake-level and river-flow data, maximum loads, and weekly output for generating-stations, maximum demands and consumption of energy for Local Supply Authorities, and other major consumers was continued throughout the year.

The reorganization of the plan recording and filing system was undertaken, and a cross-indexing card-system was inaugurated. Approximately three thousand prints of contractors' drawings and eight hundred departmental drawings were indexed and recorded.

B. Hydraulic Section.

Investigation of Power Resources.

Proposals for further development of the South Island system during the next ten years have been prepared. These comprise:—

- (1) A power-station in the Rakaia Valley opposite Methven, to develop approximately 20,000 kW. with water from the Rangitata River, conveyed by irrigation canals during the irrigation off-season;
- (2) A power-station about 20,000 kW. at Tekapo, combined with a low-regulating dam to conserve water for the winter season. This conservation will permit of further development of the Waitaki scheme; and
- (3) Completion of the Waitaki Power-station to 75,000 kW.

Investigations in the Waikato River basin, which were suspended on account of lack of staff, have been resumed. When completed a schedule for further development will be prepared for the North Island.

New Development.

During the year testing for foundations and the physical properties of the country were so far advanced that recommendations were submitted for a further development at Waikaremoana, taking the water discharged from the main station and generating power in a new station about two miles downstream. The various features of the scheme have been worked out and the general features of design prepared.

Arnold River Development.

When the Department took over this development from the Grey Electric-power Board some erosion had taken place below the dam, and the Board had prepared places and were engaged on remedial measures. This work was taken over and redesigned, and construction is well advanced. The Department has also taken over the erection of gates on the dam, raising pondage-level a further 10 ft. Before these can be utilized, however, some alterations are required at the surge chamber.

River-flow Statistics.

Collection and recording of river-flow data has been continued, and study has been given to the characteristics of the discharge from catchments of different types, and of the frequency and intensity of floods and droughts.

ELECTRIC-POWER BOARDS.

There are now forty-five electric-power districts constituted, and forty-one Electric-power Boards (including Westland Power, Ltd., operating under delegated license) are actually carrying out the distribution and sale of electrical energy (August, 1938). The total area covered is 71,816 square miles, or 69.4 per cent. of the total area of the Dominion (103,415 square miles); the total population under this form of control is 1,060,977, or 66.6 per cent. of the total population (1,591,974) of the Dominion; and the unimproved value of the land included in the electric-power districts and outer areas is £231,317,557, or 78 per cent. of the total unimproved value of the Dominion (£295,695,574).

So far only one of the four main cities—viz., Auckland—has been included in the inner area of an electric-power district, but of the secondary centres the cities of Wanganui and Palmerston North, and the boroughs of Timaru, Napier, Hastings, Blenheim, Greymouth, Gisborne, and Oamaru are included. The advantage of Power Board organization is more obvious to rural than to urban ratepayers, and yet the above position indicates that some of the more important centres have realized 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.

Table VIII gives details of the gazetted date of constitution, the area, population, and rateable value of each of forty-five power districts already formed, also the amounts of the loans already authorized, and the voting on polls taken. The total amount of the loans authorized by the forty-one districts (including Bay of Islands not yet in service) which have taken polls is £13,344,700. The population of the districts concerned is 972,477 (including the population of separately licensed boroughs forming part of the electric-power district and represented on the Power Board), so that the loans authorized amount to £13.74 per head of population, as compared with £14.22 last year. The unimproved valuation of the districts is £208,121,505, the loans authorized amounting to 6.3 per cent. of the unimproved rateable value of the lands pledged as security for the loans. The aggregate voting at the polls totalled 76,160 for and 13,835 against the respective loan proposals.

Table XI shows the capital outlay incurred by each Board up to the end of the financial year 1937–38, together with the revenue and annual expenditure.

The total capital outlay by the forty Boards which are in operation is £13,607,497, practically all of which is on works in service. The gross revenue from the sale of electricity by these Boards was £2,580,956. The general result is a profit over the whole business of the Power Boards of £179,252 for appropriation to reserve funds, &c., after paying working-expenses and capital charges for interest, sinking fund, and depreciation.

During the last year three of the Boards struck a general rate, which was collected in all cases, and the following table gives details of the rates levied and collected :—

RATES COLLECTED BY ELECTRIC-POWER BOARDS FOR YEAR ENDED 31ST MARCH, 1938.

Name of Board.	General Rate.		Availability Rate.		Special Rates.		Total Amount collected.
	Levied.	Collected.	Levied.	Collected.	Levied.	Collected.	
Banks Peninsula ..	d. 0.02 and 0.18	£ 2,449*	..	..	d. ..	£ ..	£ 2,449*
Malvern	$\frac{7}{32}$	1,927*	..	..	..	..	1,927*
Marlborough ..	..	..	..	128*	..	..	128*
Manawatu-Oroua ..	..	25*	..	..	..	..	25*
Otago .. ..	..	348*	..	..	..	..	348*
Taranaki .. ..	..	..	..	25*	..	..	25*
Wairoa	$\frac{1}{18}$	1,186*	..	..	..	..	1,186*
Totals, 1938 ..	..	5,935	..	153	..	..	6,088
„ 1937 ..	..	13,358	..	130	..	..	13,513

* Includes arrears for previous years.

LOCAL ELECTRIC-SUPPLY SYSTEMS.

Including the eight Government plants, there are now (31st March, 1938) forty-one public electric-power stations operating in the Dominion.

Ninety-one local electric-supply authorities are directly engaged in the retail sale of electricity, and the following table shows the proportion using Government-generated power :—

Class of Local Authority controlling Electric-supply System.	Using Government Supply (63).			Using Non-Government Supply (28).
	Wholly.	Partial.	Total.	
Power Board	29 (a) §	4 (b) (d) §	33	7 (c) §
City Council operating own reticulation ..	3 (e)	2 (f)	5	1 (g)
Borough Council operating own reticulation	12 (h)	7 (i)	19	9 (j)
County Council operating own reticulation	2 (k)	..	2	3 (l)
Town Board operating own reticulation ..	1 (m)	1 (n)	2	1 (o)
Company .. ..	..	..	..	5 (p)
Private .. ..	..	..	..	2 (q)
Tourist Department (Rotorua)	1	..	1	..
Public Works Department, Southland ..	1 (r)	..	1	..
	49	14	63	28
			91	

For notes, see next page.

§ Included in these respective areas are the following cities, boroughs, and town districts :—

(a) Taking whole Supply from Government.			(b) Taking partial Supply from Government.		(c) Using Non-Government Supply.			
Cities (2).	Boroughs (61).	Town Districts (38).	Boroughs (9).	Town Districts (2).	Boroughs (6).	Town Districts (2).		
Auckland. Wanganui.	Akaroa. Ashburton. Birkenhead. Brunner. Cambridge. Carterton. Dannevirke. Dargaville. Devonport. Eastbourne. Eketahuna. Featherston. Feilding. Foxton. Geraldine. Gisborne. Greymouth. Greytown. Hampden. Hastings. Huntly. Levin. Lower Hutt. Martinborough. Marton. Masterton. Matamata. Morrinsville. Mt. Albert. Mt. Eden. Napier.	New Lynn. Newmarket. Ngaruawahia. Northcote. Oamaru. Onehunga. One Tree Hill. Opotiki. Otahuhu. Otaki. Paeroa. Pahiatua. Petone. Pukekohe. Runanga. Shannon. Takapuna. Te Awamutu. Te Aroha. Te Kuiti. Temuka. Thames. Timaru. Upper Hutt. Waihi. Waimate. Waipawa. Waipukurau. Wairoa. Woodville.	Bulls. Ellerslie. Glen Eden. Havelock North. Helensville. Henderson. Hikurangi. Howick. Hunterville. Johnsonville. Kamo. Kihikibi. Leamington. Leeston. Mangaweka. Manurewa. Mercer. Ohaupo. Onerahi. Ormondville. Otorohanga. Papakura. Papatoetoe. Patutahi. Pleasant Point. Putaruru. Raglan. Rongotea. Southbridge. Taradale.	Te Karaka. Te Kauwhata. Tinwald. Tuakau. Turu. Waiuku. Warkworth. Waverley.	Balclutha. Eltham. Hawera. Kaitangata. Lawrence. Milton. Opunake. Palmerston South. Waikouaiti.	Manaia. Normanby.	Alexandra. Blenheim. Cromwell. Motueka. Richmond. Roxburgh.	Tahunanui. Takaka.

See Table on page 103.

- (d) Opunake, South Taranaki, Taranaki, and Otago (through Dunedin City Corporation).
 - (e) Palmerston North, Christchurch (including New Brighton Borough), Invercargill.
 - (f) Wellington, Dunedin (including St. Kilda, Port Chalmers, West Harbour, Green Island, and Mosgiel Boroughs and Outram Town District).
 - (g) Nelson.
 - (h) Bluff, Hamilton, Kaiapoi, Lyttelton, Napier†, Rangiora, Riccarton, Sumner, Te Aroha†, Thames†, Timaru†, Wairoa†.
 - (i) Whakatane, Waitara, Inglewood, New Plymouth, Stratford, Patea, Taihape.
 - (j) Ohakune, Picton, Queenstown, Raetihi, Taumarunui, Tauranga, Te Puke, Westport, Whangarei.
 - (k) Heathcote, Waimairi.
 - (l) Kaikoura, Murchison, Uawa.
 - (m) Mangaweka.
 - (n) Kaponga (through Taranaki Power Board).
 - (o) Manunui.
 - (p) Included boroughs (Hokitika, Kumara, Whangarei).
 - (q) Rawene, Kohukohu.
 - (r) Includes seven boroughs (Bluff (also scheduled under (h)), Gore, Mataura, Riverton, South Invercargill, Tapanui, Winton), and five town districts (Edendale, Lumsden, Nightcaps, Otautau, Wyndham).
- † Also scheduled under (a).

Summary of Numbers of Cities, Boroughs, and Town Districts.

	North Island.			South Island.		
	Cities.	Boroughs.	Town Districts.	Cities.	Boroughs.	Town Districts.
Number	4	68	48	4	49	14
Electricity available in	4	68	42	4	46	13
Government supply available in	4	62	37	3	35	10
Taking whole supply from Government	3*	52	34	2	23	9

* Wellington City takes practically the whole of its supply, although listed as "partial supply."

Public electric supply is not yet available in the following boroughs and town districts (Kohukohu Town District has partial private supply) :—

<i>Boroughs</i>	<i>Town Districts.</i>
Arrowtown (South Island).	Clinton (South Island).
Naseby (South Island).	Kawhia (North Island).
Ross (South Island).	Kaikohe (North Island).*
	Kaitaia (North Island).*
	Kawakawa (North Island).*
	Kohukohu (North Island).
	Ohura (North Island).
	Russell (North Island).*

* To be reticulated for electric supply from Bay of Islands Power Board's System.

Negotiations have been completed between the North Auckland Electric-power Board and the Kamo Town Board for the acquisition of the latter's reticulation system in Kamo, and for the inclusion of the town district as a constituent portion of the North Auckland Electric-power District.

Negotiations were also finalized with the Grey Electric-power Board for the acquiring by the Public Works Department of the Board's hydro-electric generating-station on the Arnold River. The Board now purchases its electric supply in bulk from the Government.

Havelock North Town Board's hydro-electric plant has been sold to the Hawke's Bay Electric-power Board and is now classified as standby.

A new agreement has been reached between the New Plymouth Borough Council and the Public Works Department in connection with the purchase of bulk supply from the Government.

Owing to increasing demands for additional power in Taumarunui which cannot be supplied from the Council's present generating-station at Piriaka, negotiations have been finalized between the Borough Council and the Public Works Department whereby the Council will take bulk supply from the Government.

Discussion has also taken place between Whakatane Borough Council and the Bay of Plenty Power Board regarding purchase of bulk supply by the Council from the Board, with the ultimate intention of closing the Council's hydro-generating station. This, in turn, will affect the maximum demand of the Bay of Plenty Power Board on the Government system, and has been the subject of negotiation and agreement between the Board and the Public Works Department.

The net result of the above negotiations as affecting the Public Works Department is that the local generating stations previously operated by the supply authorities concerned now come by agreement under the control of the Public Works Department and thus become part of the national electric-supply system,

During the year the Taranaki Power Board increased its installed generating-capacity in Tariki Station by the addition of one 1,600 kW. unit.

The total installed capacity (excluding standby plant) is at present 279,910 kW. The increase of 44,401 kW. is due mainly to the placing in service of two 21,600 kW. units at Arapuni.

The proportion of installed plant as at 31st March, 1938, is as follows:—

	Stations.	Kilowatts.	Proportion per Cent.
Water-power (excluding 11 standby installations)	35	278,905	99·64
Steam-power (excluding standby plants at Portland (3,190 kW.), Auckland (41,160 kW.), Wanganui (500 kW.), Wellington (24,000 kW.), Invercargill (1,000 kW.), Waihi,† Huntly (1,500 kW.), Dunedin (1,875 kW.), Christchurch (1,500 kW.), Nelson (500 kW.), Hokitika (625 kW.): totalling 75,850 kW., 10 stations)	1	750	0·27
Gas - power (excluding standby plants at Palmerston North (816 kW.), Westport (210 kW.), Kaikoura (37 kW.), Taihape (75 kW.): totalling 1,138 kW., 4 stations)	0	..	..
Oil-power (excluding standby plants at Penrose (3,750 kW.), Dobson (5,760 kW.), Palmerston North (2,000 kW.), Dunedin (860 kW.), Blenheim (1,356 kW.), Hastings (1,087 kW.), Gisborne (980 kW.), Ashburton (160 kW.), Napier (400 kW.), Thames (262 kW.), Opunake (148 kW.), Ohakune (113 kW.), Hawera (485 kW.), Oamaru (192 kW.), New Plymouth (350 kW.), Hokitika (Kanieri), (150 kW.), Hokitika (200 kW.), Motueka (110 kW.), Patea (64 kW.), Reefton (80 kW.), Queenstown (128 kW.): totalling 18,635 kW., 21 stations)	5	255	0·09
Totals	41	279,910	100·00

Additional standby plant of 9 kW. in the main station at Kohukohu brings the total standby oil-driven plant to 18,644 kW.

† 1,640 kW. plant partially dismantled at present.

The number of consumers supplied has increased from 371,027 to 388,580, an increase of 17,553, or 4·73 per cent. for the year.

The total population included in the various electric-supply areas is 1,485,239, or 93·3 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 areas supplied now exceeds the allocation of 0·15 kW., or 0·2 horse-power, per head of population, the original basis of the design of the Government schemes. Table X shows, for each supply authority, the average maximum demand per consumer.

The units sold per head of population supplied were 659, as compared with 587 last year. (See footnote on Table X.)

The total length of transmission and distribution line in service is 24,407 route-miles, as compared with 23,322 last year, an increase of 1,085 miles, or 4·66 per cent. This fact would seem to indicate that there is a steady demand for the extension of electric lines to meet the requirements of the rural areas. The number of consumers per route-mile is 15·92, as compared with 15·90 last year.

The new factor introduced in 1936 for comparative purposes as "Units sold per £1 of distribution capital," appears again this year in Table X. Last year this index figure was computed from the

total units sold (section 9 of F.P. 15*) divided by the capital outlay shown opposite subsections (c) and (d) of section 15 of F.P. 15. This year, however, the basis has been altered and the figures for capital outlay on transmission and distribution include all capital which cannot be charged to the generating system (if any).

The sales per route-mile of line were 40,100 units, and the gross revenue £233†. The units are greater than last year (36,800), and there is an increase in revenue as against £220 last year, due to a general reduction in selling-rates and to load-building campaigns. The following supply authorities notified tariff reductions during the year: Power Boards—Bay of Plenty, Franklin, Horowhenua, Malvern, Tauranga, Waimea, Wairere, Waitemata, Waitomo. Cities—Wellington, Invercargill. Boroughs—Taihape, Te Aroha, Te Puke, Thames. This increase can also be attributed to a decided improvement in the economic conditions which have prevailed during the past three years, and an examination of the table under "Growth of Load" reveals interesting figures in connection with "Electric Cooking and Electric Water-heating" for the 1935–38 period.

Out of the ninety-one distributing authorities (including Public Works Department, North Island and South Island systems, and excluding Ross Borough), seventy-nine showed a profit for the year amounting to £889,848, and twelve showed a loss amounting to £11,254. The gross revenue (including bulk sales, but excluding rates) was £5,686,397, and the general result is a profit for the whole Dominion of £878,594 after paying working-costs (£2,803,711) and capital (interest, sinking fund, and depreciation exchange, &c.) charges (£2,004,092) at the rate of 5.64 per cent. on the total capital outlay of £35,527,342. This shows a net profit of 2.47 per cent., as compared with 1.66 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 93.3 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, and Tables XI and XII show the financial statistics for each supply authority. It should be noted that the method of compilation and computation adopted for the following table is slightly different to that of years previous to 1933:—

		Water.	Steam.	Gas.	Oil.	Total.
1. Number of main stations	No.	35(a)	1(b)	..	5(c)	41
2. Installed capacity (main plant) ..	kW.	278,905	750	..	255	279,910
3. Number of standby plants	No.	11(d)	10(e)	4(f)	21(g)	46
4. Installed capacity (standby plant) ..	kW.	3,706	75,850	1,138	18,644	99,338
5. Number of consumers	No.	384,443	3,320	..	817	388,580
6. Connected load	kW.	1,664,793	10,778	..	1,118	1,676,689
7. Units generated	No.	1,237,382,468	10,038,915	186,079	2,160,993	1,249,768,455
8. Units sold to consumers (Table X) ..	No.			978,233,920		
9. Percentage of non-productive units ..	%			21.78		
10. Total operative capital (including distributing systems and standby plant) ..	£			35,527,342		
11. Total capital per kilowatt installed (including distributing systems, &c.) ..	£			93.65		
12. Annual working-costs	£			1,429,562†		
13. Annual working-cost per unit under section 8	d.			0.350		
14. Annual capital costs (interest, sinking fund, and depreciation)	£			2,004,092		
15. Annual capital cost per unit under section 8	d.			0.492		
16. Annual capital costs as percentage of capital	%			5.64		
17. Total annual costs (section 12 plus section 14)	£			3,433,654		
18. Total annual cost per unit under section 8	d.			0.842		
19. Total annual revenue (from retail sale of electricity)	£			4,190,838		
20. Average revenue per unit (from sections 19 and 8)	d.			1.028		
21. Gross revenue (excluding rates and bulk sales)	£			4,306,754		
22. Net profit (section 21 less section 17) ..	£			873,100		
23. Ratio working-costs to gross revenue (section 12 and section 21)	%			33.20		

* Annual statistical return furnished to Government Statistician by electric supply authorities. † This figure is distinct from that of £228, shown in Table XIII, which is compiled on revenue from sale of electricity only.

‡ After deducting cost of power purchased in bulk (Table XI).

NOTES:—

MAIN STATIONS.

(a) Hydro-electric: Arapuni, Horahora, Mangahao, Waikaremoana, Coleridge, Waitaki, Monowai, Arnold River, Golden Bay, Marlborough, Opunake, Otago Central, Taranaki, Teviot, Waimea (2), Wairere, Dunedin, New Plymouth, Queenstown, Raetihi, Ross, Taihape, Taumarunui, Tauranga (2), Westport, Whakatane, Kaponga, Murchison, Kerikeri, Kaniere, Reefton, Wairua Falls, Westland Power, Ltd. Total, 35.
(b) Steam: Nelson. Total, 1.
(c) Oil: Picton, Kaikoura, Uawa, Rawene, Kohukohu. Total, 5.

STANDBY STATIONS.

(d) Hydro-electric: Akaroa, Fairlie, Hawera, Havelock North, Kourarau, Oamaru, Ohakune, Patea, Rotorua, Te Aroha, Thames. Total, 11.
(e) Steam: Huntly, Auckland, Wanganui, Christchurch, Dunedin, Invercargill, Nelson, Wellington, Portland, Westland Power, Ltd. Total, 10.
(f) Gas: Palmerston North, Taihape, Westport, Kaikoura. Total, 4.
(g) Oil: Penrose, Dobson (ex Lyttelton), Ashburton, Hastings, Blenheim, Opunake, Gisborne, Hawera, Motueka, Oamaru, Dunedin, Palmerston North, Napier, New Plymouth, Ohakune, Patea, Thames, Kaniere, Reefton, Westland Power, Ltd., Queenstown. Total, 21.

BROKEN WIRES AND POLES.

There were 1,386 broken wires reported by electric-supply authorities, with 119,432 miles of conductor erected. The corresponding figures for the previous year were 2,006 broken wires and 108,249 miles of conductor in use.

Falling trees were again the principal cause of the breaks, and accounted for 29.4 per cent. of the total, as against 28 per cent. for 1937.

As regards broken poles, 323 instances were reported for the year, of which 111, or 34.4 per cent., were New Zealand blue-gum.

For 1937 the total number of broken poles reported was 574, and it is still evident that electric-supply authorities who experimented with New Zealand blue-gum and nondescript Australian hardwoods during the past decade are now being called upon to make replacements sooner than the anticipated life of fifteen years for poles used on distribution lines.

ACTUAL MILEAGES AND SIZES OF OVERHEAD CONDUCTORS IN USE AT 31ST MARCH, 1938.

Size of Conductors (S.W.G.).	Copper.		Aluminium.		Galvanized Steel.		Galvanized Iron.		Copperweld.		Steel-cored Aluminium.		Bronze.		Total Break-ages.
	Miles.	Break-ages.	Miles.	Break-ages.	Miles.	Break-ages.	Miles.	Break-ages.	Miles.	Break-ages.	Miles.	Break-ages.	Miles.	Break-ages.	
7/20 ..	6,825	329	..	..	..	..	..	..	..	..	..	..	..	..	329
7/18 ..	13,266	312	..	..	..	..	..	..	..	..	..	..	..	..	312
7/17 ..	3,018	26	..	..	..	..	..	..	..	..	..	..	..	..	26
7/16 ..	24,464	211	44	..	238	4	103	..	..	..	153	..	..	..	215
7/15 ..	241	..	..	..	..	..	..	..	..	..	203	..	..	..	..
7/14 ..	12,558	78	25	..	22	..	7	..	..	..	1,067	2	..	..	80
7/13 ..	1,277	..	14	..	5	..	2	..	..	..	145	2	..	..	2
7/12 ..	561	..	141	3	7	..	..	..	5	..	19	..	..	..	3
7/11 ..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..
7/10 ..	81	..	216	..	..	..	..	..	12	..	51	..	..	..	..
7/9 ..	76	..	2	..	5	..	..	..	..	..	..	..	..	..	..
7/8 ..	..	..	1	..	..	..	..	..	..	..	45	..	..	..	..
19/18 ..	403	4	..	..	..	..	..	..	..	..	..	..	..	..	4
19/17 ..	625	1	..	..	..	..	..	..	..	..	..	..	..	..	1
19/16 ..	1,774	5	..	..	..	..	..	..	..	..	..	..	..	..	5
19/15 ..	195	1	..	..	..	..	..	..	..	..	..	..	..	..	1
19/14 ..	642	1	..	..	..	..	..	..	..	..	..	..	..	..	1
19/13 ..	3,194	..	..	..	..	..	..	..	..	..	..	..	..	..	..
19/12 ..	589	..	..	..	2	..	..	..	..	..	..	..	..	..	..
19/10 ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
37/16 ..	56	..	..	..	..	..	..	..	..	..	..	..	..	..	..
37/15 ..	403	..	..	..	..	..	..	..	..	..	..	..	..	..	..
37/14 ..	95	..	..	..	..	..	..	..	..	..	..	..	..	..	..
37/13 ..	23	..	..	..	..	..	..	..	..	..	..	..	..	..	..
37/12 ..	80	..	..	..	..	..	..	..	..	..	227	..	..	..	..
66/13 ..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
12 ..	2,617	61	..	..	1	..	86	..	12	..	..	..	..	..	61
11 ..	285	..	..	..	..	..	..	..	..	..	..	..	..	..	..
10 ..	9,273	157	..	..	304	..	222	..	423	8	..	..	30	..	165
8 ..	13,497	103	..	..	4,796	18	5,575	22	1,111	1	..	..	..	..	144
7 ..	764	9	..	..	..	..	227	..	92	..	..	..	..	..	9
6 ..	289	1	..	..	118	2	149	..	167	2	..	..	..	..	5
5 ..	..	..	..	..	..	..	..	..	7	..	..	..	..	..	..
4 ..	593	..	..	..	..	..	..	..	79	..	2	..	..	..	..
2 ..	67	..	..	..	..	..	..	..	..	..	..	..	..	..	..
0 ..	79	..	..	..	..	..	..	..	..	..	..	..	..	..	..
2/0 ..	..	..	9	5	..	..	..	..	..	..	59	..	..	..	5
3/0 ..	4	..	..	..	..	..	..	..	..	..	339	..	..	..	..
3/12 ..	149	..	17	..	..	..	..	..	..	..	..	..	..	..	..
3/11 ..	..	..	4	..	..	..	..	..	..	..	..	..	..	..	..
3/10 ..	25	..	3	..	..	..	..	..	..	..	..	..	..	..	..
3/9 ..	..	..	6	..	..	..	..	..	..	..	..	..	..	..	..
3/8 ..	..	..	6	..	..	..	..	..	..	..	..	..	..	..	..
4/16 ..	13	..	..	..	..	..	..	..	..	..	..	..	..	..	..
4/14 ..	..	..	..	..	253	1	..	..	..	..	..	..	..	..	1
5/14 ..	..	..	..	..	209	..	..	..	..	..	..	..	..	..	..
6/-144 ..	..	..	..	..	..	..	..	..	..	..	19	..	..	..	..
7/-167 ..	..	..	..	..	..	..	..	..	..	..	636	5	..	..	..
Miscellaneous ..	58	12	1	..	..	..	2	..	12	..	..	..	..	..	17
Telephone-wires	455	..	..	..	1,164	..	710	..	1,203	..	..	..	..	..	..
Totals ..	98,616	1,311	489	8	7,124	25	7,083	22	3,123	11	2,967	9	30	..	1,386

Grand total, 119,432 miles.

No returns of conductor mileages received from Auckland, Christchurch, and Heathcote.

GROWTH OF LOAD.

The total connected load at end of the year under review was 1,676,689 kW., compared with 1,476,487 for 1937, an increase of 200,202 kW., or 13·55 per cent.

Statistics pertaining to the increasing use of electric ranges, electric water-heaters, and milking-machines have been collected and scheduled for some years past, and from the following table will be seen the annual growth which has taken place in each class:—

Year.	Route-miles of Line in Service.	Consumers.		Electric Ranges.		Electric Water-heaters.		Electrically-driven Milking-machines.	
		Number.	Per Cent.	Number.	Per Cent.	Number.	Per Cent.	Number.	Per Cent.
1925 ..	6,011	148,699	..	1,526	..	..	..	3,581	..
1926 ..	12,454	192,392	29·3	4,671	205·0	6,654	..	4,856	35·8
1927 ..	14,975	228,345	18·7	9,511	104·0	14,160	113·0	6,738	38·8
1928 ..	17,063	243,795	6·8	15,766	66·0	21,513	52·0	8,514	26·3
1929 ..	17,759	266,306	9·2	20,254	28·5	29,257	36·0	10,161	19·4
1930 ..	19,128	284,235	6·7	25,997	28·3	37,564	28·5	11,922	17·3
1931 ..	19,636	300,809	5·9	29,480	13·2	42,803	13·9	13,656	14·5
1932 ..	20,251	309,360	2·8	31,973	8·5	45,796	7·1	14,163	3·7
1933 ..	20,585	322,997	4·4	33,998	6·4	48,070	5·0	15,913	12·4
1934 ..	20,996	334,593	3·6	36,081	6·2	50,272	4·6	16,992	6·8
1935 ..	21,707	342,334	2·3	39,730	10·1	53,635	6·7	17,200	1·2
1936 ..	22,424	355,973	4·0	44,837	12·9	58,864	9·8	18,458	7·4
1937 ..	23,322	371,027	4·2	53,402	19·1	67,049	13·9	20,275	9·8
1938 ..	24,407	388,580	4·7	64,408	20·6	77,353	15·4	22,711	12·4

The total increase in route-miles of line for the above thirteen-year period is 307 per cent.

See Table XIV for details of ranges, water-heaters, and milking-machines for year ended 31st March, 1938.

CONDENSED REVIEW OF ELECTRICAL PROGRESS.

During the year the statistical records collected over the past fourteen years have been condensed into graph form, and the graphs on the next page contain the following information as at the end of each financial year from 1925 to 1938 inclusive:—

Graph No. 1.—(a) Number of units generated; (b) number of units sold (retail); (c) number of units sold per consumer (average); (d) number of units sold *per capita* (average).

Graph No. 2.—(a) Number of electric water-heaters installed; (b) number of electric ranges installed; (c) number of electric milking-machines installed.

Graph No. 3.—(a) Number of consumers per route-mile of line in operation; (b) Number of consumers supplied; (c) number of route-miles of line in operation; (d) total connected load, in kilowatts.

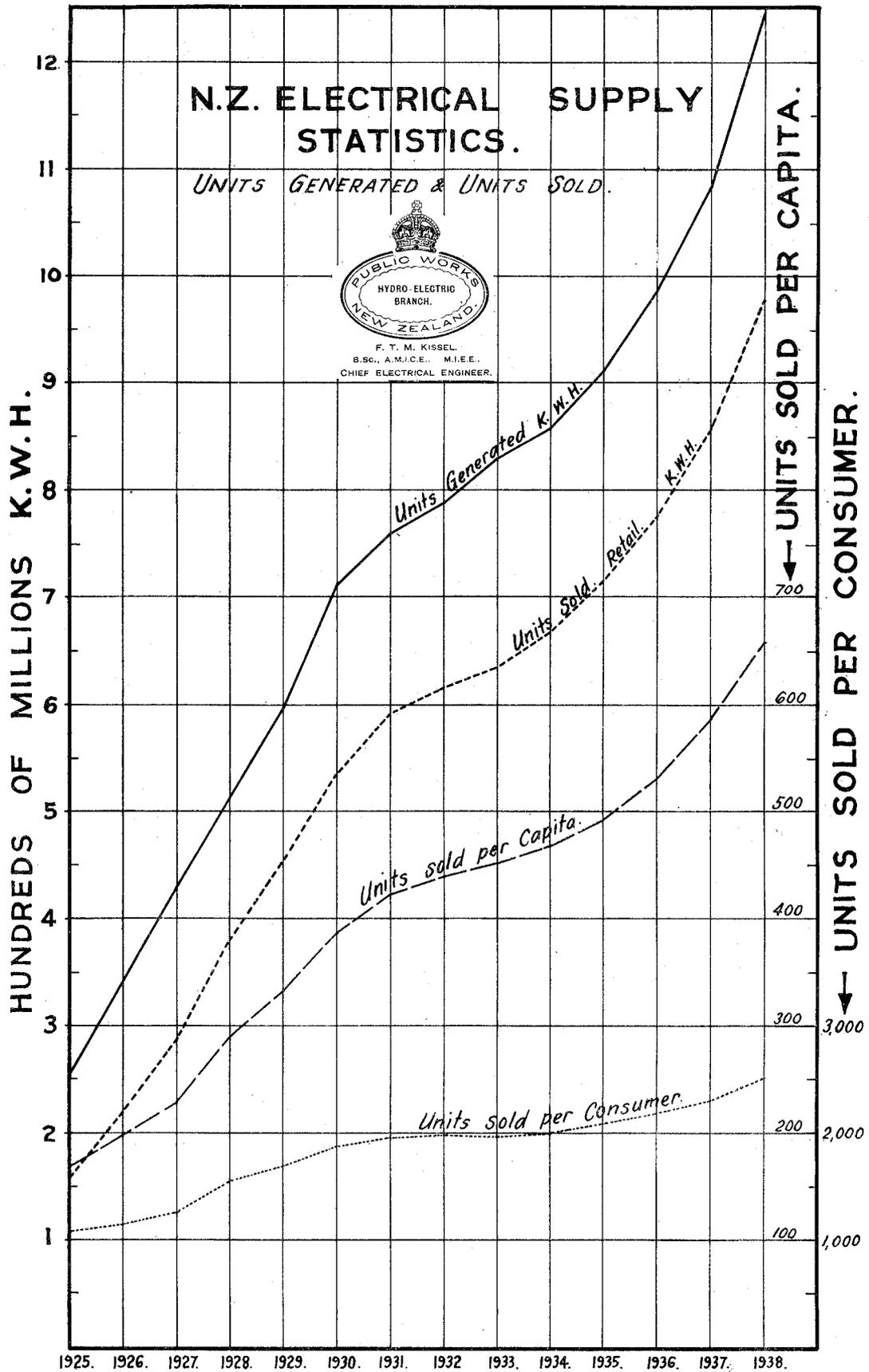
Graph No. 4.—(a) Revenue received from retail sales of electricity (pounds); (b) total working-costs (excluding bulk purchases) (pounds); (c) total capital charges (pounds); (d) total annual costs (pounds); (e) average revenue per unit sold (pence).

The curve for total capital charges on Graph No. 4 shows a sharp peak for year 1933. This is due to Arapuni again being brought into operation following the shutdown between 1930 and 1932 and to the resumption of extensions by supply authorities after the depression. The fall in the curve between 1933 and 1934 may be attributed to the reduction in interest rates resulting from the operation of the Local Authorities' Interest Reduction and Loans Conversion Act, 1932–33.

The fall in the curve for total working costs from 1932 to 1934 is due to the effect of salary and wage reductions consequent on the depression, and the rise from 1934 onwards may be attributed to the return of prosperity and the introduction of the forty-hour week.

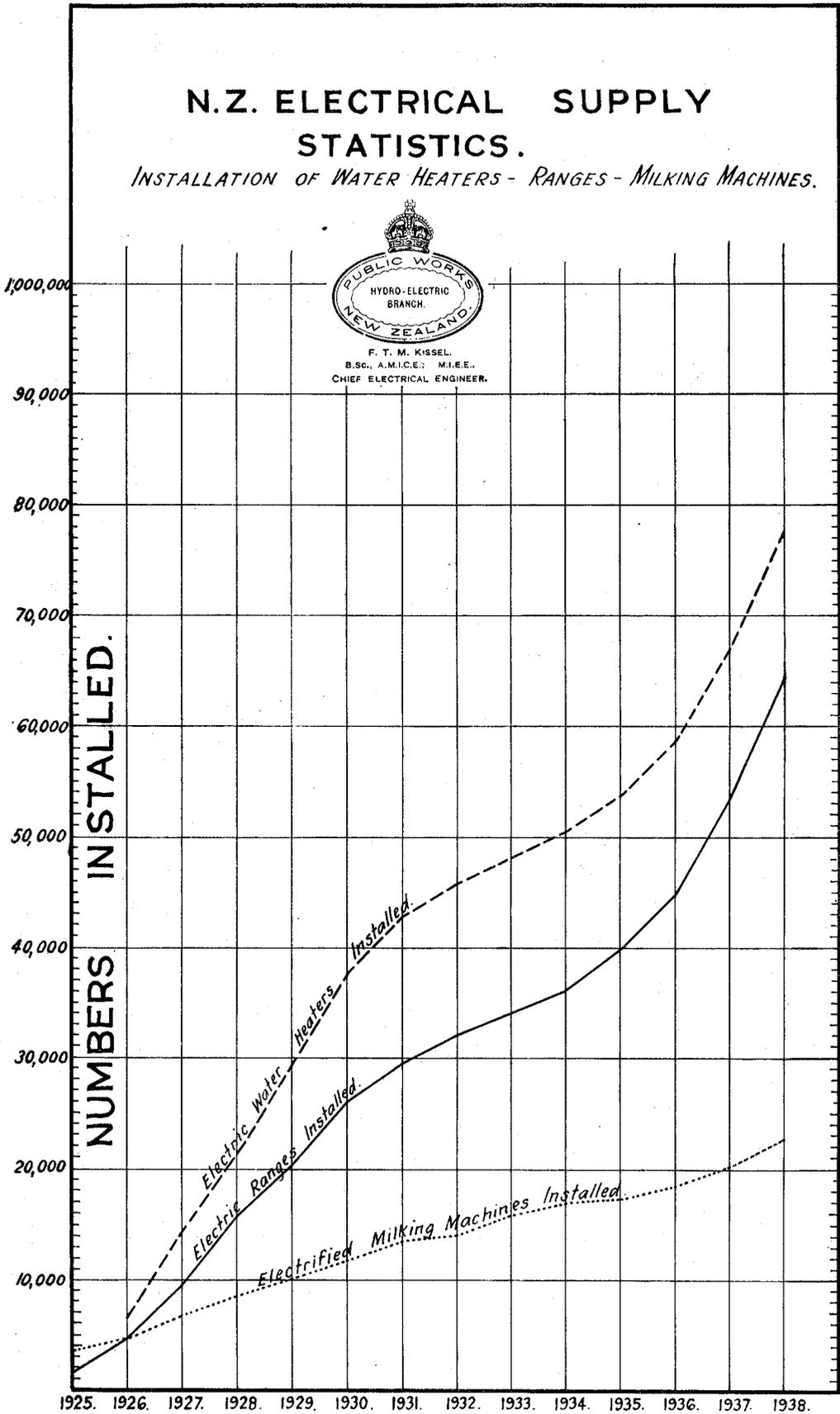
Corresponding tendencies are evident in the revenue curve. The significant feature revealed by this graph (No. 4) is the curve depicting the average revenue per unit sold. This figure shows a consistent falling tendency from 2·133d. in 1925 down to 1·028d. in 1938.

Graph No 1.

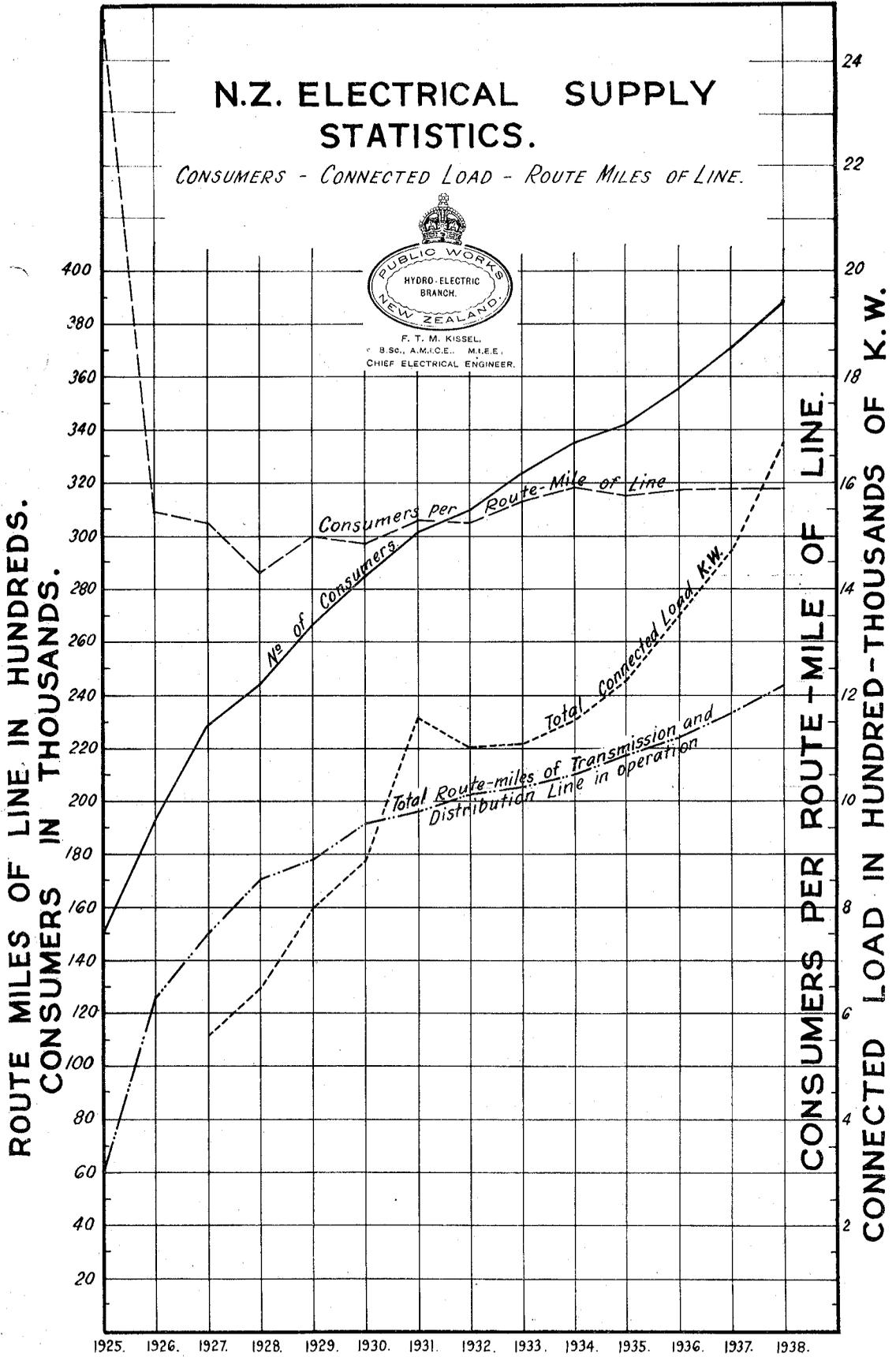


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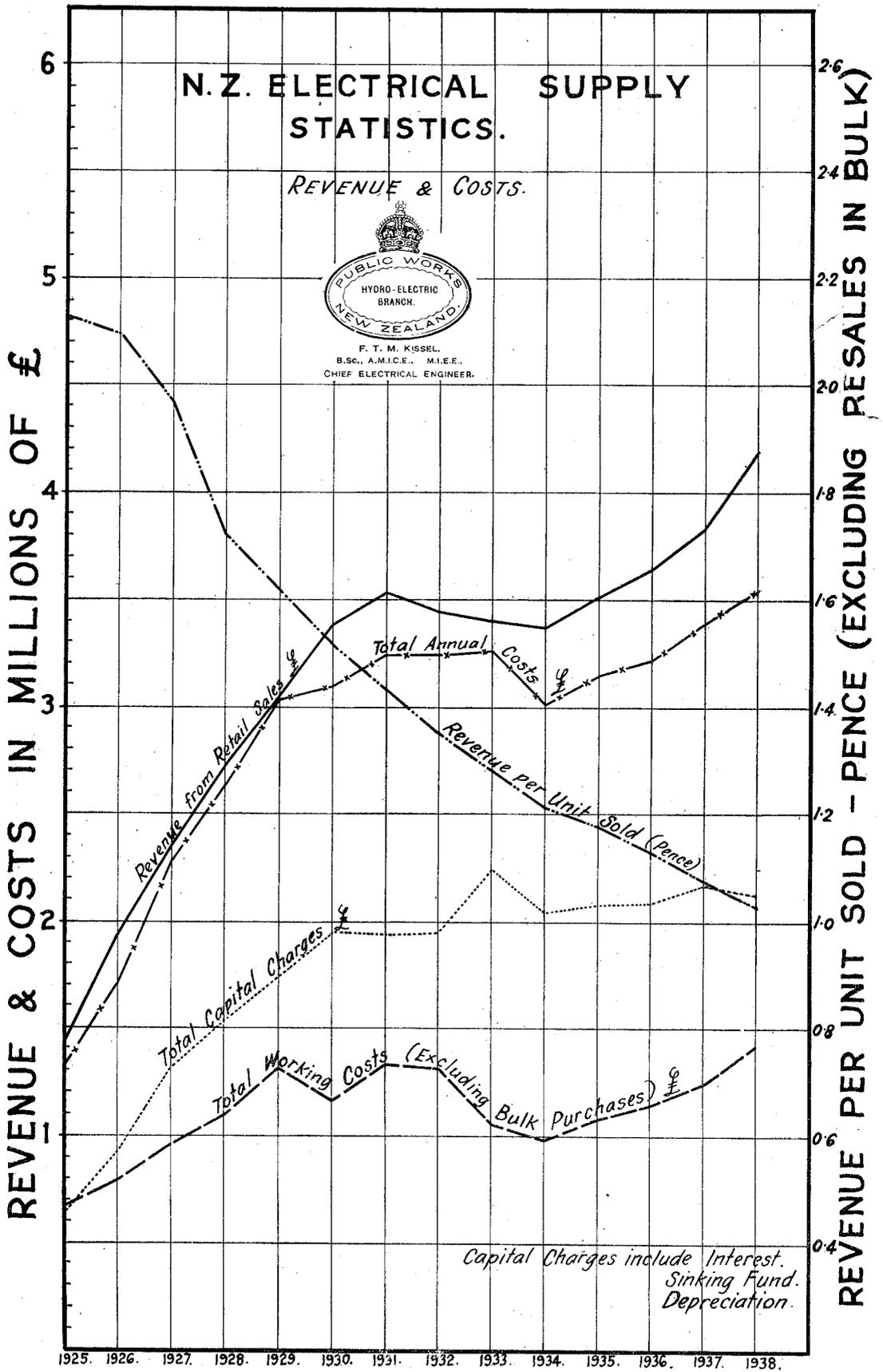
Graph No 2.



Graph No 3



Graph No. 4



In studying the preceding graphs it should be remembered that they represent a composite review of the electric-supply business as a whole, and the appropriate statistics appertaining to the Public Works Department have therefore been combined with those of all the other electrical supply authorities in the Dominion. It is hoped that the publication of these graphs will be of interest to the various electric-supply authorities throughout New Zealand, without whose valued co-operation in furnishing the requisite statistics each year it would not have been possible to compile the information now presented in graph form.

ELECTRICAL SUPPLY AND ELECTRICAL WIRING REGULATIONS.

During the past year numbers of 6-volt, 12-volt, and 18-volt portable electric-lighting plants have been installed in territories not readily accessible to public electric-supply systems. Under the Electrical Wiremen's Registration Act the services of a registered wireman are not necessary to install the wiring where the voltage does not exceed 20 volts, but this does not include exemption from the requirements of the Electrical Wiring Regulations issued under the Public Works Act. Some modification of the standard Electrical Wiring Regulations was deemed necessary in such cases, and the Regulations Advisory Committee has prepared regulations defining the requirements to be observed by persons installing such sets with a rating not exceeding 500 watts. These regulations were gazetted on 13th January, 1938.

INSPECTION OF ELECTRIC LINES, ALSO PRIVATE GENERATING-PLANTS.

The annual departmental inspection of the electric lines in operation was carried out in the case of supply authorities last year, and any defects or breaches of the regulations which came under notice were duly notified to the supply authorities concerned. These inspection activities of the Department undoubtedly tend towards the maintaining of a high standard, and the general willingness on the part of the supply authorities to co-operate in a general observance of the regulations governing such matters is of great assistance to this Department.

The following supply authorities have notified extensions to electric lines in their respective districts during the year :—

Power Boards—	Power Boards— <i>continued.</i>	Cities— <i>continued.</i>
Ashburton.	Otago Central.	Palmerston North.
Auckland.	Poverty Bay.	Wellington.
Banks Peninsula.	South Taranaki.	Boroughs—
Bay of Plenty.	Springs-Ellesmere.	Bluff.
Cambridge.	Taranaki.	Hamilton.
Central Hawke's Bay.	Tararua.	Napier.
Central Waikato.	Tauranga.	New Plymouth.
Dannevirke.	Te Awamutu.	Ohakune.
Franklin.	Thames Valley.	Taihape.
Golden Bay.	Waitomo.	Whakatane.
Hawke's Bay.	Waimea.	Town Boards—
Hutt Valley.	Wairarapa.	Kaponga.
Horowhenua.	Wairere.	County Councils—
Malvern.	Waitaki.	Waimairi.
Manawatu-Oroua.	Waitemata.	Companies—
Marlborough.	Wanganui-Rangitikei.	Westland Power, Ltd.
North Auckland.	Cities—	Hume (Cobb River) E.P. Co.
North Canterbury.	Christchurch.	
Opunake.	Dunedin.	
Otago.	Nelson.	

It is not generally known that under the Electrical Wiremen's Registration Amendment Act, 1928, it is mandatory to give notice of the installation of private electric plants, and provision is made for the inspection of these plants before same are placed in service. During the year inspections have been made as opportunity offered.

LICENSES AND PERMITS ISSUED.

The following water-power and electric-line licenses (41) and permits (22) have been issued during the period between 30th June, 1937, and 30th June, 1938 :—

- (1) *Licenses* (41) : Golden Bay Cement Co. ; Arnold River (P.W.D.) ; F. K. Pearce, Ngamatapouri ; P. Sheely, Taumarunui ; Kaitangata Coal Co. ; Wellington City Council ; E. L. Broberg, Paihia ; Te Awamutu Power Board (2) ; Hawke's Bay Power Board ; P. V. McNabb, Collingwood ; P. W. Poulton, Kumeroa ; T. Gilchrist and Sons, Oturehura ; D. Cameron, Hinakura ; Kaikoura County Council ; Auckland Transport Board ; Invercargill City Council ; B. Hope-Deans, Taueru ; W. Graham, Kiripaka ; M. Oldbury, Kawhia ; Taihape Borough Council (amendment) ; E. P. H. Burbury, Culverden ; A. E. Walker, Kokopu ; W. Scott, Kaikoura ; E. A. Hodges, Waitekauri ; Graham Bros., Waiho ; Hutt Valley Power Board ; F. W. M. Puckey, Kaitaia ; G. S. Penney, Kaikohe ; A. O. Harris, Murchison ; T. Borthwick and Sons, Waitara ; F. Armstrong, Akitio ; Wairere Power Board ; R. J. Lee, Cardrona ; Waikare Taheke River (P.W.D.) ; Alexander Mines, Reefton (amendment) ; Christchurch City Council (consolidation) ; North Auckland Power Board ; J. Hope, Matawai ; Goldfields Dredging Co., Queenstown ; H. J. McGaw, Purekireki.
- (2) *Revocations* (7) : N. Wells, Mercury Bay ; W. J. Lusty, Te Uku ; W. K. McAlpine, Craigieburn ; J. O'Halloran, Glen Tui ; Havelock North Town Board ; F. O. Mathews, Wanganui ; Kamo Town Board.
- (3) *Assignments* (1) : L. Cooper to J. W. Beggs, Whangamomona.
- (4) *Permits* (22) : L. W. Potter, Kuriwao ; W. F. Manser, Putara ; G. Richmond, Takaka ; P. T. Shand, Port Ligar ; A. Schrieber, Oparau ; A. McMillan, Rakauroa ; W. H. Moore, Hickory Bay ; S. Hall, Peraki ; T. P. McGaveston, Pokororo ; A. H. Timms, Outram ; F. Excell, Raurimu ; J. W. Fraser, Hawarden ; W. M. Turner, Mayfield ; D. S. Middleton, Cromwell ; J. McKenzie, Picton ; A. T. Young, Kamo ; F. C. Hows, Matangirau ; P. M. Anderson, Gibbston ; W. Bruce and Son, Gisborne ; W. L. Carter, Okahukura ; J. Champion, Makuri ; Doig Bros., Blackwater.

ELECTRICAL ACCIDENTS.

During the year there were reported to the Department forty electrical accidents, involving the loss of human life in nine instances. Two of the accidents included more than one person injured. Corresponding figures for 1937 were forty-seven and eleven respectively.

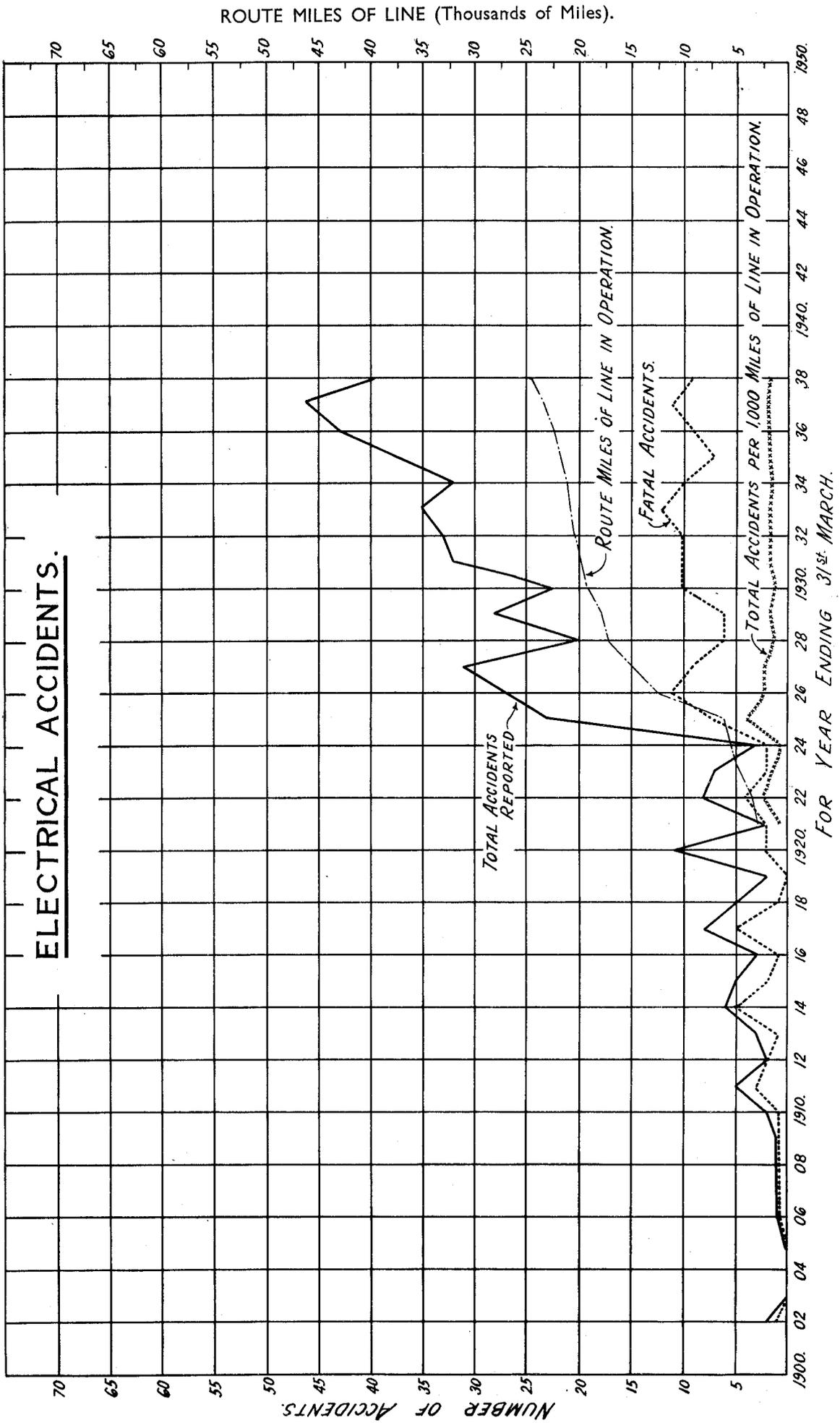
This year's electrical accidents resulted in injuries (fatal and otherwise) to the following :—

Domestic users	..	..	..	..	..	..	6
Industrial and commercial users	..	..	..	..	..	..	4
Electrical workers	..	..	..	..	..	..	15
General public not classified above	..	..	..	..	..	..	14
Stock..	..	..	..	..	..	..	3
Total..	..	..	..	..	..	..	42

The following is a summary of persons and stock involved in electrical accidents for the past six years—viz., 1933 to 1938 :—

Classification.	1933.		1934.		1935.		1936.		1937.		1938.		Total Accidents.	Total Fatalities to Human Life.
	Total.	Fatal.												
Domestic users	3	..	8	3	5	1	6	1	9	2	6	1	38	8
Industrial and commercial users	1	1	3	..	2	..	1	..	1	1	4	..	12	2
Electrical workers	16	3	11	2	19	2	14	2	16	1	15	4	91	14
General public not classified above	15	8	10	5	12	4	22	6	20	7	14	4	92	34
Stock	4	..	1	..	8	..	9	..	3	..	3	..	28	..
Totals	39	12	33	10	46	7	52	9	49	11	42	9	261	58

The following graph has been prepared to show the incidence of electrical accidents, and although such occurrences are regrettable, the curves indicate that as the risk of exposure to accident increases with the electrical development of the Dominion as represented by the erection of additional miles of reticulation and additional users are connected up, the ratio of accidents to additional risks is fortunately not increasing.



*∞

ELECTRICAL FIRES.

During the year there were 24 fires attributed to electrical causes and reported to the Department by the electrical supply authorities, as per list below. The corresponding figures for 1937 and 1936 were twenty-three and twenty-seven respectively.

The sources of this year's electrical fires included the following :—

Electric irons	3
Radiators	1
Water-heaters boiling dry	2
Other electrical appliances	6
Defective installations	9
Transformer-oil overheating	1
Rats	2
Total	24

The following is a summary of causes of electrical fires for the six-yearly period, 1933-38 :—

	1933.	1934.	1935.	1936.	1937.	1938.	Totals.
Electric irons	4	12	8	8	7	3	42
Electric radiators	2	..	1	2	..	1	6
Other electrical appliances	2	3	6	4	6	8	29
Defective installations	4	11	7	12	3	9	46
Defective flexible cords .. .. .	..	..	..	..	3	..	3
Defective radio installations	1	..	..	..	1	..	2
Bedding in contact with lamp .. .. .	..	..	..	..	1	..	1
Contact between distribution and service lines .. .. .	..	..	..	..	1	..	1
Lightning .. .. .	..	..	..	..	1	..	1
Soldering-iron .. .. .	..	..	..	1	..	..	1
Rats .. .. .	..	..	..	..	..	2	2
Transformer-oil overheating .. .. .	..	..	..	..	..	1	1
Totals	13	26	22	27	23	24	135

REGISTRATION OF ELECTRICAL WIREMEN.

The continued activity in the building and allied trades has again resulted in a busy period in connection with the administration of the Electrical Wiremen's Registration Act. During the twelve months ended 31st March, 1938, fifteen meetings were held. No meeting was held in January. This is the largest number of meetings in any one year since 1932.

Two members of the Registration Board resigned during the year and were replaced. The Act provides for the election of a new Board every three years, and the statutory period having expired on the 31st March a new Board was appointed in April.

The number of reports of defective work for the year constitutes a record. There were 99 reports, compared with 98 for the year ended March, 1931. The number of reports for the year ended March, 1937, was only 29. It is of interest to note that some electrical Supply Authorities have never reported any wiremen for defective work; one authority with just under 1,500 consumers has made twelve reports, whereas another authority with over 6,500 consumers has not made one report.

The reports of breaches of the Act and the Electrical Supply and Wiring Regulations showed an increase of 9 over the previous year and were the highest on record—namely, 125. The greatest numbers previously were 116 in 1937 and 113 in 1931. It is also interesting to note in this connection that some electrical Supply Authorities have never reported a breach of the Act or regulations, whereas others are particularly active. One authority with only 700 consumers has made fifteen reports, compared with no reports by an authority with nearly 13,000 consumers.

The prosecutions authorized were 66—that is, 3 more than last year; this also constitutes a record, the previous highest being 64 in 1931. Prosecutions were authorized for the following:—

Permitting unregistered persons to work	10
Failing to obtain a permit to do wiring	9
Salesmen doing wiring	8
Connecting wiring without permission	7
Failing to notify Supply Authority of intention to commence work	6
Connecting washing-machine to supply without permission	5
Failing to notify Supply Authority on completion of work	4
Domestic consumers doing wiring	3
Earthing a radio set to a gaspipe	2
Petrol-pump fitter removing a pump	2
Cabinet-maker doing wiring	1
Consumer failing to give notice	1
Failing to earth a washing-machine	1
Failing to produce registration certificate for inspection	1
Failing to supply information	1
Installing radio set which did not comply with regulations	1
Obstructing an Inspector	1
Using an unearthed metal-covered switch	1
Working after name had been removed from register	1
Working after provisional license had expired	1

The examiners in the written part of the examination continue to call attention to unsatisfactory writing and sketching and to the carelessness displayed in simple addition and multiplication. This is not a question of secondary or technical education, but goes right back to the tuition in primary schools and indicates that the pupils have not taken the necessary interest in their work on the foundations of ordinary education. Regarding the more technical part of the examination, the examiners are of the opinion that the poor results are due to a lack of adequate preparation and poor knowledge of fundamentals.

The examiners in the practical part report that the standard of workmanship shows an all-round improvement and is now of a reasonably good standard. Candidates, however, in a large number of cases secure very low marks for simple measurements, in spite of the fact that their attention is specially drawn to the need for keeping to the dimensions shown on the drawing. When fixing the earthing-clip the enamel is not always carefully removed from the conduit and the clip properly tightened. Work on the flexible conduit showed considerable improvement, but the cutting of threads on the rigid conduit indicates that the dies require sharpening or renewing. More care is necessary to clean the ends of the conduits and to cut the nipples to the correct length. The removal of the coverings on the conductors is still not as good as it should be, although the last examination showed a decided improvement. Porcelain-clad connections were used for the first time at the September examination, and the results were very disappointing. Many candidates fail to connect the flexible conductors correctly in screw lamp-holders and three-pin plug-sockets. The live conductor in many cases was connected to the screwed part of the lamp-holder and to the neutral contact of the plug-socket. One examination included the tying of insulated cables to insulators, and the examiners reported that very few of the candidates appeared to have had any instruction in this class of work. The joints, including the soldering, showed a decided improvement and were of a reasonably good standard.

Candidates in the practical part were permitted to continue working after the normal three hours, but marks were deducted for the excess time. The slower type of candidates were able to complete their work by this method, and thus secure additional marks.

The results of the examinations show that some of the candidates do not take advantage of the excellent training provided by the technical colleges and correspondence schools. There are signs of a definite lack of adequate technical training, and employers should insist that their apprentices, where possible, must attend a technical college, and that where this is not possible then a suitable correspondence course should be taken or the services of a private tutor be secured.

Examinations for limited registration in connection with the wiring-up of radio-receiving sets have been held for several years, and an examination in connection with wiring work involved in the investigation of interference with radio reception was held during the year. It is proposed to institute examinations for other classes of limited registration.

The Act provides that the only persons who may assist wiremen are apprentices, improvers, and university students. An improver is defined as "a person who, having completed an apprenticeship to the electrical wiring trade, has sat for the wiremen's examination, but is not yet a registered wireman." A student is defined as "one attending the university and taking a prescribed course of electrical engineering." The meaning of "apprentice" has not so far been defined for the purposes of the Act, and it has been suggested that the term be explained and thus avoid the confusion which now appears to exist. Without a definition the ordinary meaning of "apprentice" applies—namely, a person bound by a contract of apprenticeship to a tradesman or artificer whereby the apprentice agrees to serve and the master agrees to teach him his trade. A contract of apprenticeship is usually a document, and in some cases these documents have to be registered. A number of persons who had passed the wiremen's examination found that they were not eligible for registration because they had not served an apprenticeship. The difference between a contract of apprenticeship and just working for a small wage is not always readily apparent, and a circular setting out particulars was delivered during the year to electrical contractors with a request that it be prominently displayed. It has been suggested

that the electrical Supply Authorities be given power to obtain information relating to the status of assistants to wiremen in an endeavour to ensure that persons are qualified to obtain registration after passing the examination. The circular has proved very useful, and several inquiries have been received for further information. There were, however, still a few applications for registration by persons who had not served as apprentices.

Portable appliances, such as radiators, toasters, irons, vacuum cleaners, and standard lamps, and appliances such as washing-machines and refrigerators, are still being assembled and repaired in a manner which is contrary to the provisions of the Act. The Act provides that this work must be done by a qualified person when carried out on the premises where the appliance is to be used, and that in all other cases, if the work is not done by an authorized person, it must be inspected and tested by an authorized person before the appliance, or any part, is removed from the premises where the work was done. In the latter case details of the work done must be entered up in a register by the person carrying out the inspection unless this person is the one undertaking the work or is a full-time employee of that person.

Considerable trouble has been experienced in connection with the installation of washing-machines, and six prosecutions were taken during the year ended 31st March; two have been taken since the above date, and others are pending. A conference was held during the year with the managers and salesmen of one company, and the requirements of the Act and the regulations were explained to them. The position regarding petrol-pumps is more satisfactory, and very few reports of this work being done by unskilled persons were received. Action was taken during the year against a plumber who had disconnected a petrol-pump.

The danger which may result from the disconnection of an earthing-lead by a plumber, builder, painter, &c., was referred for discussion during the year, and steps are being taken to bring the matter under the notice of the persons concerned with the object of putting a stop to unqualified persons carrying out this work.

The use of obsolete forms for making application for registration and provisional licenses and for making reports of defective work and breaches of the Act still continue to cause unnecessary delay. The last new report forms for defective work and breaches of the Act were sent out to electrical Supply Authorities in September, 1935. A new form for the notification of Inspectors was sent out in July, 1937, and a new application form for wiremen was sent out in June, 1938.

The statistics for the year ended 31st March are as set out below; the figures in parenthesis are for the previous year:—

Registrations—							
Inspectors .. .. .	..	..	..	..	..	..	60 (59)
Wiremen—							
Full registration .. .. .	..	..	..	..	..	..	120 (65)
Limited registration .. .. .	..	..	..	..	..	..	64 (101)
Provisional licenses .. .. .	..	..	..	..	..	..	20 (17)
Examinations—							
Candidates—							
Written part .. .. .	..	..	..	..	..	..	379 (332)
Practical part .. .. .	..	..	..	..	..	..	323 (226)
Passed—							
Written part .. .. .	..	..	..	..	..	..	151 (97)
Practical part .. .. .	..	..	..	..	..	..	180 (90)
Highest marks—							
Written part .. .. .	..	..	..	..	..	..	89 (86)
Practical part .. .. .	..	..	..	..	..	..	91 (90)
Defective work reports .. .. .	..	..	..	..	..	..	99 (29)
Endorsements made .. .. .	..	..	..	..	..	..	7 (4)
Endorsements removed .. .. .	..	..	..	..	..	..	9 (4)
Breach of Act reports .. .. .	..	..	..	..	..	..	125 (116)
Prosecutions authorized .. .. .	..	..	..	..	..	..	66 (63)

F. T. M. KISSEL, B.Sc., M.I.E.E., A.M.I.C.E.,
Chief Electrical Engineer.

INDEX TO TABLES.

YEAR ENDING 31ST MARCH, 1938.

—	Table No.	Page No.	—	Table No.	Page No.
North Island and South Island Electric-power systems—			Electric-supply stations of New Zealand—		
Capital outlay and results of operation	I	120	(a) Population, consumers, route-miles of lines, &c.	IX	131
Analysis of capital outlay	II	122	(b) Results of generation and distribution	X	136
Analysis of working-costs	III	122	(c) Financial results of operations ..	XI	139
Gross financial results of distribution, North Island system	IV	123	(d) Appropriations and Reserves ..	XII	142
Gross financial results of distribution, South Island system	V	124	(e) Averages derived from Tables IX, X, and XI	XIII	145
Route-miles of Public Works Department's lines in operation	VI	125	(f) Electric ranges, water heaters, and milking-machines	XIV	148
Circuit-miles of electric-supply authorities' lines in operation	VII	126	(g) Abridged schedule of selling rates	XV	151
Electric-power Boards—Statistical data	VIII	128	Samoan Administration (Apia) ..	XVI	170

TABLE I.—SUMMARY OF FINANCIAL AND OPERATING STATISTICS FOR NORTH ISLAND AND SOUTH ISLAND ELECTRIC-POWER SYSTEMS FOR THE YEAR ENDING 31ST MARCH, 1938.

NOTE.—“North Island system” includes Arapuni-Horahora-Mangahao-Waikaremoana all interconnected. “South Island system” includes Lake Coleridge and Waitaki interconnected, together with Monowai (Southland) and Arnold River (Westland) not yet interconnected with Coleridge-Waitaki system.

	1937-38 (Fourth Year).		1937-38 (Fourth Year).
(a) Financial.			
(1) Capital outlay—	£	(4) Capital charges—continued.	£
Assets in operation—		Depreciation—	
North Island system	9,095,787	North Island system	50,725
South Island system	5,982,107	South Island system	112,375
Total assets in operation	15,077,894	Half capital charges, King's Wharf Station	37,593
Assets not in operation—		Total capital charges for year	774,135
North Island system	120,627	(5) Total costs for year	1,078,321
South Island system	337,508	(6) Net profit or loss for year—	
Total assets not in operation	458,135	North Island system	Cr. 360,662
Total capital outlay	15,536,029	South Island system	Cr. 30,987
(2) Revenue for year—		Total profit for year	391,649
North Island system	978,492	(7) Accumulated Depreciation Reserve—	
South Island system	491,429*	North Island system	1,016,184
Total revenue for year	1,469,921	South Island system	552,105
(3) Costs—		Total Depreciation Reserve	1,568,289
Working-costs—		(8) Accumulated Sinking Fund Reserve—	
North Island system	177,544	North Island system	210,868
South Island system	126,642†	South Island system	295,817
Total working-costs for year	304,186	Total Sinking Fund Reserve	506,685
(4) Capital charges—		Arrears in Sinking Fund payments not yet appropriated	942,757
Interest—		(9) General Reserve—	
North Island system	349,816	North Island system	Nil
South Island system	220,112	South Island system	82,399
Cost of raising loans, &c.—			
North Island system	2,151		
South Island system	1,363		

* Excludes £122 miscellaneous revenue from Southland, shown in Table XI. † Includes £579 miscellaneous payments in connection with Southland, but does not include £73 commission paid for collecting rates, which amount is shown in Table XI.

(Continued on next page.)

TABLE I.—SUMMARY OF FINANCIAL AND OPERATING STATISTICS FOR NORTH ISLAND AND SOUTH ISLAND ELECTRIC-POWER SYSTEMS FOR THE YEAR ENDING 31ST MARCH, 1938—*continued*.

NOTE.—“North Island system” includes Arapuni—Horahora—Mangahao—Waikaremoana all interconnected. “South Island system” includes Lake Coleridge and Waitaki interconnected, together with Monowai (Southland) and Arnold River (Westland) not yet interconnected with Coleridge—Waitaki system.

		1937-38 (Fourth Year).	1937-38 (Fourth Year).
(b) Operating Results.			
Maximum load (kilowatts)—			
North Island system		143,240	
South Island system		51,860	
Southland system		7,520	
Average load (kilowatts)—			
North Island system		91,095	
South Island system		27,820	
Southland system		3,640	
Average load factor—		Per Cent.	
North Island system		63·6	
South Island system		53·4	
Southland system		48·4	
Units output—		Units.	
North Island system		798,354,000	
South Island system		242,391,775	
Southland system		31,903,940	
Combined		1,072,649,715	
Units distributed—			
Units sold—			
North Island system		720,490,034	
South Island system		205,579,104	
Southland system		23,557,484	
Combined		949,626,622	
Units unsold (station auxiliaries, &c.)—			
North Island system		6,637,589	
South Island system		3,147,486	
Southland system		70,990	
Combined		9,856,065	
Total units distributed, North Island system		727,127,623	
Total units distributed, South Island system		208,726,590	
Total units distributed, Southland system		23,628,474	
Line losses—			
Transmission—		Units.	Per Cent.
North Island system		70,973,165	8·89
South Island system		32,248,112	13·23
Southland system .. .. .		..	..
Combined		103,221,277	..
Distribution—			
North Island system		253,212	0·03
South Island system		1,417,073	0·58
Southland system		8,275,466	26·16
Combined		9,945,751	..
Total line losses, North Island system		71,226,377	8·92
Total line losses, South Island system		33,665,185	13·81
Total line losses, Southland system		8,275,466	26·16
Revenue—			
Per kilowatt (system maximum)—			£
North Island system			6·83‡
South Island system			6·49‡
Southland system			20·62‡
Per unit generated—			d.
North Island system			0·294
South Island system			0·333
Southland system			1·166
Per unit distributed—			
North Island system			0·326
South Island system			0·393
Southland system			1·580
Per unit sold—			
North Island system			0·326‡
South Island system			0·393‡
Southland system			1·580‡
Working-costs—			
Per kilowatt (system maximum)—			£
North Island system			1·24
South Island system			1·30
Southland system			7·89
Per unit generated—			d.
North Island system			0·0534
South Island system			0·0660
Southland system			0·4100
Per unit distributed—			
North Island system			0·0586
South Island system			0·0770
Southland system			0·4100
Per unit sold—			
North Island system			0·0592
South Island system			0·0786
Southland system			0·6050
Capital charges—			
Per kilowatt (system maximum)—			£
North Island system			3·07
South Island system			4·71
Southland system			11·90
Per unit generated—			d.
North Island system			0·1321
South Island system			0·2420
Southland system			0·6800
Per unit distributed—			
North Island system			0·1456
South Island system			0·2810
Southland system			0·6800
Per unit sold—			
North Island system			0·1465
South Island system			0·2850
Southland system			0·9120
Total costs—			
Per kilowatt (system maximum)—			£
North Island system			4·31
South Island system			6·01
Southland system			19·79
Per unit generated—			d.
North Island system			0·185
South Island system			0·309
Southland system			1·090
Per unit distributed—			
North Island system			0·204
South Island system			0·358
Southland system			1·090
Per unit sold—			
North Island system			0·206
South Island system			0·364
Southland system			1·517

‡ Based on gross revenue. For corresponding figures, based on revenue received from sale of electricity only, see Table XIII.

TABLE II.—ANALYSIS OF CAPITAL OUTLAY AS AT 31ST MARCH, 1938.

North Island System.		South Island System (including Southland and Arnold River.)		Combined Totals.
Headworks and power-stations—		Headworks and power-stations—		
Land, fencing, and roading—	£	Land, fencing, and roading—	£	£
Arapuni	110,749	Coleridge	24,385	
Horahora	3,208	Waitaki	48,441	
Mangahao	72,130	Southland	12,226	
Waikaremoana	67,303	Arnold River	1,280	339,722
Headworks—		Headworks—		
Arapuni	1,284,983	Coleridge	519,712	
Horahora	151,483	Waitaki	1,073,887	
Mangahao	848,913	Southland	86,735	
Waikaremoana	148,673	Arnold River	80,551	4,194,937
Generating-station, buildings, and village—		Generating-station, buildings, and village—		
Arapuni	413,825	Coleridge	85,611	
Horahora	60,847	Waitaki	459,784	
Mangahao	170,197	Southland	39,182	
Waikaremoana	166,297	Arnold River	7,776	1,403,519
Generating plant and machinery—		Generating plant and machinery—		
Arapuni	677,496	Coleridge	163,565	
Horahora	95,333	Waitaki	186,717	
Mangahao	190,623	Southland	59,892	
Waikaremoana	175,870	Arnold River	17,415	1,566,911
Auxiliary stations (three)—Penrose, Huntly, Grand Junction	81,996	Auxiliary station (one)—Dobson (ex Lyttelton)	109,127	191,123
Transmission and distribution—		Transmission and distribution—		
Primary distribution—		Primary distribution—		
11 kV. lines	41,272	11 kV. lines	519,344	
33 kV. lines .. .. .	..	33 kV. lines	30,942	
50 kV. lines	389,715	50 kV. lines .. .. .	..
66 kV. lines .. .. .	..	66 kV. lines	510,371	
110 kV. lines	1,158,678	110 kV. lines	278,852	
Secondary distribution .. .. .	..	Secondary distribution	294,200	3,223,374
Substations—		Substations—		
11 kV. substations	15,429	11 kV. substations .. .. .	..
33 kV. substations .. .. .	..	33 kV. substations	14,738	
50 kV. substations	243,537	50 kV. substations .. .. .	..
66 kV. substations .. .. .	..	66 kV. substations	312,954*	
110 kV. substations	818,843	110 kV. substations	200,633	1,606,134
General—		General—		
General offices, garages, stores, and other accommodation	56,502	General offices, garages, stores, and other accommodation	17,984	
Telephone services	4,959	Telephone services	43,781	
Explorations and preliminary surveys; engineering, office, and general expenses; charges and expenses of raising loans	810,926	Explorations and preliminary surveys; engineering, office, and general expenses; charges and expenses of raising loans	650,372	
Interest during construction	956,627	Interest during construction	469,158	3,010,309
			6,319,615	
Grand totals	9,216,414			15,536,029

* Includes, £2,544 for substation cottages, Southland.

TABLE III.—OPERATING OR WORKING COSTS FOR YEAR ENDED 31ST MARCH, 1938.

	North Island System.				South Island System (including Southland and Arnold River.)			
	Cost.	Cost per Unit.			Cost.	Cost per Unit.		
		Generated.	Distributed.	Sold.		Generated.	Distributed.	Sold.
(a) Headworks and power-stations	£ 49,116	d. 0·0148	d. 0·0162	d. 0·0164	£ 25,502	d. 0·0223	d. 0·0263	d. 0·0267
(b) Auxiliary stations	95	..	..	..	7,188	0·0063	0·0074	0·0075
	49,211	0·0148	0·0162	0·0164	32,690	0·0286	0·0337	0·0342
(c) Transmission and distribution—								
Primary distribution	36,728	0·0111	0·0121	0·0122	11,484	0·0100	0·0119	0·0120
Secondary distribution .. .. .	..	..	..	..	9,043	0·0079	0·0093	0·0095
(d) Substations	25,988	0·0078	0·0086	0·0087	16,788	0·0147	0·0174	0·0176
(e) Management and general—								
General expenses	751	0·0002	0·0002	0·0003	10,006	0·0088	0·0104	0·0105
Management	54,749	0·0165	0·0181	0·0182	44,073	0·0386	0·0455	0·0462
Total costs (a) to (e)	167,427	0·0504	0·0552	0·0558	124,084	0·1086	0·1282	0·1300
(f) Power purchased .. .. .	..	..	..	..	..	..	..	..
(g) Standby provision	10,117	0·0030	0·0034	0·0034	2,631	0·0023	0·0027	0·0028
Total costs (a) to (g)	177,544	0·0534	0·0586	0·0592	126,715	0·1109	0·1309	0·1328

North Island System.

Units generated	798,354,000
Units distributed	727,127,623
Units sold	720,490,034

South Island System.

Units generated	274,295,715
Units distributed	232,355,064
Units sold	229,136,588

TABLE V.—SOUTH ISLAND ELECTRIC-POWER SYSTEM.—GROSS FINANCIAL RESULTS OF DISTRIBUTION OF ENERGY FOR THE YEAR ENDED 31ST MARCH, 1938.

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.	Other Funds Principal Repayments.	Other Expenditure.	Total.	Profits.	Losses.		
		£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	
(A) RECEIVING BULK SUPPLY DIRECT FROM PUBLIC WORKS DEPARTMENT.																					
1. Public Works Department (Coleridge-Waitaki—Arnold River land)	124	4,798,907	48,202	283,909	..	288	3,986	336,385	..	..	67,343	160,483	82,885	..	971	311,682	24,703	..	..	..
2. Public Works Department (Southland)	10,886	1,520,708	122,186	25,316	..	446	7,218	155,166	..	..	59,372	59,629	29,490	..	392	148,883	6,283	..	..	..
3. Ashburton Power Board	4,425	345,766	52,479	..	..	242	736	53,457	15,517	9,755	15,415	1,917	1,812	..	..	49,716	3,741	..	..	..
4. Banks Peninsula Power Board	1,071	104,014	13,321	..	..	167	329	16,266	4,664	5,414	3,942	..	2,265	..	..	16,285	..	..	..	..
5. Bluff Borough Council	547	6,738	4,741	..	..	..	423	5,164	2,829	1,210	316	..	88	..	..	4,668	496	..	..	19
6. Christchurch City Council	31,630	857,621	256,041	12,746	..	4,245	8,034	281,066	135,286	82,097	11,682	29,018	2,555	..	1,072	261,710	7,622	11,734	..	..
7. Dunedin City Council	29,233	1,709,274	254,060	13,324	..	..	2,379	269,763	23,299	72,575	51,577	2,200	27,103	..	3,509	180,263	89,500	..	..	..
8. Grey Power Board	4,226	169,895	51,464	..	..	473	30	51,967	12,025	11,500	14,097	..	5,836	..	..	46,158	..	..	..	..
9. Heathcote County Council	1,370	25,103	11,249	..	..	..	62	11,311	7,258	3,538	1,058	..	869	..	..	12,723	..	..	..	..
10. Invercargill City Council	6,385	152,427	53,118	..	..	..	4,549	57,667	25,333	9,180	4,526	1,413	..	2,366	..	42,818	14,849	..	..	1,412
11. Kaipoi Borough Council	515	11,470	3,302	..	..	..	66	3,377	1,344	1,149	279	183	145	..	..	3,100	277	..	..	..
12. Lyttelton Borough Council	980	13,839	7,492	..	..	72	..	7,564	3,277	2,522	169	106	181	..	..	6,255	315	994	..	..
13. Malvern Power Board	722	72,917	8,220	..	..	147	253	10,547	2,189	3,608	3,112	..	920	..	..	9,829	..	..	..	..
14. North Canterbury Power Board	2,674	195,899	29,883	3,564	..	230	885	34,562	12,957	8,913	6,947	63	3,870	..	..	32,750	331	1,481	..	..
15. Riccarton Borough Council	1,615	24,000	13,706	..	..	567	..	14,273	6,702	4,922	229	362	156	..	..	12,371	862	1,040	..	..
16. Rangiora Borough Council	745	9,165	5,829	..	..	..	9	5,838	2,220	2,383	174	393	78	..	..	5,248	287	303	..	..
17. South Canterbury Power Board	4,800	355,450	46,359	20,913	..	446	2,085	69,803	35,112	9,979	12,833	3,631	6,226	..	..	67,781	..	2,022	..	..
18. Springs-Ellesmere Power Board	2,768	164,806	31,613	..	..	88	227	31,928	14,046	8,949	6,114	..	2,991	..	..	32,100	..	..	..	..
19. Sumner Borough Council	1,110	15,866	5,987	..	..	9	..	5,996	3,222	2,113	299	248	101	..	..	5,983	13	..	..	..
20. Waimairi County Council	3,749	68,020	24,147	33	..	..	74	24,322	13,272	4,464	1,429	4,318	1,263	..	..	24,746	..	..	..	..
21. Waitaki Power Board	4,452	201,777	41,542	..	..	1,405	510	43,457	16,392	10,052	8,049	1,139	3,279	..	..	39,468	3,343	646	..	..
Sub-total of (A)	114,027	10,823,162	1,084,941	359,805	4,444	8,834	31,855	1,489,879	336,944	381,038	362,359	157,454	59,875	10,923	5,944	1,314,537	152,622	24,747	2,027
(B) RECEIVING SUPPLY THROUGH BULK-SUPPLY PURCHASERS IN SECTION (A).																					
1. Otago Power Board	4,338	313,039	47,277	348	..	47,738	13,324	9,643	12,802	5,051	3,866	4,360	..	49,046	1,308
2. Timaru Borough Council	4,909	110,655	45,380	125	45,505	20,913	13,036	1,970	..	3,302	39,221	6,284
Total	123,274	11,246,856	1,177,598	359,805	4,792	8,947	31,980	1,583,122	371,181	403,717	377,131	162,505	67,043	15,283	5,944	1,402,804	158,906	24,747	3,335

Gross profit, £180,318; rates collected, £4,792; net profit, £175,526. Ratio working-expenses to revenue = 49.0 per cent; ratio capital charges to capital outlay = 5.58 per cent.

TABLE VI.—ROUTE-MILES OF LINE OPERATED BY THE PUBLIC WORKS DEPARTMENT, AS AT 31ST MARCH, 1938.

NORTH ISLAND SYSTEM.

Voltage	110 kV.		50 kV.		11 kV.				3 kV.	Total Route-miles, 1,286·00
	1.	2.	1.	2.	1.	2.	3.	4.	1.	
Miles	486·40	258·57	447·72	45·48	13·90	22·58	0·18	4·55	6·62	

SOUTH ISLAND SYSTEM.
(Including Southland.)

Voltage ..	110 kV.		66 kV.		33 kV.		11 kV.				6·6 kV.	3 kV.	L.T.	Total Route-miles, 3,168·43
	1.	2.	1.	2.	1.	2.	1.	2.	3.	4.	1.	1.	..	
Miles ..	183·85	37·79	487·94	1·56	39·18	19·69	1,702·65	83·51	1·27	5·52	4·17	38	563·3	

Actual Mileages and Sizes of Overhead Conductors in use in connection with above Lines.

	North Island System.						South Island System. (Including Southland.)					
	Copper.	A.C.S.R.	Galvanized Iron.	Copperweld.	Cadmium Copper.	Total Miles.	Copper.	Aluminium.	A.C.S.R.	Galvanized Iron.	Copperweld.	Total Miles.
1/-104..	..	..	..	..	..	..	56	..	..	..	..	56
1/-112..	..	..	..	..	282	282	..	..	..	..	..	..
1/-128..	..	..	..	..	..	..	450	..	..	..	..	450
1/-160..	..	..	202	573	..	775	4,026	..	..	2,973	14	7,013
1/-176..	..	..	..	..	..	..	764	..	..	..	..	764
1/-192..	..	..	..	..	..	..	..	..	..	..	..	..
1/0 ..	72	..	..	..	..	72	..	..	..	..	..	..
3/0 ..	..	..	..	..	..	..	..	..	339	..	..	339
7/-036..	..	..	..	..	..	..	74	..	..	..	..	74
7/-044..	3	..	..	..	..	3	69	..	..	..	..	69
7/-052..	..	..	..	..	..	..	3	..	..	..	..	3
7/-064..	70	..	..	..	..	70	221	5	..	..	..	226
7/-080..	667	..	..	..	..	667	1,047	2	..	..	..	1,049
7/-092..	..	..	..	..	..	..	967	14	..	..	..	981
7/-104..	201	..	..	..	..	201	59	..	..	..	..	59
7/-128..	..	..	..	..	..	..	..	180	..	..	..	180
7/-135..	..	..	..	..	..	..	..	..	..	..	..	..
7/-167..	..	636	..	..	..	636	..	..	..	..	4	4
7/-182..	..	..	..	..	..	..	..	..	..	..	8	8
19/-052..	7	..	..	..	..	7	..	..	..	..	..	..
19/-064..	409	..	..	..	..	409	40	..	..	..	..	40
19/-072..	2	..	..	..	..	2	..	..	..	..	..	..
19/-080..	..	..	..	..	..	..	5	..	..	..	..	5
19/-092..	2,133	..	..	..	..	2,133	1,048	..	..	..	..	1,048
19/-104..	436	..	..	..	..	436	34	..	..	..	..	34
37/-072..	359	..	..	..	..	359	..	..	..	..	..	..
37/-092..	17	..	..	..	..	17	..	..	..	..	..	..
37/-102..	..	..	..	..	..	..	..	..	227	..	..	227
Totals	4,376	636	202	573	282	6,069*	8,863	201	566	2,973	26	12,629†

* Includes 1,039 miles of telephone line conductors.

† Does not include 1,262 miles of telephone line conductors.

TABLE VII.—CIRCUIT-MILES OF SUPPLY AUTHORITIES' LINES CONNECTED TO GOVERNMENT SYSTEMS AS AT 31ST MARCH, 1938.

Voltage ..	22,000, or 33,000		11,000.		6,600.		3,300.		400/230.		Total Route-miles (a)
	1.	..	1.	2.	3.	4.	1.	2.	1.	2.	
Number of Circuits
<i>North Island System.</i>											
Auckland Power Board ..	54	179	180	16	..	..	..	..	720	..	1,198
Bay of Plenty Power Board	241	..	..	..	..	..	..	33	..	274
Cambridge Power Board	3	..	..	..	..	..	..	106	..	194
Central Hawke's Bay Power Board	218	31	..	..	..	..	..	44	..	303
Central Waikato Power Board	356	..	..	1	..	..	..	328	..	795
Dannevirke Power Board	24	..	..	2	..	..	..	100	..	444
Franklin Power Board	459	216	..	..	..	..	..	209	..	679
Hamilton Borough Council	8	..	..	..	..	..	..	54	..	62
Hawke's Bay Power Board	259	..	..	2	..	..	..	12	..	536
Horowhenua Power Board	183	..	..	1	..	..	..	250	..	718
Hutt Valley Power Board	15	91	..	..	..	..	..	528	..	718
Manawatu-Oroua Power Board	300	..	13	..	..	..	..	195	..	339
New Plymouth Borough Council	269	..	..	1	..	..	..	811	..	1,310
North Auckland Power Board	220†	..	..	2	..	..	..	63	..	353
Opunake Power Board	235
Poverty Bay Power Board	45	..	..	..	..	..	..	..	..	287
Rotorua (Tourist Department)	152	10	..	..	..	..	..	..	454
South Taranaki Power Board	218	..	..	..	..	..	..	118	..	78
Taranaki Power Board	48	..	..	..	..	..	..	233	..	425
Taranua Power Board	158	..	..	..	..	..	..	8	..	662
Te Awamutu Power Board	92	..	..	..	..	..	..	252	..	464
Te Aroha Borough Council	1	..	..	..	..	..	..	154	..	324
Thames Borough Council	94	..	19
Thames Valley Power Board	594	..	..	..	..	..	..	14	..	22
Wairarapa Power Board	278	..	..	..	..	..	..	16	..	923
Waioa Power Board	38	..	..	..	..	..	..	27	..	1,016
Waitemata Power Board	872†	..	..	..	..	..	..	10	..	121
Waitomo Power Board	123	..	..	..	..	..	..	6	..	884
Wanganui-Rangitikei Power Board	260	182	..	..	..	..	..	..	..	154
Wellington City Council	3	..	2,092
Totals ..	88	5,461	338	60	10	4	1,393	60	811	2	15,365 (a)

* 1938 figures not received in time for inclusion in this table.
 † 33 kV.
 ‡ 400 volt lines are included with 11 kV lines. Separate figures not available.
 § 400 volt lines are included with 6.6 kV lines. Separate figures not available.
 (a) Includes underground cables.

TABLE VII.—CIRCUIT-MILES OF SUPPLY AUTHORITIES' LINES CONNECTED TO GOVERNMENT SYSTEMS AS AT 31ST MARCH, 1938—continued.

Voltage	33,000.		11,000.			6,600.		3,300.			400.		230.	Underground Cables.	Total Route-miles.	
	1.	2.	1.	2.	3.	4.	1.	2.	1.	2.	1.					
	Number of Circuits	1.	2.	1.	2.	3.	4.	1.	2.	1.	2.	3.	1.			
<i>South Island System.</i>																
Ashburton Power Board	1,078	
Banks Peninsula Power Board	260	
Bluff Borough Council	18	
Christchurch City Council	375	
Dunedin City Council	597	
Grey Power Board	295	
Heathcote County Council	36	
Invercargill City Council	94	
Kaipoi Borough Council	15	
Lyttelton Borough Council	13	
Malvern Power Board	186	
North Canterbury Power Board	733	
Otago Power Board	642	
Rangiora Borough Council	14	
Riccarton Borough Council	23	
South Canterbury Power Board	833	
Springs-Ellesmere Power Board	334	
Summer Borough Council	10	
Timaru Borough Council	69	
Waikaki Power Board	620	
Waimairi County Council	149	
Totals	159	4	1059	98	1	1	1	2,304	28	291	11	3	1,758	4	465	6,294

Grand total, 21,659 circuit miles.

TABLE VIII.—ELECTRIC-POWER DISTRICTS OF NEW ZEALAND AS CONSTITUTED AT 31ST MARCH, 1938.

Name of Board.	Proclamation affecting Constitution gazetted.	Members on Board.	Approximate Area.		Population.		Value of Rateable Property.				Valuation Basis used for Rating Purposes.	Total Amount of Loans authorized.	Total Votes cast for Loan Polls.		Number of Rate-payers.
			Sq. Miles.	Outer Area.	District.	Outer Area.	Number.	Outer Area.	Used as Rating Basis.	District.			Outer Area.	Number.		Against.
1. Ashburton	17/11/21 1/4/22 7/9/22 21/8/24 15/7/25 12/11/25 29/7/26 8/1/20 24/11/21	12	1,193	1,271	19,070	506	£ 11,500,000	£ 8,314,594	£ 700,000	Capital ..	..	£ 411,150	2,999	706	4,175
2. Auckland	15/7/25 12/11/25 29/7/26	12	325	..	225,000	..	78,840,179	50,491,865	..	Capital ..	..	2,542,500	11,004	1,367	35,000
3. Banks Peninsula	8/1/20 24/11/21	7	387	..	3,777	..	3,575,965	..	..	Capital ..	..	114,680	658	113	1,123
4. Bay of Islands ¹	4/3/37	6	1,456	2,030	17,434	9,404	1,367,260	1,367,260	531,097	Unimproved	..	200,000	908	246	3,344
5. Bay of Plenty	20/8/25	7	536	2,678	10,500	5,670	1,497,032	1,497,032	188,502	Unimproved	..	206,000	654	153	2,289
6. Buller ¹	11/5/22	5	1,987	..	9,197	..	696,374	696,374	..	Unimproved	..	..	Poll not yet taken.	..	..
7. Cambridge	8/1/20 6/9/23 19/10/22	8	137	..	6,000	..	2,559,567	1,550,262	..	Capital ..	..	122,835	749	123	1,620
8. Central Hawke's Bay	7/4/27 28/8/30 7/9/22 8/7/20 6/3/24 7/8/24 8/1/25	10	1,350	..	11,100	..	5,589,823	5,589,823	..	Unimproved	..	150,000	543	41	2,750
9. Central Waikato	3/12/25 3/9/27 27/3/30 11/8/21 2/10/24 28/7/27 31/10/29	10	985	155	19,400	N.A.*	9,275,536	4,663,847 ⁵	N.A.*	Capital ..	..	469,000	2,004	168	4,500
10. Dannevirke	8/1/25	10	585	118	12,779	378	3,557,153	3,557,153	355,700	Unimproved	..	224,000	1,587	330	4,452
11. Franklin	2/10/24 28/7/27 31/10/29	9	628	58	19,430	550	8,092,168	4,926,883	111,365	Capital ..	..	404,820	2,471	478	5,080
12. Golden Bay	18/6/25 4/5/35 21/7/36	5	62	956	1,520	1,830	493,407	264,659	302,525	Capital ..	..	29,500	418	98	423
13. Grey	26/10/22 19/6/24 3/2/27 7/4/27	9	702	810	14,320	768	2,458,847	652,097	118,500	Capital ..	..	232,315	1,022	228	3,353
14. Hawke's Bay	19/6/24 3/2/27 7/4/27 28/8/30	9	1,682	2	46,481 ⁸	..	9,629,443	9,629,443	..	Unimproved	..	438,910	681	68	11,220
15. Horowhenua	1/12/21	9	630	..	17,500	..	6,898,987 ⁶	3,403,255	..	Capital ..	..	260,000	973	26	3,780 ⁷
16. Hutt Valley	6/7/22 11/12/24	11	530	..	48,200	..	5,386,273	5,386,273	..	Unimproved	..	390,000	2,333	343	13,139

(For notes see p. 130.)

TABLE VIII.—ELECTRIC-POWER DISTRICTS OF NEW ZEALAND AS CONSTITUTED AT 31ST MARCH, 1938—continued.

Name of Board.	Proclamation affecting Constitution gazetted.	Members on Board.	Approximate Area.		Population.		Value of Rateable Property.				Valuation Basis used for Rating Purposes.	Total Amount of Loans authorized.	Total Votes cast for Loan Polls.		Number of Rate-payers.
			District.	Outer Area.	District.	Outer Area.	Used as Rating Basis.	District.	Outer Area.	District.			Outer Area.	For.		Against.
		Number.	Sq. Miles.	Sq. Miles.	Number.	Number.	£	£	£	£	£	Number.	Number.		
17. Lake Wakatipu ¹	1/2/34	7	73	3,800	1,700	1,200	171,920	321,690	..	..	..	508	33	474
18. Malvern ..	{ 28/6/23 17/3/30 }	6	308	1,773	3,550	1,500	2,497,802	1,073,106	..	Capital ..	65,000	..	..	1,054
9. Manawatu-Oroua ..	{ 1/12/21 20/6/29 }	12	1,301	..	43,059 ^s	..	12,918,565	..	..	Unimproved	550,000	..	96	9,100
20. Marlborough ..	{ 1/11/34 25/10/23 }	8	3,218	..	14,530	..	7,449,979	..	..	Capital ..	349,500	..	431	3,760
21. North Auckland ..	{ 29/3/23 5/12/29 5/3/31 13/12/34 }	12	2,220	5	27,290	7,154	3,581,247	788,782	..	Unimproved	297,000	..	958	7,021	
22. North Canterbury ..	{ 1/2/34 11/1/34 18/8/21 }	8	1,628	2,948	15,679	3,606 [{]	10,991,538 ³ 1,033,590 ⁴	4,798,121	..	Capital and unimproved	210,700	..	150	3,722	
23. Opunake ..	{ 19/3/25 20/8/25 26/10/22 4/12/24 19/7/28 }	7	240	10	6,750	380	2,220,383	54,269	..	Capital ..	97,000	..	107	1,004	
24. Otago Central ..	{ 18/10/23 23/12/26 1/11/28 26/4/29 }	9	774	1,949	4,643	473	1,323,653	466,501	..	Capital ..	159,000	..	71	1,330	
25. Otago ..	{ 26/10/22 19/7/28 }	9	1,391	890	17,931	6,251	4,797,711	1,634,860	..	Capital ..	310,500	..	206	5,535	
26. Poverty Bay ..	{ 26/4/29 20/12/23 }	11	1,742	..	25,510	..	14,461,734	..	..	Capital ..	379,750	..	530	8,173
27. Reefon ¹	{ 30/6/21 26/10/22 }	5	24	..	1,639	..	178,065	38,054	..	Capital ..	..	..	..	..
28. South Canterbury ..	{ 8/3/28 13/12/28 }	12	1,673	3,579	37,486 ^s	6,980	13,311,561	2,283,540	..	Capital ..	395,220	..	587	6,410	
29. South Taranaki ..	{ 30/4/25 5/2/31 8/7/20 29/3/23 }	10	434	46	20,000	1,500	9,059,095	79,442	..	Capital ..	227,500	..	300	3,847	
30. Springs-Ellesmere ..	{ 23/8/23 17/3/30 5/2/31 6/8/31 }	5	524	..	12,330	..	7,856,719	32,000	..	Capital ..	166,520	..	105	3,133	

(For notes see p. 130.)

TABLE VIII.—ELECTRIC-POWER DISTRICTS OF NEW ZEALAND AS CONSTITUTED AT 31ST MARCH, 1938—continued.

Name of Board.	Proclamation affecting Constitution gazetted.	Members on Board.		Approximate Area.		Population.		Value of Rateable Property.				Valuation Basis used for Rating Purposes.	Total Amount of Loans authorized.	Total Votes cast for Loan Polls.		Number of Rate-payers.
		Number.	Sq. Miles.	District.	Outer Area.	Number.	District.	Outer Area.	Used as Rating Basis.	District.	Outer Area.			Number.	Against.	
31. Taranaki ..	{ 19/5/22 6/5/26 20/5/28 5/2/31 2/11/33 }	8	355	1,333	8,015	6,141,672	2,865,396	3,109,336	Capital ..	449,800	1,165	263	2,150			
32. Taranua ..	{ 14/6/23 16/7/31 1/6/33 }	10	700	524	1,805	2,815,000	2,815,000	1,262,581	Unimproved	200,000	714	83	3,600			
33. Tauranga ..	{ 8/1/20 27/11/24 28/1/37 }	7	646	3	4,510	1,004,372	1,004,372	517,107	Unimproved	184,500	1,555	342	2,600			
34. Te Awamutu ..	{ 22/7/20 6/11/24 }	8	342	58	150	1,849,902	1,849,902	N.A.*	Unimproved	216,000	814	148	2,268			
35. Teviot ..		7	102	..	..	176,839	255,661	..	Unimproved	55,500	280	32	404	
36. Thames Valley ..	{ 8/1/20 6/9/23 22/12/24 }	12	2,301	..	46,979 ⁸	14,420,582	6,587,837	..	Capital ..	925,000	3,917	1,087	15,122			
37. Waimea ..	{ 1/6/33 2/5/29 25/3/20 20/5/26 22/7/26 4/11/26 3/2/27 17/10/29 18/1/23 4/11/26 21/3/29 24/9/31 25/6/36 29/7/20 }	7	434	1,126	14,000	2,656,884	N.A.*	N.A.*	Capital ..	157,500	3,062	697	2,960			
38. Wairarapa ..		9	637	1,359	5,770	10,705,778	5,772,319	2,656,117	Capital ..	333,100	2,295	312	5,499			
39. Wairea ..		7	455	25	200	717,137	717,137	163,379	Unimproved	65,850	176	19	760			
40. Wairoa ..		10	1,354	..	6,970	4,171,231	1,612,815	..	Capital ..	100,000	504	31	1,551			
41. Waitaki ..	{ 9/8/23 5/4/28 18/10/23 27/11/24 26/8/26 7/3/29 24/1/35 6/3/24 28/1/37 1/12/21 23/12/26 20/6/29 6/11/34 28/10/20 }	9	560	1,813	500	5,747,283	4,406,970	239,322	Capital ..	240,650	1,959	222	4,752			
42. Waitemata ..		12	1,106	..	48,734	13,903,497	5,821,648	..	Capital ..	495,000	11,326	2,214	16,206 ⁶			
43. Waitomo ..		7	170	1,090	2,400	880,236	880,236	N.A.*	Unimproved	143,400	784	109	1,742			
44. Wanganui-Rangitikei ..		12	1,648	972	3,000	22,099,617	6,568,540	1,408,210	Capital ..	375,000	1,315	214	10,350			
45. Westland ² ..		9	900	..	3,462	401,319	220,810	..	..	..	Poll not yet taken.	683	..
Totals, 1937-38 ..		394	40,435	31,381	88,500	330,799,995	208,121,505	23,196,052	..	13,344,700	76,160	13,835	221,458			
.. 1936-37 ..		394	39,878	31,868	95,262	326,641,373	209,806,297	22,231,939	..	13,040,770	76,816	14,206	216,780			

¹ Not yet actively functioning.

² License delegated to Westland Power, Ltd.

³ Figures given in 1930-31 returns; later information not available.

⁴ Unimproved basis.

⁵ Includes population of separately licensed boroughs forming part of the electric-power district and represented on the electric-power board.

⁶ Figures given in 1934-35 returns; later information not available.

⁷ Figures given in 1936-37 returns; later information not available.

⁸ Figures given in 1936-37 returns; later information not available.

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¹⁴⁶ Figures given in 1936-37 returns; later information not available.

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TABLE IX.—STATISTICS OF POPULATION, CONSUMERS, SYSTEM VOLTAGES, ROUTE-MILES OF LINES, ETC., FOR THE YEAR ENDED 31ST MARCH, 1938.

NOTE.—In the column describing the Source of Supply the following abbreviations are used: G.N. = Government supply, North Island system; G.S. = Government supply, South Island system; I. = Independent supply (own generating-plant); B. = Bulk supply from another authority.

Supply Authority.	Source of Supply.	Year when Supply commenced.	Population included in Area of Supply.	Number of Consumers.	Ratio of Consumers to Population in Area of Supply.	Generation.			Transmission.	Voltage.		Secondary Distribution (and System of Supply).	Distribution Transformers.		Route-miles of Lines.	Consumers per Route-mile of Line.	Static Head.	Street Lighting System.	No.
						11,000 6,600 5,000	110,000 50,000	11,000 3,300		Number.	Total kVA.								
PUBLIC WORKS DEPARTMENT.																			
1. Arapuni-Mangahao-Waikaremoana	I.	1921	..	388	..	{ 11,000 6,600 5,000	{ 110,000 50,000	{ 11,000 3,300	{ 400/230 A.C.	58	5,292	1,285	..	{ Ft. Arapuni=175 Hora Hora=27 Mangahao=896 Waikaremoana=676 Coleridge=480 Waitaki=70 Arnold River=42 Monowai=154	..	..	..	1
2. Coleridge - Waitaki - Arnold River	I.	1915	..	124	..	{ 11,000 6,600	{ 110,000 33,000	{ 11,000 6,600	{ 400/230 A.C.	64	4,735	680	2
3. Southland Electric - power Supply ⁴	I.	1925	48,875	10,886	22.24	{ 6,600	{ 66,000	{ 11,000 3,300	{ 400/230 A.C.	1,624	19,007	2,492	4.4	..	..	..	Series and Parallel	3
Totals, P.W.D.	..	..	48,875	11,398	..	..	..	..	..	1,746	29,034	4,457	..	..	..	..	..	..
ELECTRIC-POWER BOARDS.																			
1. Ashburton	G.S.	1923	19,070	4,425	23.20	400 (s)	..	{ 11,000 6,600	{ 400/230 A.C.	901	9,578	952	4.6	..	..	..	Series	1
2. Auckland	G.N.	1908	225,000	58,342	25.93	6,600 (s)	22,000	{ 11,000 6,600 6,600	{ 400/230 A.C. 460/230 D.C.	975	52,028	1,198	48.7	..	..	..	Series and Parallel	2
3. Banks Peninsula	G.S.	1921	3,777	1,071	28.36	3,300 (s)	33,000	{ 11,000 6,600 3,300	{ 400/230 A.C.	185	1,641	213	5.0	310	..	..	Parallel	3
4. Bay of Islands ⁵	G.N.	1928	10,500	1,809	17.23	..	..	{ 11,000 3,300	{ 400/230 A.C.	350	4,713	274	6.6	..	..	..	Series	4
5. Bay of Plenty	G.N.	1921	6,000	1,570	26.16	..	..	{ 11,000 3,300	{ 400/230 A.C.	143	1,986	195	8.0	..	..	..	Series	5
6. Buller ¹	G.N.	1925	11,100	1,930	17.38	..	..	{ 11,000 6,600 3,300	{ 400/230 A.C.	293	4,172	257	7.5	..	..	..	Parallel	6
7. Cambridge	G.N.	1921	19,400	6,091	31.39	..	..	{ 11,000 6,600 3,300	{ 400/230 A.C.	395	8,889	795	7.7	..	..	..	Parallel	7
8. Central Hawke's Bay	G.N.	1925	13,157	3,001	22.80	..	..	{ 11,000 6,600	{ 400/230 A.C.	264	2,583	345	8.7	..	..	..	Series	8
9. Central Waikato	G.N.	1925	19,980	4,610	23.07	..	..	{ 11,000 6,600	{ 400/230 A.C.	438	7,970	680	6.8	..	..	..	Parallel	9
10. Dannevirke	G.N.	1929	1,820	447	29.41	400	..	{ 6,600 3,300	{ 400/230 A.C.	64	1,092	73	6.12	..	..	..	Parallel	10
11. Franklin	I.	1926	14,820	4,226	29.50	3,300	33,000	{ 11,000 6,600	{ 400/230 A.C.	134	7,724	258	16.4	..	..	..	Series	11
12. Golden Bay	G.S.	1927	31,179	7,845	25.20	3,300 (s)	..	{ 11,000 3,300	{ 400/230 A.C.	299	7,535	421	18.6	..	..	..	Series and Parallel	12
13. Grey	G.N.	1924	17,500	5,195	29.70	..	..	{ 11,000 6,600	{ 400/230 D.C.	200	6,855	346	15.0	..	..	..	Series and Parallel	13
14. Hawke's Bay	G.N.	1925	48,200	13,488	27.98	..	..	{ 11,000 6,600	{ 400/230 A.C.	186	11,432	304	44.4	..	..	..	Series and Parallel	14
15. Horowhenua	G.N.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	Series and Parallel	15
16. Hutt Valley	G.N.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	Series and Parallel	16
17. Lake Wakatipu ¹	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	Series and Parallel	17

(For notes, see page 135.)

TABLE IX.—STATISTICS OF POPULATION, CONSUMERS, SYSTEM VOLTAGES, ROUTE-MILES OF LINES, ETC., FOR THE YEAR ENDED 31ST MARCH, 1938—continued.

Supply Authority.	Source of Supply.	Year when Supply commenced.	Population included in Area of Supply.	Number of Consumers.	Ratio of Consumers to Population in Area of Supply.	Voltage.			Secondary Distribution (and System of Supply).	Distribution Transformers.		Route-miles of Lines.	Consumers per Route-mile of Line.	Static Head. Ft.	Street Lighting System.	No.
						Transmission.	Primary Distribution.	Generation.		Number.	Total kVA.					
ELECTRIC-POWER BOARDS—contd.																
18. Matveru	G.S.	1925	3,550	722	20.35	..	6,600	400/230 A.C.	190	1,352	187	3.9	..	Parallel Series and	18	
19. Manawatu-Oroua	G.N.	1924	20,868	5,441	26.09	..	11,000	400/230 A.C.	465	9,673	640	8.5	..	Parallel Series	19	
20. Marlborough	I.	1927	14,530	3,106	21.38	6,600	33,000	400/230 A.C.	212	3,636	287	10.8	100	..	20	
21. North Auckland	G.N.	1936	27,290	1,973	7.23	..	11,000	400/230 A.C.	151	3,310	235	8.4	..	Parallel	21	
22. North Canterbury	G.S.	1928	15,679	2,674	17.05	..	6,600	400/230 A.C.	458	4,607	594	4.5	..	Parallel	22	
23. Opunake	G.N.	1924	6,750	1,145	16.96	6,600	..	400/230 A.C.	104	1,134	162	7.1	47	Series	23	
24. Otago Central	I.	1925	4,643	1,079	23.23	6,600	33,000	400/230 A.C.	153	2,430	183	5.9	987	Parallel	24	
25. Otago	B.	1926	17,931	4,479	24.98	..	33,000	400/230 A.C.	317	3,479	542	8.3	..	Series and Parallel	25	
26. Poverty Bay	G.N.	1912	25,510	5,624	22.05	6,600 (s)	..	400/230 A.C. } 460/230 D.C. }	346	7,812	396	14.2	..	Series	26	
27. Reefton ¹	G.S.	1925	19,986	4,800	24.00	400 (s)	..	400/230 A.C.	724	7,796	832	5.8	66	Series and Parallel	27	
28. South Canterbury	G.N.	1929	20,000	3,677	18.39	5,500 (s)	..	400/230 A.C.	251	5,283	315	11.7	57	Series and Parallel	28	
29. South Taranaki	G.S.	1922	12,330	2,768	22.45	..	..	400/230 A.C.	444	3,681	334	8.3	..	Series and Parallel	29
30. Springs-Ellesmere	G.S.	1927	13,985	2,812	20.10	6,600	33,000	400/230 A.C.	348	6,201	427	6.6	300	Series	30	
31. Taranaki	I. & G.N.	1925	8,115	1,926	23.74	..	..	400/230 A.C.	311	2,927	291	6.6	..	Series	31
32. Taranua	G.N.	1926	10,360	2,046	19.74	..	33,000	400/230 A.C. } 400/230 A.C. } 11,000-3 ph. } 6,350-1 ph. } 3,300-3 ph. }	338	4,197	517	4.0	..	Parallel	32	
33. Tauranga	B.	1921	9,710	2,305	23.74	..	..	400/230 A.C.	242	3,465	321	7.2	..	Series and Parallel	33
34. Te Awamutu	G.N.	1924	1,910	444	23.24	3,300	..	400/230 A.C.	160	1,121	75	5.9	380	Series	34	
35. Teviot	G.N.	1921	40,345	8,987	22.28	..	..	400/230 A.C.	541	12,963	922	9.8	..	Parallel	35
36. Thames Valley	I. & B.	1912	9,235	2,326	25.20	400 } 3,300 } 2,500 }	..	400/230 A.C.	116	2,449	147	15.8	960/16/10	Series and Parallel	36	
37. Waimea	G.N.	1923	19,612	5,637	28.76	3,300 (s)	..	400/230 A.C.	353	9,737	570	9.9	429/290	Series	37	
38. Wairarapa	I.	1925	2,500	432	17.28	6,600	..	400/230 A.C.	199	1,622	164	2.6	65	Parallel	38	
39. Waikare	G.N.	1923	6,970	477	6.13	..	..	400/230 A.C.	93	2,527	121	3.9	..	Parallel	39
40. Waioa	G.N.	1923	6,970	477	6.13	..	..	400/230 A.C.	93	2,527	121	3.9	..	Parallel	40

(For notes, see page 135.)

TABLE IX.—STATISTICS OF POPULATION, CONSUMERS, SYSTEM VOLTAGES, ROUTE-MILES OF LINES, ETC., FOR THE YEAR ENDED 31ST MARCH, 1938—continued.

G.N. = Government supply, North Island system. G.S. = Government supply, South Island system. I. = Independent supply (own generating-plant). B. = Bulk supply from another authority.

Supply Authority.	Source of Supply.	Year when Supply commenced.	Population included in Area of Supply.	Number of Consumers.	Ratio of Consumers to Population in Area of Supply.	Generation.	Transmission.	Voltage.		Secondary Distribution (and System of Supply).	Distribution Transformers.		Route-miles of Lines.	Consumers per Route-mile of Line.	Static Head.	Street Lighting System.	No
								Primary Distribution.	Trans- mission.		Number.	Total KVA.					
ELECTRIC-POWERS BOARDS—contd.																	
41. Waitaki	G.S.	1926	18,000	4,452	24.74	3,300 (\$)	..	{ 11,000 6,600 3,300 }	..	400/230 A.C.	496	4,753	503	8.8	Ft. 250	Series and Parallel	41
42. Waitemata	G.N.	1926	48,734	13,315	27.33	..	..	{ 11,000 11,000 11,000 }	..	400/230 A.C.	413	13,176	884	15.1	..	Parallel	42
43. Waitomo	G.N.	1926	7,100	1,601	22.55	..	..	{ 11,000 11,000 }	..	400/230 A.C.	161	2,910	153	10.5	..	Parallel	43
44. Wanganui-Rangitikei	G.N.	1924	52,380	11,185	21.36	3,300 (\$)	..	{ 11,000 6,600 3,300 }	..	400/230 A.C. 500 D.C. (Trams)	651	12,212	872	12.8	..	Series and Parallel	44
45. Westland ² .. .. .	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	45
Totals, Power Boards..	..	..	878,726	209,483	23.85	..	..	..	..	..	13,064	262,641	16,985	12.33	..	..	..
OTHER LOCAL AUTHORITIES.																	
<i>City Councils.</i>																	
1. Christchurch	G.S.	1903	99,000	31,629	31.95	460 D.C. (\$)	..	{ 11,000 3,300 }	..	400/230 A.C. 460/230 D.C.	265	34,365	354	89.3	..	Series	1
2. Dunedin.. .. .	I. & G.S.	1907	87,500	29,233	33.40	{ 6,600 2,400 550 D.C. (\$) 3,300 (\$) 400 (\$) 600 D.C. (\$) 3,300 (\$)	35,000	{ 6,600 3,300 }	..	400/230 A.C. 500 D.C. (Trams)	793	31,245	595	49.1	700	Series	2
3. Invercargill	G.S.	1914	22,000	6,385	29.03	..	..	{ 11,000 3,300 }	..	400/230 A.C.	69	3,762	81	78.8	..	Series and Parallel	3
4. Nelson	I.	1923	11,214	3,320	29.60	..	..	{ 3,300 3,300 }	..	500 D.C. (Trams)	15	1,705	56	59.3	..	Series	4
5. Palmerston North	B.	1924	23,000	6,354	27.63	3,300 (\$)	..	{ 11,000 3,300 }	..	400/230 A.C.	40	3,675	77	82.6	..	Parallel	5
6. Wellington	G.N.	1907	125,000	38,136	30.52	11,000 (\$)	..	{ 11,000 3,300 }	..	400/230 A.C. 500 D.C. (Trams)	106	38,440	287	133.0	..	Parallel	6
Totals, City Councils ..	..	..	367,714	115,057	31.30	..	..	..	..	..	1,288	113,192	1,450	79.4	..	..	..
<i>Borough Councils.</i>																	
1. Bluff	G.S.	1903	2,036	547	26.89	..	..	3,300	..	400/230 A.C.	16	596	12	45.6	..	Series and Parallel	1
2. Hamilton	G.N.	1913	16,100	5,069	31.49	..	..	11,000	..	400/230 A.C.	39	3,600	62	81.8	..	Parallel	2
3. Inglewood	B.	1905	1,300	442	34.00	..	..	3,300	..	400/230 A.C.	3	175	9	49.0	..	Parallel	3
4. Kaipoi	B.	1917	1,800	515	28.60	..	..	3,300	..	400/230 A.C.	2	240	15	35.5	..	Parallel	4
5. Lyttelton	G.S.	1918	3,300	980	29.70	..	..	11,000	..	400/230 A.C.	8	600	10	98.0	..	Series	5
6. Napier	B.	1913	15,302	4,920	32.15	3,300 (\$)	..	3,300	..	400/230 A.C.	30	4,900	43	114.3	..	Parallel	6
7. New Plymouth	I. & G.N.	1905	21,000	6,860	32.67	6,600	..	11,000	..	400/230 A.C. 500 D.C. (Trams)	241	11,030	353	19.4	240/120	Series and Parallel	7
8. Ohakeune	B. & I.	1914	1,758	518	29.45	2,400 (\$)	..	{ 6,600 2,400 }	..	400/230 A.C.	17	271	19	27.3	42	Parallel	8
9. Patca	B. & I.	1901	2,500	449	17.96	3,300 (\$)	..	3,300	..	400/230 A.C.	17	426	18	25.0	78	Parallel	9

(For notes, see page 135.)

TABLE IX.—STATISTICS OF POPULATION, CONSUMERS, SYSTEM VOLTAGES, ROUTE-MILES OF LINES, ETC., FOR THE YEAR ENDED 31ST MARCH, 1938—continued.

Supply Authority.	Source of Supply.	Year when Supply commenced.	Population included in Area of Supply.	Number of Consumers.	Ratio of Consumers to Population in Area of Supply.	Generation.	Transmission.	Voltage.		Secondary Distribution (and System of Supply).	Distribution Transformers.		Route-miles of Lines.	Consumers per mile of Line.	Static Head.	Street Lighting System.	No.
								Primary Distribution.	Trans-mission.		Number.	Total kVA.					
OTHER LOCAL AUTHORITIES—continued.																	
<i>Borough Councils—continued.</i>																	
10. Picton ..	I.	1917	1,400	416	29.72	460	..	3,300	..	460/230 D.C.	..	..	11	37.8	279	Parallel	10
11. Queenstown ..	I.	1924	900	283	31.44	3,300	..	3,300	..	400/230 A.C.	2	60	8	35.4	510	Parallel	11
12. Raetihi ..	I.	1917	4,500	436	9.69	3,300 (s)	..	6,600	..	400/230 A.C.	18	451	28	15.6	380	Parallel	12
13. Rangiora ..	B.	1919	2,236	745	33.32	..	..	3,300	..	400/230 A.C.	7	422	14	53.0	..	Series	13
14. Riccarton ..	G.S.	1916	5,300	1,615	30.47	..	..	3,300	..	400/230 A.C.	7	1,000	18	89.8	..	Parallel	14
15. Ross ³ ..	G.N.	1901	11,400	2,585	22.68	6,600 (s)	..	..	..	400/230 A.C.	132	1,865	77	33.6	14	Parallel	15
16. Rotorua (Tourist Department)	G.N.	1901	11,400	2,585	22.68	6,600 (s)	..	..	..	400/230 A.C.	132	1,865	77	33.6	14	Parallel	16
17. Stratford ..	B.	1898	3,753	1,230	32.77	..	..	6,600	..	200/115 A.C.	10	900	22	55.9	..	Parallel	17
18. Sumner ..	G.S.	1918	3,500	1,110	31.70	..	..	6,600	..	400/230 A.C.	8	555	10	111.0	..	Parallel	18
19. Taihape ..	I. & B.	1913	2,181	626	28.70	460/230	..	..	..	460/230 D.C.	..	..	11	56.9	30	Parallel	19
20. Taumarunui ..	I.	1924	5,600	1,119	19.97	3,300	..	6,600	..	400/230 A.C.	17	825	27	41.5	25	Parallel	20
21. Tauranga ..	I.	1915	3,540	1,323	37.4	3,300	50,000	3,300	..	400/230 A.C.	13	1,250	64	20.7	110/80	Parallel	21
22. Te Aroha ..	B.	1906	2,370	761	32.10	3,300 (s)	33,000	3,300	..	400/230 A.C.	9	560	19	40.1	600	Parallel	22
23. Te Puke ..	B.	1921	980	354	36.10	..	..	3,300	..	400/230 A.C.	4	338	12	29.5	..	Series and Parallel	23
24. Thames ..	B.	1914	4,268	1,222	28.62	3,300 (s)	..	11,000	..	400/230 A.C.	20	1,020	22	55.5	130	Parallel	24
25. Timaru ..	B.	1908	17,500	4,909	28.08	400 (s)	..	3,300	..	400/230 A.C.	21	3,485	60	81.8	..	Series	25
26. Wairoa ..	B.	1913	2,519	770	30.60	..	..	3,300	..	400/230 A.C.	10	790	15	51.4	..	Parallel	26
27. Waikara ..	B.	1905	1,990	570	28.65	..	..	3,300	..	400/230 A.C.	3	150	13	43.9	..	Parallel	27
28. Westport ..	I.	1925	4,500	1,216	27.02	400	..	6,600	..	400/230 A.C.	9	418	20	60.8	430	Parallel	28
29. Whakatane ..	I. & B.	1922	1,850	565	30.55	3,300	22,000	3,300	..	400/230 A.C.	8	580	37	15.3	258	Parallel	29
30. Whangarei ..	B.	1915	7,900	2,351	29.76	..	..	2,200	..	400/230 A.C.	23	2,050	41	57.3	..	Series and Parallel	30
Totals, Borough Councils																	
			153,283	44,506	29.04	..	..	..	..	..	694	38,557	1,070	41.6	..	..	..
<i>Town Boards.</i>																	
1. Kamo ⁶ ..	I. & B.	1916	1,400	408	29.14	3,300	..	3,300	..	400/230 A.C.	33	475	51	8.0	31	Parallel	1
2. Kaponga ..	B.	1913	436	127	29.13	..	..	2,400	..	400/230 A.C.	7	91	11	11.6	..	Parallel	2
3. Mangaweka ..	B.	1929	775	178	22.96	..	..	3,300	..	400/230 A.C.	2	25	5	35.6	..	Parallel	3
4. Manunui ..	B.	1929	775	178	22.96	..	..	3,300	..	400/230 A.C.	2	25	5	35.6	..	Parallel	4
Totals, Town Boards ..																	
			2,611	713	27.30	..	..	..	..	..	42	591	67	10.7	..	..	..

(For notes, see page 135)

TABLE IX.—STATISTICS OF POPULATION, CONSUMERS, SYSTEM VOLTAGES, ROUTE-MILES OF LINES, ETC., FOR THE YEAR ENDED 31ST MARCH, 1938—continued.

G.N.—Government supply, North Island system. G.S.—Government Supply, South Island system. I.—Independent supply (own generating-plant). B.—Bulk supply from another authority.

Supply Authority.	Source of Supply.	Year when Supply commenced.	Population included in Area of Supply.	Number of Consumers.	Ratio of Consumers to Population in Area of Supply.	Voltage.			Secondary Distribution (and System of Supply).	Distribution Transformers.		Route-miles of Lines.	Consumers per Route-mile of Line.	Static Head.	Street Lighting System.	No.
						Generation.	Transmission.	Primary Distribution.		Number.	Total kVA.					
OTHER LOCAL AUTHORITIES—																
<i>continued.</i>																
<i>County Councils.</i>																
1. Heathcote	G.S.	1914	6,000	1,370	22.83%	..	..	{ 11,000 } 3,300	400/230 A.C.	17	1,178	35	39.2	Ft. ..	Series	1
2. Kaikoura	I.	1922	1,000	180	18.00	3,300	..	{ 3,300 } 3,300	400/230 A.C.	6	63	6	30.0	..	Series	2
3. Murchison	I.	1925	540	194	35.90	3,300	..	{ 3,300 } 230	400/230 A.C.	12	142	16	12.1	105	Parallel	3
4. Uawa	I.	1917	400	105	26.25	..	..	{ 6,600 } 3,300	230 D.C.	..	..	3	35.0	..	Parallel	4
5. Waimairi	B.	..	14,520	3,749	25.82	..	..	{ 6,600 } 3,300	400/230 A.C.	71	3,235	148	25.4	..	Series and Parallel	5
Totals, County Councils	..	..	22,460	5,598	24.92	..	..	..	..	106	4,618	208	26.9	..	..	..
Totals, other Local Authorities	..	..	546,068	165,874	30.40	..	..	..	..	2,130	156,958	2,795	59.3	..	..	..
COMPANIES.																
1. Alderton Utility Co.	I.	1930	620	84	13.55	400	..	6,350	230 A.C.	17	245	14	6.0	123	Parallel	1
2. Kanieri Electric, Ltd.	I.	1921	2,700	805	29.83	2,400	..	11,000	400/230 A.C.	6	1,580	29	27.8	250/110	Series	2
3. Kohukohu (L. Keys)	I.	1933	300	60	20.00	110	..	..	110 D.C.	..	..	2	30.0	..	Parallel	3
4. Befton Electric Light and Power Co., Ltd.	I.	1887	1,500	347	23.14	230	..	..	230 D.C.	..	..	7	49.5	27	Parallel	4
5. Rawene Motors, Ltd.	I.	1926	300	56	18.77	230	..	2,200	230 D.C.	..	..	1	56.0	..	Parallel	5
6. Wilson's (N.Z.) Portland Cement, Ltd.	I.	1916	500	182	36.40	5,500	22,000	..	400/230 A.C.	30	459	45	..	130	..	..
7. Westland Power, Ltd.	I.	1928	5,650	291	..	{ 6,600 } 400	..	{ 11,000 } 6,600	400/230 A.C.	30	2,560	72	4.0	260/105	Parallel	7
Totals, Companies	..	..	11,570	1,825	15.77	..	..	..	..	83	4,844	170	10.74	..	..	..
Totals, all Supply Authorities	..	..	1,485,239	388,580	26.16	..	..	..	..	17,023	453,477	24,407	15.92	..	..	..

NOTES.—(s) = Standby supply. ¹ Not actively functioning. ² License delegated to Westland Power, Ltd. ³ No returns received. ⁴ Formerly the Southland Electric-power Board. Taken over by the Public Works Department on 13th October, 1936. ⁵ New Electric-power district constituted 3rd March, 1937, but Board not yet actively functioning as a supply authority. ⁶ Taken over by North Auckland Power Board on 1st October, 1937.

Total Population of Dominion at 30th September, 1937: 1,591,974.
Ratio of Total Population in Areas of Supply to Total Population of Dominion: 93.30 per cent.

TABLE X.—RESULTS OF GENERATION AND DISTRIBUTION FOR YEAR ENDED 31ST MARCH, 1938—continued.

NOTE.—In the columns detailing the capacity of generating plant the following symbols are used to denote the type of prime mover: * Water; † Steam; ‡ Oil; § Gas.

Supply Authority.	Capacity of Generating Plant.				Connected Load.				Generated.				Units.				Average Demand per Consumer						
	Main Plant.		Standby Plant.		Including Bulk Supply.	Excluding Bulk Supply.	Water.	Steam.	Oil.	Gas.	Purchased.	Total generated and purchased.	Including Bulk Supply for Resale.	Retail to Consumers.	Non-productive.	Percentage Production.		Annual Load Factor.	Units sold (Average).				
	KVA.	KW.	KVA.	KW.															KWh.	KWh.	KWh.	KWh.	KWh.
					Per Head of Pop.	Per Cent of Distribution.	No																
OTHER LOCAL AUTHORITIES.																							
<i>City Councils.</i>																							
1. Christchurch	17,400*	4,00†	1,875†	1,800†	180,674	162,653	12,97	874,850	45,930	..	89,453,052	89,453,052	73,012,132	64,008,716	13,839,224	13,839,224	43-60	738	2,310	94	0-685	1	
2. Dunedin	750†	1,000†	1,000†	1,250	..	18,697	11,71	..	..	7,341,790	7,341,790	6,349,737	6,349,737	992,053	992,053	38-30	288	898	73	0-312	2
3. Invercargill	10,778	9-00	..	..	2,624,890	2,624,890	2,024,196	2,024,196	508,783	508,783	19-38	186	638	93	0-281	3		
4. Nelson	26,025	13-59	..	2,123	17,653,000	17,653,123	15,434,269	15,434,269	2,220,854	2,220,854	37-00	672	2,429	108	0-537	4		
5. Palmerston North	169,036	17-35	..	..	92,429,000	92,429,000	84,564,420	84,564,420	11,019,913	11,019,913	11-52	676	1,937	81	0-604	5		
6. Wellington	483,424	..	62,658,380	48,053	..	223,566,842	297,928,348	245,543,470	..	36,779,976	36,779,976	12-35	668	2,134	86	..	6	
Totals, City Councils																							
Borough Councils.																							
1. Bluff	287	1,947	12-71	..	..	609,071	609,071	581,487	581,487	27,584	27,584	12-74	261	971	79	0-506	1		
2. Hamilton	2,088	15,657	12-34	..	..	8,286,270	8,286,270	7,694,734	7,694,734	571,536	571,536	6-91	416	1,518	150	0-412	2		
3. Inglewood	164	2,014	18-34	..	..	778,730	778,730	710,280	710,280	68,450	68,450	8-79	546	1,607	95	0-371	3		
4. Kaapoi	184	4,092	12-28	..	..	457,080	457,080	430,500	430,500	26,580	26,580	5-82	239	836	46	0-260	4		
5. Lyttelton	341	4,922	15-48	..	605	1,367,440	1,367,440	1,095,401	1,095,401	272,039	272,039	19-89	332	1,118	82	0-348	5		
6. Napier	1,943	12,198	15-94	..	58,115	10,895,400	10,896,005	9,982,917	9,982,917	933,088	933,088	8-56	650	2,025	101	0-385	6		
7. New Plymouth	3,500*	4,375	1,200*	437	..	23,904	13-71	13,902,957	..	7,723,364	21,684,436	19,385,476	19,385,476	2,298,960	2,298,960	10-60	923	2,710	166	0-636	7		
8. Ohakune	150	977	15-35	78,810	3,450	448,100	630,360	450,362	450,362	79,998	79,998	13-07	236	870	126	0-290	8		
9. Patea	212	1,001	21-16	192,474	..	742,610	935,084	893,477	893,477	81,607	81,607	8-73	342	1,900	80	0-472	9		
10. Picton	93	773	12-03	..	209,840	209,840	222,340	171,270	171,270	38,570	38,570	13-38	210	412	19	0-224	10		
11. Queenstown	82	529	15-36	140,519	81,821	..	222,340	189,537	189,537	32,803	32,803	14-75	210	670	38	0-290	11		
12. Raetihi	270	1,628	10-36	1,169,250	..	1,169,250	1,169,250	682,688	682,688	58,462	58,462	5-00	247	1,520	106	0-344	12		
13. Rangiora	226	2,495	9-05	..	..	949,500	949,500	827,300	827,300	122,200	122,200	12-87	370	1,110	90	0-303	13		
14. Riccarton	883	7,584	11-24	..	..	3,852,710	3,852,710	3,243,652	3,243,652	339,058	339,058	9-46	612	2,008	135	0-547	14		
15. Ross†	1,002	7,718	12-98	229,371	..	4,441,133	4,667,504	3,428,173	3,428,173	1,239,331	1,239,331	26-55	801	1,326	51	..	15		
16. Rotorua (Tourist Dept.)	739	3,226	22-90	..	..	3,192,300	3,192,300	2,672,182	2,672,182	520,118	520,118	16-30	712	2,174	101	0-601	16		
17. Stratford	360	2,901	12-41	..	..	1,782,775	1,782,775	1,535,216	1,535,216	197,559	197,559	11-41	438	1,384	97	0-324	17		
18. Sumner	246	1,424	17-28	628,610	..	96,414	752,814	682,974	682,974	61,870	61,870	8-54	304	1,060	137	0-393	18		
19. Taihape	450	2,754	16-34	1,715,131	..	820	3,414	1,394,066	1,394,066	1,284,578	1,284,578	16-24	257	1,284	58	0-382	19		
20. Taumarunui	2,810	3,600	21-70	16,853,341	..	17,498	16,853,341	14,236,342	14,236,342	2,617,000	2,617,000	26-57	1,197	3,200	209	0-366	20		
21. Tauranga	167	2,767	10-08	37,894	..	1,269,528	1,269,528	1,281,922	1,281,922	125,498	125,498	8-92	541	1,684	74	0-366	21		
22. Te Aroha	350	1,413	11-82	54,000	127,808	1,970,030	1,751,388	1,486,974	1,486,974	264,864	264,864	13-12	348	1,216	71	0-472	22		
23. Te Puke	2,246	20,199	11-11	..	..	9,626,400	9,626,400	7,941,770	7,941,770	1,684,630	1,684,630	17-50	434	1,619	84	0-457	23		
24. Thames	582	3,302	17-63	..	..	2,388,378	2,388,378	2,400,185	2,400,185	188,193	188,193	50-75	953	3,118	201	0-756	24		
25. Timaru	167	1,440	14-65	869,260	..	637,490	1,077,490	904,264	904,264	63,226	63,226	9-62	299	1,043	72	0-293	25		
26. Waitara	364	2,731	13-33	..	..	1,044,519	1,044,519	1,434,814	1,434,814	143,708	143,708	13-76	200	741	64	0-299	26		
27. Westport	320	2,434	13-15	1,462,170	..	185,259	1,647,429	1,434,814	1,434,814	220,309	220,309	13-40	670	2,520	52	0-566	27		
28. Whakatane	1,030	7,986	12-23	..	..	3,618,310	3,618,310	3,063,211	3,063,211	437,151	437,151	12-07	886	1,299	39	0-438	28		
29. Whangarei	29		
30. Totals, Borough Councils	8,940	10,548	3,423	4,166	..	147,575	..	37,320,787	481,639	65,693,849	103,682,354	79,987,929	79,987,929	14,974,630	14,974,630	14-45	322	1,797	104	30	

(For notes see page 188.)

TABLE X.—RESULTS OF GENERATION AND DISTRIBUTION FOR YEAR ENDED 31ST MARCH, 1938—continued.

NOTE.—In the columns detailing the capacity of generating plant the following symbols are used to denote the type of prime mover: * Water; † Steam; ‡ Oil; § Gas.

Supply Authority.	Capacity of Generating Plant.		Generated.				Purchased.		Total generated and purchased.		Sold.		Non-productive.		Percentage Non-productive.		Units.			No. per Consumer.	
	Main Plant.	Standby Plant.	Water.	Steam.	Oil.	Gas.	Including Bulk Supply for Resale.	Retail to Consumers.	kWh.	kWh.	kWh.	kWh.	kWh.	kWh.	%	%	Annual Load Factor.	Per Head of Population.	Per 100 of Distribution Capital.		Average Maximum Demand per Consumer.
OTHER LOCAL AUTHORITIES—cont.																					
<i>Town Boards.</i>																					
1. Kamo*	96*	120	631,430	..	..	..	..	128,448 ²	..	..	128,448 ²	128,448 ²	..	..	200,180	20.40	49.35	1,915	47	0.587
2. Kaponga	..	..	631,430	..	..	..	..	349,340	..	..	349,340	781,090	..	..	19,442	19.42	87.35	1,602	70	0.260
3. Mangaweka	..	..	..	..	..	..	..	252,429	..	..	252,429	49,038	..	..	5,224	12.30	21.08	1,609	11	0.120
4. Manunui	..	..	..	..	..	..	..	42,487	..	..	42,487	..	..	..	..	..	..	..	..	..
Totals, Town Boards	96	120	631,430	..	..	..	..	772,704	..	..	1,404,634	1,404,634	..	..	254,442	18.12	44.1	1,625	51	..
<i>County Councils.</i>																					
1. Heathcote	..	..	..	..	..	..	..	2,992,297	..	..	2,992,297	2,992,297	..	..	384,037	12.83	40.05	1,904	104	0.622
2. Kaitiaki	..	..	..	..	..	..	..	83,100	..	..	83,100	59,470	..	..	23,630	28.45	18.97	331	14	0.278
3. Murehara	..	..	..	..	..	..	..	..	..	..	220,980	169,985	..	..	50,995	23.08	43.50	876	18	0.299
4. Uawa	..	..	..	..	..	..	..	28,100	..	..	28,100	19,850	..	..	8,250	29.36	16.04	189	8	0.190
5. Waimatiri	..	..	..	..	..	..	..	..	..	..	7,889,631	7,095,864	..	..	788,963	10.00	51.30	1,893	104	0.439
Totals, County Councils	158	160	220,980	..	..	..	..	10,881,928	..	..	9,953,429	11,214,108	..	..	1,255,875	11.20	44.3	1,778	91	..
Totals, other Local Authorities	27,344	33,515	100,832,077	6,655,073	186,079,805	915,323	..	336,635,020	..	..	53,624,923	53,624,923	..	..	53,624,923	12.85	61.6	2,030	..	..
COMPANIES.																					
1. Alderton Utility Co.	88*	110	300,051	..	..	..	..	..	..	..	300,051	244,907	..	..	55,144	18.37	38.05	2,915	72	1.072
2. Kanieri Electric Ltd.	1,500*	1,806	5,362,500	..	..	..	..	..	..	..	5,362,500	4,486,575	..	..	877,047	16.35	55.76	1,230	150	0.217
3. Kohukohu (L. Keys)*	33†	9†	15,867.70	..	..	..	..	..	..	..	17,462	17,462	..	..	6,192	35.89	18.38	188	15	0.404
4. Reefton Electric Light and Power Co., Ltd.	98*	140	197,245	..	..	..	..	..	..	..	197,245	147,184	..	..	50,061	25.38	16.08	424	48	0.404
5. Ravene Motors, Ltd.	19†	D.C.	83,16.87	..	..	..	..	..	..	..	18,695	..	..	..	360	15.25	61	328	80	0.280
6. Wilson's (N.Z.) Portland Cement, Ltd.	2,000*	2,500	10,816,300	..	..	..	..	..	..	..	10,816,300	5,791,889	..	..	1,405,601	13.00	57.70	810	418	..
7. Westland Power, Ltd.	876*	1,008	3,938,341	258,900	20,300	..	..	..	..	..	4,217,541	3,574,403	..	..	648,138	15.25	43.00	270	107	..
Totals, Companies	4,614	5,424	20,614,437	258,900	57,582	..	..	13,529,876	..	..	20,380,919	13,529,876	..	..	3,087,543	14.50	282	1,790	203	..
Totals, all Supply Authorities	270,910	330,682	99,338	113,208	1,676,689	..	..	975,233,920	272,076,610	21.78	592	2,263	45	..	..	..	..	..	..	..

TABLE A.—SUMMARY OF TOTALS RELEVANT TO TABLE X.

Supply Authority.	Units generated.	Population included in Area of Supply.	Number of Consumers.	Capital invested in Transmission and Distribution Systems.
Public Works Department	1,072,647,901	48,875	11,308	6,234,938
Electric-power Boards	47,875,514	878,726	209,453	11,292,961
Other Local Authorities— City Councils	69,361,506	367,714	115,057	3,025,525
Borough Councils	37,938,505	153,283	44,506	851,255
Town Boards	631,930	2,611	22,665	22,665
County Councils	332,180	22,400	5,508	109,513
Totals for other Local Authorities	108,314,121	546,068	165,874	4,006,958
Companies	20,930,919	11,570	1,825	88,287
Totals for all Supply Authorities	1,249,768,455	1,485,239	388,580	21,623,144

NOTES TO TABLE X.

Based on Total Units Sold to Ultimate Consumers less Units supplied for Large Industrial and Traction Loads (879,766,130 net).
592
2,263

NOTES.—¹ Arnold River Generating-station, formerly owned by Grey Power Board, taken over by Public Works Department on 1st February, 1938. ² Formerly the Southland Electric-power Board. Taken over by Public Works Department on 13th October, 1936. ³ Bay of Islands Electric-power District constituted 3rd March, 1937, but Board not yet functioning as a supply authority. ⁴ Not actively functioning. ⁵ Commenced supplying power on 19th December, 1936. ⁶ License returned to Westland Power, Ltd. ⁷ No returns received. ⁸ Taken over by North Auckland Power Board on 1st October, 1937. ⁹ Returns for first half of year only. ¹⁰ Commenced supplying power in March, 1933. Not shown in returns for intervening years. ¹¹ Includes the following units generated for the Public Works Department: steam-station available for general supply when required. ¹² Includes the following units generated for the Public Works Department: By Wairarapa Power Board, 2,023,992; by Otago Power Board, 949,350. ¹³ Generated for the Public Works Department by Auckland Power Board's Steam-station. ¹⁴ Includes the following units generated for the Public Works Department: By Hawke's Bay Power Board, 9,765; by Otago Power Board, 7,949. ¹⁵ Includes 212,137 units generated by Blackwater Mines, Ltd., and supplied to Grey Power Board. ¹⁶ Includes Public Works Department totals above (see notes 11 and 13), but not in totals for Power Board group. ¹⁷ Does not include units generated for Public Works Department (shown in brackets). ¹⁸ Total units sold, bulk plus retail, divided by capital expenditure on transmission and distribution system, including 770 *ruia* allocation of miscellaneous capital expenditure. ¹⁹ Percentage of total units generated and purchased. ²⁰ Percentage of total units generated (1,249,768,455). ²¹ Kamo Town Board paid on units measured on consumers' meters; losses included in Whangarei Borough Council's return. ²² Tauranga Power Board pays on units measured at consumers' meters; losses included in Whangarei Borough Council's return. ²³ Excludes units supplied for gold-dredging (3,498,120). ²⁴ Excludes units supplied to Whangarei (3,618,810) and to cement-works (5,644,432). ²⁵ Excludes units supplied for gold-mining (1,120,000). ²⁶ Total units sold to ultimate consumers (978,233,920), divided by total capital invested in transmission and distribution systems (£21,623,144).

TABLE XI.—FINANCIAL RESULTS OF OPERATION FOR THE YEAR ENDED 31ST MARCH, 1938.
(For Appropriations and Reserves see Table XII.)

Supply Authority.	Capital on Electric-supply System.	Loan Liability.		Sale of Electricity.		Revenue.		Working Expenses.			Capital Charges.				Total Annual Costs.		Net Results.		No.	
		£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£		£
PUBLIC WORKS DEPARTMENT.																				
1. Araripi-Manzhaoh-Waikaremoana	9,215,414	8,373,856	44,108	924,622	9,762	978,492	59,328	62,716	55,500	177,544	18.14	349,816	39,745	50,725	89,745	617,830	360,682	£	1	
2. Capeuni-Waitaki-Arnold River	4,798,907	4,093,476	288	283,909	336,385	24,122	24,122	20,638	20,638	67,843	20.00	160,483	971	82,885	971	311,082	24,703	£	2	
3. Southland Electric-power Supply	1,520,708	1,579,770	446	25,316	7,218	155,163	11,198	14,152	34,022	59,872	38.28	59,820	392	29,490	392	148,883	6,283	£	3	
Totals, P.W.D.	15,536,029	14,047,102	734	1,233,847	20,966	1,470,043	94,648	100,031	109,580	304,259	20.70	569,928	41,108	168,100	41,108	1,078,395	301,648	£		
ELECTRIC-POWER BOARDS.																				
1. Ashburton	345,766	358,900	52,479	708,047	736	53,457	241	15,276	3,907	25,272	47.30	15,412	1,917	1,917	5,300	49,716	3,741	£	1	
2. Auckland	8,524,578	2,411,700	13,321	13,321	6,974	710,021	3,796	265,055	56,828	423,521	59.60	117,063	32,884	32,884	49,639	686,080	23,941	£	2	
3. Bay of Islands	104,014	97,800	167	167	329	13,817	79	4,885	2,242	10,078	72.94	3,942	2,242	2,242	2,242	16,285	2,468	£	3	
4. Bay of Plenty	206,311	199,700	44,287	297	685	46,706	..	14,356	4,124	25,141	53.83	8,482	390	390	..	37,408	9,298	£	4	
5. Buller	103	207	21,195	..	51	25,104	..	8,044	2,630	13,680	63.60	4,175	..	..	..	19,921	1,584	£	5
6. Cambridge	174,773	147,987	24,738	..	51	25,104	..	8,044	2,630	13,680	63.60	4,175	..	..	..	19,921	1,584	£	6
7. Central Hawke's Bay	419,153	396,646	452,774	..	56	33,274	..	29,796	5,947	45,947	51.30	6,439	634	634	5,717	26,207	5,080	£	7	
8. Central Waikato	227,370	227,370	33,010	..	242	277	..	8,241	3,567	11,106	51.30	9,418	3,483	3,483	2,896	30,939	2,590	£	8	
9. Dannevirke	388,631	340,373	61,823	..	2,705	66,680	..	25,470	6,507	39,928	59.90	14,132	5,279	5,279	20,026	59,954	6,708	£	9	
10. Framingham	29,994	26,074	51,025	..	1,131	3,813	..	7,571	1,091	2,663	43.90	1,098	363	363	1,773	4,036	1,123	£	10	
11. Golden Bay	169,895	907,785	51,464	..	30	91,987	..	8,601	4,671	22,525	45.30	14,097	5,836	5,836	2,700	22,633	18,338	£	11	
12. Grey	439,420	550,809	80,520	18,274	464	99,238	54	4,058	7,859	63,894	63.36	18,745	127	127	4,118	46,158	8,809	£	12	
13. Hawke's Bay	251,244	212,016	50,668	..	956	52,135	..	24,682	10,923	22,894	61.80	8,686	163	163	5,006	24,900	11,374	£	13	
14. Horowhenua	376,937	350,007	126,442	..	881	128,642	..	57,204	13,191	84,121	65.40	16,604	4,092	4,092	11,799	51,322	8,863	£	14	
15. Hutt Valley	72,917	74,350	8,220	..	147	263	..	2,189	1,735	5,797	67.20	3,112	..	..	..	4,032	1,209	£	15
16. Lake Wakatipu	480,557	504,485	73,782	27,295	385	101,696	..	46,455	5,877	64,319	63.20	21,100	2,825	2,825	804	96,060	5,636	£	16	
17. Manawatu-Oroua	350,274	349,000	32,696	..	593	33,284	5,376	3,792	3,055	12,223	36.75	14,644	5,081	5,081	7,420	31,113	2,151	£	17	
18. Marlborough	195,585	204,868	14,827	..	482	18,081	..	4,969	3,840	7,870	43.20	6,339	..	..	..	15,237	2,844	£	18
19. North Auckland	110,559	180,650	29,853	3,564	2,772	34,582	..	12,957	5,429	21,810	63.80	2,947	63	63	10,880	32,750	1,812	£	19	
20. North Canterbury	81,040	81,040	14,188	..	108	14,275	891	1,524	1,681	6,032	42.25	3,638	280	280	5,915	6,907	2,828	£	20	
21. Opanake	128,527	86,801	18,226	..	124	18,453	591	3,736	5,132	9,459	51.25	3,916	520	520	2,191	11,947	2,087	£	21	
22. Otago Central	333,089	294,565	47,277	..	113	47,300	2,478	13,324	3,123	22,967	48.48	12,802	5,051	5,051	4,360	26,079	1,656	£	22	
23. Poverty Bay	342,202	303,132	66,673	..	41	68,218	..	17,944	13,457	41,190	60.88	11,021	1,795	1,795	25,695	348	2,087	£	23	
24. Reefton	355,450	303,300	46,359	20,913	446	69,803	3,400	35,112	6,579	45,091	64.59	12,833	3,631	3,631	22,690	67,781	2,022	£	24	
25. South Canterbury	229,946	223,066	44,717	1,622	493	46,845	2,546	10,962	4,938	24,898	53.10	8,854	1,960	1,960	18,854	38,752	8,093	£	25	
26. South Taranaki	164,906	143,900	31,613	..	297	33,284	..	14,946	6,072	22,995	72.02	6,114	..	..	32,100	2,151	£	26	
27. Springs-Blenheim	508,916	458,797	42,382	10,475	38	53,352	2,568	8,905	7,732	18,536	84.75	19,335	..	..	7,891	45,758	7,594	£	27
28. Taranaki	136,547	173,000	27,010	..	983	269	..	3,302	4,496	21,835	55.45	7,268	432	432	1,600	27,226	1,504	£	28	
29. Tauranga	166,042	173,000	32,192	..	169	33,284	..	10,147	5,546	18,979	57.10	7,047	800	800	4,322	30,523	2,708	£	29	
30. Te Awaunui	210,134	170,036	36,394	..	18	35,806	..	12,817	5,150	21,968	58.47	7,047	190	190	3,266	31,480	4,326	£	30	
31. Te Wairarapa	54,100	54,100	5,512	..	18	35,806	..	12,817	5,150	21,968	58.47	7,047	306	306	10,545	5,748	..	£	31	
32. Tewit	842,202	799,807	132,623	5,741	..	139,590	400	48,219	21,198	79,542	57.00	31,809	..	..	128,140	11,459	..	£	32
33. Thames Valley	132,983	131,671	13,069	..	1,235	18,526	1,574	1,023	4,129	30,856	43.50	4,713	8,628	8,628	9,458	17,514	1,012	£	33	
34. Waikato	383,045	355,617	61,777	..	823	61,295	798	15,132	9,590	30,800	48.04	14,439	..	..	54,699	9,599	..	£	34
35. Wairapa	65,045	61,117	11,170	5,895	..	1,174	241	9,628	1,556	12,848	70.45	2,444	600	600	35,390	8,628	..	£	35	
36. Waikare	209,882	209,543	41,549	..	1,405	43,457	1,206	16,392	6,241	26,444	60.80	8,049	1,869	1,869	8,229	17,217	1,027	£	36	
37. Waitaki	508,289	513,584	108,152	..	1,104	116,636	..	4,738	18,511	10,589	70,941	64.12	20,628	2,673	31,024	39,468	3,989	£	37	
38. Waitemata	113,340	113,226	22,985	..	1,340	23,086	..	8,403	3,131	13,975	53.30	4,379	292	292	7,189	21,265	1,448	£	38	
39. Westland	585,891	503,093	118,944	..	1,655	121,346	918	48,475	10,412	63,808	52.58	23,322	11,768	11,768	10,157	110,175	11,171	£	39	
Totals, Power Boards	13,607,497	11,947,617	2,436,822	94,879	18,535	30,720	27,394	891,190	340,852	1,494,730	57.90	517,979	81,449	81,449	140,353	2,401,704	184,854	£	40	
Totals	29,143,526	25,994,719	5,483,924	1,328,726	39,501	4,940,086	122,042	1,891,221	781,432	3,989,460	54.30	1,087,907	122,557	122,557	141,461	5,483,924	566,498	£	41	
Totals	29,143,526	25,994,719	5,483,924	1,328,726	39,501	4,940,086	122,042	1,891,221	781,432	3,989,460	54.30	1,087,907	122,557	122,557	141,461	5,483,924	566,498	£	42	
Totals	29,143,526	25,994,719	5,483,924	1,328,726	39,501	4,940,086	122,042	1,891,221	781,432	3,989,460	54.30	1,087,907	122,557	122,557	141,461	5,483,924	566,498	£	43	
Totals	29,143,526	25,994,719	5,483,924	1,328,726	39,501	4,940,086	122,042	1,891,221	781,432	3,989,460	54.30	1,087,907	122,557	122,557	141,461	5,483,924	566,498	£	44	
Totals	29,143,526	25,994,719	5,483,924	1,328,726	39,501	4,940,086	122,042	1,891,221	781,432	3,989,460	54.30	1,087,907	122,557	122,557	141,461	5,483,924	566,498	£	45	

(For notes see page 141.)

TABLE XI.—FINANCIAL RESULTS OF OPERATION FOR THE YEAR ENDED 31ST MARCH, 1938—continued. (For Appropriations and Reserves see Table XII.)

Table with columns: Supply Authority, Capital Outlay on Electric-supply System, Loan Liability, Sale of Electricity (Retail, Bulk for Resale), Revenue (Profits from Trading Accounts, Other Sources), Total, Cost of Power (Generated, Purchased), Working Expenses (Transmission and Distribution, Management and General), Per Cent. of Revenue, Interest, Sinking Fund, Depreciation, Other Capital Charges, Total, Per Cent. of Capital Outlay, Total Annual Costs, Net Results (Profit, Loss), and Amount collected by Rates to make up Deficiencies. Rows include various local authorities like Christchurch, Dunedin, Invercargill, Nelson, Palmerston North, Wellington, and Borough Councils.

(For notes see page 141.)

TABLE XI.—FINANCIAL RESULTS OF OPERATION FOR THE YEAR ENDED 31ST MARCH, 1938—continued.
(For Appropriations and Reserves see Table XII.)

Supply Authority.	Capital Outlay on Electric-supply System.	Loan Liability.	Revenue.			Working Expenses.				Capital Charges.					Net Results.		No up Defences.				
			Retail.	Bulk for Resale.	Profits from Trading Account.	Sources (not including Other Rates).	Total.	Cost of Power.	Management and General.	Total.	Per Cent. of Revenue.	Interest.	Sinking Fund.	Depreciation.	Other Capital Charges.	Total.		Per Cent. of Capital Outlay.	Total Annual Costs.	Profit.	Loss.
	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	%	£	£	£		
<i>County Councils.</i>																					
1. Heathcote ..	25,103	20,121	11,249	..	62	11,311	7,258	2,733	805	10,706	95.40	1,058	869	..	1,927	7.68	12,723	..	1,412	1	
2. Kaikoura ..	11,622	8,137	2,063	..	..	2,222	1,263	2,788	980	2,321	5.08	354	..	590	5.08	2,911	601	689	..	2
3. Murchison ..	16,494	12,006	2,581	..	..	2,615	1,239	444	343	3,416	35.00	823	..	823	4.93	1,739	..	876	..	3
4. Uawa ..	6,275	1,298	1,211	..	74	1,272	627	6	39	672	52.82	71	..	554	8.83	1,226	..	46	..	4	
5. Waimairi ..	68,020	31,700	23,147	24,254	13,272	2,443	2,021	17,736	73.10	1,429	1,263	..	7,010	10.30	24,746	..	492	..	5
Totals, County Councils ..	127,514	73,262	41,251	..	197	41,674	20,019	5,704	4,188	32,441	77.90	3,735	2,132	..	10,904	8.56	43,345	922	2,593	669	
Totals, other Local Authorities	6,098,872	3,411,013	1,505,313	..	32,609	1,368,257	88,923	482,959	159,973	978,129	61.60	150,157	61,188	..	312,154	5.12	1,280,283	301,493	8,519	1,444	
<i>COMPANIES.</i>																					
1. Alderton Utility Co. ..	6,778	4,585	1,228	..	..	1,228	52	61	384	497	40.48	212	..	528	7.79	1,025	203	..	..	1
2. Kanieri Electric, Ltd. ..	80,831	60,000	13,698	..	239	13,698	2,793	1,509	3,252	7,554	55.20	2,769	..	3,993	4.94	11,547	2,151	..	..	2
3. Kōhukōha (L. Keys) ..	3,736	3,736	564	564	388	31	101	520	92.20	520	3
4. Reefton Electric Light and Power Co., Ltd. ..	7,003	6,000	3,680	..	8	3,878	1,085	313	1,370	2,768	71.40	2,768	1,110	4
5. Rawene Motors, Ltd. ..	1,061	400	576	..	27	735	464	108	65	637	86.70	41	..	138	12.19	770	35	5
6. Wilson's (N.Z.) Portland Cement, Ltd. ..	91,121	16,213	7,021	..	393	15,157	3,737	1,331	844	5,912	39.01	900	1.00	6,812	8,345	6
7. Westland Power, Ltd. ..	94,384	..	7,769	..	5	11,881	4,786	412	3,437	8,685	73.10	3,132	..	5,294	5.61	13,979	2,098	7
Totals, Companies	284,944	90,934	34,207	..	672	47,141	13,305	3,765	9,503	26,573	56.40	6,204	..	10,848	3.81	37,421	11,853	2,133	..	..
Totals, all Supply Authorities	35,527,342	29,496,666	4,190,838	..	84,967	5,686,397	224,270	1,374,149	690,922	2,303,711	49.30	1,244,268	223,361	..	2,004,092	5.64	4,807,803	889,848	11,254	7,532	

NOTES.—¹ Formerly the Southland Electric-power Board. Taken over by the Public Works Department on 13th October, 1938. ² New electric-power district constituted 3rd March, 1937, but Board not yet functioning as a supply authority. ³ Not actively functioning. ⁴ License delegated to Westland Power, Ltd. ⁵ Taken over by North Auckland Power Board on 1st October, 1937. Returns for period 1st April to 30th September, 1937, not available. ⁶ Includes cost of street lighting. ⁷ Includes cost of raising loans, &c. ⁸ (29,153). ⁹ Cost of raising loans, &c. ¹⁰ After deducting proportion of half capital charges on Auckland Power Board's steam-station paid by Public Works Department. ¹¹ Actual running costs (fuel, if any, wages, stores, &c.), repairs and maintenance only. ¹² General rate. ¹³ Arrears only. ¹⁴ Appropriated for reduction of arrears in sinking funds. ¹⁵ Includes £122 revenue from arrears levied by the former Southland Electric-power Board. ¹⁶ Includes £73 commission paid to local authorities for collecting rates. ¹⁷ Principal repayment. ¹⁸ Exchange on overseas interest payments.

Net profit for year—

Public Works Department	£ 391,648 ¹⁴
Power Boards	179,232
Cities	208,362
Boroughs	90,574
Town Boards	679
Counties	9,720
Companies	1,671 (loss)
Less	£880,265
Total net profit	£878,594

TABLE XII.—APPROPRIATIONS AND RESERVES FOR YEAR ENDED 31ST MARCH, 1938—continued.

(For Statistics of Capital, Revenue, and Expenditure see Table XI.)

Supply Authority.	Appropriations of Net Surplus for Year ended 31st March, 1938 (after paying Working-expenses and Statutory Capital Charges).										Accumulated Reserves and Funds.						Debit Balance, Revenue Account.	No.		
	Renewal Fund.	General Reserve Fund.	Accident Insurance Fund.	Relief of Rates (Local Authorities).	Payment of Dividends (Companies).	Capital Expenditure out of Revenue.	Miscellaneous Appropriations.	Unappropriated Surplus.	Total (Net Profit for Year).	Sinking Fund.		Depreciation.		Renewal.		General and Other Reserves.			Credit Balance, Revenue Account.	
										Reserve.	Funds.	Reserve.	Funds.	Reserve.	Funds.	Reserve.				Funds.
ELECTRIC-POWER BOARDS—continued.																				
39. Wairere
40. Wairoa
41. Waitaki
42. Waitemata
43. Waitemoa
44. Waitemoa
45. Westland ³
Totals, Power Boards	1,245	9,000	2,288	..	..	53,310	27,129	91,882	184,854	1,615,118	1,623,595	1,430,876	543,536	55,616	16,290	1,548,847	69,329	270,274	36,190	..
OTHER LOCAL AUTHORITIES.																				
City Councils.																				
1. Christchurch
2. Dunedin
3. Invercargill
4. Nelson
5. Palmerston North
6. Wellington
Totals, City Councils	5,568	2,000	..	49,884	39,072	82,276	29,592	208,392	208,392	513,229	513,229	940,366	60,917	366,572	323,031	1,080,861	92,106	776,277	..	..
Borough Councils.																				
1. Bluff
2. Hamilton
3. Inglewood
4. Kaipoi
5. Lyttelton
6. Napier
7. New Plymouth
8. Ohakune
9. Patea
10. Picton
11. Queenstown
12. Raetihi
13. Rangiora
14. Riccarton
15. Ross ⁴
16. Rotorua (Tourist Department)
17. Stratford
18. Sumner
19. Taihape
20. Taurarunui
21. Tauranga
22. Te Aroha
23. Te Puke
24. Thames

(For notes see page 144.)

TABLE XII.—APPROPRIATIONS AND RESERVES FOR YEAR ENDED 31ST MARCH, 1938—continued.
(For Statistics of Capital, Revenue, and Expenditure see Table XI.)

Supply Authority.	Appropriations of Net Surplus for Year ended 31st March, 1938 (after paying Working-expenses and Statutory Capital Charges).										Accumulated Reserves and Funds.						Debit Balance, Revenue Account.		
	Renewal Fund.	General Reserve Fund.	Accident Insurance Fund.	Relief of Rates (Local Authorities).	Payment of Dividends (Companies).	Capital Expenditure out of Revenue.	Miscellaneous Appropriations.	Unappropriated Surplus.	Total Profit (Net Profit for Year).	Sinking Fund.		Depreciation.		Renewal.		General and Other Reserves. ³		Credit Balance, Revenue Account.	
										Reserve.	Funds.	Reserve.	Funds.	Reserve.	Funds.	Reserve.			Funds.
OTHER LOCAL AUTHORITIES—continued.																			
<i>Borough Councils—continued.</i>																			
25. Timaru	2,000	..	..	1,000	..	3,284	..	6,284	..	15,156	..	1,132	..	6,212	..	52,814	..	13,916	..
26. Wairoa .. .. .	..	..	725	1,000	..	..	263	1,263	..	1,542	..	1,132	..	..	..	1,504	..	2,073	..
27. Waitara .. .. .	..	..	..	..	..	..	..	819	..	3,779	..	2,174	..	..	..	1,009	..	7,725	..
28. Westport .. .. .	..	..	..	380	..	439	..	819	..	6,342	..	3,622	..	..	..	2,993	..	7,284	..
29. Whakatane .. .. .	..	..	..	792	..	..	594	1,386	..	1,024	..	153	..	..	..	1,671	..	866	..
30. Whangarei .. .. .	..	..	..	3,227	..	1,642	..	4,869	..	7,951	..	8,294	..	..	..	917	..	56,813	..
Totals, Borough Councils	2,585	4,786	800	31,820	..	20,104	20,838	91,293	145,379	156,853	158,801	136,926	8,039	6,212	393,834	70,216	225,340	8,457	
<i>Town Boards.</i>																			
1. Kamo ⁵ .. .. .	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
2. Kaponga .. .. .	..	..	..	..	..	..	42	42	..	..	236	..	..	..	..	..	..	..	153
3. Mangaweka .. .. .	..	..	..	..	..	..	134	134	..	..	952	..	..	..	..	..	..	..	5,852
4. Manunui .. .. .	..	..	..	..	..	..	..	..	..	..	52	..	..	..	..	..	..	..	653
Totals, Town Boards .. .. .	..	..	..	..	..	..	176	176	..	..	1,240	..	..	..	..	..	..	..	153
<i>County Councils.</i>																			
1. Heathcote .. .. .	..	..	..	..	..	..	..	..	..	9,773	9,773	..	..	..	..	..	..	..	5,366
2. Kaikoura .. .. .	..	..	..	..	..	876	..	876	..	..	..	125	..	..	..	4,381	..	..	2,422
3. Murchison .. .. .	..	..	..	..	..	..	46	46	..	..	..	..	..	..	..	1,307	..	..	92
4. Uawa .. .. .	..	..	..	..	..	..	..	..	..	5,108	5,123	..	..	..	..	38,890	..	..	639
5. Waimairi .. .. .	..	..	..	..	..	876	..	922	..	14,881	14,896	125	..	..	..	44,578	..	..	3,734
Totals, County Councils .. .. .	..	..	800	81,704	..	60,032	50,652	300,783	1,105,652	684,963	688,166	197,968	874,611	329,243	1,519,273	162,322	1,013,488	12,344	
Totals, other Local Authorities	8,153	6,786	800	81,704	..	60,032	50,652	300,783	1,105,652	684,963	688,166	197,968	874,611	329,243	1,519,273	162,322	1,013,488	12,344	
COMPANIES.																			
1. Alderton Utility Co. .. .. .	..	..	..	..	..	..	203	203	..	..	..	..	..	..	..	..	..	..	462
2. Kanieri Electric Ltd. .. .. .	..	..	..	..	..	551	..	2,151	..	..	..	..	..	..	..	..	..	..	6,944
3. Kohukohu (L. Keys) .. .. .	..	..	..	..	..	..	44	44	..	..	..	..	..	..	..	..	..	..	..
4. Reefton Electric Light and Power Co., Ltd. .. .. .	..	..	..	..	..	..	10	1,110	..	..	..	..	..	..	..	..	..	..	1,490
5. Raewene Motors Ltd. .. .. .	..	..	..	..	..	..	..	8,345	..	..	..	..	..	..	..	..	..	..	2
6. Wilson's (N.Z.) Portland Cement, Ltd. .. .. .	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
7. Westland Power Ltd. .. .. .	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Total, Companies .. .. .	..	..	..	..	1,100	551	9,945	11,853	..	..	..	..	..	..	7,618	..	..	..	8,896
Totals, all Supply Authorities	9,398	15,786	3,088	81,704	1,100	113,913	521,359	889,139	4,104,817	2,806,766	2,503,082	741,504	430,227	345,533	3,158,137	231,651	1,292,658	48,536	

NOTES.—¹New electric-power district constituted 3rd March, 1937, but Board not yet actively functioning as a supply authority. ²Not functioning. ³License delegated to Westland Power, Ltd. ⁴No returns received. ⁵Taken over by North Auckland electric-power Board and included in that Board's returns. ⁶Applied towards reduction of accumulated loss and arrears of Sinking Fund. ⁷Includes General Reserves, Accident Fund Reserves, Loan Repayment Reserves, Capital Expenditure out of Revenue Reserve, Loan Development Reserve, &c. ⁸Applied towards reduction of Sinking Fund arrears. ⁹Applied towards reduction of accumulated loss.

TABLE XIII.—AVERAGES DERIVED FROM TABLES IX, X, AND XI, FOR YEAR ENDED 31ST MARCH, 1938.
(For Summary of Relevant Totals from above-named Tables see Table XIIIb on page 147.)

Supply Authority.	Number of Consumers.	Capital Outlay.				Revenue from Sale of Electricity.						Working-costs.			Capital Charges.		Total Costs.	
		Per Head of Population.	Per £ of Consumer.	Per £ of Revenue.	Per Unit sold (Overall including Bulk and Supply).	Per Unit sold (Domestic Supply).	Per Head of Population.	Per Retail Consumer.	Per KW. of Maximum Demand.	Per Route-mile of Line.	Per Unit sold.	Per KW. of Maximum Demand.	Per Unit sold.	Per KW. of Maximum Demand.	Per Unit sold.	Per KW. of Maximum Demand.	Per Unit sold.	Per KW. of Maximum Demand.
PUBLIC WORKS DEPARTMENT.																		
1. Arapani-Mangahoe-Waikaremoana	888	..	..	9.54	0.323	0.305	..	6.76	764	0.059	1.94	0.147	3.07	0.206	4.31	0.117	6.01
2. Coleridge-Waitaki-Arnold River ¹	139	..	..	14.43	0.387	1.878	..	6.40	430	0.079	1.30	0.285	4.71	0.304	19.79	0.317	19.79
3. Southland Electric-power Supply ²	10,888	31.12	140.0	10.30	1.502	..	11.23	19.62	59	0.603	7.89	0.912	11.90	..	..	..	..
Averages, Public Works Department																		
..	..	..	..	10.78	0.366(b)	..	..	..	325	..	..	..	..	..	..	..	..
ELECTRIC-POWER BOARDS.																		
1. Ashburton	4,425	18.13	78.20	6.60	1.579	1.579	2.80	24.65	55	0.760	11.86	0.737	11.48	1.487	23.34	0.888	19.42	
2. Auckland	58,342	18.66	60.41	5.01	0.859	0.922	3.10	14.09	587	0.542	8.48	0.386	5.26	0.878	13.74	0.202	15.36	
3. Banks Peninsula	1,071	27.94	97.12	7.81	1.379	1.613	3.66	22.69	63	1.195	17.17	0.736	10.57	1.931	27.74	0.351	24.65	
4. Bay of Plenty	1,809	19.65	114.10	4.63	1.060	1.071	4.42	26.56	163	0.598	15.00	0.292	7.32	0.890	22.32	0.275	19.42	
5. Buller	1,570	18.04	68.95	5.10	0.945	0.945	3.58	20.65	109	0.610	13.84	0.275	6.08	0.888	24.65	0.351	24.65	
6. Cambridge	1,930	15.75	90.80	7.00	1.210	1.210	2.26	24.80	96	0.681	15.95	0.351	10.70	1.202	19.42	0.275	19.42	
7. Central Hawke's Bay	6,091	21.61	69.82	5.53	0.969	1.101	3.98	27.70	96	0.876	17.62	0.386	7.16	0.914	19.67	0.351	24.65	
8. Central Waikato	3,001	17.24	73.61	6.88	1.596	1.650	2.55	19.43	91	0.876	17.62	0.386	14.08	1.468	31.70	0.275	19.42	
9. Franklin	4,610	17.42	73.40	5.47	1.596	1.596	3.43	19.43	91	0.876	17.62	0.386	14.08	1.468	31.70	0.275	19.42	
10. Franklin	4,447	19.73	67.10	5.97	1.406	1.406	3.39	24.62	200	0.603	11.84	0.292	8.29	0.968	18.83	0.275	19.42	
11. Golden Bay	4,226	11.86	40.20	3.30	1.462	1.462	3.63	17.15	200	0.403	7.84	0.386	7.59	1.129	19.78	0.275	19.42	
12. Grey	7,843	14.10	56.01	4.45	0.801	1.065	2.60	17.15	295	0.510	11.89	0.292	4.52	0.712	15.31	0.275	19.42	
13. Hawke's Bay	5,193	14.36	48.37	4.93	0.948	0.948	2.98	17.56	147	0.701	12.99	0.292	4.52	0.712	15.31	0.275	19.42	
14. Horowhenua	13,488	7.82	27.95	2.98	0.972	0.972	2.67	16.94	416	0.646	11.27	0.201	3.51	0.847	17.76	0.275	19.42	
15. Hutt Valley	7,221	20.55	101.00	8.57	2.446	2.446	2.43	32.00	44	1.725	22.55	1.200	15.71	2.025	38.26	0.275	19.42	
16. Lake Wakatipu	4,845	23.45	90.00	4.85	0.704	1.055	4.87	16.43	153	0.448	10.45	0.291	15.16	0.469	16.41	0.275	19.42	
17. Manawatu-Oroua	3,106	11.80	112.80	10.72	1.852	1.852	2.38	22.02	114	0.693	11.98	0.410	18.52	1.715	29.51	0.275	19.42	
18. Marlborough	1,973	4.98	68.90	9.16	1.670	1.670	0.66	32.88	63	0.880	12.06	0.358	11.43	1.234	20.15	0.275	19.42	
19. North Auckland	2,674	12.49	73.30	5.86	1.290	1.445	1.98	20.59	56	0.824	13.45	0.410	6.70	1.234	20.15	0.275	19.42	
20. North Canterbury	1,145	16.59	96.64	7.80	1.813	1.813	2.12	26.45	88	0.770	11.24	0.410	11.03	1.525	22.27	0.275	19.42	
21. Otago	1,079	27.74	119.40	7.07	0.992	1.038	3.97	17.37	100	0.514	9.02	0.376	6.58	0.890	15.60	0.275	19.42	
22. Poverty Bay	4,479	17.46	69.80	6.62	1.849	1.849	2.64	28.78	87	0.898	13.97	0.292	15.83	1.918	29.83	0.275	19.42	
23. Poverty Bay	5,624	13.41	60.85	5.13	1.235	1.235	2.67	21.36	168	0.763	13.19	0.478	8.23	1.239	21.42	0.275	19.42	
24. South Canterbury	4,800	17.78	74.10	5.28	1.347	1.173	2.45	15.57	81	0.590	10.44	0.297	5.24	0.887	15.68	0.275	19.42	
25. South Taranaki	3,677	11.45	62.30	4.95	1.195	1.253	2.26	12.16	147	0.642	11.80	0.358	6.58	1.000	18.38	0.275	19.42	
26. Springs-Ellesmere	2,768	13.37	59.54	5.21	1.194	1.364	2.59	17.31	95	0.868	12.59	0.344	4.99	1.212	17.38	0.275	19.42	
27. Taranaki	2,812	35.95	179.00	9.52	1.020	1.170	3.07	19.06	124	0.358	6.68	0.525	9.82	0.883	16.30	0.275	19.42	
28. Taranaki	1,926	23.00	96.85	6.91	1.328	0.992	3.48	14.02	93	0.769	17.38	0.559	12.62	1.328	30.00	0.275	19.42	
29. Tauranga	2,046	15.80	80.04	5.10	1.059	1.059	3.21	30.00	62	0.626	13.55	0.381	6.83	1.007	20.38	0.275	19.42	
30. Te Anau	2,305	21.64	91.16	5.94	1.024	1.024	3.68	22.91	110	0.606	13.55	0.305	6.83	0.911	20.38	0.275	19.42	
31. Te Anau	444	30.47	131.09	10.55	0.724	0.724	2.96	11.49	73	0.302	4.79	0.454	7.19	0.756	11.68	0.275	19.42	
32. Thames Valley	8,987	20.89	93.75	6.09	0.984	0.747	3.32	23.90	150	0.565	13.73	0.346	8.40	0.911	23.13	0.275	19.42	
33. Waimea	2,326	14.30	56.80	7.32	3.255	3.255	2.01	32.85	123	1.452	14.65	1.704	17.20	3.156	31.85	0.275	19.42	
34. Waipara	5,637	25.22	146.00	11.92	1.155	1.155	3.28	24.50	108	0.578	12.25	0.446	9.45	1.024	21.70	0.275	19.42	
35. Waipara	4,477	9.46	138.30	3.65	0.941	0.941	2.48	14.85	35	0.369	5.82	0.580	9.15	0.949	14.97	0.275	19.42	
36. Waipara	4,452	11.21	45.80	4.85	1.017	1.017	1.77	16.20	149	0.597	11.89	0.203	3.88	0.800	16.34	0.275	19.42	
37. Waikato	13,315	11.09	40.60	5.00	1.071	1.071	2.42	17.20	83	0.648	10.95	0.319	5.39	0.907	15.27	0.275	19.42	
38. Waikato	1,601	16.00	70.95	4.95	1.092	1.092	3.38	20.35	422	0.703	13.35	0.310	5.88	1.011	19.69	0.275	19.42	
39. Waikato	1,125	10.68	50.00	4.87	1.124	1.124	2.30	22.07	137	0.599	11.76	0.435	8.55	1.034	20.31	0.275	19.42	
Averages, Power Boards																		
..	..	15.48	65.00	5.38	0.998(b)	1.077(d)	2.88(h)	..	149(n)	..	..	..	..	..	..	..	..
OTHER LOCAL AUTHORITIES.																		
City Councils.																		
1. Christchurch	31,629	8.66	27.12	3.19	0.799	0.842	2.71	11.47	759	0.646	9.28	0.132	1.89	0.778	11.17	0.275	19.42	
2. Dunedin	29,233	19.54	58.49	6.39	0.892	0.871	2.93	13.27	449	0.320	4.76	0.282	4.19	0.602	8.95	0.275	19.42	
3. Invercargill	3,820	6.93	27.90	2.87	2.006	2.137	2.62	24.25	653	1.305	15.76	0.314	3.79	1.419	19.65	0.275	19.42	
4. Nelson	3,920	11.78	39.80	4.27	3.508	3.517	2.83	31.88	552	2.192	19.92	0.950	8.64	3.142	28.56	0.275	19.42	
5. Palmerston North	6,354	11.60	41.98	4.09	1.015	0.649	10.27	28.28	848	0.575	10.45	0.155	4.30	0.811	14.75	0.275	19.42	
6. Wellington	38,136	11.07	36.30	3.75	1.047	1.090	3.00	12.69	1,286	0.726	8.72	0.132	1.86	0.881	10.58	0.275	19.42	
Averages, City Councils																		
..	..	12.24	39.13	4.27	0.969(b)	1.025(d)	2.88(h)	..	728(n)	..	..	..	..	..	..	..	..

(For notes see page 147.)

TABLE XIII.—AVERAGES DERIVED FROM TABLES IX, X, AND XI, FOR YEAR ENDED 31ST MARCH, 1938—continued.
(For Summary of Relevant Totals from above-named Tables see Table XIIIb on page 147.)

Supply Authority.	Number of Consumers.	Capital Outlay.			Revenue from Sale of Electricity.					Working-costs.		Capital Charges.		Total Costs.		No.	
		Per Head of Population.	Per Consumer.	Per £1 of Revenue.	Per Unit sold (Including Bulk Supply).	Per Unit sold (Excluding Bulk and Traction).	Per Unit of Domestic Supply.	Per Head of Population.	Per Retail Consumer.	Per kW. of Maximum Demand.	Per Unit sold.	Per kW. of Maximum Demand.	Per Unit sold.	Per kW. of Maximum Demand.			
OTHER LOCAL AUTHORITIES—continued.																	
Borough Councils.																	
1. Bluff	547	8.31	12.32	1.42	2.140	2.140	3.833	2.54	8.67	17.75	15.13	0.284	2.35	2.107	17.48	1	
2. Hamilton	5,069	4.10	13.01	1.52	1.472	1.472	1,191	2.72	8.56	20.78	12.63	0.286	1.97	0.954	14.65	2	
3. Inglewood	442	6.90	20.56	2.08	1.472	1.472	1,876	3.71	9.85	26.56	19.22	0.319	5.77	1.384	24.99	3	
4. Kaiapoi	515	5.54	19.37	3.02	1.842	1.842	2,000	1.88	6.41	24.64	18.60	0.338	4.53	1.728	23.13	4	
5. Lyttelton	980	4.04	13.61	1.78	1.642	1.642	1,791	2.29	17.00	21.06	17.00	0.100	1.84	1.370	18.34	5	
6. Napier	4,920	8.58	26.70	2.82	1.122	1.122	0,870	3.33	10.47	23.95	16.06	0.220	3.97	0.973	20.76	6	
7. New Plymouth	6,860	17.19	52.63	4.85	0.922	0.922	0,750	3.72	9.67	15.83	9.47	0.231	3.97	0.782	13.44	7	
8. Ohakune	518	5.42	18.42	2.38	2.135	2.135	2,116	2.31	12.58	26.70	15.74	0.520	1.779	1.779	22.25	8	
9. Patea	449	7.78	43.36	3.45	1.590	1.590	4,770	2.60	8.73	26.65	18.45	0.232	3.90	1.332	22.35	9	
10. Pleton	416	11.78	39.65	4.54	5.090	5.090	390	2.55	7.77	29.81	33.60	1.728	10.23	2.286	46.85	10	
11. Queenstown	283	15.93	50.70	6.52	2.785	2.785	1,318	2.61	10.05	28.22	11.78	0.375	6.44	0.980	15.95	11	
12. Raethi	436	5.24	14.30	4.79	1.063	1.063	1,757	2.61	7.82	20.36	17.82	0.187	2.85	1.523	23.21	12	
13. Rangiora	745	4.10	12.30	1.57	1.691	1.691	1,757	2.69	8.49	15.32	13.16	0.055	0.85	0.915	14.01	13	
14. Riccarton	1,615	4.53	14.86	1.75	1.014	1.014	1,098	2.69	8.49	15.32	13.16	0.055	0.85	0.915	14.01	14	
15. Ross?	2,585	7.39	32.60	3.18	1.853	1.853	1,733	2.34	10.24	26.40	16.65	0.502	7.16	1.671	23.81	15	
16. Rotorua (Tourist Department)	1,280	8.70	26.55	2.22	1.320	1.320	1,080	3.92	11.84	19.37	11.88	0.297	4.48	1.073	16.16	16	
17. Stratford	1,110	4.53	14.30	2.65	0.936	0.936	1,255	1.71	5.40	16.63	14.81	0.101	1.80	0.933	16.61	17	
18. Summer	1,626	4.97	17.30	1.78	2.195	2.195	1,877	2.86	9.70	24.88	16.35	0.483	5.42	1.938	21.77	18	
19. Taupo	1,119	42.00	60.15	5.31	2.114	2.114	2,024	2.22	11.32	28.15	9.35	0.703	7.44	1.262	16.79	19	
20. Tauranga	1,323	18.00	128.60	6.41	0.517	0.517	854	4.38	11.38	9.45	9.45	0.143	3.10	0.313	5.73	20	
21. Te Anau	761	7.59	23.62	2.08	1.615	1.615	1,263	3.66	11.34	30.32	24.80	0.088	1.68	0.873	26.48	21	
22. Te Aroha	354	13.49	37.35	3.18	1.304	1.304	1,085	4.31	11.77	24.95	12.54	0.217	4.15	0.873	16.69	22	
23. Te Puke	2,292	7.46	26.05	2.73	1.833	1.833	1,805	2.75	9.54	33.35	21.72	0.095	1.69	1.323	23.41	23	
24. Thames	4,909	6.33	22.55	2.44	1.372	1.372	1,196	2.60	9.25	20.20	15.12	0.159	2.35	1.185	17.47	24	
25. Timaru	4,770	4.74	15.50	1.21	0.972	0.972	0,785	3.91	8.33	28.44	13.68	0.108	1.86	0.857	14.74	25	
26. Wairoa	570	4.17	14.60	1.75	1.917	1.917	1,747	2.42	7.80	28.10	17.50	0.391	5.80	1.650	24.46	26	
27. Westport	1,216	7.76	28.74	3.68	2.528	2.528	2,778	2.15	13.87	24.40	17.50	0.630	6.59	2.332	24.09	27	
28. Whakatane	1,565	19.60	64.20	4.63	1.321	1.321	1,193	4.33	13.87	24.40	17.50	0.510	9.46	1.117	20.71	28	
29. Whangarei	2,351	10.27	34.51	3.84	1.595	1.595	1,627	2.79	8.70	20.33	13.73	0.233	3.64	1.350	17.37	29	
Averages, Borough Councils	..	9.41	32.43	3.28	1.193(b)	1.287(d)	..	2.87(h)	9.54(i)	..	411(m)	30
Town Boards.																	
1. Kamo	408	11.91	40.90	2.90	1.767	1.767	2,533	4.16	14.10	25.34	21.06	0.383	5.49	1.832	26.55	1	
2. Kaponga	122	13.32	45.75	4.75	1.444	1.444	1,400	2.99	9.63	37.08	34.82	0.133	3.43	1.488	38.25	2	
3. Mangaweka	178	4.09	17.79	3.11	6.550	6.550	6,630	1.31	5.72	44.20	27.57	1.604	10.83	5.689	38.40	3	
4. Manunui	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4
Averages, Town Boards	..	9.82	36.00	2.86	2.016(b)	2.016(c)	..	3.70(h)	13.55(i)	..	144(m)	..	..	..	..	..
County Councils.																	
1. Heathcote	1,370	4.18	18.33	2.23	1.035	1.035	9.0	1.89	8.21	13.18	12.65	0.177	2.26	1.171	14.91	1	
2. Kaitiaki	180	11.62	64.60	5.64	8.322	8.322	9.0	2.06	11.46	41.26	46.42	2.380	11.80	11.740	58.22	2	
3. Murchison	194	30.55	85.10	6.39	3.645	3.645	..	3.84	13.30	44.50	15.80	1.162	14.20	2.456	30.00	3	
4. Uawa	105	15.69	59.76	5.18	14.640	14.640	15,520	3.18	11.53	60.55	33.60	6.70	27.70	14.82	61.30	4	
5. Waimairi	3,749	4.69	18.14	2.81	0.817	0.817	0,744	1.67	6.44	13.76	10.10	0.237	3.99	0.837	14.09	5	
Averages, County Councils	..	5.63	22.80	3.09	0.995(b)	0.995(d)	..	1.86(h)	7.36(i)	..	..	..	..	..	..	..
Averages, other Local Authorities																	
Averages, other Local Authorities	..	11.17	36.75	3.95	1.123(d)	1.123(f)	..	2.84(h)	9.02(i)	..	552(m)	..	..	..	..	..

(For notes see page 147.)

TABLE XIV.—RETURN OF ELECTRIC RANGES, WATER-HEATERS, AND MILKING-MACHINES CONNECTED TO ELECTRIC-SUPPLY SYSTEMS AS AT 31ST MARCH, 1938.

Supply Authority.	Number of Consumers.			Ranges.			Water-heaters.			Milk-machines.			
	Domestic.	Commercial.	Total.	Under 5 Kilowatts.	5 Kilowatts and over.	Total Number.	Total kW.	Percentage of Domestic Consumers.	Number.	Total Kilowatts.	Percentage of Total Number of Consumers.	Number.	Horse-power.
	Number.	Number.	Number.	Number.	Number.	Number.		Per Cent.			Per Cent.		
PUBLIC WORKS DEPARTMENT.													
1. Arapuni-Mangahao-Waikaremoana	377	11	388	21	215	236	1,552	62.60	250	306	64.45	2	6
2. Coleridge-Waitaki-Arnold River	93	31	124	27	79	106	593	100.00	126	163	100.00	1,181	2,137
3. Southland Electric-power Supply	8,314	2,572	10,886	69	1,484	1,553	10,453	18.10	397	476	3.66	1,183	2,143
Totals, Public Works Department	8,784	2,614	11,398	69	1,778	1,847	12,578	21.01	773	945	6.78	1,183	2,143
ELECTRIC-POWER BOARDS.													
1. Ashburton	3,803	522	4,425	69	1,108	1,177	6,144	30.15	661	1,267	14.94	92	129
2. Auckland	47,264	11,078	58,342	89	11,460	11,460	80,220	24.24	15,405	8,472	26.40	554	1,108
3. Banks Peninsula	1,006	65	1,071	..	197	286	1,649	28.43	254	373	23.72	228	143
4. Bay of Islands(1)	..	..	..	..	..	..	..	..	..	..	..	..	..
5. Bay of Plenty	1,583	226	1,809	69	547	616	3,651	38.90	1,145	858	63.30	632	852
6. Buller(2)	..	..	..	..	..	..	..	..	..	..	..	..	..
7. Cambridge	1,334	236	1,570	27	242	269	1,529	20.20	656	575	41.80	365	463
8. Central Hawke's Bay	1,563	367	1,930	17	316	333	2,126	21.30	397	399	20.60	115	195
9. Central Waikato	5,507	584	6,091	168	644	812	4,728	14.74	2,153	1,385	35.35	1,739	2,763
10. Dannevirke	2,462	509	3,001	16	290	306	1,985	12.28	670	477	22.32	442	555
11. Franklin	4,150	460	4,610	298	984	1,282	6,450	30.90	2,339	1,430	50.75	1,785	2,128
12. Golden Bay	373	74	447	41	31	72	264	19.30	95	67	21.25	100	95
13. Grey	3,624	602	4,226	115	328	443	2,803	12.22	298	328	8.22	32	40
14. Hawke's Bay	6,980	865	7,845	95	1,388	1,483	12,849	21.25	1,502	857	19.15	290	401
15. Horowhenua	3,338	1,257	5,195	..	1,039	1,039	6,534	26.40	1,447	916	27.85	1,144	1,078
16. Hutt Valley	12,642	846	13,488	135	2,396	2,531	13,583	20.00	2,412	2,171	17.88	93	125
17. Lake Wakatipu(2)	..	..	..	..	..	..	..	..	..	..	..	..	..
18. Malvern	642	80	722	31	138	169	981	26.32	74	125	10.25	6	10
19. Manawatu-Oroua	5,229	212	5,441	..	1,072	1,072	6,310	20.50	1,783	1,210	32.80	1,303	1,961
20. Marlborough	2,645	461	3,106	162	422	584	3,178	22.08	309	217	9.95	114	181
21. North Auckland	1,579	394	1,973	186	..	186	1,144	11.78	336	203	17.03	298	339
22. North Canterbury	2,438	236	2,674	147	330	477	2,736	19.57	333	554	12.45	111	129
23. Opunake	1,005	140	1,145	11	128	139	745	13.83	184	124	16.07	312	482
24. Otago Central	847	232	1,079	10	178	188	1,146	22.20	196	201	18.17	82	63
25. Otago	4,443	36	4,479	17	370	387	2,519	8.71	348	358	7.77	126	198
26. Poverty Bay	4,497	1,127	5,624	..	1,483	1,483	9,576	33.00	1,145	771	20.36	208	195
27. Reefton(2)	..	..	..	..	..	..	..	..	..	..	..	..	..
28. South Canterbury	4,133	617	4,800	120	697	817	6,002	19.53	575	841	11.97	196	253
29. South Taranaki	2,107	570	2,677	12	471	483	3,089	15.55	869	659	23.64	697	946
30. Springs-Ellesmere	2,521	247	2,768	145	275	420	2,216	16.67	246	325	8.89	163	225
31. Taranaki	1,302	1,510	2,812	11	419	430	2,992	33.00	1,072	675	38.10	1,116	1,354
32. Taranua	1,647	279	1,926	164	275	439	2,299	26.65	523	335	27.15	426	555
33. Tauranga	1,957	89	2,046	78	450	528	3,389	27.00	1,049	704	51.20	700	969
34. Te Awamutu	1,921	384	2,305	84	379	463	2,632	24.10	379	674	38.13	776	1,150
35. Teviot	1,362	82	1,444	18	163	181	1,181	50.00	144	118	32.43	2	1
36. Thames Valley	8,117	870	8,987	65	1,688	1,753	12,581	21.59	3,826	2,786	42.57	2,989	5,149
37. Wainaea	2,020	306	2,326	39	733	772	5,509	7.38	129	77	5.55	55	29
38. Wairarapa	4,648	989	5,637	88	725	813	1,176	17.50	1,183	1,183	20.86	555	892
39. Wairere	362	70	432	6	131	137	857	37.85	298	105	48.20	90	109

(For notes, see page 150.)

TABLE XIV.—RETURN OF ELECTRIC RANGES, WATER-HEATERS, AND MILKING-MACHINES CONNECTED TO ELECTRIC-SUPPLY SYSTEMS AS AT 31ST MARCH, 1938—continued.

Supply Authority.	Number of Consumers.			Ranges.			Water-heaters.			Milk-machines.			
	Domestic.	Commercial.	Total.	Under 5 Kilowatts.	5 Kilowatts and over.	Total Number.	Total k.W.	Percentage of Domestic Consumers.	Number.	Total Kilowatts.	Percentage of Total Number of Consumers.	Number.	Horse-power.
	Number.	Number.	Number.	Number.	Number.	Number.	k.W.	Per Cent.	Per Cent.	k.W.	Per Cent.	Number.	Horse-power.
ELECTRIC-POWER BOARDS—continued.													
40. Wairoa	393	84	477	34	81	115	605	29.30	142	92	29.80	169	134
41. Waitaki	3,902	550	4,452	126	903	1,029	6,773	26.40	1,003	1,229	22.54	44	57
42. Waitemata	12,234	1,081	13,315	60	3,095	3,095	17,458	25.28	2,790	1,869	20.95	1,026	735
43. Waitomo	1,221	380	1,601	63	373	436	2,741	35.70	556	386	34.70	250	361
44. Wanganui-Rangitikei	9,011	2,174	11,185	..	1,451	1,451	9,112	16.10	1,950	1,346	17.43	817	1,072
45. Westland(3) .. .. .	..	..	..	..	..	..	..	..	..	..	..	..	..
Totals, Power Boards	178,592	30,891	209,483	2,816	36,717	39,533	251,989	22.13	51,279	36,742	24.47	20,242	28,244
OTHER LOCAL AUTHORITIES.													
City Councils.													
1. Christchurch	27,029	4,600	31,629	622	8,999	9,621	63,313	35.60	7,494	7,566	23.70	27	38
2. Dunedin	22,321	6,912	29,233	340	1,768	2,108	12,159	9.44	3,359	3,554	11.49	143	237
3. Invercargill	5,376	1,009	6,385	10	96	106	624	1.97	1	1	..	..	..
4. Nelson	3,320	..	3,320	..	..	..	..	..	..	..	..	..	..
5. Palmerston North	5,139	1,215	6,354	107	784	891	4,625	17.40	1,663	1,053	26.35	3	6
6. Wellington	28,022	10,114	38,136	313	2,214	2,527	16,164	9.02	4,795	6,285	12.57	9	8
Totals, City Councils	91,207	23,850	115,057	1,392	13,861	15,253	96,885	16.72	17,312	18,459	15.04	182	289
Borough Councils.													
1. Bluff	443	104	547	5	3	8	25	1.81	2	2	0.37	..	..
2. Hamilton	3,728	1,341	5,069	15	175	190	1,201	5.10	449	342	8.86	..	..
3. Inglewood	370	72	442	3	34	37	263	10.00	28	25	6.33	3	4
4. Kaipoi	447	68	515	52	36	88	400	19.68	13	13	2.52	3	1
5. Lyttelton	847	133	980	7	124	131	850	15.47	61	57	6.23	1	3
6. Napier	3,686	1,234	4,920	37	340	377	2,504	10.23	782	504	15.90	..	..
7. New Plymouth	5,822	1,638	7,460	248	1,336	1,584	8,340	27.20	1,632	1,020	23.79	571	949
8. Ohakune	403	115	518	14	15	29	127	7.20	24	18	4.63	7	8
9. Patea	449	..	449	29	54	83	387	18.48	58	37	12.92	19	19
10. Pictou	335	81	416	1	1	2	11	0.60	..	..	..	..	..
11. Queenstown	213	70	283	3	12	15	70	7.04	1	1	0.35	..	..
12. Raetihi	346	90	436	1	14	15	94	4.34	41	30	9.40	..	..
13. Rangiora	635	110	745	3	72	75	473	11.81	75	90	10.07	..	..
14. Riccarton	1,475	140	1,615	43	445	488	3,088	33.10	485	433	30.00	..	..
15. Ross(4) .. .. .	..	..	..	..	..	..	..	..	..	..	..	..	..
16. Rotorna (Tourist Department)	1,943	642	2,585	135	210	345	1,716	17.75	395	348	15.28	104	132
17. Stratford	970	260	1,230	8	214	222	1,198	22.89	212	194	17.23	3	4
18. Sumner	1,110	..	1,110	63	140	203	1,196	18.28	119	111	10.72	1	3
19. Talhpe	462	164	626	5	1	6	120	1.30	19	19	3.04	2	5
20. Taumarunui	741	378	1,119	9	44	53	296	7.16	55	41	4.92	30	26
21. Tauranga	1,028	295	1,323	103	465	568	2,840	55.20	611	248	46.20	..	..
22. Te Aroha	530	231	761	6	74	80	371	15.10	93	62	12.22	7	15
23. Te Puke	223	131	354	10	41	51	295	22.86	58	32	16.38	6	9
24. Thames	941	281	1,222	..	42	62	312	6.60	66	37	5.40	..	..
25. Timaru	3,898	1,011	4,909	..	658	658	4,247	16.87	587	727	11.96	..	..

(For notes, see page 150.)

TABLE XIV.—RETURN OF ELECTRIC RANGES, WATER-HEATERS, AND MILKING-MACHINES CONNECTED TO ELECTRIC-SUPPLY SYSTEMS AS AT 31st MARCH, 1938—continued.

Supply Authority.	Number of Consumers.			Ranges.			Water-heaters.			Milk-machines.			
	Domestic.	Commercial.	Total.	Under 5 Kilowatts.	5 Kilowatts and over.	Total Number.	Total k.w.	Percentage of Domestic Consumers.	Number.	Total Kilowatts.	Percentage of Total Number of Consumers.	Number.	Horse-power.
	Number.	Number.	Number.	Number.	Number.	Number.	Total k.w.	Per Cent.	Number.	Total Kilowatts.	Per Cent.	Number.	Horse-power.
OTHER LOCAL AUTHORITIES—continued.													
<i>Borough Councils—continued.</i>													
26. Wairoa	529	241	770	14	167	181	1,275	33.60	216	124	28.05	..	2
27. Waitara	454	116	570	10	49	59	335	13.00	41	31	7.20	..	2
28. Westport	943	273	1,216	1	16	17	117	1.80	34	29	2.80	..	9
29. Whakatane	403	162	565	20	110	130	810	32.26	135	82	23.90	..	7
30. Whangarei	1,674	677	2,351	35	207	242	1,493	14.45	161	95	6.85	..	25
Totals, Borough Councils	35,048	9,458	44,506	900	5,099	5,999	34,654	17.12	6,453	4,752	14.50	821	1,256
<i>Town Boards.</i>													
1. Kamo ⁽⁵⁾
2. Kaponga	341	67	408	12	31	43	216	12.60	75	51	18.38	133	232
3. Mangaweka	96	31	127	1	26	27	145	28.12	22	10	17.32	11	9
4. Manunui	157	21	178	..	..	..	..	..	..	..	..	4	4
Totals, Town Boards	594	119	713	13	57	70	361	11.78	97	61	13.60	148	245
<i>County Councils.</i>													
1. Heathcote	1,366	4	1,370	104	406	510	2,750	37.30	378	354	27.60	10	8
2. Kaikoura	130	50	180	2	..	2	3	1.54	..	..	..	..	..
3. Murchison	172	22	194	6	..	12	47	6.98	15	10	7.74	22	26
4. Uawa	90	15	105	..	..	..	..	..	..	..	..	..	..
5. Waimairi	3,541	208	3,749	74	947	1,021	5,947	28.83	919	772	24.52	36	34
Totals, County Councils	5,299	299	5,598	186	1,359	1,545	8,747	29.18	1,312	1,136	23.44	68	68
Totals, other Local Authorities	132,148	33,726	165,874	2,491	20,376	22,867	140,647	17.30	25,174	24,408	15.17	1,219	1,858
COMPANIES.													
1. Alderton Utility Co.	68	16	84	10	25	35	189	51.50	32	19	38.10	5	3
2. Kanieri Electric, Ltd.	570	235	805	18	79	97	612	17.00	47	47	5.84	..	..
3. Kōhukohu (L. Keys)	37	23	60	..	..	..	..	..	1	1	1.67	..	..
4. Reefion Electric Light and Power Co., Ltd.	268	79	347	..	..	..	..	..	2	3	0.57	1	2
5. Rawene Motors, Ltd.	37	19	56	..	..	..	..	..	..	..	..	..	..
6. Wilson's (N.Z.) Portland Cement, Ltd.	143	39	182	3	..	6	27	4.20	7	5	3.85	24	42
7. Westland Power, Ltd.	251	40	291	5	18	23	117	9.16	38	56	13.05	37	59
Totals, Companies	1,374	451	1,825	36	125	161	945	11.72	127	131	6.96	67	106
Totals, all Supply Authorities, 1938	320,898	67,682	388,580	5,412	58,996	64,408	406,169	20.07	77,353	62,226	19.90	22,711	32,351
1937	307,007	64,020	371,027	4,520	48,882	53,402	333,966	17.40	67,049	54,122	18.07	20,275	29,982

Ratio of Domestic Consumers to Total Consumers = 82.6 per cent.

NOTES.—(1) New electric-power district constituted 3rd March, 1937, but Board not actively functioning as a supply authority. (2) Not actively functioning. (3) License delegated to Westland Power, Ltd. (4) No return received. (5) Taken over by North Auckland Electric-power Board as from 1st October, 1937, and figures included in North Auckland Electric-power Board's return.

TABLE XV.—ABRIDGED SCHEDULE OF TARIFFS FOR ELECTRICAL ENERGY, 1937-38.

(NOTE.—In the following table, on account of space limitations, only the more representative selling-rates are given in each case. For further information reference should be made to the Rate-book of the Electric-power Boards and Supply Authorities Association, or to the tariff schedules of individual supply authorities. Wherever possible a general domestic tariff covering electric cooking is quoted. Abbreviations: T.S. = Time switch; C.O.S. = Change-over switch used with range, motors, &c. The period for which discounts hold good is usually 14 days.)

Supply Authority.	Domestic.	Commercial.								
<p>PUBLIC WORKS DEPARTMENT. 1. Arapuni-Mangahao-Waikaremoana 2. Coleridge - Waitaki - Arnold River 3. Southland Electric-power Supply(*)</p>	<p>Bulk supply only { £2 10s. per kVA. of maximum demand per quarter for first 200 kVA. £2 per kVA. of maximum demand per quarter for next 4,800 kVA. £1 15s. per kVA. of maximum demand per quarter for next 15,000 kVA. £1 6s. 3d. per kVA. of maximum demand per quarter for all over 20,000 kVA.</p> <p><i>Lighting, heating, and power—</i> Units per month: 21 @ 6½d. 21 @ 4d. 42 @ 2½d. Excess @ 1½d.</p> <p><i>Cooking:</i> 1d. per unit.</p> <p><i>Water-heating:</i> ¾d. per unit on C.O.S.; ½d. per unit in Gore. <i>Minimum charges:</i> Lighting, £4 p.a. Range up to 6 kW.: £6 p.a. Range over 6 kW.: £8 p.a. <i>Above rates are net.</i></p>	<p><i>Lighting, heating, cooking, and small power:</i> As for Domestic.</p> <p><i>Industrial power:</i> 1½d. per unit net, subject to discounts for quantity.</p> <p><i>Minimum charge for milking-motors—</i> Up to 1 h.p., £6 p.a. Over 1 h.p., £10 p.a.</p>								
<p>ELECTRIC-POWER BOARDS. 1. Ashburton</p>	<p><i>Lighting, heating, and cooking, with range over 3 kW. or heat-storage range:—</i> Units per month: As per schedule @ 8d. Next 84 @ 2d. Excess @ 1½d.</p> <p><i>Schedule:—</i></p> <table> <thead> <tr> <th>Lighting Connected Load.</th> <th>Units @ 8d.</th> </tr> </thead> <tbody> <tr> <td>Up to 150 W.</td> <td>7</td> </tr> <tr> <td>151 to 500 W.</td> <td>10</td> </tr> <tr> <td>Over 500 W.</td> <td>13</td> </tr> </tbody> </table> <p>Min. ch. per month: Ashburton, 4s. Country districts, 6s.</p> <p><i>Water-heating:—</i> Metered: ¾d. per unit. No min. ch. Flat rates: 750 W., 9s. 6d. per month. 1,000 W., 12s. 6d. per month. 2,000 W., 25s. per month. On C.O.S. or T.S. (off up to 4 hrs. per day). <i>Above rates are net.</i></p>	Lighting Connected Load.	Units @ 8d.	Up to 150 W.	7	151 to 500 W.	10	Over 500 W.	13	<p><i>Lighting:—</i> Units per month: 150 @ 6d. 100 @ 5d. Excess at 4d. Min. ch.: As for Domestic.</p> <p><i>Heating:—</i> Units per month: 60 @ 2d. 60 @ 1½d. Excess at 1d. Min. ch.: 5s. per month only if power used.</p> <p><i>General tariff, including cooking and small power for Hotels, &c.—</i> Units per month: 100 @ 6d. 100 @ 2d. 100 @ 1½d. Excess at 1d. Min. ch.: £8 10s. per month.</p> <p><i>Water-heating:</i> As for Domestic.</p> <p><i>Power:—</i> Units per month: 80 @ 3d. 120 @ 2d. Excess at 1½d. Min. ch.: 5s. per month per h.p. of connected load. Reduced rates for guarantees and for off-peak supply. <i>Above rates are net.</i></p>
Lighting Connected Load.	Units @ 8d.									
Up to 150 W.	7									
151 to 500 W.	10									
Over 500 W.	13									
<p>2. Auckland</p>	<p><i>General tariff:—</i> Units per month: 36 @ 3d. Excess @ ¾d. Min. ch.: 1s. per month.</p> <p><i>Water-heating:</i> Flat rate: £12 12s. per 1,000 W. p.a., or <i>pro rata</i> according to size of element. Min. ch.: £4 p.a. Metered: ¾d. per unit, with thermostat control; min. size, 10 gal.; min.-max. wattage, 400-3,000. Discount on above rates: 10 per cent.</p>	<p><i>Lighting:—</i> Units per month: M.D. × 14 @ 3d. Excess @ 1½d.</p> <p><i>Radiators:</i> 3d. per unit (1st May to 31st October).</p> <p><i>Cooking:</i> 1d. per unit (7 a.m. to 10 p.m.). ½d. per unit (10 p.m. to 7 a.m.). On 2-rate meter and T.S.</p> <p><i>Power:</i> Unit rate:— Units per month: 100 @ 2½d. 3,500 @ 1d. Excess @ ¾d.</p> <p><i>Power:</i> Demand rate: 8s. per kVA of M.D. per month, plus ¾d. per unit. Min. ch.: 3s. per kVA. of M.D. per month for over 10 kVA. demand. Discount on above rates: 10 per cent.</p>								

(*) Formerly Southland Electric-power Board. Taken over by the Public Works Department on 13th October, 1936.

TABLE XV.—ABRIDGED SCHEDULE OF TARIFFS FOR ELECTRICAL ENERGY, 1937-38—continued.

Supply Authority.	Domestic.	Commercial.												
3 Banks Peninsula	<p><i>Lighting, heating, cooking, and small power</i> :— Units per quarter : As per schedule @ 9d. Excess @ 1½d.</p> <p>The above rate holds good provided an electric range is in use, otherwise an intermediate block of 450 units per quarter is charged for at 2d. per unit.</p> <p>Schedule :—</p> <table border="0"> <tr> <td>Connected Lighting Load.</td> <td>Units per Quarter @ 9d.</td> </tr> <tr> <td>Up to 200 W.</td> <td>.. 27</td> </tr> <tr> <td>201 to 500 W.</td> <td>.. 33</td> </tr> <tr> <td>501 to 600 W.</td> <td>.. 40</td> </tr> <tr> <td>601 to 800 W.</td> <td>.. 50</td> </tr> <tr> <td>Over 800 W.</td> <td>.. 60</td> </tr> </table> <p>Min. ch. per quarter per kW. of connected load :— Lighting : 15s. (Akaroa); 22s. 6d. (Counties). Heating : 10s. 6d. Cooking : 6s. Power : 12s. 6d. per h.p. per quarter (min. 6s. 3d.).</p> <p><i>Water-heating</i> :— (a) 9.30 p.m. to 5.30 a.m. : ½d. per unit on T.S. (b) Off peak (18 hrs. service) : ¾d. per unit on T.S. and C.O.S. or thermostat. Min. ch. : (a) 7s. 6d.; (b) 10s. 6d. per kW. per quarter. Discount on above rates : 7½ per cent.</p>	Connected Lighting Load.	Units per Quarter @ 9d.	Up to 200 W. 27	201 to 500 W. 33	501 to 600 W. 40	601 to 800 W. 50	Over 800 W. 60	<p><i>Lighting</i> : 7d. per unit. Min. ch. : As for Domestic.</p> <p><i>Heating</i> :— Units per quarter : 450 @ 2d. Excess @ 1½d. Min. ch. : 10s. 6d. per kW. per quarter (min. 15s. per quarter).</p> <p><i>General purpose motors</i> (off from 5 p.m. to 6.30 p.m., May-September) :— Units per quarter : 240 @ 3d. 360 @ 2d. Excess @ 1½d. Min. ch. : £2 10s. per h.p. per annum. If on unrestricted service, £2 10s. per h.p. per annum in addition to unit rates above.</p> <p><i>Milking-motors</i> :— Units per quarter : 360 @ 2d. Excess @ 1½d. Plus £5 per h.p. per season.</p> <p><i>Dairy water-heaters</i> : ¼d. per unit, plus 12s. per kW. per quarter on C.O.S. or T.S. Discount on above rates : 7½ per cent.</p>
Connected Lighting Load.	Units per Quarter @ 9d.													
Up to 200 W. 27													
201 to 500 W. 33													
501 to 600 W. 40													
601 to 800 W. 50													
Over 800 W. 60													
4. Bay of Plenty	<p><i>General tariff</i> :— Units per quarter : As per schedule @ 8d. Next 200 @ 2d. Excess @ 1½d.</p> <p>Schedule :—</p> <table border="0"> <tr> <td>Rooms.</td> <td>Units per Quarter @ 8d.</td> </tr> <tr> <td>5 or less</td> <td>.. 27</td> </tr> <tr> <td>6 or 7</td> <td>.. 30</td> </tr> <tr> <td>8 or 9</td> <td>.. 33</td> </tr> <tr> <td>10 or more</td> <td>.. 36</td> </tr> </table> <p>Min. ch. :—Borough : 15s. per quarter. County : From £1 per quarter for two or three rooms to £3 per quarter for over nine rooms.</p> <p><i>Water-heating</i> : 4s. per 100 W. per quarter on T.S. (18 hrs. per day approx.). Above rates are net.</p>	Rooms.	Units per Quarter @ 8d.	5 or less 27	6 or 7 30	8 or 9 33	10 or more 36	<p><i>Lighting</i> :— Shops and offices : 8d. per unit. Hotels, &c. : Per quarter— 8d. for first unit per light. 6d. for excess.</p> <p><i>Heating</i> :— Shops and offices— Unrestricted : 4d. per unit. Off peak— Units per month per kW. : 20 @ 3d. Excess @ 1½d. Hotels, &c. : Units per quarter : 200 @ 2d. Excess @ 1½d.</p> <p><i>General-purpose motors</i> :— Units per quarter : 80 per h.p. @ 3d. 600 @ 2½d. Excess @ 2d.</p> <p><i>Milking-motors</i> :— Units per quarter— Fractional h.p. : 120 @ 5d. Excess @ 1½d. 1 h.p. and over : 120 per h.p. @ 5d. Excess @ 1½d.</p> <p><i>Dairy water-heaters</i> : 30s. per quarter for 750 W., 600 of which on C.O.S. Above rates are net.</p>		
Rooms.	Units per Quarter @ 8d.													
5 or less 27													
6 or 7 30													
8 or 9 33													
10 or more 36													
5. Cambridge	<p><i>Lighting</i> : 6d. per unit. Discount : 5 per cent.</p> <p><i>Heating and cooking</i> :— Units per month : 10 @ 3d. 90 @ 1½d. Excess @ ¾d. Combined min. ch. : 3s. 6d. per month. Discount : 5 per cent.</p> <p><i>Water-heating</i> :— Restricted— 750 W., £4 10s. p.a. } on T.S. 1,000 W., £6 p.a. .. } Continuous : £12 per kW. p.a.</p>	<p><i>Lighting</i> :— (a) Units per month : 100 @ 6½d. 100 @ 5½d. Excess @ 4½d. (b) First 60 hrs. of connected load @ 6½d. per unit. Excess @ 3½d. per unit. Discount : 5 per cent.</p> <p><i>Power</i> :— (a) Unrestricted— Units per month : 100 @ 3d. 900 @ 1½d. Excess @ ¾d. (b) Restricted hours— Units per month : 100 @ 3d. 400 @ 1½d. 5,500 @ ¾d. Excess @ ½d. Discount : 5 per cent.</p> <p><i>Milking-motors</i> :— Units per month : 60 per h.p. @ 4d. Excess @ 1d.</p>												

TABLE XV.—ABRIDGED SCHEDULE OF TARIFFS FOR ELECTRICAL ENERGY, 1937-38—continued.

Supply Authority	Domestic.	Commercial.
6. Central Hawke's Bay ..	<p><i>Lighting</i> :— Units per quarter : As per schedule @ 7d. Next 90 @ 3½d. Next 90 @ 2d. Excess @ 1½d.</p> <p>Schedule— Units per Quarter @ 7d. Rooms. Jan.—Mar. April—June. July—Sept. Oct.—Dec. 5 or less .. 24 30 30 24 6 or 7 .. 27 33 33 27 8 or 9 .. 30 36 36 30 10 or more 33 39 39 33</p> <p>The above tariff also applies to heating, &c., where no range is installed; but with a range in use the heating and cooking rate is as follows :—</p> <p><i>Heating and cooking</i> :— Units per quarter : 90 @ 2½d. 90 @ 2d. Excess @ 1½d.</p> <p><i>Water-heating</i> :— £6 per 1,000 W. p.a., with range or milking-motor. £8 per 1,000 W. p.a. without. Booster elements and elements not equipped with a T.S. will be metered and current charged at heating rates. <i>Above rates are net.</i></p> <p>Min. ch. :— Borough : 15s. per quarter. Country : 15s. per quarter up to six rooms. 25s. per quarter over six rooms.</p>	<p><i>Lighting</i> : 7d. per unit.</p> <p><i>Heating</i> :— Units per quarter : 120 @ 3d. 120 @ 2d. Excess @ 1½d. Off-peak heating (8.30 a.m. to 11 a.m. and 12.45 p.m. to 4.30 p.m.) as follows :— Units per quarter : 90 @ 2d. Excess @ 1d.</p> <p><i>Industrial motors</i> :— 8 a.m. to 5 p.m. on T.S. if required— Units per quarter : 1,000 @ 3d. 1,000 @ 2½d. Excess @ 2d. From 9 p.m. to 6 a.m. : 1d. per unit on T.S.</p> <p><i>Milking-motors</i> :— Units per quarter : 1,000 @ 2½d. Excess @ 2d. <i>Above rates are net.</i></p>
7. Central Waikato ..	<p><i>Lighting, heating, and cooking</i>, with range of not less than 2 kW. :— Units per month : 16 @ 5d. 80 @ 1½d. Excess @ 1d. Min. ch. per month : 4s. 6d.</p> <p><i>Water-heating</i> :— With range of not less than 2 kW. : 12s. per 100 W. p.a. on T.S. Without range : 16s. per 100 W. p.a. on T.S. Unrestricted rate : 22s. per 100 W. p.a. Discount on above rates : 5 per cent.</p>	<p><i>Lighting</i> : 5d. per unit. Min. ch. : 2s. 3d. per month.</p> <p><i>Heating and cooking</i> : 1½d. per unit. Min. ch. : 2s. 3d. per month.</p> <p><i>Power</i> :— <i>Ordinary rate</i> : 2½d. per unit. Min. ch. : 5s. per h.p. per month up to 5 h.p. 2s. 6d. per h.p. per month for excess over 5 h.p. <i>Milking-motors</i> (2 h.p. or less) : 2½d. per unit. <i>Off-peak supply</i> (on T.S.) :— Units per month : 30 per h.p. @ 2½d. Excess @ 1½d. Min. ch. : 5s. per h.p. per month. Alternatively : 4½d. per unit; no min. ch. Discount on above rates : 5 per cent.</p>
8. Dannevirke ..	<p><i>Lighting</i> : 7d. per unit. Min. ch. : 2s. 6d. per month.</p> <p><i>Heating</i> : 4d. per unit.</p> <p><i>Cooking</i> :— Units per month : 20 @ 3d. Excess @ 1½d. Min. ch. : 5s. per month. Where range installed all heating, ironing, &c., will be connected to range meter. Discount on above rates : 7½ per cent.</p> <p><i>Water-heating</i> :— Metered : ½d. per unit (600 W., 16 hrs. per day on T.S.) plus 2s. 6d. per month T.S. rental. Flat rate : £1 per 100 W. p.a. on T.S. (off up to 8 hrs. per day). Min. ch. : £5 p.a.</p>	<p><i>Lighting</i> : 6d. per unit. Min. ch. : 2s. 6d. per month.</p> <p><i>Heating and power</i> :— Units per month : 80 @ 3d. 120 @ 2d. Excess @ 1½d. Min. ch. : Heating : 2s. 6d. per month. Motors : 2s. 6d. per h.p. per month. Discount on above rates : 7½ per cent.</p> <p><i>Milking-motors</i> : £1 per h.p. p.a. plus the following unit charges per month :— 70 @ 4d. 100 @ 2½d. Excess @ 1d.</p>
9. Franklin ..	<p><i>Lighting</i> : 5d. per unit. Min. ch. : 3s. per month.</p> <p><i>Heating, power, and cooking</i>, where range installed : 1d. per unit. Min. ch. : 5s. per month.</p> <p><i>Water-heating</i> :— On C.O.S. or T.S. : 14s. per 100 W. p.a. Min. ch. : £4 4s. p.a. Continuous rate : 20s. per 100 W. p.a. Min. ch. : £6 p.a. Discount on above rates : 10 per cent.</p>	<p><i>Lighting and heating</i> : As for Domestic.</p> <p><i>Industrial and milking-motors</i> :— Units per quarter : 200 @ 2½d. Excess @ 2d. Min. ch. : 3s. per month for 1 h.p. and 2s. 6d. per month for each additional h.p. Discount on above rates : 10 per cent.</p>

TABLE XV.—ABRIDGED SCHEDULE OF TARIFFS FOR ELECTRICAL ENERGY, 1937—38—continued.

Supply Authority.	Domestic.	Commercial.																	
10. Golden Bay	<p><i>Lighting</i> :— Units per month : 80 @ 9d. Excess @ 7d. Min. ch. : 5s. per month.</p> <p><i>Heating</i> (including cookers up to 2½ kW. and small motors up to ½ h.p.) :— Units per month : 8 @ 4½d. 12 @ 3d. 120 @ 1½d. Excess @ 1d. Min. ch. : 2s. 6d. per month.</p> <p><i>Electric ranges</i> (including all heating) :— Units per month : 140 @ 1½d. 460 @ 1d. Excess @ ¾d. Min. ch. : 2s. 6d. per month. Heat-storage range up to 750 W. : £6 p.a. Discount on above rates : 5 per cent.</p> <p><i>Water-heating</i> :— (a) £1 per 100 W. p.a. (b) £6 per kW. p.a., with electric range.</p>	<p><i>Lighting and heating</i> : As for Domestic.</p> <p><i>Power</i> :— Units per month : 80 @ 4d. 240 @ 3d. Excess at 1d. Min. ch. : 2s. per h.p. per month. Discount : 5 per cent.</p>																	
11. Grey	<p><i>Lighting</i> :— Units per month : 100 @ 6d. Excess @ 4d. Min. ch. : 2s. 6d. per month.</p> <p><i>Heating and cooking</i> : 1d. per unit. Min. ch. per month : 7s. 6d. with range ; 2s. 6d. without.</p> <p><i>Water-heating</i> : With range : ¼d. per unit. Without range : ½d. per unit. No min. ch.</p>	<p><i>Lighting and heating</i> : As for Domestic.</p> <p><i>Power</i> : 2d. per unit. Min. ch. : 2s. 6d. per month.</p>																	
12. Hawke's Bay	<p><i>General tariff (lighting, heating, cooking, and motors up to ½ h.p.)</i> :— Units per 2 months : As per schedule @ 6d. Next 28 @ 2d. Excess @ 1½d.</p> <p><i>Schedule</i>—</p> <table border="1"> <thead> <tr> <th rowspan="2">Rooms.</th> <th colspan="2">Units per 2 Months @ 6d.</th> </tr> <tr> <th>Within Hastings</th> <th>Outside Hastings</th> </tr> </thead> <tbody> <tr> <td>5 or less ..</td> <td>Borough. 12</td> <td>Borough. 14</td> </tr> <tr> <td>6 or 7 ..</td> <td>.. 14</td> <td>.. 18</td> </tr> <tr> <td>8 or 9 ..</td> <td>.. 16</td> <td>.. 20</td> </tr> <tr> <td>10 or more ..</td> <td>.. 18</td> <td>.. 22</td> </tr> </tbody> </table> <p><i>Alternative tariff</i> for private residences with range of not less than 5 kW. : Service charge 1s. per month per room (min. 5 rooms) plus 1d. per unit.</p> <p><i>Water-heating</i> : £1 per 100 W. p.a. for not less than 500 W. on T.S. or control wire (21 hrs. service).</p> <p><i>Minimum charges</i> :— Country : 4s. per month. Hastings : 2s. per month. Above rates are net.</p>	Rooms.	Units per 2 Months @ 6d.		Within Hastings	Outside Hastings	5 or less ..	Borough. 12	Borough. 14	6 or 7 14	.. 18	8 or 9 16	.. 20	10 or more 18	.. 22	<p><i>Lighting</i> :— Country— Units per 2 months : 200 @ 6d. Excess @ 4d. Hastings— Units per 2 months : M.D. per month × 30 units @ 5½d. Excess @ 1½d.</p> <p><i>Heating</i> :— Country— Units per 2 months : 120 @ 2d. Excess @ 1½d. Hastings : 3d. per unit.</p> <p><i>Cooking</i> :— Units per 2 months : 200 @ 2d. Excess @ 0.9d.</p> <p><i>Power</i> :— Units per 2 months : 50 per h.p. @ 2½d. (max., 500). Excess @ 1½d.</p> <p><i>Minimum charges</i> :— Country : 4s. per month. Hastings : Up to 300 W., 2s.; over 300 W., 5s. per month. Above rates are net.</p>
Rooms.	Units per 2 Months @ 6d.																		
	Within Hastings	Outside Hastings																	
5 or less ..	Borough. 12	Borough. 14																	
6 or 7 14	.. 18																	
8 or 9 16	.. 20																	
10 or more 18	.. 22																	
13. Horowhenua	<p><i>General tariff</i> :— Units per month : 10 @ 5d. 200 @ 1d. Excess @ ¾d. Min. ch. : 3s. per month.</p> <p><i>Water-heating</i> : £12 per kW. p.a., continuous. £9 per kW. p.a. on C.O.S. Above rates are net.</p>	<p><i>Lighting</i> : 4d. per unit net. Min. ch. : 3s. 6d. per month.</p> <p><i>Heating</i> :— Units per month : 100 @ 1½d. Excess @ 1d. Min. ch. : 2s. 6d. per month.</p> <p><i>Power</i> :— (a) Units per month : 200 @ 2½d. Excess @ 2d. Min. ch. : 2s. 6d. per h.p. per month. (b) 6d. per unit up to 3 h.p. No min. ch. <i>Milking-motors</i> charged on rate (a) but with no minimum. Above rates are net.</p>																	

TABLE XV.—ABRIDGED SCHEDULE OF TARIFFS FOR ELECTRICAL ENERGY, 1937-38—continued.

Supply Authority.	Domestic.	Commercial.								
14. Hutt Valley	<p><i>General tariff</i> :— Units per month : 14 @ 4½d. 64 @ 1½d. 464 @ 1d. Excess @ ¾d.</p> <p>With an electric range of the fixed type :— Units per month : 14 @ 4½d. Excess at ¾d.</p> <p><i>Discount</i> : 12½ per cent. adjustable, plus 8½ per cent. for cash. Min. ch. : 2s. 6d. per month.</p> <p><i>Water-heating</i> :— 19s. 6d. per 100 W. p.a. (22 hrs.) 16s. 9d. per 100 W. p.a. (on thermostat) } Min: 500 W. 12s. per 100 W. p.a. with range (on C.O.S. and thermostat) 5s. per 100 W. p.a. (10 p.m. to 7 a.m. on T.S.). Min. 750 W. : max. 3,000 W. Metered : ½d. per unit. Max. 3,000 W. (min. ch. 2s. 6d. per 1,000 W. per month). <i>Discount</i> on water-heating rates : 8½ per cent.</p>	<p><i>Lighting</i> :— Units per month : 32 @ 5d. 350 @ 3½d. Excess @ 3d. Min. ch. : 3s. per month.</p> <p><i>Heating</i> :— Units per month : 12 @ 2½d. 12 @ 2d. 476 @ 1½d. Excess @ 1d. Min. ch. : 2s. 6d. per month.</p> <p><i>Power</i> (7 a.m. to 10 p.m.) :— Units per month : 80 @ 3d. 120 @ 2d. 120 @ 1½d. Excess @ 1d. Min. ch. : 2s. 6d. per h.p. per month.</p> <p><i>Power</i> (10 p.m. to 7 a.m.) : 0.65d. per unit. Min. ch. : 1s. per h.p. per month.</p> <p><i>Power</i> (25 h.p. to 100 h.p.) :— Units per month : 228 @ 2d. Excess @ 1d. Min. ch. : 2s. 6d. per h.p. per month.</p> <p><i>Milking-motors</i>— Units per month : 124 @ 2d. Excess @ 1d. Min. ch. : 2s. 6d. per h.p. per month.</p> <p><i>Discount</i> : 8½ per cent. on all of the above rates, except power (25-100 h.p.) where 15 per cent. is allowed.</p>								
15. Malvern	<p><i>Lighting, heating, and small motors up to ½ h.p.</i> :— <i>Rate A</i>— Units per quarter : As per schedule @ 10d. Next 150 @ 3d. Excess @ 2d. Min. ch. : £1 7s. 6d. per quarter.</p> <p><i>Schedule</i>—</p> <table border="1"> <thead> <tr> <th>Number of Points.</th> <th>Units per Quarter @ 10d.</th> </tr> </thead> <tbody> <tr> <td>Up to 7</td> <td>36</td> </tr> <tr> <td>8 to 12</td> <td>42</td> </tr> <tr> <td>Over 12</td> <td>48</td> </tr> </tbody> </table> <p><i>Rate B, with range</i>— Units per quarter : 48 @ 10d. 300 @ 2d. Excess @ 1d.</p> <p><i>Water-heating</i> :— 9.30 p.m. to 7.30 a.m. on T.S. : ¼d. per unit. 24 hr. service (up to 2 kW. heater, where range installed) : ¼d. per unit, reducible to ⅓d. where water-heater installation approved.</p> <p><i>Discount</i> on above rates : 10 per cent.</p>	Number of Points.	Units per Quarter @ 10d.	Up to 7	36	8 to 12	42	Over 12	48	<p><i>Power</i> :— Units per quarter : 240 @ 3½d. 360 @ 2½d. Excess @ 1½d. Min. ch. : 18s. per h.p. per quarter.</p> <p><i>Discount</i> on above rates : 10 per cent.</p>
Number of Points.	Units per Quarter @ 10d.									
Up to 7	36									
8 to 12	42									
Over 12	48									
16. Manawatu-Oroua	<p><i>General tariff</i> :— Units per month : 15 @ 6d. 25 @ 2d. 60 @ 1½d. Excess @ 1¼d., net.</p> <p>Min. ch. per month : One meter, 4s. 6d. ; two or more meters, 7s.</p> <p><i>Water-heating</i> :— Flat rates per annum : 500 W., £4 10s. 600 W., £5 8s. 750 W., £6 15s. 1,000 W., £9. Subject to control by T.S., C.O.S., or pilot wire during peak-load hours. Min. ch. : £4 10s. per annum. Above rates are net.</p>	<p><i>Lighting</i> :— Units per month : 100 @ 6d., net. 100 @ 5d., net. Excess @ 4d., net.</p> <p><i>Heating</i> : 1½d. per unit net, if on separate meter. Min. ch. : As for Domestic.</p> <p><i>Power</i> :— Units per month : 100 @ 3½d., net. 100 @ 3d., net. Excess @ 1½d., net. Subject to discount of 5 per cent. where static condensers are installed to maintain at least 0.95 P.F. Min. ch. p.a. : Up to ½ h.p., £2 ; ½ to 3 h.p., £2 10s. ; over 3 h.p., £5.</p> <p><i>Milking-motors</i>— Units per month : 100 @ 3d., net. 100 @ 2½d., net. Excess @ 1½d., net. Subject to P.F. discount as above. Min. ch. : £2 10s. p.a. Large power consumers are charged on a kVA. demand plus unit basis, for which see Board's tariff schedule. Min. ch. : £180 p.a.</p>								

TABLE XV.—ABRIDGED SCHEDULE OF TARIFFS FOR ELECTRICAL ENERGY, 1937-38—continued.

Supply Authority.	Domestic.	Commercial.										
17. Marlborough	<p><i>Lighting, heating, cooking, and small power :—</i> Units per quarter : As per schedule @ 8d. Next 21 @ 2½d. Next 180 @ 2d. Excess @ 1½d.</p> <p>Schedule—</p> <table> <thead> <tr> <th>Rooms.</th> <th>Units per Quarter @ 8d.</th> </tr> </thead> <tbody> <tr> <td>5 or less</td> <td>27</td> </tr> <tr> <td>6 or 7</td> <td>30</td> </tr> <tr> <td>8 or 9</td> <td>33</td> </tr> <tr> <td>10 or more</td> <td>36</td> </tr> </tbody> </table> <p><i>Water-heating : 8 p.m. to 6.30 a.m., not less than 500 W. on T.S. : 9s. 6d. per 100 W. p.a. Above rates are net.</i></p> <p><i>Minimum charges per quarter—</i> Borough and town districts : 7s. 6d. Country areas— 2- and 3-roomed houses, 10s. 4- and 5-roomed houses, 15s. 6- and 7-roomed houses, 20s. 8- and 9-roomed houses, 25s. Over 9-roomed houses, 30s.</p>	Rooms.	Units per Quarter @ 8d.	5 or less	27	6 or 7	30	8 or 9	33	10 or more	36	<p><i>Lighting : 6d. per unit.</i></p> <p><i>Heating :—</i> Units per quarter : 120 @ 3d. Excess @ 1½d. } Shops and offices. Units per quarter : 21 @ 2½d. 180 @ 2d. } Hotels, &c. Excess @ 1½d.</p> <p><i>Motors :—</i> Units per quarter : 48 per h.p. @ 4d. 600 @ 2½d. Excess @ 2d.</p> <p>Min. ch. : 2s. 6d. per month. Large power consumers are charged on a kVA demand plus unit basis, for which see Board's tariff schedule. Min. ch. : £45 per quarter. Above rates are net.</p>
Rooms.	Units per Quarter @ 8d.											
5 or less	27											
6 or 7	30											
8 or 9	33											
10 or more	36											
18. North Auckland	<p><i>Lighting : 7d. per unit. Min. ch. : 4s. per month.</i></p> <p><i>Heating and cooking :—</i> Units per month : 10 @ 2½d. 10 @ 1½d. Excess @ 1½d. Min. ch. : 3s. per month.</p> <p><i>Water-heating :—</i> Restricted— (a) With range or milking-motor, 17s. per 100 W. p.a. on T.S. or C.O.S. (off 4 hrs.). (b) Without range or milking-motor, 22s. per 100 W. p.a. on T.S. or C.O.S. Unrestricted— (a) 22s. (b) 27s. 6d. } per 100 W. p.a. Above rates are net.</p>	<p><i>Lighting, heating, cooking, and water-heating : As for Domestic.</i></p> <p><i>Industrial motors :—</i> Units per month : 500 @ 3½d. 500 @ 2½d. Excess @ 2½d. Min. ch. : 1 h.p. and over, 5s. per h.p. per month. Minimum, 4s. ; maximum, 20s.</p> <p><i>Milking-motors : 3½d. per unit. Min. ch. : 6s. per month. Above rates are net.</i></p>										
19. North Canterbury	<p>Rate "B" : General domestic service (with range over 3 kW.) :— (a) Consumers guaranteeing 27s. 6d. per month— Units per month : As per schedule @ 6d. Next 50 @ 2d. Excess @ 1½d. (b) Consumers guaranteeing 35s. per month— Units per month : As per schedule @ 6d. Next 50 @ 2d. Next 100 @ 1½d. Excess @ 1d.</p> <p>Schedule—</p> <table> <thead> <tr> <th>Number of Rooms.</th> <th>Units per Month @ 6d.</th> </tr> </thead> <tbody> <tr> <td>6 and under</td> <td>12</td> </tr> <tr> <td>7 to 10</td> <td>20</td> </tr> <tr> <td>Over 10</td> <td>30</td> </tr> </tbody> </table> <p><i>Water-heating (on T.S. and thermostat) :—</i> First 600 units per quarter @ ½d. per unit. Excess per quarter @ ¼d. per unit. Maximum wattage, 3,000. Min. ch. : Nil under Rate "B" above ; otherwise 5s. per month. Above charges are net.</p>	Number of Rooms.	Units per Month @ 6d.	6 and under	12	7 to 10	20	Over 10	30	<p><i>Lighting :—</i> Units per month : 80 @ 6d. Excess @ 4d. Min. ch. : 6s. per month.</p> <p><i>Heating :—</i> Units per month : 60 @ 2d. 60 @ 1½d. Excess @ 1d. Min. ch. : 5s. per month ; nil if no power used.</p> <p><i>Power :—</i> Ordinary rate— Units per month : 80 @ 3d. 120 @ 2d. Excess @ 1½d. Min. ch. : 5s. per h.p. per month.</p> <p><i>Milking-machines—</i> (1) Three-phase motors : £4 per h.p. per year plus unit rate as above. (2) Single-phase motors : 5s. per h.p. per month plus unit rate as above. Above charges are net.</p>		
Number of Rooms.	Units per Month @ 6d.											
6 and under	12											
7 to 10	20											
Over 10	30											
20. Opunake	<p><i>General tariff :—</i> (a) Units per month : 12 per kW. of connected load @ 8d. Excess @ 3d. Min. ch. : 5s. per month. (b) Alternative rate— Units per month : 20 per kW. of connected load @ 8d. Excess @ 1½d. Min. ch. : 10s. per month. Discount : 10 per cent.</p> <p><i>Water-heating (net) :—</i> £1 per 100 W. p.a. (continuous). 15s. per 100 W. p.a. (on C.O.S.).</p>	<p><i>Lighting and heating : As for Domestic.</i></p> <p><i>Industrial motors :—</i> Units per month : 200 @ 3d. Excess @ 2d. Min. ch. : 5s. per h.p. per month.</p> <p><i>Milking-motors :—</i> Units per month : 60 per h.p. @ 4d. Excess @ 2d. Min. ch. : 5s. per month. Discount on above rates : 10 per cent.</p>										

TABLE XV.—ABRIDGED SCHEDULE OF TARIFFS FOR ELECTRICAL ENERGY, 1937-38—continued.

Supply Authority.	Domestic.	Commercial.																											
21. Otago Central	<p><i>Lighting</i> :— Per two months: Fixed charge of 3s. 4d. per 100 W. connected load, plus 30 @ 4d. 120 @ 2d. Excess @ 1d.</p> <p><i>Heating and cooking</i> :— Per two months: Fixed charge of 3s. 4d. per 1,000 W. connected load plus units as for lighting.</p> <p><i>Water-heating</i> :— £12 per kW. p.a. (continuous). £6 per kW. p.a. on C.O.S. or T.S.</p> <p>Discounts from 5 to 10 per cent. allowed where</p>	<p><i>Lighting, heating, and cooking</i>—At Domestic rates, or, alternatively, at the following :— <i>Lighting</i> : 8d. per unit. Where heating installed— Units per two months : 30 @ 8d. 120 @ 4d. Excess @ 2d. Min. ch. : 2s. per two months.</p> <p><i>Industrial and farm motors</i> : Per two months: Fixed charge of 6s. 8d. per h.p., plus units as for domestic lighting.</p> <p>consumption exceeds 1,000 units per two months.</p>																											
22. Otago	<p><i>Lighting, heating, and cooking, with range over 3 kW.</i> :— (a) Units per quarter : 36 @ 9d. 300 @ 2d. Excess @ 1½d. Min. ch. : £4 10s. per quarter. (b) Units per quarter : 36 @ 9d. 300 @ 2d. 300 @ 1½d. Excess @ 1d. Min. ch. : £6 per quarter.</p> <p><i>Water-heating</i> :— ½d. per unit on T.S. for 11 hours per day. 0·4d. per unit on T.S. for 16 hours per day. ¾d. per unit on T.S. for 22 hours per day. Flat rates on T.S. and thermostat— 750 W. : £5 5s. p.a. 1,000 W. : £6 p.a.</p>	<p><i>Lighting</i> : 9d. per unit.</p> <p><i>Heating</i> :— (a) 3d. per unit. (b) 1½d. per unit on T.S. off peak.</p> <p><i>Power</i> :— Units per quarter : 300 @ 4d. 240 @ 2d. Excess @ 1d. Min. ch. : £5 per h.p. p.a.</p>																											
23. Poverty Bay	<p><i>General tariff (with range)</i> :— Units per month : As per schedule @ 4¾d. Next 30 @ 2½d. Next 170 @ 1d. Excess @ ¾d.</p> <p><i>Schedule</i> :—</p> <table border="1"> <thead> <tr> <th>Rooms.</th> <th>Apr. to Sept. Units.</th> <th>Oct. to Mar. Units.</th> </tr> </thead> <tbody> <tr><td>5</td><td>10</td><td>7</td></tr> <tr><td>6</td><td>12</td><td>9</td></tr> <tr><td>7</td><td>16</td><td>12</td></tr> <tr><td>8</td><td>20</td><td>15</td></tr> <tr><td>9</td><td>24</td><td>18</td></tr> <tr><td>10</td><td>28</td><td>21</td></tr> <tr><td>11</td><td>32</td><td>24</td></tr> <tr><td>12 and over</td><td>36</td><td>27</td></tr> </tbody> </table> <p>Min. ch : 2s. per month.</p> <p><i>Water-heating</i> (all rates quoted are for off-peak supply) :— Flat rate : 19s. per 100 W. p.a. Metered : ¾d. per unit.</p>	Rooms.	Apr. to Sept. Units.	Oct. to Mar. Units.	5	10	7	6	12	9	7	16	12	8	20	15	9	24	18	10	28	21	11	32	24	12 and over	36	27	<p><i>Lighting</i> :— Units per month : 100 @ 4¾d. Excess @ 3½d. Min. ch. : 2s. per month.</p> <p><i>Heating</i> :— Units per month : 60 @ 2½d. Excess @ 1½d. Min. ch. : 2s. per month.</p> <p><i>Cooking</i> :— Units per month : 30 @ 2½d. Next 270 @ 1d. Excess @ ¾d. Min. ch. : 2s. per month per kW. connected load</p> <p><i>Dairy water-heating</i> : 15s. per 100 W. p.a. (off peak).</p> <p><i>Power</i> :— <i>Industrial</i>— Units per month : 400 @ 2d. Excess @ 1½d. Min. ch. : 2s. per h.p. per month up to 20 h.p. 1s. per h.p. per month thereafter. <i>Milking-motors</i> : 2¾d. per unit. Min. ch. as above, but applies only from September to April inclusive.</p>
Rooms.	Apr. to Sept. Units.	Oct. to Mar. Units.																											
5	10	7																											
6	12	9																											
7	16	12																											
8	20	15																											
9	24	18																											
10	28	21																											
11	32	24																											
12 and over	36	27																											
24. South Canterbury..	<p><i>General tariff (per month)</i> :—</p> <table border="1"> <thead> <tr> <th>Rooms.</th> <th>Units @ 7d.</th> <th>Units @ 8d.</th> </tr> </thead> <tbody> <tr><td>4 or less</td><td>6</td><td>12</td></tr> <tr><td>5 or less</td><td>8</td><td>16</td></tr> <tr><td>6 or less</td><td>10</td><td>20</td></tr> <tr><td>7 or less</td><td>12</td><td>24</td></tr> <tr><td>8 or less</td><td>14</td><td>28</td></tr> <tr><td>9 or less</td><td>16</td><td>32</td></tr> <tr><td>10 or less</td><td>18</td><td>36</td></tr> <tr><td>11 or over</td><td>20</td><td>40</td></tr> </tbody> </table> <p>Min. ch. for lighting and cooking : 17s. 6d. per month.</p> <p><i>Water-heating</i> :— With range— (a) 13s. 4d. per kW. per month plus 6s. 8d. per month for each kW. in excess (on T.S., 20 to 22 hrs. per day). (b) ½d. per unit. On C.O.S. Min. ch. : 5s. per month.</p>	Rooms.	Units @ 7d.	Units @ 8d.	4 or less	6	12	5 or less	8	16	6 or less	10	20	7 or less	12	24	8 or less	14	28	9 or less	16	32	10 or less	18	36	11 or over	20	40	<p><i>Lighting</i> :— Units per month : 20 @ 7d. 40 @ 5d. Excess @ 4d. Min. ch. : 5s. per month.</p> <p><i>Heating</i> : 3d. per unit. Min. ch. : 2s. 6d. per month.</p> <p><i>Cooking</i> :— Units per month : 100 @ 2d. Excess @ 1d. Min. ch. : 12s. 6d. per month.</p> <p><i>Power</i> :— Units per month : 80 @ 3d. 120 @ 2d. Excess @ 1d. Min. ch. : 2s. 6d. per h.p. per month for farmers. 5s. per h.p. per month for commercial. <i>Milking-motors</i> : £3 per h.p. per year plus 2d. per unit.</p>
Rooms.	Units @ 7d.	Units @ 8d.																											
4 or less	6	12																											
5 or less	8	16																											
6 or less	10	20																											
7 or less	12	24																											
8 or less	14	28																											
9 or less	16	32																											
10 or less	18	36																											
11 or over	20	40																											

TABLE XV.—ABRIDGED SCHEDULE OF TARIFFS FOR ELECTRICAL ENERGY, 1937-38—continued.

Supply Authority.	Domestic.	Commercial.						
25. South Taranaki ..	<p><i>Lighting</i> :— Units per month : 100 @ 6d. Excess @ 4½d. Min. ch. : 2s. 6d. per month.</p> <p><i>Heating and cooking</i> :— Units per month : 15 @ 2d. Excess @ 1½d. Min. ch. : 2s. 6d. per month. Discount on above rates : ½d. per unit ; also 5 per cent. off min. and flat rates.</p> <p><i>Water-heating</i>, with range or milking-motor :— 15s. per 100 W. p.a. on T.S. or C.O.S. (20 hrs.). 20s. per 100 W. p.a. (continuous).</p>	<p><i>Lighting, heating, and cooking</i> : As for Domestic.</p> <p><i>Industrial motors</i> :— Units per month : 400 @ 3d. Excess @ 2d. Min. ch. per month : Under 1 h.p., 3s. ; 1 h.p. and over, 5s. per h.p. Max., 10s.</p> <p><i>Milking-motors</i> : 3d. per unit. Min. ch. : 5s. per month. Discount on above rates, as for Domestic.</p>						
26. Springs-Ellesmere	<p><i>Lighting and heating</i> :— Units per month : As per schedule @ 5d. Excess @ 1½d.</p> <p>Schedule—</p> <table> <thead> <tr> <th>Rooms.</th> <th>Units per Month @ 5d.</th> </tr> </thead> <tbody> <tr> <td>5 or less</td> <td>.. 12</td> </tr> <tr> <td>6 and over</td> <td>.. 16</td> </tr> </tbody> </table> <p>Min. ch. : 5s. per month.</p> <p><i>Cooking</i> : 1d. per unit. Min. ch. : 2s. per kW. of connected load per month.</p> <p><i>Water-heating</i>, with range, 2 kW. or over :— (a) ½d. per unit. Min. ch. : 2s. 6d. } On thermostat per kW. per month } or C.O.S. (b) £1 per 100 W. p.a. .. } (c) £4 per 1,000 W. p.a. 9 p.m. to 7.30 a.m. on T.S.</p>	Rooms.	Units per Month @ 5d.	5 or less 12	6 and over 16	<p><i>Lighting</i> : 4d. per unit. Min. ch. : 5s. per month.</p> <p><i>Heating</i> :— Units per month : 80 @ 3d. Excess @ 2d. Min. ch. : 5s. per kW. per month.</p> <p><i>Power</i> :— <i>Under 15 h.p.</i>— Units per month : 80 @ 3d. 120 @ 2d. Excess @ 1½d. Min. ch. : 2s. 6d. per h.p. per month. <i>15 h.p. and over</i>— Units per quarter : 150 per h.p. or per kVA. of M.D. @ 1½d. Excess @ ½d. 10 per cent. discount for P.F. maintenance at 90 per cent. or over. Min. ch. : 7s. 6d. per h.p., or per kVA. per quarter. <i>Milking-motors</i> : 3d. per unit. Min. ch. : £3 per h.p. p.a.</p>
Rooms.	Units per Month @ 5d.							
5 or less 12							
6 and over 16							
27. Taranaki ..	<p><i>Lighting</i> : 6½d. per unit, net.</p> <p><i>Heating</i> :— 3½d., net, combination meter. 1½d., net, special meter, with separate min. 5s. per month. 1½d., net, on cooking-meter.</p> <p><i>Cooking</i> : 1½d., net.</p> <p><i>Water-heating</i> :— 600 W., £6 p.a. 10s. p.a. for each additional 50 W. On 24 hr. service or on T.S. or C.O.S., at Board's option.</p>	<p><i>Lighting, heating, and cooking</i> : As for Domestic.</p> <p><i>Power</i> :— ½ to 5 h.p. and all milking-motors, 3½d. per unit. 5 h.p. and over, 5s. per ampere of M.D. per month, plus— Units per month : 240 @ 3d. Excess @ 1d. For dairy-factory motors the unit charge is as above, but the M.D. charge is 4s. per amp. per month for first 10 amps. and 1s. per amp. in excess of 10 amps. Min. ch. : 2s. 6d. per h.p. per month.</p>						
28. Taranua ..	<p><i>Lighting</i> : 7d. per unit.</p> <p><i>Heating and cooking</i> :— Units per month : 200 @ 1½d. Excess @ 1d. Min. ch. : 12s. 6d. per month.</p> <p><i>Special rate for lighting and range</i> :— Lighting, 7d. Range and heating, 1d. Min. ch. : 10s. 6d. per month.</p> <p><i>Water-heating</i>—On T.S. (20 hrs.) :— 750 W., 12s. per month. 1,000 W., 15s. 4d. per month. Continuous : £14 per kW. p.a., or <i>pro rata</i> for smaller size. <i>Above rates are net.</i></p>	<p><i>Lighting, heating, &c.</i> : As for Domestic.</p> <p><i>Industrial motors</i> :— Units per month : 80 @ 3d. 120 @ 2d. Excess @ 1½d. Min. ch. : 2s. 6d. per h.p. per month.</p> <p><i>Milking-motors</i> : 3½d. per unit. Min. ch. p.a. : ¼ h.p., £4 ; ½ h.p., £5 ; 1 h.p. and 2 h.p., £6.</p> <p><i>Dairy water-heaters</i> (on C.O.S. with motor) :— 750 W., £1 10s. per quarter. 1,000 W., £2 per quarter. <i>Above rates are net.</i></p>						
29. Tauranga ..	<p><i>General tariff</i> (includes domestic motors up to ½ h.p.) :— Units per month : 20 @ 5d. Excess @ 1d. Min. ch. : 5s. per month.</p> <p><i>Alternative rate</i>, with range (2½ kW. or over) and water-heater (minimum 500 W.) on continuous supply :— £6 p.a. plus ½d. per unit.</p> <p><i>Water-heating</i> :— (a) Flat rate : 1s. 8d. per 100 W. per month, continuous. Minimum, 500 W. (b) Metered : ½d. per unit. Min. ch. : 1s. 6d. per month. <i>Above rates are net.</i></p>	<p><i>Lighting</i> : 5d. per unit.</p> <p><i>Heating</i> : 1d. per unit. Min. ch. per month : 4s. 2d. (shops, halls, &c.).</p> <p><i>Motors</i> (under 5 h.p.) :— Units per month : 66 @ 3d. 66 @ 2½d. Excess @ 1½d. Min. ch. : 4s. 2d. per month. <i>Above rates are net.</i></p>						

TABLE XV.—ABRIDGED SCHEDULE OF TARIFFS FOR ELECTRICAL ENERGY, 1937-38—continued.

Supply Authority.	Domestic.	Commercial.												
30. Te Awamutu	<p><i>Lighting and small heating loads</i> :— Units per month : Active load in kW. \times 60 hrs. @ 5d. Excess @ 3d. “Active load” = 80 per cent. of the first $\frac{1}{2}$ kW. of connected load (excluding irons and small appliances) plus 60 per cent. of the load in excess of $\frac{1}{2}$ kW. Min. 150 W. Min. ch. : 2s. 6d. per month.</p> <p><i>Heating and cooking</i> :— (a) With range of $2\frac{1}{2}$ kW. or more : 1d. per unit. (b) Without range— Units per month : 30 @ 2d. Excess @ $1\frac{1}{2}$d. Minimum charge : 5s. per month in each case.</p> <p><i>Water-heating</i> :— 750 W., £4 p.a. } On T.S. or C.O.S. 1,000 W., £5 p.a. } 750 W., £9 10s. p.a. } Continuous. 1,000 W., £11 10s. p.a. } The above rates are net.</p>	<p><i>Lighting</i> : 5d. per unit. Min. ch. : 2s. 6d. per month. No minimum for churches and schools.</p> <p><i>Power</i> :— (a) 5 a.m. to 5 p.m.— Units per month : 120 @ $2\frac{1}{2}$d. 80 @ 2d. Excess @ $1\frac{1}{2}$d. (b) 5 p.m. to 9 p.m. : 3d. per unit. (c) 9 p.m. to 5 a.m. : $\frac{3}{4}$d. per unit. Min. ch. : 5s. per h.p. per month up to 5 h.p. ; 2s. 6d. per h.p. per month for excess. Alternative charge where three or more motors total over 15 h.p., 15s. per kVA. of M.D. per quarter for first 5 kVA. and 7s. 6d. per kVA. for excess. (d) <i>Milking-motors</i> : Rate (a) above. Above rates are net.</p>												
31. Teviot	<p>Tariffs consist of a capacity charge plus a unit charge, as follows :— <i>Capacity Charge.</i> <i>Lighting</i> : £10 per kW. p.a. Min. : £2 p.a. (200 W.).</p> <p><i>Heating and cooking</i> : 10s. per kW. of installed capacity.</p> <p><i>Water-heating</i> :— Continuous : £10 per kW. p.a. Intermittent : £6 per kW. p.a. on C.O.S.</p> <p><i>General-purpose point</i> : 30s. p.a. Not charged for if range installed.</p> <p><i>Unit Charge.</i> Units per 2 months : 20 @ 3d. 120 @ 1d. Excess @ $\frac{1}{2}$d. <i>Discount</i> on above rates : 5 per cent.</p>	<p><i>Lighting, heating, cooking, and water-heating</i> : As for Domestic.</p> <p><i>Motors</i> :— 1 h.p. and over : 33s. per h.p. p.a. (min. £5), for which 99 units allowed. Excess units at 1d. per unit continuous and 3d. per unit intermittent. Under 1 h.p. (intermittent) : £8 p.a.</p>												
32. Thames Valley	<p><i>Lighting</i> : $4\frac{1}{2}$d. per unit.</p> <p><i>Heating and cooking</i> :— Units per month : 20 @ 3d. Excess @ 1d. Min. ch. : Combined supply, 3s. per month.</p> <p><i>Water-heating</i> :— 13s. less 10 per cent. per 100 W. p.a. on T.S. 24s. per 100 W. p.a. continuous. 9.30 p.m. to 5.30 a.m. : 0.225d. per unit on T.S. Above charges are net.</p>	<p><i>Lighting, heating, cooking, and water-heating</i> : As for Domestic.</p> <p><i>Industrial supply (unrestricted)</i> :— Units per month : 100 @ 3d. 100 @ 2d. 4,800 @ $1\frac{1}{2}$d. Next 5,000 @ $1\frac{1}{4}$d. Next 5,000 @ 1d. Next 5,000 @ 0.9d. Next 5,000 @ 0.8d. Next 5,000 @ 0.7d. Next 5,000 @ 0.6d. Over 35,000 @ 0.5d. Min. ch.—Unrestricted supply : 20 units per h.p. per month.</p> <p><i>Alternative Industrial rate (for factories, &c.)</i> :— Demand charge per month— First 120 kVA. of M.D. @ 6s. 8d. per kVA. Excess @ 2s. 3d. per kVA. plus Unit charge per month— 30,000 @ 0.45d. Excess @ 0.30d. <i>Milking and farm motors</i> : 3d. per unit. Above charges are net.</p>												
33. Waimea	<p><i>General tariff</i> :— Units per quarter : As per schedule @ 10d. Next 120 @ $3\frac{1}{4}$d. Next 180 @ 3d. Excess @ $2\frac{1}{2}$d. Min. ch. : 15s. per quarter.</p> <p>Schedule—</p> <table border="1"> <thead> <tr> <th>Rooms.</th> <th>Units per Quarter @ 10d.</th> </tr> </thead> <tbody> <tr> <td>Up to 3 ..</td> <td>27</td> </tr> <tr> <td>4 to 5 ..</td> <td>27</td> </tr> <tr> <td>6 to 7 ..</td> <td>30</td> </tr> <tr> <td>8 to 9 ..</td> <td>33</td> </tr> <tr> <td>Over 9 ..</td> <td>36</td> </tr> </tbody> </table> <p>Borough : Rates per month, one-third of country rates per quarter. Min. ch. : 5s. per month. <i>Discount</i> : 1d. per unit.</p> <p><i>Water-heating</i> : £10 per kW. p.a. on T.S. (off peak).</p>	Rooms.	Units per Quarter @ 10d.	Up to 3 ..	27	4 to 5 ..	27	6 to 7 ..	30	8 to 9 ..	33	Over 9 ..	36	<p><i>Lighting</i> : Units per month : 1 per point @ 10d. Next 2 per point @ 7d. Excess @ $5\frac{1}{2}$d.</p> <p><i>Heating</i> : 4d. per unit, unrestricted. $2\frac{1}{2}$d. per unit, off peak.</p> <p><i>Motors</i> :— Units per quarter : 90 per h.p. @ $4\frac{1}{2}$d. 600 @ $3\frac{1}{2}$d. Excess @ 3d. Or,— 8 p.m. to 6 a.m. : 2d. per unit (on T.S.)</p> <p><i>Discount</i> on above rates : 1d. per unit.</p>
Rooms.	Units per Quarter @ 10d.													
Up to 3 ..	27													
4 to 5 ..	27													
6 to 7 ..	30													
8 to 9 ..	33													
Over 9 ..	36													

TABLE XV.—ABRIDGED SCHEDULE OF TARIFFS FOR ELECTRICAL ENERGY, 1937-38—continued.

Supply Authority.	Domestic.	Commercial.
34. Wairarapa	<p><i>Lighting</i> : 5½d. per unit net.</p> <p><i>Heating</i> : 2¾d. per unit net.</p> <p>When electric range installed :— <i>Lighting</i> : 4½d. per unit net.</p> <p><i>Cooking and heating</i> :— Units per month : 100 @ 1½d. Excess @ ¾d.</p> <p><i>Water-heating</i> :— 9 hrs. : £3 10s. per 1,000 W. p.a. 14 hrs. : £5 5s. per 1,000 W. p.a. 16 hrs. : £6 per 1,000 W. p.a. 21 hrs. : £9 per 1,000 W. p.a.</p>	<p><i>Lighting</i> :— Units per month : 100 @ 5½d. Excess @ 4½d.</p> <p><i>Industrial motors</i> : From 2d. to ¾d. per unit, in accordance with M.D.</p> <p><i>Milking-motors</i> : 2d. per unit net.</p>
35. Wairere	<p><i>Lighting, heating, and cooking</i> :— Units per month : 10 @ 9d. 20 @ 2d. 100 @ 1d. Excess @ ½d.</p> <p>Min. ch. : 5s. per month.</p> <p><i>Water-heating</i> :— 750 W. : 13s. per month } On T.S. or C.O.S. 1,000 W. : 15s. per month } Above rates are net.</p>	<p><i>Lighting, heating, and cooking</i> : As for Domestic.</p> <p><i>Power</i> :— General purposes: 4½d. per unit. <i>Milking-motors</i>— Units per month : 67 @ 3½d. 33 @ 2d. Excess @ ¾d. Above rates are net.</p>
36. Wairoa	<p><i>General tariff</i> :— Units per month : 10 @ 9d. 60 @ 3d. 200 @ 2d. Excess @ 1d.</p> <p><i>Water-heating</i>—750 W. : 25s. per quarter. 1,000 W. : 32s. 6d. per quarter. On T.S., otherwise 50 per cent. additional charge. Min. ch. (residences) : 15s. per quarter.</p>	<p><i>Power</i> :— Units per month : 80 @ 3d. 120 @ 2d. Excess @ 1½d.</p> <p>Min. ch. : 5s. per h.p. per month.</p> <p><i>Milking-motors</i>— 2 or 3 h.p., £16 10s. p.a. up to 600 units; next 400 @ 3d.; excess @ 1½d. ½ or 1 h.p., £8 5s. p.a. up to 300 units; next 200 @ 3d.; excess @ 1½d.</p>
37. Waitaki	<p><i>Lighting, heating, and cooking, with range of over 3 kW.</i> :— Urban area— (a) Min. ch. : 10s. per month. Units per month : Units as per schedule @ 6d. Excess @ 1½d.</p> <p>(b) Min. ch. : £1 per month. Units per month : As per schedule @ 6d. 100 @ 1½d. Excess @ 1d.</p> <p>Country areas— (c) Min. ch. : £2 10s. per quarter. Units charged as in (a).</p> <p>(d) Min. ch. : £5 per quarter. Units charged as in (b).</p> <p>Schedule— Lamp Load installed. Units per Month @ 6d. Up to 200 W. 6 Each further 50 W. 1</p> <p><i>Water-heating</i> :— 1s. per 100 W. per month on C.O.S. 2s. per 100 W. per month continuous, with range; otherwise 2s. 6d. Metered: ¾d. per unit (10 p.m. to 7 a.m.) on T.S. Min. ch. : £3 p.a. Discount on all above rates : 30 per cent.</p>	<p><i>Lighting</i> : 6d. per unit up to 7 units per month per 100 W. (Min. 500 W.). Excess @ 3d. Discount : 30 per cent.</p> <p><i>Heating</i> : 2d. per unit. Min. ch. : £1 per kW. connected load for the two winter quarters. Discount : 30 per cent.</p> <p><i>Power</i> :— <i>Industrial</i>— (a) Units per month— 12 per h.p. (or per kVA. of M.D.) @ 3d. Next 18 per h.p. (or per kVA. of M.D.) @ 2d. Next 24 per h.p. (or per kVA. of M.D.) @ 1½d. Excess @ 1d.</p> <p>Min. ch. : 3s. per h.p. per month. Discount : 15 per cent.</p> <p>(b) 10 p.m. to 7 a.m. : ¾d. per unit on T.S. Min. ch. : 2s. per h.p. per month. Discount as above.</p> <p><i>Milking-motors</i> (up to 2 h.p.) : £2 per h.p. p.a. plus 2d. per unit. Discount : 30 per cent.</p>
38. Waitemata	<p><i>Lighting</i> : 4½d. per unit.</p> <p><i>Heating, cooking, and domestic power</i> :— Units per month : 30 @ 3d. Excess @ 1¾d.</p> <p>Min. ch. : 4s. per month.</p> <p><i>Alternative rate</i> (with range 5 kW. or over) : £5 p.a. (8s. 4d. per month) plus 1d. per unit.</p> <p><i>Water-heating</i> :— 20 hrs. : 21s. per 100 W. p.a. Min. ch. : £6 6s. p.a. Minimum capacity, 30 gals. 8 hrs. (night) : 6s. 4d. per 100 W. p.a. Min. ch. : £3 16s. p.a. Discount on above rates : 25 per cent.</p>	<p><i>Lighting</i> : 15s. per amp. of M.D. per quarter plus 2½d. per unit.</p> <p><i>Industrial load</i> :— Units per month : 100 @ 3d. 100 @ 2½d. Excess @ 1¾d.</p> <p>Min. ch. : Nil up to and including 3 h.p.; over 3 h.p., 5s. per h.p. of connected load per month.</p> <p><i>Milking-motors</i> : 5s. per h.p. per month plus 2d. per unit. Flat rate remitted from May to October inclusive. Discount on above rates : 25 per cent.</p>

TABLE XV.—ABRIDGED SCHEDULE OF TARIFFS FOR ELECTRICAL ENERGY, 1937-38—continued.

Supply Authority.	Domestic.	Commercial.																																								
39. Waitomo	<p><i>General Tariff</i> (single meter) with range not less than 2½ kW. :—</p> <p>Units per month : As per schedule @ 5d. Next 20 @ 3d. Excess @ 1d.</p> <p>Min. ch. : Lighting and heating, 4s. per month ; range, 5s. per month extra.</p> <table border="1"> <tr> <td colspan="2">Schedule—</td> <td colspan="2">Units per month at 5d.</td> </tr> <tr> <td>Lamp Load.</td> <td></td> <td>Oct.—March.</td> <td>April—Sept.</td> </tr> <tr> <td>200 W.</td> <td>..</td> <td>6</td> <td>8</td> </tr> <tr> <td>300 W.</td> <td>..</td> <td>8</td> <td>10</td> </tr> <tr> <td>Each additional 100 W.</td> <td>..</td> <td>2</td> <td>2</td> </tr> </table> <p><i>Water-heating</i> (600 W. on T.S.) :—</p> <p>With range : £4 16s. p.a. Min. ch. : 24s. per quarter.</p> <p>Without range : £6 p.a. Min. ch. : 30s. per quarter.</p> <p>Larger elements <i>pro rata</i>. Above rates are net.</p>	Schedule—		Units per month at 5d.		Lamp Load.		Oct.—March.	April—Sept.	200 W.	..	6	8	300 W.	..	8	10	Each additional 100 W.	..	2	2	<p><i>Lighting, heating, and cooking</i> : As for Domestic.</p> <p><i>Dairy water-heaters</i> :—</p> <p>750 W on C.O.S. : £5 p.a. Min. ch. £1 5s. per quarter.</p> <p><i>Industrial power</i> :—</p> <p>Up to 50 h.p.—</p> <p>Units per month : 30 per h.p. @ 2½d. Excess @ 1½d.</p> <p>Min. ch. : 2s. 6d. per h.p. per month.</p> <p>50 h.p. and over—Special contracts : Min. ch., 15s. per h.p. per quarter.</p> <p><i>Milking-motors</i> : 2½d. per unit. Min. ch. per month : 1 h.p., 2s. 6d. ; 1½ h.p., 3s. 9d. Above rates are net.</p>																				
Schedule—		Units per month at 5d.																																								
Lamp Load.		Oct.—March.	April—Sept.																																							
200 W.	..	6	8																																							
300 W.	..	8	10																																							
Each additional 100 W.	..	2	2																																							
40. Wanganui-Rangitikei	<p><i>General tariff</i> :—</p> <p>Units per month : As per schedule @ 5d. Next 120 @ 1½d. Next 180 @ 1d. Excess @ ½d.</p> <p>Min. ch. : 2s. 6d. per meter per month.</p> <table border="1"> <tr> <td colspan="2">Schedule—</td> <td colspan="2">Units per Month @ 5d.</td> </tr> <tr> <td>Rooms.</td> <td></td> <td>May—Oct.</td> <td>Nov.—April.</td> </tr> <tr> <td>5 or less</td> <td>..</td> <td>10</td> <td>6</td> </tr> <tr> <td>6</td> <td>..</td> <td>12</td> <td>8</td> </tr> <tr> <td>7</td> <td>..</td> <td>14</td> <td>10</td> </tr> <tr> <td>8</td> <td>..</td> <td>16</td> <td>12</td> </tr> <tr> <td>9</td> <td>..</td> <td>18</td> <td>16</td> </tr> <tr> <td>10</td> <td>..</td> <td>20</td> <td>20</td> </tr> <tr> <td>11</td> <td>..</td> <td>22</td> <td>22</td> </tr> <tr> <td>12 or more</td> <td>..</td> <td>24</td> <td>24</td> </tr> </table> <p><i>Water-heating</i> :—</p> <p><i>Flat rate</i> : With range or milking-motor, 15s. per 100 W. p.a.</p> <p>Without : 20s. Subject to pilot wire or T.S. control.</p> <p><i>Metered</i> : ½d. per unit. Above rates are net.</p>	Schedule—		Units per Month @ 5d.		Rooms.		May—Oct.	Nov.—April.	5 or less	..	10	6	6	..	12	8	7	..	14	10	8	..	16	12	9	..	18	16	10	..	20	20	11	..	22	22	12 or more	..	24	24	<p><i>Lighting</i> :—</p> <p>Units per month : 50 @ 5d. 250 @ 4d. Excess @ 3d.</p> <p><i>Heating</i> :—</p> <p>Units per month : 300 @ 1d. } On pilot Excess @ ½d. } control.</p> <p>Without pilot control : Half lighting rates.</p> <p><i>Industrial power</i> :—</p> <p>(a) Over 5 h.p.—</p> <p>Units per month : 80 @ 3d. 120 @ 2d. 400 @ 1½d. Excess @ 1d.</p> <p>Min. ch. : 2s. 6d. per h.p. per month.</p> <p>(b) 1 to 5 h.p. : Either as in (a) above, or at commercial lighting rates with 2s. 6d. minimum charge monthly.</p> <p><i>Milking-motors</i> :—</p> <p>With condenser : 1½d. per unit. Without condenser : 3d. per unit. Min. ch. : 2s. 6d. per h.p. per month. Above rates are net.</p>
Schedule—		Units per Month @ 5d.																																								
Rooms.		May—Oct.	Nov.—April.																																							
5 or less	..	10	6																																							
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11	..	22	22																																							
12 or more	..	24	24																																							
CITY COUNCILS. 1. Christchurch	<p><i>Lighting</i> :—</p> <p>Units per month : M.D. in kW. × 40 units @ 4d. Excess @ ¾d.</p> <p>(M.D. = ¾ of load of "active" lamps, excluding pantry, bathroom, &c.)</p> <p><i>Lighting, cooking, and domestic appliances</i> :—</p> <p>Where "specified" cooker is installed—</p> <p>Units per month : M.D. × 40 units @ 4d. Excess @ ½d.</p> <p><i>Water-heating</i> :—</p> <p>(a) 10 p.m. to 7 a.m. : ½d. per unit. (b) Unrestricted : ¼d. per unit. (c) Unrestricted : ½d. per unit where "specified" cooker installed—i.e., a cooker of 4 kW. or over and having its own fixed wiring.</p> <p>Min. ch. for domestic supply : Lighting, 2s. ; range, 2s. 6d. per month.</p>	<p><i>Lighting</i> :—</p> <p>Units per month : M.D. in kW. × 40 units @ 4d. Excess @ 1d.</p> <p>Min. ch. : 2s. per kW. per month.</p> <p><i>Radiators</i> : Offices and shops : 2d. per unit. Hotels : 1d. per unit. Min. ch. : 1s. per month, winter only.</p> <p><i>Industrial supply</i> :—</p> <p>Units per month : 50 per kW. of M.D. @ 1d. Next 100 per kW. @ ½d. Excess @ ¼d., less 10 per cent.</p> <p><i>Farm-motors</i> : 30s. per ½ h.p. p.a. plus ¾d. per unit. Min. ch. : 2s. 6d. to 1s. 6d. per kW.</p>																																								
2. Dunedin	<p><i>Lighting, heating, and cooking</i> :—</p> <p>Primary rate : 4½d. per unit for 1½ units every two months per 100 sq. ft. floor-space, less 10 per cent. (Max., 2,400 sq. ft. ; min., 600 sq. ft.)</p> <p>Secondary rate—</p> <p>(a) City and boroughs : ¾d. per unit. (b) Country districts—</p> <p>(i) 1½d. per unit. (ii) With min. guarantee of £6 p.a. : 1d. per unit. (iii) With min. guarantee of £12 p.a. : ¾d. per unit.</p> <p>Min. ch. : City and boroughs : 20s. p.a. Country districts : 36s. p.a.</p> <p><i>Water-heating</i> :—</p> <p>(a) 24 hr. service : £10 per kVA. p.a. (c) 10 p.m. to 7.30 a.m. : £3 per kVA. p.a. on T.S. (e) On C.O.S. : £6 per kVA. p.a. (f) Meter rate : Eight summer months, ¼d. per unit ; four winter months, ½d. per unit up to 650 units per kW. per two months ; excess @ ½d.</p>	<p><i>Lighting</i> :—</p> <p>(a) 5d. per unit. (b) Units per month : kVA. of M.D. × 45 @ 5d. Excess @ 1d.</p> <p><i>Heating</i> :—</p> <p>(a) 1½d. per unit. (b) Units per month : kVA. of M.D. × 50 @ 1½d. Excess @ ½d.</p> <p><i>Power</i> :—</p> <p>Unrestricted—</p> <p>Units per month : 50 per h.p. or kVA. of M.D. @ 1½d. Excess @ ½d.</p> <p><i>Milking-motors</i> : £4 p.a. for first h.p., £2 p.a. for each additional h.p., plus 1d. or ¾d. per unit depending on annual guarantee.</p>																																								

TABLE XV.—ABRIDGED SCHEDULE OF TARIFFS FOR ELECTRICAL ENERGY, 1937-38—continued.

Supply Authority.	Domestic.	Commercial.																																																
3. Invercargill	<p><i>Lighting</i> :— (a) 3½d. per 100 sq. ft. illuminated floor-space per month (min., 700 sq. ft.); plus secondary charge as follows :— Units per month : 30 at 2½d. Next 3,000 @ 1½d. Excess @ 1¼d.</p> <p>(b) Flat rate : 6d. per unit.</p> <p><i>Cooking (with range not less than 4 kW.)</i> : 1d. per unit.</p> <p><i>Water-heating</i>.—Min-max. wattage : 600-3,000. Min. capacity : 20 gals.</p> <p>(1) Unrestricted : 2s. per 100 W. per month. (2) On thermostat : 1s. 9d. per 100 W. per month. (3) On T.S. (off 4 p.m. to 9 p.m.)— First 1,000 W. : £5 10s. p.a. Next 1,000 W. : £4 10s. p.a. (4) Metered : ½d. per unit.</p> <p><i>Discount</i> on above rates : 5 per cent.</p>	<p><i>Lighting, cooking, and water-heating</i> : As for Domestic.</p> <p><i>Power</i> :— Rate C. 1 : Units per month : 30 @ 2½d. 3,000 @ 1½d. Excess @ 1¼d.</p> <p>C. 2 : 2½d. per unit, 3.30 p.m. to 9.30 p.m. 1d. per unit, 9.30 p.m. to 3.30 p.m.</p> <p>C. 3 : 2d. per unit, 9 a.m. to 9 p.m. ¾d. per unit, 9 p.m. to 9 a.m.</p> <p>C. 4 : 2½d. per unit, 7 a.m. to 11 p.m. ¾d. per unit, 11 p.m. to 7 a.m.</p> <p>C. 5 : 6s. per h.p. per month, plus ½d. per unit.</p> <p><i>Discount</i> on above rates : 5 per cent.</p>																																																
4. Nelson	<p><i>Lighting</i> : 6d. per unit.</p> <p><i>Heating</i> :— Units per month : 30 @ 4d. 160 @ 3d. Excess @ 2d.</p> <p><i>Water-heating</i> :— 11 p.m. to 7 a.m.— (a) 1¼d. per unit ; or (b) 2s. per 100 W. per month. Min. ch. : 2s. 6d. per month.</p> <p><i>Discounts</i> : 1d. per unit for lighting and ½d. per unit for power.</p>	<p><i>Lighting</i> :— Units per month : 300 @ 6d. 300 @ 4d. Excess @ 3d.</p> <p><i>Small power</i> :— Units per month : 160 @ 3d. Excess @ 2d.</p> <p><i>Large power</i> :— Units per month : 1,500 to 6,000 @ 1¼d. Over 6,000 @ 1½d.</p> <p>Restricted between 4 p.m. and 10 p.m. May, June, and July, with 10 per cent. reduction on accounts during these months.</p> <p>Min. ch. and discounts : As for Domestic.</p>																																																
5. Palmerston North	<p><i>Lighting</i> : 4d. per unit net.</p> <p><i>Heating and cooking</i> : ¾d. per unit net.</p> <p><i>Water-heating</i> :— 21½ hrs. : 1s. 4d. net per 100 W. per month. 24 hrs. : 2s. net per 100 W. per month.</p> <p>Min. ch. on any service : 2s. 6d. per month.</p>	<p><i>Lighting</i> :— 5d. per unit for first 5 units per month per 100 lamp-watts. 3d. excess. Discount : 12½ per cent.</p> <p><i>Heating</i> :— 1¼d. per unit. 1d. per unit in excess of first 500 units (with range). Discount : 12½ per cent.</p> <p><i>Power</i> :— Units per month : 200 @ 3d. 100 @ 2½d. Excess @ 1¼d.</p> <p>Discount : 12½ per cent.</p> <p><i>Large-power consumers</i> :— Units per month : 600 @ 2d. Excess @ 1d.</p> <p>Discount : 12½ per cent. Min. ch. on any service : 2s. 6d. per month.</p>																																																
6. Wellington	<p><i>General tariff</i> :— Units per month : Units as per schedule @ 4d. net. Excess @ ¼d.</p> <p><i>Schedule</i>—</p> <table border="1"> <thead> <tr> <th colspan="12">Number of Rooms.</th> </tr> <tr> <th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th></th> </tr> </thead> <tbody> <tr> <td colspan="12">Units per month @ 4d.</td> </tr> <tr> <td>8</td><td>10</td><td>12</td><td>14</td><td>16</td><td>18</td><td>20</td><td>22</td><td>24</td><td>26</td><td>28</td><td></td> </tr> </tbody> </table> <p><i>Water-heating</i> :— (a) 10.30 p.m. to 7.30 a.m. : 6d. per 100 W. per month. (b) On thermostat control either at Domestic rates or as follows :— 500 W. : £5 p.a. 1,000 W. : £10 p.a.</p>	Number of Rooms.												5	6	7	8	9	10	11	12	13	14	15		Units per month @ 4d.												8	10	12	14	16	18	20	22	24	26	28		<p><i>Lighting</i> :— (a) Units per month : 1-600 @ 3¼d. 601-1,600 @ 2d. Over 1,600 @ 1¼d.</p> <p>Less 15 per cent. discount.</p> <p>Or, (b) Units per month : kVA. demand × 45 @ 5d. Excess @ 1d</p> <p><i>Heating</i> : 2d. per unit, less 10 per cent.</p> <p><i>Power</i> :— (a) <i>Unit rate</i> : Units per month— 1-320 @ 1½d. 321-1,040 @ 1d. 1,041-3,040 @ ¾d. Over 3,040 @ 0-6d.</p> <p>(b) <i>Demand rate</i> : 6s. per kVA. of M.D. per month up to 50 kVA. 5s. per kVA. of M.D. per month for excess. Plus ¼d. per unit for all units. Discount : 20 per cent. on unit charge.</p>
Number of Rooms.																																																		
5	6	7	8	9	10	11	12	13	14	15																																								
Units per month @ 4d.																																																		
8	10	12	14	16	18	20	22	24	26	28																																								
BOROUGH COUNCILS. 1. Bluff	<p><i>Lighting</i> :— Units per month : 300 @ 6d. net. Excess @ 4d. net.</p> <p>Min. ch. : 2s. 6d. per month.</p> <p><i>Heating</i> : 2d. per unit net.</p>	<p><i>Lighting and heating</i> : As for Domestic.</p> <p><i>Power</i> :— Units per month : 200 @ 3d., net. Excess @ 1¼d., net.</p> <p><i>Large-power consumers</i> : 1¼d. per unit, net. Min. ch., power : 12s. per h.p. p.a.</p>																																																

TABLE XV.—ABRIDGED SCHEDULE OF TARIFFS FOR ELECTRICAL ENERGY, 1937-38—*continued.*

Supply Authority.	Domestic.	Commercial.																
2. Hamilton	<p><i>General tariff</i> :— Units per month : As per schedule @ 5d., net. Next 80 @ 1½d., net. Excess @ 1d., net. Discount : 10 per cent. Min. ch. : 2s. per month.</p> <p><i>Schedule</i>— kW. Demand. Units per Month @ 5d. net.</p> <table border="0"> <tr><td>Up to 0.75</td><td>8</td></tr> <tr><td>Up to 1.5</td><td>12</td></tr> <tr><td>Up to 3</td><td>18</td></tr> <tr><td>Up to 5</td><td>24</td></tr> <tr><td>Up to 6</td><td>30</td></tr> <tr><td>Up to 7</td><td>36</td></tr> <tr><td>Up to 8 and over</td><td>42</td></tr> </table> <p><i>Water-heating</i> :— (1) 10 p.m. to 7 a.m. on T.S. : 6s. per 100 W. p.a. net. (2) Off peak on T.S. : 19s. per 100 W. p.a. net. (3) Continuous : 20s. per 100 W. p.a. net. Min. ch. in each case : £3 p.a.</p>	Up to 0.75	8	Up to 1.5	12	Up to 3	18	Up to 5	24	Up to 6	30	Up to 7	36	Up to 8 and over	42	<p><i>Lighting</i> :— Units per month : 100 @ 5d., net. 100 @ 4d., net. Excess @ 3d., net. Discount : 10 per cent. Min. ch. : 2s. per month.</p> <p><i>Power</i> :— Units per month : 300 @ 2d., net. 200 @ 1½d., net. Excess @ 1d., net. Discount : 10 per cent. Min. ch. : 2s. per month.</p>		
Up to 0.75	8																	
Up to 1.5	12																	
Up to 3	18																	
Up to 5	24																	
Up to 6	30																	
Up to 7	36																	
Up to 8 and over	42																	
3. Inglewood	<p><i>Lighting</i> : 6d. per unit, net.</p> <p><i>Heating</i> : 2d. per unit, net.</p> <p><i>Domestic rate</i> : 1½d. per unit, net.</p>	<p><i>Lighting and heating</i> : As for Domestic.</p> <p><i>Power</i> : 2d. and 1½d. per unit, net.</p>																
4. Kaiapoi	<p><i>Lighting, ironing, &c.</i> :— 4d. per unit, 1st April to 30th September. 5d. per unit, 1st October to 31st March. Min. ch. : 4s. per kW. connected load.</p> <p><i>Cooking</i> :— 2s. 6d. for first kW. of connected load. 1s. for each extra kW. of connected load. Plus 1½d. per unit up to connected load minimum and 1d. per unit excess.</p>	<p><i>Lighting</i> : As for Domestic.</p> <p><i>Power</i> : 2s. 6d. per h.p. per month, plus. Units per month : 2 × min. connected load @ 2d. Excess @ 1d. Max. @ 2d. per unit : £2 per month.</p>																
5. Lyttelton	<p><i>Lighting</i> :— 4½d. per unit, net. Min. ch. : 2s. per month.</p> <p><i>Heating</i> :— 1d. per unit, net. Min. ch. : 1s. per month.</p>	<p><i>Lighting and heating</i> : As for Domestic.</p> <p><i>Power</i> :— Units per month : 80 @ 3d. 120 @ 2d. 160 @ 1½d. Excess @ 1d. Min. ch. : 2s. per h.p. per month.</p>																
6. Napier	<p><i>General tariff</i> :— Units per month : As per schedule @ 6d. Next 60 @ 1½d. Excess @ 1d. Discount 10 per cent.</p> <p><i>Schedule</i>—</p> <table border="0"> <tr><td>Rooms.</td><td>Units per Month @ 6d.</td></tr> <tr><td>Up to 5</td><td>6</td></tr> <tr><td>6</td><td>8</td></tr> <tr><td>7</td><td>10</td></tr> <tr><td>8</td><td>12</td></tr> <tr><td>9</td><td>14</td></tr> <tr><td>10</td><td>16</td></tr> <tr><td>Over 10</td><td>18</td></tr> </table> <p><i>Water-heating</i> :— (a) 1s. 10d. per 100 W. per month (b) 1s. 8d. per 100 W. per month (with range). (c) ¾d. per unit, net. (d) ¾d. per unit, less 10 per cent. (with range).</p>	Rooms.	Units per Month @ 6d.	Up to 5	6	6	8	7	10	8	12	9	14	10	16	Over 10	18	<p><i>Lighting</i> :— Units per month : M.D. × 30 @ 6d. Excess @ 2d. Less 10 per cent. discount. (M.D. : 1 kW. min. ; 10 kW. max.).</p> <p><i>Radiators and small power</i> :— Units per month : 100 @ 3½d. 100 @ 2d. Excess @ 1½d. Less 10 per cent. discount.</p> <p><i>Heating</i> :— 9 p.m. to 4 p.m. (19 hrs.) : 1d. per unit. Less 10 per cent.</p> <p><i>Power</i> :— (a) Units per month : 20 per h.p. @ 3½d. 150 @ 2d. Excess @ 1½d. Less 10 per cent. discount, or 12½ per cent. for over 2,000 units. (b) Units per month : 500 per kV.A. @ 2½d. Excess @ 1½d. Less 10 per cent. discount.</p>
Rooms.	Units per Month @ 6d.																	
Up to 5	6																	
6	8																	
7	10																	
8	12																	
9	14																	
10	16																	
Over 10	18																	

TABLE XV.—ABRIDGED SCHEDULE OF TARIFFS FOR ELECTRICAL ENERGY, 1937-38—continued.

Supply Authority.	Domestic.	Commercial.																																				
11. Queenstown	<p><i>Lighting</i> :— Up to 10 points— Units per month : First 2 per light @ 7d. Next 2 per light @ 4d. Excess @ 2d.</p> <p>Over 10 points— Units per month : First 2 per light (up to 10 lights) @ 7d. Next 1 per light (over 10 lights) @ 7d.</p> <p>Plus { 2 per light (up to 10 lights) @ 4d. 1 per light (over 10 lights) @ 4d. Excess @ 2d.</p> <p>Min. ch. : 5s. per month. Discount : 1d. per unit.</p>	<p><i>Lighting</i> : As for Domestic.</p> <p><i>Power</i> :— Units per month : 20 @ 4d. 50 @ 3d. Excess @ 2d.</p> <p>Min. ch. and discount : As for Domestic.</p>																																				
12. Raetihi	<p><i>Lighting</i> :— Units per month : 150 @ 8d. 50 @ 5d. Excess @ 3d.</p> <p>Min. ch. : 3s. per month.</p> <p><i>Heating</i> : 1d. per unit. Min. ch. : 1s. per month.</p> <p><i>Water-heating</i> :— 750 W. : 6s. 3d. per month. 1,000 W. : 8s. 4d. per month.</p>	<p><i>Lighting, heating, and water-heating</i> : As for Domestic.</p> <p><i>Power</i> :— Rate (a)— Units per month : 300 @ 3d. 700 @ 2½d. 1,000 @ 2d. Excess @ 1½d.</p>																																				
13. Rangiora	<p><i>General tariff</i> :— Units per month : 12 @ 5d. 12 @ 2½d. 50 @ 1½d. 100 @ ¾d. Excess @ ½d.</p> <p>Discount : 7½ per cent. Min. ch. per month : Lighting 3s., plus range 2s. per kW. for first 4 kW. ; 1s. per kW. excess.</p> <p><i>Water-heating</i> (on pilot-wire control) :— Units per month : kW. of M.D. × 60 @ ½d. Excess @ ¼d. Discount : 7½ per cent.</p>	<p><i>Lighting, &c.</i> :— Units per month : Sq. ft. floor space divided by 100 @ 5½d. Next 50 @ 5d. Next 250 @ 4d. Excess @ 3d.</p> <p>Minimum floor space : 1,200 sq. ft. Discount : 7½ per cent. Min. ch. : 3s. per month.</p> <p><i>Radiators</i> (on pilot-wire control) : 1d. per unit. Discount : 7½ per cent. Min. ch. : 2s. 6d. per month.</p> <p><i>Power</i> :— Units per month : 200 @ 3d. Excess @ 1d. Min. ch. : 2s. 6d. per h.p. per month. Discount : 7½ per cent.</p>																																				
14. Riccarton	<p><i>Lighting</i> :— (a) 4d. per unit, net. (b) Units per month : M.D. in kW. × 40 @ 6d. Excess @ ¾d.</p> <p><i>Heating and cooking</i> : ¾d. per unit, net. Min. ch. in each case : 2s. 6d. per month.</p> <p><i>Water-heating</i> (on T.S.) :— 12 hrs. : 7s. 11d. per 100 W. p.a. 17 hrs. : 12s. 9d. per 100 W. p.a. 22 hrs. : 17s. 8d. per 100 W. p.a. Discount on above rates : 15 per cent.</p>	<p><i>Lighting, heating, cooking, and water-heating</i> : As for Domestic.</p> <p><i>Power</i> : 1½d. per unit. Min. ch. : 2s. 6d. per h.p. per month. Discount on above rates : 15 per cent.</p>																																				
15. Rotorua (Tourist Dept.)	<p><i>Lighting, heating, and cooking (combined tariff)</i> :— Units per month : As per schedule at 6d. Next 16 @ 3d. Next 32 @ 1½d. Excess @ 1d.</p> <p>Schedule—</p> <table border="1"> <thead> <tr> <th>Rooms.</th> <th>Units per Month, @ 6d.</th> <th>Rooms.</th> <th>Units per Month, @ 6d.</th> </tr> </thead> <tbody> <tr><td>1</td><td>5</td><td>9</td><td>16</td></tr> <tr><td>2</td><td>6</td><td>10</td><td>18</td></tr> <tr><td>3</td><td>7</td><td>11</td><td>20</td></tr> <tr><td>4</td><td>8</td><td>12</td><td>22</td></tr> <tr><td>5</td><td>10</td><td>13</td><td>24</td></tr> <tr><td>6</td><td>12</td><td>14</td><td>26</td></tr> <tr><td>7</td><td>13</td><td>15</td><td>28</td></tr> <tr><td>8</td><td>14</td><td></td><td></td></tr> </tbody> </table> <p><i>Water-heating</i> :— ½d. per unit "off peak" (on T.S.).</p>	Rooms.	Units per Month, @ 6d.	Rooms.	Units per Month, @ 6d.	1	5	9	16	2	6	10	18	3	7	11	20	4	8	12	22	5	10	13	24	6	12	14	26	7	13	15	28	8	14			<p><i>Lighting</i> :— Units per month : 40 @ 6d. 240 @ 5d. 720 @ 4d. Excess @ 3d.</p> <p><i>Industrial motors, office radiators, &c.</i> (except during evening hours) :— Units per month : 20 @ 3d. 980 @ 2d. Excess @ 1d.</p> <p><i>Dairy water-heating</i> : £5 per kW. p.a. on C.O.S. <i>Milking-motors</i> : As for industrial motors.</p>
Rooms.	Units per Month, @ 6d.	Rooms.	Units per Month, @ 6d.																																			
1	5	9	16																																			
2	6	10	18																																			
3	7	11	20																																			
4	8	12	22																																			
5	10	13	24																																			
6	12	14	26																																			
7	13	15	28																																			
8	14																																					

TABLE XV.—ABRIDGED SCHEDULE OF TARIFFS FOR ELECTRICAL ENERGY, 1937-38—continued.

Supply Authority.	Domestic.	Commercial.
16. Stratford	<p><i>Lighting</i> : 8d. per unit for first 2 units per room per month.</p> <p><i>Heating and cooking</i> :— Next 60 units over lighting @ 2d. Excess @ 1d. No min. ch.</p> <p><i>Water-heating</i> :— (a) 1s. per 100 W. per month (on T.S., 20 hrs.). (b) 2s. per 100 W. per month (24 hrs.). (c) 6d. per 100 W. per month (night). Min. ch. : 5s. per month.</p>	<p><i>Lighting</i> :— Units per month : First 3 per 100 W. @ 8d. Excess @ 3d. Min. high rate : 20. No min. ch.</p> <p><i>Heating</i> :— Units per month : 40 @ 3d. 60 @ 2d. Excess @ 1d. Min. ch. : 12s. p.a.</p> <p><i>Power</i> :— Units per month : First 20 per h.p. (to 10 h.p.) @ 4d. Excess @ 1d. Min. ch. : 4s. per h.p. per month up to 3 h.p.</p>
17. Sumner	<p><i>Lighting</i> : 4d. per unit, net</p> <p><i>Heating</i> : 1d. per unit, net</p> <p><i>Water-heating</i> :— 10s. per 100 W. p.a. (600 W. min.), 10.30 p.m. to 6.30 a.m. £1 per 100 W. p.a. (600 W. min.), 11.30 p.m. to 3.30 p.m. 30s. per 100 W. p.a., continuous.</p>	<p><i>Lighting, heating, and water-heating</i> : As for Domestic.</p> <p><i>Power</i> : 1d. per unit, net. Less 2½ per cent. special discount.</p>
18. Taihape	<p><i>General tariff</i> : D.C. supply :— April-Sept. : 2 units per room per month, plus 1 unit @ 9d., next 24 @ 2¼d., excess @ 1½d. Oct.-March : At above rates, less 4 units @ 9d., next 24 @ 2¼d., excess @ 1½d. A.C. lighting : 9d. per unit. <i>Discount</i> on above rates : 33½ per cent.</p>	<p><i>Lighting</i> : 9d. per unit.</p> <p><i>Heating</i>—Units per month : 100 @ 2¼d. Excess @ 1½d.</p> <p><i>Power</i>—Units per month : D.C. : 750 @ 3d. Excess @ 1½d. A.C. : 80 @ 6¼d. 100 @ 4¼d. Excess @ 3d.</p> <p><i>Discount</i> on above rates : 33½ per cent.</p>
19. Taumarunui	<p><i>Lighting</i> : 8d. per unit for units per month = 2 × number of living-rooms (max. 6 ; min. 3 rooms).</p> <p><i>Heating</i> :— First 10 over lighting units per month @ 4d. Excess @ 2d. Min. ch. : 2s. 6d. per month. <i>Discount</i> : 1d. per unit.</p> <p><i>Water-heating</i> :— On T.S. with 3 kW. range (off ½ hr. before sunset to 9 p.m.)— 500 W. : £6 p.a. Each extra 100 W. : £1 p.a.</p>	<p><i>Lighting</i> : 8d. per unit, net.</p> <p><i>Heating</i> :— Units per month : 20 @ 3d. Excess @ 2d. Min. ch. : 2s. 6d. per month <i>Discount</i> : 1d. per unit.</p> <p><i>Power</i> :— Units per month : 600 @ 3¼d. 900 @ 2¼d. 1,500 @ 2d. 2,500 @ 1¾d. Next 5,500 @ 1½d. Min. ch. : 5s. for first 2½ h.p. ; 1s. per h.p. over. <i>Discount</i> : ½d. per unit.</p>
20. Tauranga	<p><i>Lighting</i> : 5d. per unit, net.</p> <p><i>Heating</i> : 1d. per unit, net.</p> <p><i>Water-heating</i> : 2s. per 100 W. per month.</p>	<p><i>Lighting</i> : As for Domestic.</p> <p><i>Heating</i> :— (a) 1d. per unit. (b) 1s. 6d. per kW. installed, plus ¾d. per unit.</p> <p><i>Power</i> :— Units per month : 200 @ 2d. 800 @ 1d. 10,000 @ 0.8d. Over 11,000 @ 0.6d.</p>
21. Te Aroha	<p><i>Lighting, heating, and cooking</i> :— Units per month : 25 @ 3d., net. 10 @ 2d., net. Excess @ 1d., net.</p> <p><i>Water-heating</i> :— (a) With range : 1s. 1d. per 100 W. per month. (b) Without range : 1s. 3d. per 100 W. per month. <i>Discount</i> : 10 per cent.</p>	<p><i>Lighting, heating, and cooking</i> : As for Domestic.</p> <p><i>Power</i> (not including domestic motors) :— Units per month : 10 per h.p. @ 3d., net. 333 @ 2d., net. 667 @ 1½d., net. Excess @ 1d., net. <i>Discount</i> : 10 per cent.</p>

TABLE XV.—ABRIDGED SCHEDULE OF TARIFFS FOR ELECTRICAL ENERGY, 1937-38—continued.

Supply Authority.	Domestic.	Commercial.																
22. Te Puke	<p><i>Lighting</i> : 6d. per unit. Min. ch. : 3s. 6d. per month.</p> <p><i>Heating</i> :— Units per month : 40 @ 2d. Excess @ 1d. Min. ch. : 3s. 6d. per month.</p> <p><i>Domestic concession</i> :— For 30-39 heating units, 3 lighting units free. For 40-49 heating units, 4 lighting units free. For 50-59 heating units, 5 lighting units free. For 60-69 heating units, 6 lighting units free. For 70 and over heating units, 7 lighting units free.</p> <p><i>Water-heating</i> :— On T.S. : First 100 W. per month @ 3s. 1d.; each additional 100 W. is 3d. 24 hr. service : 2s. 8d. per 100 W. per month.</p>	<p><i>Lighting</i> : 6d. per unit, net.</p> <p><i>Heating</i> :— Units per month : 40 @ 2½d. Excess @ 1½d. Min. ch. : 3s. 6d. per month.</p> <p><i>Power</i> :— Units per month : 200 @ 2½d. Excess @ 1½d. Min. ch. : 4s. per h.p. per month.</p>																
23. Thames	<p><i>General tariff</i> :— Units per month : 10 @ 6d. 25 @ 3d. Excess @ 1d. Min. ch. : 2s. 6d. per month.</p> <p><i>Water-heating</i> :— On T.S. : 1s. 8d. per 100 W. per month. Continuous : 2s. 4d. per 100 W. per month. Min. ch. : 6s. 8d. per month. <i>Above rates are net.</i></p>	<p><i>Lighting</i> : 6d. per unit.</p> <p><i>Heating</i> :— Units per month : 25 @ 3d. 75 @ 1½d. Excess @ 1d. Min. ch. : 2s. 6d. per month.</p> <p><i>Power</i> :— Units per month : 80 @ 3d. 120 @ 2d. 4,800 @ 1d. 5,000 @ 0.9d. 5,000 @ 0.8d. 5,000 @ 0.7d. 5,000 @ 0.6d. Excess @ ½d. Min. ch. : 5s. per h.p. per month. <i>Above rates are net.</i></p>																
24. Timaru	<p><i>General tariff</i> :— Units per month : As per schedule @ 5d. Excess @ 1d.</p> <table border="1"> <thead> <tr> <th>Schedule— Number of Rooms.</th> <th>Units per Month @ 5d.</th> </tr> </thead> <tbody> <tr><td>4 or less</td><td>6</td></tr> <tr><td>5</td><td>8</td></tr> <tr><td>6</td><td>10</td></tr> <tr><td>7</td><td>12</td></tr> <tr><td>8</td><td>14</td></tr> <tr><td>9</td><td>16</td></tr> <tr><td>10 or more</td><td>18</td></tr> </tbody> </table> <p>Min. ch. : 2s. 6d. per month.</p> <p><i>Water-heating</i> : 0.3d. per unit, 16 hrs., controlled.</p>	Schedule— Number of Rooms.	Units per Month @ 5d.	4 or less	6	5	8	6	10	7	12	8	14	9	16	10 or more	18	<p><i>Lighting and heating</i> :— (a) 4d. per unit. (b) Units per month : kW. of M.D. per month, × 50 @ 4d. Next (kW. of M.D. per month, × 50) @ 2d. Excess @ ½d. Min. ch. : 2s. 6d. per month.</p> <p><i>Power</i> :— Units per month : 50 × h.p. @ 2d. Excess @ ½d. Min. ch. : 2s. 6d. per h.p. per month.</p>
Schedule— Number of Rooms.	Units per Month @ 5d.																	
4 or less	6																	
5	8																	
6	10																	
7	12																	
8	14																	
9	16																	
10 or more	18																	
25. Wairoa	<p><i>Lighting</i> : 5d. per unit.</p> <p><i>Heating and cooking</i> :— Units per month : 20 @ 2½d. 200 @ 1d. Excess @ ½d.</p> <p><i>Water-heating</i> :— 700 W. : 13s. 2d. per month. 1,000 W. : 18s. 2d. per month. Note.—All of the above rates are increased by 10 per cent., but are also subject to discounts.</p>	<p><i>Lighting</i> : 5d. per unit.</p> <p><i>Lighting, heating, and power</i> (single meter) :— Units per month : 3 per 100 W. @ 5d. Excess @ 1½d.</p> <p><i>Motors</i> :— (a) Units per month : 25 per h.p. @ 3d. Excess @ 1½d. (b) Units per month : 500 @ 3d. 1,500 @ 1½d. Excess @ 1d. Min. ch. : 5s. per h.p. per month. NOTE.—All of the above rates are increased by 10 per cent., but are also subject to discount.</p>																
26. Waitara	<p><i>Lighting, heating, and cooking</i> :— Units per month : 10 @ 7d., net. 70 @ 2d., net. Excess @ 1d., net.</p> <p><i>Water-heating</i>—750 W. : £5 per annum, net. Booster heaters : ½d. per unit.</p>	<p><i>Lighting</i> : 7d. per unit, net.</p> <p><i>Heating</i> : 3d. per unit, net. 2d. per unit, net (off between 5 p.m. and 7 p.m. daily).</p> <p><i>Power</i> :— Units per month : 50 per h.p. @ 3d., net. Excess @ 1d., net.</p>																

TABLE XV.—ABRIDGED SCHEDULE OF TARIFFS FOR ELECTRICAL ENERGY, 1937-38—continued.

Supply Authority.	Domestic.	Commercial.																				
27. Westport	<p><i>General tariff</i> :— Units per month : As per schedule @ 6d., net. Next 40 @ 3d., net. Excess @ 1d., net.</p> <p>Schedule—</p> <table style="margin-left: 40px;"> <tr> <td>Rooms.</td> <td></td> <td>Units per Month</td> </tr> <tr> <td>4 or less</td> <td>.. .. .</td> <td>@ 6d. net. 8</td> </tr> <tr> <td>5 and 6</td> <td>.. .. .</td> <td>9</td> </tr> <tr> <td>7 and 8</td> <td>.. .. .</td> <td>10</td> </tr> <tr> <td>9 and 10</td> <td>.. .. .</td> <td>11</td> </tr> <tr> <td>11 or more</td> <td>.. .. .</td> <td>12</td> </tr> </table> <p>Min. ch. : Borough, 3s. ; county, 5s. per month.</p> <p><i>Water-heating</i> : 1s. per 100 W. per month (24 hrs.).</p>	Rooms.		Units per Month	4 or less	@ 6d. net. 8	5 and 6	9	7 and 8	10	9 and 10	11	11 or more	12	<p><i>Lighting</i> :— Units per month : 20 @ 6d., net. Excess @ 5d., net.</p> <p><i>Heating</i> :— Units per month : 40 @ 3d., net. Excess @ 1d., net.</p> <p><i>Power</i> :— Units per month : 27 per h.p. @ 3d., net. 200 @ 2½d., net. Excess @ 2d., net.</p> <p>Min. ch. : Borough, 2s. per h.p. per month ; county, 2s. 6d. per h.p. per month.</p>		
Rooms.		Units per Month																				
4 or less	@ 6d. net. 8																				
5 and 6	9																				
7 and 8	10																				
9 and 10	11																				
11 or more	12																				
28. Whakatane	<p><i>Lighting and heating</i> :— Units per month : 12 @ 8d. Excess @ 2d.</p> <p>Min. ch. : 5s. per month.</p> <p><i>Cooking</i> : 1½d. per unit. Min. ch. : 2s. 6d. per month.</p> <p><i>Water-heating</i> : £1 per 100 W. p.a. (24 hrs.).</p>	<p><i>Lighting, heating, cooking, and water-heating</i> : As for Domestic.</p> <p><i>Power</i> :— Units per month : 100 @ 3½d. 200 @ 2½d. Excess @ 1½d.</p>																				
29. Whangarei	<p><i>Lighting</i> :— Units per month : 100 @ 4½d., net. Excess @ 4d., net.</p> <p><i>Domestic power</i> : 1d. per unit.</p> <p><i>Water-heating</i> : £1 per 100 W. p.a.</p>	<p><i>Lighting and water-heating</i> : As for Domestic.</p> <p><i>Power</i> :— Units per month : 100 @ 2½d., net. 100 @ 1½d., net. Excess @ 1¼d., net.</p>																				
TOWN BOARDS.																						
1. Kaponga	<p><i>Lighting and heating</i> :— Units per month : 10 @ 8d., net. 10 @ 4d., net. Excess @ 2d., net.</p> <p><i>Cooking</i> : 1½d. per unit, net.</p> <p><i>Water-heating</i> : £1 per 100 W. p.a.</p>	<p><i>Lighting, heating, and cooking</i> : As for Domestic.</p> <p><i>Industrial motors</i> : 4d. per unit, net.</p> <p><i>Milking-motors</i> :— Units per season : 1,100 @ 3½d., net. Excess @ 2d., net.</p>																				
2. Mangaweka	<p><i>Lighting</i> : 7d. per unit. Min. ch. : 3s. 6d. per month.</p> <p><i>Heating</i> :— Units per month : 50 @ 2½d. Excess @ 1½d.</p> <p><i>Cooking</i> :— Units per month : 300 @ 1½d. Excess @ 1d.</p> <p><i>Water-heating</i> :— (a) 10s. per 50 W. p.a. (T.S., 20 hrs.). (b) 7s. 6d. per 50 W. p.a. (range).</p>	<p><i>Lighting, heating, cooking, and water-heating</i> : As for Domestic.</p> <p><i>Power</i> : 4d. per unit.</p>																				
3. Manunui.. .. .	<p><i>General tariff</i> :— Units per month : As per schedule @ 9d. Excess @ 4½d.</p> <p>Schedule—</p> <table style="margin-left: 40px;"> <tr> <td>Rooms.</td> <td>Units @ 9d.</td> <td>Rooms.</td> <td>Units @ 9d.</td> </tr> <tr> <td>3</td> <td>.. 6</td> <td>7</td> <td>.. 14</td> </tr> <tr> <td>4</td> <td>.. 8</td> <td>8</td> <td>.. 16</td> </tr> <tr> <td>5</td> <td>.. 10</td> <td>9</td> <td>.. 18</td> </tr> <tr> <td>6</td> <td>.. 12</td> <td>10</td> <td>.. 20</td> </tr> </table>	Rooms.	Units @ 9d.	Rooms.	Units @ 9d.	3	.. 6	7	.. 14	4	.. 8	8	.. 16	5	.. 10	9	.. 18	6	.. 12	10	.. 20	<p><i>Lighting</i> : 9d. per unit.</p> <p><i>Heating and cooking</i> : 4½d. per unit.</p>
Rooms.	Units @ 9d.	Rooms.	Units @ 9d.																			
3	.. 6	7	.. 14																			
4	.. 8	8	.. 16																			
5	.. 10	9	.. 18																			
6	.. 12	10	.. 20																			
COUNTY COUNCILS.																						
1. Heathcote	<p><i>Lighting</i> :— Cashmere area : 4d. per unit. Mount Pleasant area : 5d. per unit.</p> <p><i>Heating and cooking</i> :— Cashmere area : ¾d. per unit. Mount Pleasant area : 1d. per unit.</p> <p><i>Water-heating</i> :— 18 hrs. : £8 per kW. p.a. (½d. per unit if metered). 11 hrs. : ½d. per unit. Above charges are net.</p>	<p><i>Lighting, heating, and water-heating</i> : As for Domestic.</p> <p><i>Power</i> :— (a) Up to 3 h.p.— Units per 2 months : 400 @ 2d. Excess @ 1d.</p> <p>(b) Over 3 h.p.— Units per 2 months : 160 @ 3d. 240 @ 2d. Excess @ 1d.</p> <p>Min. ch. : 2 h.p. or under, 3s. 6d. per month. Over 2 h.p., 5s. per month.</p>																				
2. Kaikoura	<p><i>Lighting</i> : 9d. per unit, net. Min. ch. : 5s. per month.</p>	<p><i>Power</i> : 4d. per unit. Min. ch. : 5s. per month.</p>																				

TABLE XV.—ABRIDGED SCHEDULE OF TARIFFS FOR ELECTRICAL ENERGY, 1937-38—continued.

Supply Authority.	Domestic.	Commercial.
3. Murchison	<p><i>Lighting</i> : 7s. per month for 12 lighting and 2 heating points, plus 4d. per unit.</p> <p><i>Heating</i> : 3d. per unit, net.</p> <p><i>Cooking</i> : 2d. per unit, net.</p> <p><i>Water-heating</i> :— 15s. per 100 W. p.a. on T.S. or C.O.S. 20s. per 100 W. p.a. continuous.</p>	<p><i>Lighting, heating, and cooking</i> : As for Domestic.</p> <p><i>Power</i> :— £3 per h.p. p.a., plus 3d. per unit for first 40 units per month and 2d. per unit for excess.</p> <p><i>Milking-motors</i> : £6 per h.p. p.a., plus unit charges as above.</p>
4. Uawa	<p><i>Lighting</i> : 17d. per unit.</p> <p><i>Heating</i> : 11d. per unit.</p>	<p><i>Power</i> : 11d. per unit.</p>
5. Waimairi	<p><i>General tariff</i> :— Assessed load : According to connected load @ 4d. per unit; excess @ 1d. per unit. No min. ch. Discount : 1d. per 1s.</p> <p><i>Water-heating</i> :— (a) Metered, unrestricted : ½d. per unit. Min. : 16s. 8d. per kW. per month. (b) On T.S. (18 hrs.) : 10s. per kW. per month. (c) On T.S. (12 hrs.) : 5s. per kW. per month. (d) On T.S. (10 hrs.) : 3s. 6d. per kW. per month.</p>	<p><i>Power</i> :— Units per month : 100 @ 2d. Excess @ 1d. Off from sunset to 10.30 p.m. Min. ch. : 2s. 6d. per h.p. per month. Discount : 1d. per 1s.</p> <p><i>Milking-motors</i> :— £4 per h.p. p.a., plus 1d. per unit (off from sunset to 10.30 p.m.). Discount : 1d. per 1s.</p>
COMPANIES.		
1. Alderton Utility Co.	<p><i>General tariff</i> :— Units per month : 20 @ 7d. 30 @ 3d. 50 @ 1½d. 100 @ 1¼d. Excess @ 1d. Min. ch. : 10s. per month.</p> <p><i>Water-heating</i> :— 20s. per 100 W. p.a., with <i>pro rata</i> reduction in charge where T.S. in use. 8.30 p.m. to 6.30 a.m. : 5s. per 100 W. p.a. <i>Above charges are net.</i></p>	<p><i>Power</i> : £5 per h.p. a.</p>
2. Kanieri Electric, Ltd.	<p><i>Lighting</i> :— Units per month : 200 @ 6d., net. Excess @ 4d., net. Min. ch. : 4s. per month.</p> <p><i>Heating, cooking, and domestic power</i> : 1d. per unit, net. Min. ch. : 4s. per month.</p> <p><i>Water-heating</i> :— Continuous, with thermostat, and approved system : ¾d. per unit, net. Unapproved systems : ¾d. per unit, net. On T.S. or C.O.S. : ¾d., net.</p>	<p><i>Power</i> :— Rate PA— Units per month: 80 @ 3d., net. 80-200 @ 2-67d., net. 200-1,000 @ 2d., net. 1,000-3,000 @ 1¼d., net. 3,000-4,000 @ 1d., net. 4,000-6,000 @ 0-4d., net.</p> <p>Rate PB— Where consumption exceeds 6,000 units per month : £15 per month, plus 0-4d. per unit.</p>
3. Kohukohu (L. Keys)	<p><i>Lighting, &c.</i> : 1s. per unit.</p>	<p><i>Lighting, &c.</i> : 1s. per unit.</p>
4. Reefton Electric Light and Power Co., Ltd.	<p><i>Lighting</i> : 9d. per unit.</p> <p><i>Heating</i> : 4d. per unit.</p>	<p><i>Power</i> :— Units per month : 80 @ 3d. Excess @ 1½d.</p>
5. Rawene Motors, Ltd.	<p><i>Lighting</i> : 1s. per unit.</p> <p><i>Heating</i> : 6d. per unit.</p>	<p><i>Power</i> : 6d. per unit.</p>
6. Wilson's (N.Z.) Portland Cement, Ltd.	<p><i>Lighting</i> :— Units per quarter : 150 @ 5½d., net. Excess @ 5d., net.</p> <p><i>Domestic power</i> : 1½d. per unit, net.</p> <p><i>Water-heating</i> : ½d. per unit on C.O.S. Discount on above rates : 3 per cent. Min. ch. : 5s. per quarter.</p>	<p><i>Lighting</i> : As for Domestic.</p> <p><i>Power</i> :— (a) Units per quarter : 300 @ 3d., net. Excess @ 2½d., net. (b) 1½d. and 1½d. per unit. Discount on (a) and (b) : 3 per cent. (c) £1 10s. per kVA. of M.D. per quarter, plus ½d. per unit. Discount : 10 per cent. Min. ch. : 5s. per quarter.</p>
7. Westland Power, Ltd.	<p><i>Lighting</i> : 9d. per unit where water-heater, range, or motor of 2 h.p. or over in use; otherwise, 1s. per unit. Min. ch. : 8s. per month.</p> <p><i>Heating</i> : 3d. per unit; with range, 2½d. per unit. Min. ch. : 2s. 8d. per month.</p> <p><i>Cooking</i> : 2½d. per unit. Min. ch. : 4s. 3d. per kW. connected load.</p> <p><i>Water-heating</i> :— Metered : 1½d. per unit. Min. ch. : 4s. 3d. per kW. Flat rate : £1 6s. 8d. per 100 W. p.a. for approved systems with thermostat and C.O.S. Discount on above rates : 25 per cent.</p>	<p><i>Lighting, &c.</i> : As for Domestic.</p> <p><i>Power</i> :— Up to 15 h.p. day load— Units per month : 100 @ 4d. Excess @ 2d. Min. ch. : 6s. per h.p. per month. <i>Milking-plants</i> : £10 per h.p. p.a. if water-heater installed and on C.O.S. Discount on above rates : 25 per cent.</p>

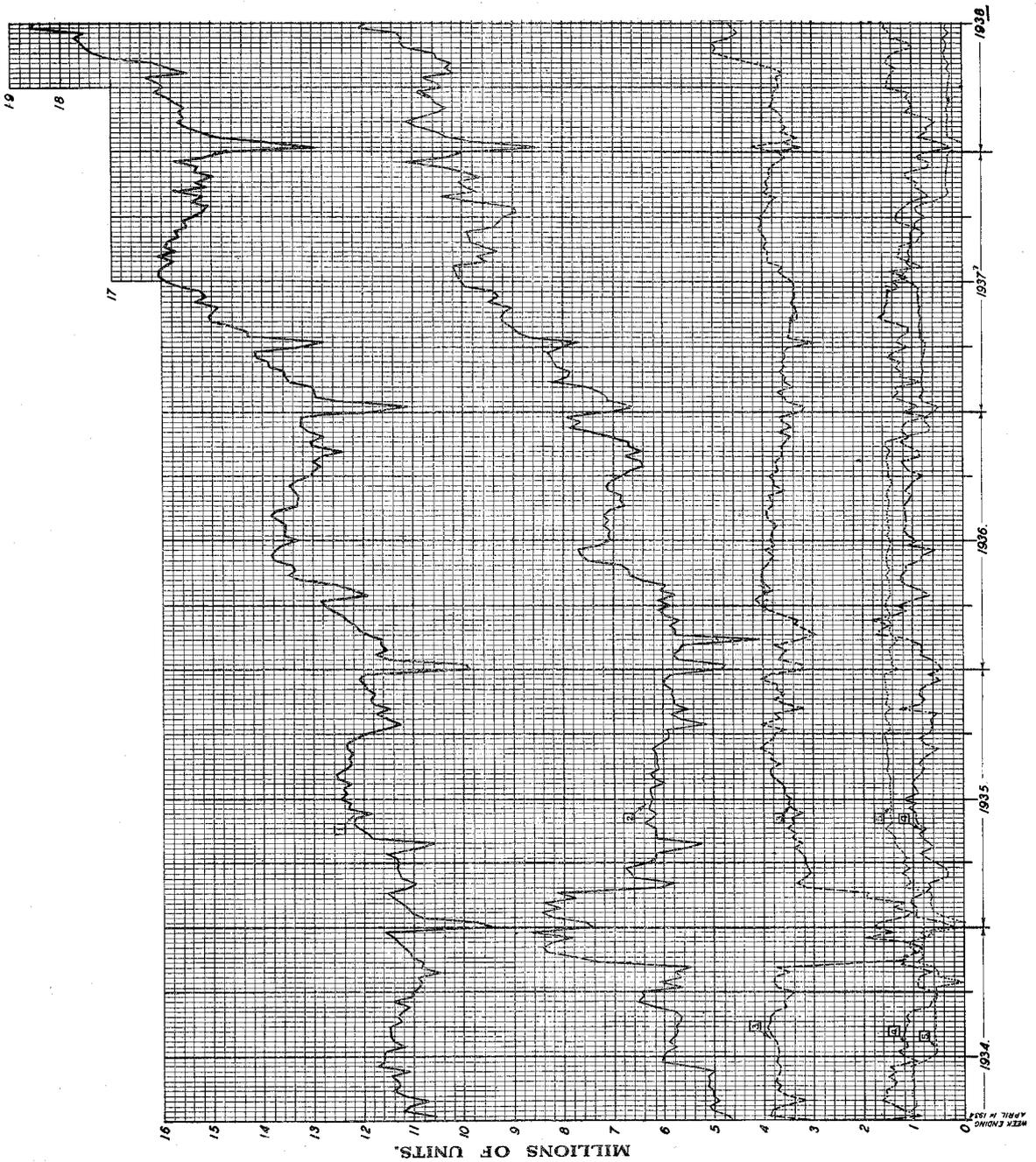
TABLE XVI.—SAMOAN ADMINISTRATION (APIA).—STATISTICS FOR YEAR ENDED 31ST MARCH, 1938.
Installed in December, 1928.

	1935.	1936.	1937.	1938.	Financial.	1935.	1936.	1937.	1938.
Statistical.									
Installed capacity (hydro)	Capital outlay	£	£	£	£
Installed capacity (oil)	Loan liability	21,580	22,843	23,371	22,974
Static head	Revenue from sale of electricity	13,331	12,171	10,748	7,769
Generating voltage	Revenue, miscellaneous	3,676	3,865	4,111	4,641
Supply voltage	Working-expenses	843	639	686	719
Number of consumers (domestic)	Capital charges	1,058	1,177	1,448	1,566
Number of consumers (commercial)	Total annual costs	1,887	1,800	1,755	1,506
Units generated (hydro)	Profit	2,945	2,977	3,203	3,072
Units generated (oil)	Accumulated Depreciation Reserve	1,574	1,527	1,594	2,288
Units sold	Average revenue per unit sold	7,895	9,128	10,366	11,416
Units non-productive	Average working-cost per unit sold	d.	d.	d.	d.
Maximum load	Average total cost per unit sold	5.35	5.62	5.30	5.43
Connected load	Capital outlay per £1 of revenue	1.54	1.71	1.87	1.83
Average load factor	Ratio working-expenses to gross revenue	4.29	4.33	4.13	3.60
Demand factor	Ratio capital charges to capital outlay	£	£	£	£
Route-miles of reticulation—	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Overhead	10½	10½	10½	11½	23.40	26.13	30.20	29.22	
Underground	6¼	6¼	6¼	7	8.74	7.88	7.51	6.56	
					7.30	6.68	6.82	9.96	

NORTH ISLAND POWER SYSTEM. UNITS GENERATED PER WEEK.

CURVES :

1. NORTH ISLAND SYSTEM.
2. ARAPUNI POWER STATION.
3. WAIKAREMOANA POWER STATION.
4. MANGAHAO POWER STATION.
5. HORAHORA POWER STATION.

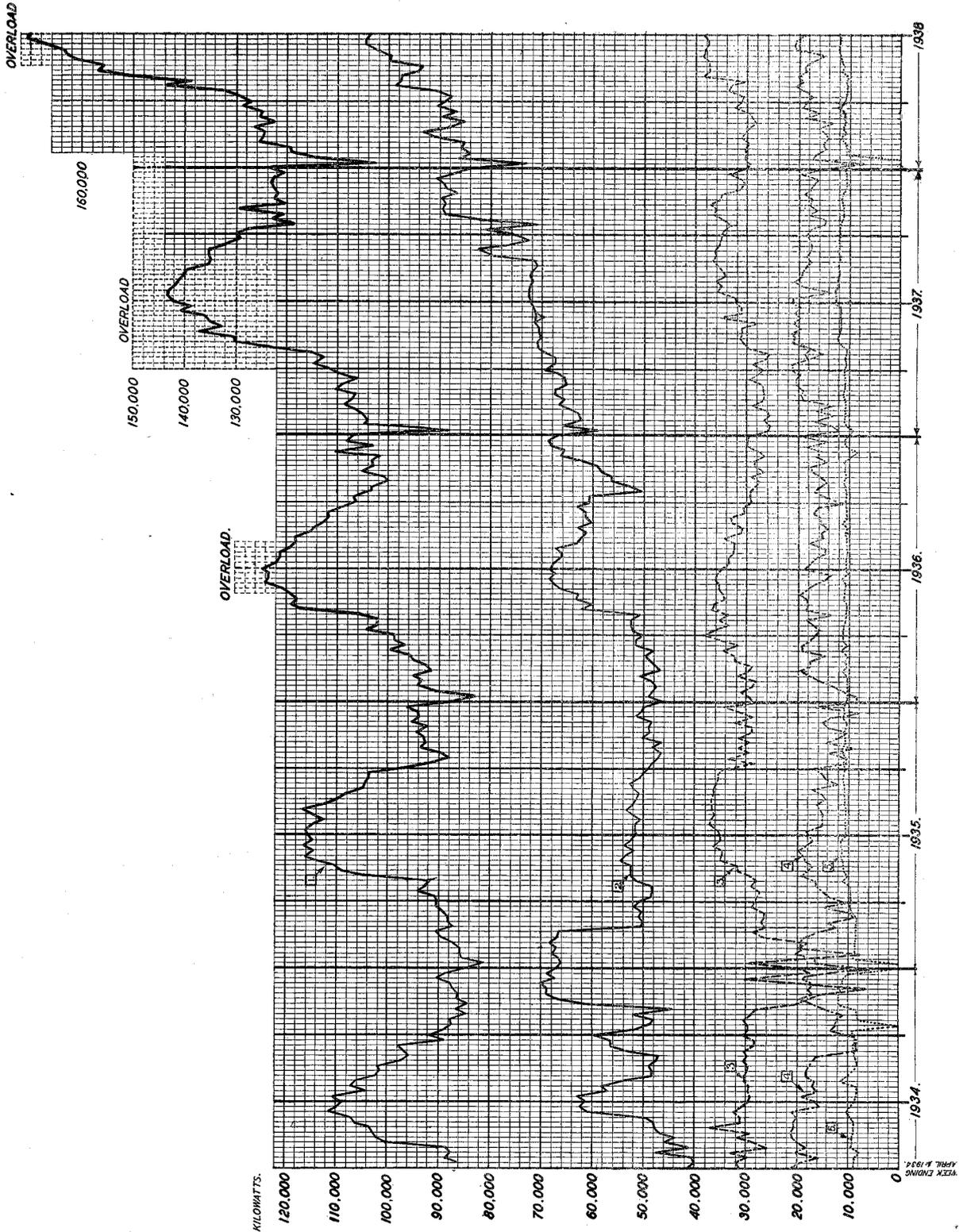


NORTH ISLAND POWER SYSTEM. MAXIMUM WEEKLY LOADS.

CURVES :

- 1. NORTH ISLAND SYSTEM.
- 2. ARAPUNI POWER STATION.
- 3. WAIKAREMOANA POWER STATION.
- 4. MANGAHAO POWER STATION.
- 5. HORAHOA POWER STATION.

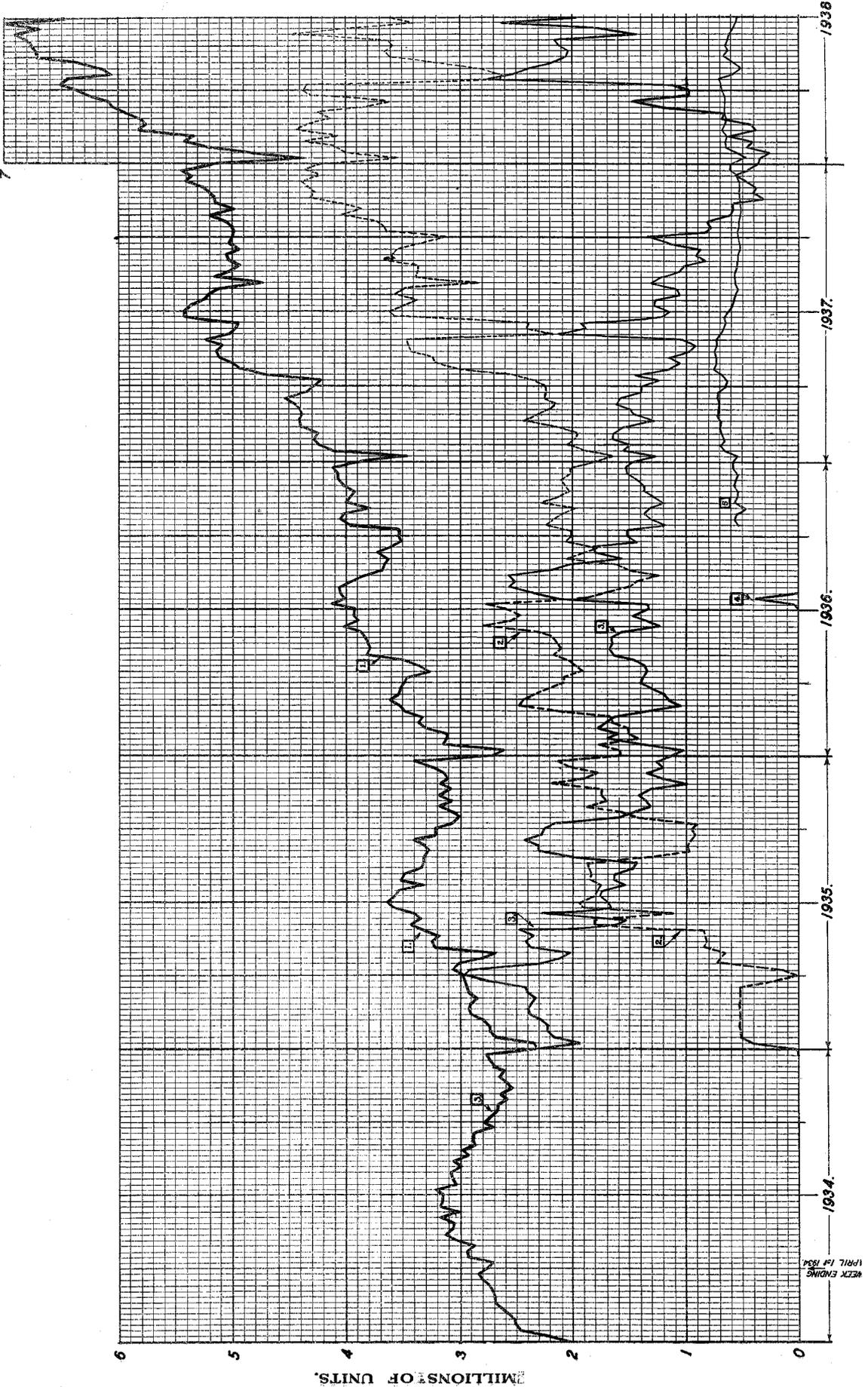
PLANT CAPACITY INSTALLED: MAIN PLANT, 165,000 kW.; STANDBY PLANT, 5,250 kW.



SOUTH ISLAND POWER SYSTEM. UNITS GENERATED PER WEEK.

CURVES:

- 1. SOUTH ISLAND SYSTEM.
- 2. WAITAKI POWER STATION.
- 3. LAKE COLERIDGE POWER STATION.
- 4. SOUTH ISLAND DIESEL STATION.
- 5. MONOWAI POWER STATION.

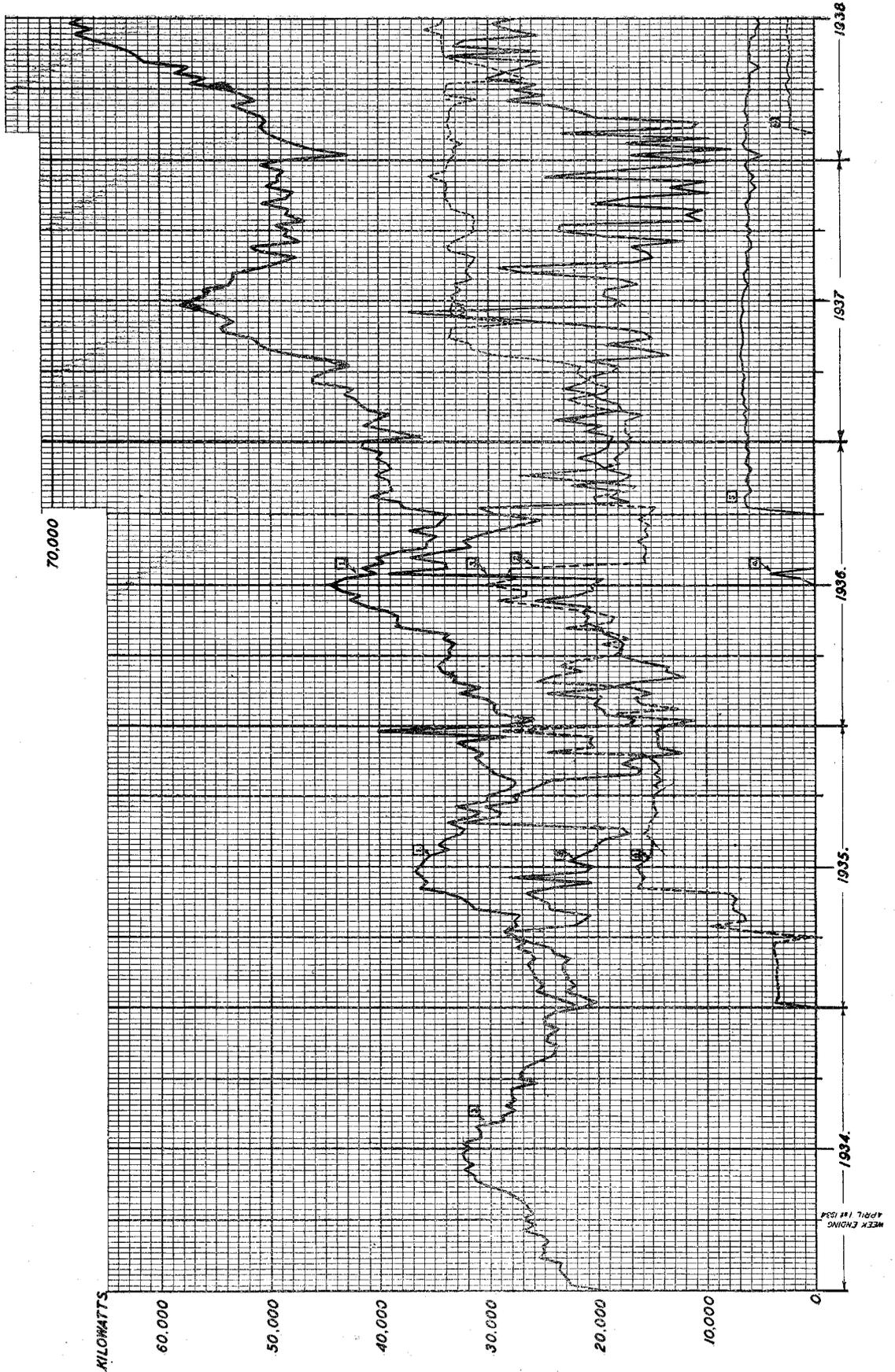


SOUTH ISLAND POWER SYSTEM. MAXIMUM WEEKLY LOADS.

CURVES:

- 1. SOUTH ISLAND SYSTEM.
- 2. WAITAKI POWER STATION.
- 3. LAKE COLERIDGE POWER STATION.
- 4. SOUTH ISLAND DIESEL STATION.
- 5. MONOWAI POWER STATION.

PLANT CAPACITY INSTALLED: MAIN PLANT, 73,560 kW.; STANDBY PLANT, 5,760 kW.



APPENDIX E.

FOURTEENTH ANNUAL REPORT OF THE MAIN HIGHWAYS BOARD.

The Hon. MINISTER OF PUBLIC WORKS.

SIR,—

In accordance with the requirements of section 24 of the Main Highways Act, 1922, the Main Highways Board has the honour to submit its fourteenth annual report for presentation to Parliament.

The report covers the period from the 1st April, 1937, to the 31st March, 1938, though a number of matters referred to are subsequent to the latter date and are included for convenience and completeness of record.

GENERAL.

The present length of main highways maintained or subsidized by the Board is 12,136 miles, and particulars of expenditure for the year ended 31st March, 1938, as well as a detailed statement on the position of various works, are shown later in this report. Of the total length of main highways, 3,921 miles have been classified as State highways, and subsequent reference is made in the report to activities and expenditure in respect of State highways.

The total expenditure from the Main Highways Account for the financial year ended on the 31st March, 1938, amounted to £4,113,046, compared with £3,114,196 for the year immediately preceding. These figures include a number of charges against the account under special legislative authority and which are not directly related to matters covered by the Main Highways Act, 1922.

The total amount of £4,113,046 expended during the year 1937–38 constitutes a record in the Board's history.

Increased costs, both as regards wages and materials, have contributed in some degree towards this grand total, but, notwithstanding these considerations, a very substantial programme of work has been undertaken during the year under review. Particulars relating to improvement or reconstruction operations are described later herein under the heading "Progress Report." From the registrations of motor-vehicles and the importations of motor-spirits during the past financial year it may be claimed that the year was an outstanding one from the standpoint of roading authorities in that the density of traffic was greater than has ever been the case previously.

PERSONNEL.

During the year Mr. T. A. Barrow, Chief Accountant of the Public Works Department, resigned as a member of the Board consequent upon his appointment as Air Secretary. The Board placed on record its appreciation of the services rendered by Mr. Barrow during his period of membership.

The vacancy was filled by Mr. J. W. Scott, who succeeded Mr. Barrow as Chief Accountant of the Public Works Department.

LEGISLATION.

The only new legislation passed since last report and directly affecting the Board's administration was **Section 12 of the Finance Act, 1937**. This section empowered the Minister of Finance to borrow up to an additional amount of £2,000,000 for the purposes of construction or reconstruction of main highways, making the total loan authority for highways £8,000,000.

FINANCE.

The actual income of the Main Highways Account from revenue sources for the financial year 1937–38 amounted to £2,607,027. The table below shows how this amount is made up, and also the corresponding figures over the previous nine years. In addition to this amount, £1,676,800 was borrowed for main highways. The annual loan charges against the Main Highways Account increased from £307,516 for the year 1936–37 to £338,494 for the year 1937–38 :—

	1928–29.	1929–30.	1930–31.	1931–32.	1932–33.	1933–34.	1934–35.	1935–36.	1936–37.	1937–38.
	£	£	£	£	£	£	£	£	£	£
Transfer from Consolidated Fund	35,000	35,000	*	*	*	*	*	*	*	*
Proceeds of tax on tires and tubes collected through the Customs Department	196,747	155,722	129,188	84,649	63,253	62,979	91,693	93,308	138,894	158,526
Registration and license fees of motor-vehicles, &c.	341,017	378,135	397,139	372,224	354,216	354,444	355,990	397,606	545,763	523,853
Motor-spirits tax ..	730,414	873,369	1,219,209	1,231,202	644,126	669,868	970,506	1,449,125	1,697,942	1,918,486
Mileage-tax ..	..	..	..	..	..	1,133	1,284	1,616	3,290	6,162
Totals ..	1,303,178	1,442,226	1,745,536	1,688,075	1,061,595	1,088,424	1,419,473	1,941,655	2,385,889	2,607,027

* Further transfers abolished by amending legislation.

It will be noted that income from revenue sources for the year 1937-38 was £221,000 greater than for the year immediately preceding when the amount was the highest on record.

The receipts from the Customs tax on tires and tubes amounted to approximately £20,000 more than for the previous year, and is the largest sum obtained from this source since the year 1928-29.

Compared with last year, registration and license fees, &c., show a small decrease as regards the amount paid into the Main Highways Account for the financial year ended on 31st March, 1938. Actually the number of vehicles registered was greater than for the preceding year, but the difference in revenue credited for highways purposes is due to the fact that this revenue is collected in the first instance by the Post and Telegraph Department. The amounts shown in the statements relate only to the period covered by the financial year and exclude balances not transferred to the Main Highways Account within that particular period.

The proceeds from motor-spirits taxation were £220,000 in advance of the amount received under this heading in the previous year, and represent the largest sum which has been credited to the Main Highways Account in any one year up to the present.

Revenue from the mileage-tax levied in respect of motor-vehicles using other than motor-spirits, and trackless trolley-omnibuses, increased by nearly £3,000, or approximately double the amount received in the previous year. The steadily growing income from this source over the past few years indicates particularly the increasing use of passenger and general transport vehicles having Diesel or electricity power units.

The gross importations of motor-spirits since 1927 have been as follows, and these figures are usually accepted as providing an index of maintenance and construction requirements:—

	Gallons.		Gallons.
1927 (January to December) ..	48,000,000	1933 (January to December) ..	55,400,000
1928	54,500,000	1934	64,600,000
1929	62,400,000	1935	65,300,000
1930	68,300,000	1936	86,800,000
1931	61,800,000	1937	85,700,000
1932	58,400,000		

It will be seen that for the last calendar year the gross total importations are somewhat less than for the preceding year. The decrease is not reflected in the revenue from this source owing to the fact that considerable importations occurred during the latter months of the financial year 1937-38. The receipts from motor-spirits taxation for the financial year, as shown in the income table set out earlier in this report, are a definite indication of the very substantial increase in mileage travelled by motor traffic.

The following is a summary of expenditure from the Main Highways Account for the year ended 31st March, 1938:—

	Expenditure.
	£
Maintenance—	
North Island	713,882
South Island	360,230
Renewals—	
North Island	95,385
South Island	42,889
Construction and improvements—	
North Island	1,270,546
South Island	909,781
Administration and general charges	175,312
Loan charges (including commutation of toll-gate charges and of Hutt Road fees)	338,493
Subsidy on rates	206,528
	<u>4,113,046</u>

An analysis of the expenditure for 1937-38 by the Board and by local authorities on **maintenance** of main and State highways, as distinct from renewals, construction, interest on loans, and other overhead charges, is shown in the tabulation below:—

	Board's Contribution.	Local Authorities' Contribution.	Total.	Percentage Board's Contribution to Total.	Percentage Local Authorities' Contribution to Total.
	£	£	£		
North Island	713,882	93,236	807,118	88.45	11.55
South Island	360,230	60,207	420,437	85.68	14.32
Total	1,074,112	153,443	1,227,555	87.51	12.49

An analysis of the actual expenditure by the Board on maintenance in each Island, as compared with the number of motor-vehicles in each Island at the 31st March, shows the following comparisons for the last ten years:—

—	1923-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.
North Island—										
Maintenance expenditure	66·13	62·30	59·23	62·31	62·84	63·80	65·44	64·80	66·82	66·46
Motor-vehicles ..	63·08	63·63	63·84	63·77	63·78	63·94	64·31	64·84	65·30	65·70
South Island—										
Maintenance expenditure	33·87	37·70	40·77	37·69	37·16	36·20	34·56	35·20	33·18	33·54
Motor-vehicles ..	36·92	36·37	36·16	36·23	36·22	36·06	35·69	35·16	34·70	34·30

NOTE.—Prior to 1936-37 these percentages relate rather to expenditure from the Revenue Fund, but as from 1st April, 1936, true maintenance figures have been recorded.

The following table shows an analysis of expenditure for the year 1937-38 by the Board and by local authorities on **renewals** in respect of main and State highways:—

—	Board's Contribution.	Local Authorities' Contribution.	Total.	Percentage of Board's Contribution to Total.	Percentage of Local Authorities' Contribution to Total.
	£	£	£		
North Island	95,385	10,642	106,027	89·96	10·04
South Island	42,889	2,786	45,675	93·90	6·10
Totals	138,274	13,428	151,702	91·14	8·86

An analysis of the Board's expenditure and the expenditure by local authorities for the year 1937-38 on **improvements and construction** shows the following position in respect of main and state highways:—

—	Board's Contribution.	Local Authorities' Contribution.	Total.	Percentage of Board's Contribution to Total.	Percentage of Local Authorities' Contribution to Total.
	£	£	£		
North Island	1,270,546	70,837	1,341,383	94·72	5·28
South Island	909,781	23,960	933,741	97·43	2·57
Totals	2,180,327	94,797	2,275,124	95·83	4·17

The following tabulation shows the amounts which have been provided by the Board and the local authorities on maintenance, renewals, and construction during the last ten years in respect of the complete highways system:—

—	1923-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.	1937-38.
	£	£	£	£	£	£	£	£	£	£
Maintenance by Board ..	756,399	1,049,249	872,577	849,734	600,324	674,026	932,675	1,190,179	900,731*	1,074,112*
Maintenance by local authorities	284,526	375,849	317,839	215,568	168,466	187,735	226,554	284,423	196,023*	153,443*
Construction by Board ..	936,148	1,007,957	667,902	361,969	159,223	198,295	325,483	428,084	1,501,261†	2,318,600†
Construction by local authorities	214,155	203,148	150,984	94,973	43,181	55,997	57,975	78,263	103,260†	108,225†
Totals	2,191,228	2,636,203	2,009,302	1,522,244	971,294	1,116,053	1,542,687	1,980,949	2,701,275	3,654,380
<i>Percentages.</i>	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Maintenance by Board ..	72·7	73·6	73·3	79·8	78·1	78·2	80·5	80·7	82·1	87·5
Maintenance by local authorities	27·3	26·4	26·7	20·2	21·9	21·8	19·5	19·3	17·9	12·5
Construction by Board ..	81·4	83·3	81·6	79·2	77·6	77·0	84·9	84·5	93·6†	95·5†
Construction by local authorities	18·6	16·7	18·4	20·8	22·4	23·0	15·1	15·5	6·4†	4·5†

* These figures represent true maintenance expenditure, whereas in preceding years expenditure under the Revenue Account was shown.
 † These figures and percentages relate to renewals and construction; previously renewals have been absorbed in both maintenance and construction.

The maintenance figures in the above tabulation exclude indirect charges such as supervision, interest, &c., but include the cost of earthquake and flood-damage restoration.

It will be noticed that expenditure on constructional work was approximately £800,000 greater than in the previous year, and further that the proportion found by local authorities continued to diminish, particularly in respect of construction work, to which the local authorities contributed only 4·5 per cent.

The following statement shows the total expenditure by the Board in each Island on both maintenance and construction for the financial year ended 31st March, 1938, the latter including renewals. The figures take into account administration charges, but exclude interest on highways loans :—

	Expenditure on Maintenance.	Expenditure on Renewals and Construction.	Total Expenditure in each Island.	Percentage of Expenditure in each Island.
	£	£	£	
North Island	750,785	1,436,537	2,187,322	61·30
South Island	378,831	1,001,872	1,380,703	38·70
Totals	1,129,616	2,438,409	3,568,025	100·00

MAINTENANCE.

The total maintenance expenditure by the Board and by local authorities during the financial year 1937-38 amounted to £1,227,555, which is equivalent to an average of £101·2 per mile over the total main highways system of 12,136 miles. During the year immediately preceding, maintenance expenditure by the Board and local authorities amounted to £1,096,754, which was equivalent to an average of £90·5 per mile.

The increase in total expenditure for the year under review is an indication that roading authorities were required to intensify maintenance in order to maintain highways for the greater amount of traffic. In the last report it was stated that additional plant had been obtained or ordered for the Board's use in maintaining highways under its direct control, including the State highways system. This year a similar statement can be made relative to the acquisition of plant by local authorities for the maintenance of highways under their control. Throughout the past year the Board has executed with local bodies several hire-purchase agreements in respect of up-to-date maintenance equipment, and there is no doubt that local bodies generally are devoting more attention to highway and road maintenance. This condition of affairs is particularly pleasing to the Board by reason of the fact that since its inception it has continually emphasized the necessity for regular, systematic, and adequate maintenance, but sometimes without a very successful response.

During the past few years the amount of traffic on main highways has increased tremendously, as may be judged from the fact that the registrations of motor-vehicles were greater than ever before, while the importation of motor-spirits also exceeded previous returns. In consequence additional maintenance operations were required to prevent rapid deterioration of highway surfaces, more especially in the case of gravelled roads. The standard of maintenance throughout the highways system shows an improvement, although this condition is qualified by a few exceptions where the local body is severely handicapped by financial limitations, notwithstanding preferential assistance from the Board. For some time past the Board has been endeavouring to facilitate the maintenance of gravelled highways by providing metal supplies from which requirements could be drawn without payment of royalty charges. In some measure this has contributed towards the higher standard of gravelled surfaces and the strengthening of weak metal crusts. The application of suitable maintenance metal, combined with more frequent gradings, has done much towards producing a better-class road as well as a better class of maintenance. There is still a tendency in some quarters to spread unnecessarily large metal which will not bind under fast-moving motor traffic, but this practice is definitely disappearing in favour of the use of properly graded material, including fines, which produces a good running surface and reasonably withstands wear-and-tear.

In order to assist field officers and local authorities' staffs in the stabilization of metalled surfaces the Board issued for general information a statement prepared by the Highways Engineer relative to the use of fine materials of good cohesive variety. It has not always been sufficiently appreciated that under fast-moving motor traffic fine material is lost from the road surface, and unless this is replaced at appropriate intervals, the wearing-course becomes loosened to the extent that a relatively stable crust is impossible. Consequently the lack of any binding element causes the dispersement of larger fractions, resulting in the eventual loss of the upper wearing-course. In one case the whole of the top course was lost, leaving only a hard, uneven base of spawls. This was satisfactorily remedied by the application of a properly graded wearing-course containing an adequate proportion of fine material of cohesive quality, and an even-running surface was thus restored.

FLOOD DAMAGE.

During the financial year under review a considerable amount of flood damage occurred throughout the main highways system. Generally speaking, it is always to be anticipated that minor damage, arising from seasonal floodings, will occur, and such damage is usually regarded as an accepted contingency in highway maintenance. However, exceptional conditions have been experienced in

quite a number of districts, resulting in damage of a much more extensive nature than usual. Extraordinarily heavy rainfall in concentrated areas caused major flooding, and severely damaged works which were not designed to meet the conditions which arose. Highways are designed with due regard to local conditions, and with reasonable allowance for a margin of safety, and this especially applies to structures such as bridges and culverts. However, the circumstances which produced some of the flooding during the past year were without precedent, and even had it been possible to anticipate them it is obvious that it would not have been practicable, even at great expense, to overcome the position. In some instances steep hillsides were heavily scoured by the intense rainfall which amounted to as much as 32 in. in three days, bringing down enormous quantities of silt, rocks, and debris which the natural watercourses could not possibly carry.

Some indication of the siltation which occurred is seen in the fact that, after the Hawke's Bay flood, up to 5 ft. of silt remained on the highway in the Esk Valley, where prior to the flood the roadway was several feet higher than the natural waterway in the valley. Also in the East Coast district north of Gisborne a deposit of silt, some feet in depth, was left on the main highway after flooding had occurred. The abnormal hydraulic conditions caused heavy scouring in rivers and streams, with consequent damage to bridges and culverts. In a few cases it was remarkable to find that concrete culverts remained bare but intact after the flood-waters had washed away the approaches, even where they had been in comparatively solid country.

The sudden disorganization of road transport necessitated urgent measures to open up detours or otherwise restore communications, and the staff of the Public Works Department lost no time in carrying out temporary repairs. Mobile plant was quickly obtained from other districts in order to remove slips and rebuild the damaged highways, temporary bridges were constructed, and railway viaducts and bridges, where available, were converted for the temporary use of road vehicles. The work of complete restoration is proceeding, and new road structures will be built as soon as circumstances permit.

RENEWALS AND IMPROVEMENT.

For the financial year covered by this report expenditure on renewals amounted to £138,274, compared with £106,404 for the previous year, and expenditure on improvements, including construction and reconstruction, amounted to £2,180,327, as against £1,394,857 for the preceding year.

As explained on previous occasions, progress in connection with the renewal of decayed or obsolete bridges is governed to a large extent by the availability of materials and the rate at which designs can be completed. Difficulty in obtaining supplies of reinforcing steel has proved a very real handicap, and construction work has been considerably delayed on this account. Other urgent public works have made great demands on the limited staff engaged on design, and, unfortunately, it has not been possible to overcome the position because efficient and trained technical staff cannot be procured. Nevertheless, substantial progress has been made with bridge renewals, as will be seen from the fact that during the year under review new bridging totalling 11,000 lineal feet was completed.

The past season was very favourable for bituminous surfacing work, and 288 miles of main highways received an initial paved surface, bringing the total length of dustless highways up to 2,415 miles, which is practically 20 per cent. of the main highways system. In addition to this new paving, a considerable amount of maintenance sealing or other bituminous treatment was carried out on sections which were paved several years ago, the surfaces of which were in need of reconditioning to prevent undue damage from increased traffic.

It is proposed to continue the policy of dustless paving as far as possible, especially where maintenance costs on gravelled sections are relatively high and where the dust nuisance is a menace to traffic safety.

Reconstruction work in the direction of widening and realignment has been continued, and last year 330 miles were improved and 240 miles were metalled. Details of these works are described more particularly in the progress report included later herein.

The table below shows the extent and types of work carried out on the main highways system by the Board and local authorities each year since the Board commenced active operations in 1924 :—

Year.	Formation and Widening.	Gravelling and Metalling.	Tar and Bituminous Sealing.	Road-and-Plant-mix Bituminous Surfacing.	Bituminous Macadam (Penetration).	Bituminous Concrete.	Portland-cement Concrete.	Bridges.
	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Ft.
1924-25.. ..	19	63	6	..	6	..	..	2,434
1925-26.. ..	45	88	16	..	45	4	6	5,168
1926-27.. ..	174	151	35	..	38	12	16	6,408
1927-28.. ..	173	133	83	..	34	..	6	7,760
1928-29.. ..	224	185	122	..	51	14	11	9,482
1929-30.. ..	173	179	133	..	39	31	12	7,547
1930-31.. ..	130	128	95	..	41	14	9	11,175
1931-32.. ..	139	69	129	..	32	9	3	4,062
1932-33.. ..	56	45	72	..	8	..	..	3,178
1933-34.. ..	44	28	75	..	7	..	1	4,988
1934-35.. ..	113	69	172	27	3	..	2	6,641
1935-36.. ..	152	98	245	91	2	..	..	8,718
1936-37.. ..	272	131	184	67	3	..	..	9,575
1937-38.. ..	329	241	282	49	..	..	..	11,106
Totals	2,043	1,608	1,649	234	309	84	66	98,242

A general description of some of the more important activities in each highway district is given hereunder:—

Whangarei District.

During the past year work was continued on the raising of sections of highway which were subject to flooding, and good progress was made. This class of work is particularly important in the North Auckland district, where in the past frequent flooding has caused interruptions to traffic.

The construction of the Brynderwyn Deviation was well advanced, and proposals have been adopted for reconstructing the highway northwards from Topuni in order to obtain standard alignment. By deviating from the existing road, which is of irregular curvature and width, a much higher standard of construction can be obtained, and this will eventually connect with the improvements at the southern end of the Brynderwyn scheme.

Special attention was given to the State highways in the direction of raising the standard of maintenance, and noticeable improvements have been effected to the running-surface on the arterial highways throughout this district. For several miles across the Ruawai Flats the formation was widened, shoulders built up and strengthened, and proper superelevation on curves was provided. It is hoped that paving will be commenced during the current year on the Dargaville-Maungaturoto section and certain other sections which carry a large amount of traffic. Consequent upon the transfer of Rodney County to the No. 2 Highways District, a depot has been established at Maungaturoto in connection with the supervision of State highways radiating from that centre.

In the course of its visit of inspection towards the latter part of the financial year the Board was impressed with the urgent necessity for replacing numerous old single-way wooden bridges, which in many cases are dangerous for traffic not only on account of limited width, but also because of bad alignment. Proposals for renewals are under consideration with a view to expediting this important work.

Auckland District.

Further progress has been made with the extension of dustless surfacing on State highways, and in addition several local authorities have commenced reconstruction and paving other main highways with subsidy assistance from highways funds.

At the time the State highways scheme was introduced work on the Auckland-Helensville Highway had been commenced on various lengths some distance apart, this policy being based upon circumstances relating to the internal finances of the local authority concerned. The Board's policy has been to concentrate upon linking up the uncompleted sections, and satisfactory progress has been made.

Very considerable improvements have been made on the State highway between Birkenhead and Warkworth consequent upon the completion of heavy reconstruction and realignment on the Albany Hill, Johnstons Hill, Schedewy's Hill, &c. The reconstruction and sealing of the Wairau Road northwards from Takapuna was commenced by the Waitemata County Council in accordance with proposals sanctioned by the Board.

Reconstruction, bridging, and paving have been completed on the Great South Road to the southern extremity of the Waipa County, and this type of improvement is being continued southwards into the Otorohanga County.

On the State highway between Pokeno and Paeroa reconstruction has been continued in readiness for extending the paving from Pokeno, and further paving was completed in the vicinity of Waitakaruru.

The improvement of the arterial highway between Thames and Paeroa was advanced and the heavy reconstruction work through the Karangahake Gorge continued in preparation for paving during the current year.

Severe damage occurred on the Thames-Coromandel highway during a storm when exceptionally high tides were experienced, and it has been found necessary to place heavy stone protection along the coastal section immediately north of Thames.

Particulars of other general improvements throughout the district are shown in greater detail in the progress report.

Tauranga District.

Improvements to the main highway over the Kaimai Hills have been further advanced and good progress made with the heavy reconstruction work.

The widening and realignment of the Rotoma Hill section have been completed, and this notable improvement has been much appreciated by traffic. A commencement has been made with widening and generally improving the length of State highway along the Lakes section from Rotoma Hill towards Te Ngae and Rotorua.

Between Wairakei and Taupo a great deal of realignment has been carried out to meet the needs of tourist and holiday traffic, which has very much increased. The construction of approaches for a new bridge over the Waikato River at Atiamuri, and the widening, straightening, and strengthening of the highway from Atiamuri towards Putaruru, have been commenced and are now well under way.

The difficulty in maintaining a satisfactory standard of wearing surface on the State highways in the vicinity of Whakatane, combined with the dangerous conditions arising from the dust nuisance in the summer months, has necessitated consideration being given to a paving programme for the current year, and it is hoped to be able to complete several miles in the immediate vicinity of Whakatane itself.

Towards the end of the financial year under review proposals were formulated for accelerating improvements and bridging on the Opotiki-Te Araroa coastal highway. Better access is required for existing settlement on this route, which is also increasing in popularity as a holiday resort. Work has already commenced on widening and major maintenance and contracts have been arranged for a number of bridges,

Gisborne District.

This district is subject to fairly frequent and severe flooding, and, in consequence, highway operations are subject to interference and delay. However, a number of important works have progressed particularly as regards bridging.

A new bridge over the Uawa River at Tolaga Bay has been completed and opened for traffic. The replacement of the Waipaoa River Bridge at Kaiteratahi to replace the old structure on which loading has had to be restricted is nearing completion after a series of unfortunate delays.

In connection with improvements at Waikohu, progress has been made with a comprehensive scheme, which was prepared in connection with bridge-replacements and the elimination of two railway-crossings. By deviating the main highway, involving the erection of two river bridges, the alignment is being very much improved. One bridge replaces an old structure which was extremely narrow with sharp approaches and urgently in need of renewal.

On the East Coast highway from Te Araroa towards Opotiki a commencement was made with the erection of a 300 ft. bridge over the Whangaparaoa River where traffic has had to use a ford, negotiable only under favourable weather conditions. Continual floods have been experienced ever since the work was started and these have retarded progress.

Reconstruction and metalling have been carried on as weather conditions allowed, and major flood damage has been repaired. Several sections of highway in this district traverse unstable country, large hillsides are continually on the move, causing frequent subsidences in the road surface, and often necessitating the restoration of a length of road which has moved downhill.

Napier District.

A considerable amount of reconstruction and widening have been carried out during the past year, but the extraordinarily heavy flooding which occurred in the Hawke's Bay area has necessitated the concentration of operations in the direction of restoring communications. The complete obliteration of considerable lengths of State highway passing through steep hilly country has required the use of men and machinery to open up access for arterial and local traffic. Owing to the destruction of several bridges temporary structures have been erected to carry traffic until permanent arrangements can be finalized.

Heavy formation work has been continued on the Runanga Deviation between Tarawera and Taupo, and also on the highway skirting Lake Waikaremoana towards Hopuruaheine.

Investigations have been made with regard to reconstruction work required on the State highway between Wairoa and Hangaroa with a view to adopting a deviation for improving alignment northwards from Opoiti towards Te Reinga.

Portions of the Napier - Palmerston North State highway have been in course of reconstruction, particularly in respect of certain lengths where irregularities in the paving had developed. In the vicinity of Woodville the old pavement requires widening and some of the alignment needs correction.

In connection with the elimination of the level railway-crossing at Mangamanaia, a deviation has been commenced on the Gorge side for the purpose of avoiding an existing sharp bend. A new bridge on this deviation will replace an old wooden structure near the bend in question.

Taumarunui District.

The principal works in this district, other than ordinary maintenance, have been the renewal of old bridges and the reconstruction and metalling of sections of highway below standard requirements.

On the Te Kuiti - New Plymouth State highway heavy formation has been in progress, particularly between Te Kuiti and Pio Pio. A considerable length has been practically completed as regards formation and metalling. The new alignment has been placed on a higher level so as to avoid sections which in the past have been subject to flooding, and the general standard of the road has been vastly improved. Proposals for this length include final preparation and sealing, and it is hoped to carry out a certain amount during the current year.

On the Te Kuiti - Taumarunui arterial highway improvements have been continued, and metal was placed on lengths completed. Consideration is to be given this year to the possibility of sealing a number of miles on this highway.

It is also expected that certain lengths of heavily trafficked highway in this district, which do not require reconstruction, will be sealed during next season.

Improvements by way of widening, &c., have been in progress on the Pio Pio - Tatu, Te Maire - Mangaohutu, and Stratford - Taumarunui main highways and work has been in progress in connection with the erection of an overbridge to eliminate the level railway-crossing on the Main Trunk line at the top of the Spiral Hill.

Taranaki and Wanganui Districts.

Further progress has been made in the reconstruction and realignment of the arterial highway between Waitara and Mount Messenger, on the Te Kuiti - New Plymouth State highway.

A large amount of reconstruction has also been carried out on the New Plymouth - Hawera and Hawera - Wanganui State highways. This work is in the nature of rebuilding lengths of pavement laid many years ago and which were of irregular camber and insufficient width and, in addition, showed signs of weakness under present traffic. In the course of reconstruction, improvements have been made in the alignment, and by adjustment of grading visibility has been very much improved. This class of work has been carried out over a number of sections which were most urgently in need of attention, and the general standard has been raised considerably. In due course the remaining sections which do not meet the needs of traffic will be dealt with in similar fashion.

On the arterial highway from New Plymouth to Wanganui there are several one-way bridges which are dangerous to traffic, and a commencement has been made with a programme for providing adequate two-way structures.

In the Wanganui area the reconstruction of the Wanganui - National Park State highway has been continued on what is generally known as the Parapara Section.

The Bulls - Taihape State highway has received special attention in the way of major maintenance, due to the fact that the top metal-course had practically disappeared over a long mileage, leaving only the spawl base-course. The surface of the road has been built up by placing a stabilized top-course of graded materials, and a very great improvement has resulted.

Throughout the Taranaki and Wanganui areas several level crossing elimination schemes have been under construction, and a number have been almost completed.

Wellington District.

Work has been continued on the Whirokino Deviation, which will improve the alignment of a section of State highway and raise the level above floods. The reinforced-concrete trestle has been in progress, and the piles for the piers have been driven. The reinforcing has been set up in readiness for concreting the columns, and a commencement has been made with the concreting of the spans.

On the main highway between Shannon and Palmerston North realignment has been in progress and a considerable length completed in readiness for sealing. The general standard of this route, which traverses undulating country, has been very much improved, and numerous sharp bends have been eliminated.

A contract has been in progress in connection with the replacement of the old narrow portion of the bridge over the Oroua River at Awahuri by a new reinforced-concrete structure.

The sections of State highway passing through the boroughs of Carterton and Pahiatua have been under reconstruction. It has been necessary to reform the road in order to adjust the camber and, after strengthening the metal crust, a new pavement has been laid.

On the Featherston side of the Rimutaka Hill a commencement has been made with the widening of the narrow bridges, and a number have been completed.

General reconstruction, paving, and bridging have been in progress throughout the year, and work has been in hand on a number of level crossing elimination schemes. The Porirua overbridge and deviation have been finished, and the Paraparamu overbridge is nearing completion.

Nelson District.

Reconstruction has been continued on the arterial highways in this district. Considerable improvement in the alignment of the Moutere Hill section between Nelson and Motueka has been in progress, and excavating plant has been used on the heavy earthwork with very satisfactory results. Between Nelson and Blenheim widening and realignment on the hill sections have been in progress, and similar reconstruction work has been in hand on the Glenhope-Murchison length.

Preparations have been commenced in readiness for sealing several miles of State highways, particularly in the immediate vicinity of Blenheim, and it is hoped to be able to arrange contracts so that a certain amount of dustless surfacing will be completed during the current year.

At the close of the year covered by this report serious flooding occurred, and, in addition to extensive general damage, three spans of the Wairau River Bridge on the Nelson-Blenheim State highway were destroyed, causing dislocation of traffic. This timber structure suffers damage by floods from time to time, and the question of building a new bridge capable of carrying two-way traffic will have to be considered before very long.

The construction of an overbridge and approaches in order to eliminate the level railway-crossing at Elevation on the Picton-Blenheim section has been practically completed.

On the main highway giving access to the Blenheim Aerodrome a contract has been arranged for erecting a bridge over the Taylor River, and on the Dashwood-Upcot main highway the construction of a suspension bridge over the Hodder River was advanced.

Consequent upon the opening-up of the Lewis Pass road, which will connect Canterbury with the Nelson and West Coast districts, it has been decided to reconstruct the road via the Maruia and Shenandoah Valleys in order to provide improved access from the Nelson district. Investigations showed that even at much greater cost the existing highway via the Matakita Valley could not be reconstructed to afford the easy alignment obtainable on the Maruia route.

Greymouth District.

With the completion of the Flowery Creek Deviation there has been provided a paved surface throughout the section of State highway between Greymouth and Hokitika. Improvements have been continued on the arterial highway from Greymouth towards Reefton, and in the course of reconstruction a deviation was made between Kamaka and Spring Creek for the purpose of eliminating two level railway-crossings and at the same time providing a higher standard of alignment.

Widening and general improvements have been continued on the Buller Gorge section and also on the Coastal Highway from Westport to Greymouth. In the Buller Gorge heavy retaining-walls have been constructed in a number of places in order to obtain increased width without disturbing the existing steep batters.

The new bridge over the Hokitika River at Kanieri has been completed and opened for traffic. The erection of a new bridge over the Orowaiti River near Westport has been practically completed. Several other structures of moderate dimensions have also been renewed.

Satisfactory progress has been made with the programme for eliminating several railway-crossing on main highways in this district.

Improvements on the main highway from Reefton towards Lewis Pass have progressed, but owing to severe flood damage on this road the construction organization has been engaged on the necessary repairs.

A deviation has been commenced at Ross in order to improve the alignment of the State highway, and the widening of the narrow section through Hari Hari has been practically completed in readiness for metalling.

On the Christchurch - Kumara Junction State highway heavy flood damage occurred, including a large slip in the Otira Gorge.

Canterbury District.

In the northern portion of this district the arterial highway adjacent to the South Island Main Trunk railway, now under construction, has been improved in conjunction with the railway operations, especially where the road is affected to some extent by the railway work. General improvement work has also been in progress on other parts of the State highway in Waipara and Cheviot Counties. On the inland route between Kaikoura and Waipara the Conway River Bridge has been completed and a commencement made with the Weka Pass Deviation.

On the State highway from Christchurch to the West Coast district sealing has been extended, and the widening of the Porter's Pass section has been in hand. Progress has also been made with the bridging of a number of waterways on this route where open crossings have caused interruptions and delays to traffic after heavy rain.

The Summit highway along the Port Hills from Evans Pass to Dyer's Pass has been sealed. Further work has been carried out on the construction of retaining-walls between Evans Pass and Lyttelton, while general widening has been in progress on the Lyttelton - Governor's Bay section.

Sealing has been extended on the Christchurch-Akaroa main highway, and further reconstruction has been in hand in preparation for continuing the paving in due course.

Satisfactory progress has been made with the construction of the Rangitata Deviation, including the erection of the bridge over the north branch of the Rangitata River.

In the last report it was stated that a contract had been let for building a traffic bridge approximately 6,000 ft. long across the Rakaia River, and during the past year very satisfactory progress has been made. It is anticipated that by the end of the current year the new structure will be practically completed.

Except for bridging in hand, the reconstruction and sealing of the arterial highway in the Waimate County has been completed. Also on the State highway from Timaru to Fairlie reconstruction and paving has been extended. Further bridging has been carried out on the Pukaki-Hermitage main highway.

Dunedin District.

The dustless paving of unsealed sections between Oamaru and Dunedin has been completed, and progress has been made with the extension of similar work in other parts of the district.

South of Dunedin reconstruction of the State highway towards Invercargill was continued and dustless surfacing placed on a further length beyond Milton.

On the Milton-Queenstown State highway widening and general realignment have been continued on the Manuka Gorge section. The improvement and sealing of the length through the Cromwell Gorge have been completed, and the construction organization has been transferred to the Kawarau Gorge for widening that portion.

Improvements have also been in progress on the Lindis-Tarras section of State highway.

In the immediate vicinity of Dunedin reconstruction has been in hand on the Dunedin-Duke's Road highway and on the Dunedin-Waitati via Leith Valley highway. When completed the latter will provide an alternative route to the north from Dunedin City. The reconstruction and paving of the Green Island - Brighton section have been completed, thus affording much improved access to the seaside resort at Brighton. Progress has also been made with the reconstruction and paving of the Mosgiel-Middlemarch main highway in the Taieri County.

The programme for eliminating level railway-crossings has been well advanced, and a number of bridges have been renewed on main highways throughout this district.

Southland District.

Satisfactory progress has been made with the reconstruction and general improvement of State highways in this district. On the Dunedin-Gore section construction of the deviation between Pukerau and McNab, to eliminate flooding, has been continued. On the Gore-Invercargill section reconstruction has been advanced sufficiently to enable a priming coat to be laid from Kennington to Dacre, and the paving of this length will be taken in hand during the current year. Reconstruction of the Invercargill-Bluff State highway has been continued, and it is anticipated that a section of this arterial road will be paved during the current year. General improvements and realignment have been in hand on the length between Dipton and Lumsden, on the Invercargill-Queenstown State highway.

Construction of the new highway from Te Anau to Milford Sound has been continued, and particulars are given in the detailed progress report. New formation has been extended on both the Milford Sound and Hollyford sections, while the bottom heading of the tunnel through the Homer Saddle has been pushed forward.

BRIDGES.

During the past year 124 bridges were completed, the total length being 11,106 ft., and a large number are at present under construction.

The Board is still faced with the problem of urgent bridge-renewals, which has been accentuated to some extent by the continued increase in traffic. The rate of progress depends, firstly, on the preparation of detailed designs and specifications and, secondly, on the availability of materials. In the matter of design it may be explained that the Public Works Department's staff is working under great pressure and additional qualified staff cannot be procured. With regard to materials, delays have been experienced in connection with the delivery of steel, but it is hoped that the position in this respect will improve.

The standard bridge width for important highways is 24 ft., and only under exceptional circumstances, where traffic is relatively low and likely to remain so, is any modification of this standard entertained. The usual practice is to provide footways in addition to the 24 ft. roadway where local circumstances require special accommodation for pedestrian traffic.

In order to further assist local authorities in the early replacement of old bridges on main highways under their control it was decided to increase the subsidy for highway bridging from £2 for £1 to £3 for £1. This higher rate applies to work carried out subsequent to the 31st March, 1938.

In the last report a description was given of several major bridge works for which contracts had been arranged, and the position regarding those and other structures is shown in the progress report.

ELIMINATION OF LEVEL CROSSINGS.

During the past year almost £300,000 was expended on the elimination of dangerous level railway-crossings on main highways, bringing the total amount spent by the Board to £400,000 since the present major programme was commenced some two years ago.

The following summary shows the position of this programme as at the end of the last financial year compared with the schedule which appeared in the previous annual report:—

	As at 31st March, 1938.	As at 31st March, 1937.
Work completed	50 crossings.	15 crossings.
Contracts let and/or work in hand	56 „	67 „
Proposals completed	5 „	7 „
Proposals in hand	42 „	57 „
Surveys, &c., in hand	38 „	36 „
Investigated and deferred meantime	28 „	18 „
	219	200

As explained in the last report, those cases where proposals have been deferred in the meantime generally relate to crossings in boroughs, townships, and other closely built-up areas where interference with property would involve costly schemes. In these localities traffic speeds are usually restricted, thereby minimizing danger to some extent, and automatic warning-devices have been installed. This arrangement allows of immediate attention being concentrated upon dangerous crossings on trunk routes in rural areas where expenditure can be applied towards securing the immediate elimination of a greater number of level crossings. When in due course the rural elimination projects are well advanced, further consideration can be given to closely investigating proposals for dealing with open crossings in built-up localities.

Details regarding operations carried out last year are shown in the progress report.

The following is a description of a number of typical elimination schemes:—

Hopu Hopu.—This crossing, on the Auckland-Hamilton State highway, was eliminated by the construction of an overbridge. The bridge is 108 ft. long, made up of two spans of 54 ft. each, and has pile foundations with heavy wingwalls so that approach fillings would be kept clear of the space required for the railway. A curve of 12 chains radius is built into the bridge.

Tirau.—This crossing, located on the Hamilton-Rotorua State highway, was characterized by the railway being on a curve with visibility to road traffic restricted by a curve and a grade in the highway. A subway for road traffic has been constructed, the railway being carried on 55 ft. plate girders on a skew of 34°. The road has been realigned and regraded to give approaches to the subway.

Koutu.—This level crossing at Rotorua, also on the Hamilton-Rotorua State highway, is being dealt with by the erection of an overbridge 121 ft. in length, comprising three simple spans of 40 ft., 41 ft., and 40 ft. respectively. The bridge, which has spread footings, provides a roadway 24 ft. wide and is located on a skew of 49½° to the railway.

Puha.—At this locality the highway formerly crossed the railway twice within a distance of half a mile, and although the road and rail traffic are not of high intensity there was a particularly dangerous feature in that the railway is in a block cutting adjacent to one of the crossings.

The highway has been deviated and kept on the western side, thus eliminating two crossings.

Mangamania.—This crossing, on the Palmerston North-Napier State highway, is being eliminated by the erection of an overbridge 120 ft. in length and consisting of three 40 ft. simple spans with a 24 ft. roadway. The structure is supported by reinforced-concrete columns on footings and has a skew of 53° to the railway.

Short Street.—This crossing is on the Taumarunui—Ongarue main highway in the Taumarunui Borough, and is being dealt with by the construction of a subway under the Main Trunk line and three sidings. The railway is being carried on 40 ft.-plate-girder spans supported by mass concrete abutments at a skew of 79°.

Wellington Road.—This crossing is on the Turakina—Cliff Road main highway in the Marton Borough. Elimination is being effected by lifting the railway so that the road can be lowered to pass through a subway. Work is in progress.

Cliff Road.—This crossing, on the Bulls—Taihape State highway, is being eliminated by the construction of a subway to take road traffic under the Main Trunk railway. The railway is carried on plate girders, which have already been placed in position. Progress on the road deviation is well advanced.

Paraparumu.—This crossing, on the State highway between Wellington and Levin, is being eliminated by an overbridge to carry traffic over the Main Trunk railway. The bridge itself is 130 ft. in length, made up of two end spans each 40 ft. long and one central span 50 ft. long. In addition to a 24 ft. roadway, one 4 ft. footpath is being provided. The structure is on a $7\frac{1}{2}$ chain radius curve and is built on pile foundations.

Tuamarina and Spring Creek.—These two crossings, on the Picton—Christchurch State highway, are being eliminated by the construction of a deviation alongside the railway, involving the erection of a bridge over the Wairau River approximately 1,000 ft. in length. A commencement has been made with the deviation, and plans of the river bridge are in hand.

Prebbleton.—This crossing, on the Sockburn—Southbridge—Rakaia Huts main highway, is being eliminated by the construction of an overbridge 260 ft. in length, consisting of four 50 ft. and two 30 ft. spans. A 24 ft. roadway and one footway is provided for, and the structure will be supported on spread footings.

Palmerston.—This crossing is on the Timaru—Dunedin State highway and is being eliminated by an overbridge 200 ft. in length, comprising four 50 ft. spans, with a 24 ft. roadway. The abutments and piers are on footings, and the structure is located on a curve of 12 chains radius.

STATE HIGHWAYS.

The year under review has been marked by much activity on all State highways throughout the Dominion. In the last report reference was made to the fact that the system of arterial highways was not inaugurated until late in the preceding financial year, and, therefore, this present report covers the first complete year of the Board's direct control of the State system.

Perhaps the most important phase of the Board's control has been improving the standard of maintenance on these trunk roads. Special efforts were made to secure uniformity in maintenance standards by the use of mechanical plant and the organization of maintenance staff, and it can be claimed that the general condition of the arterial highways has considerably improved.

In the case of State highways with gravelled surfaces, augmented plant and equipment enabled field officers to organize a regular series of gradings, and smoother travelling conditions have resulted. Where the density of traffic is very high, it is almost impracticable to maintain a continuously good surface, and some form of pavement is the only solution to this difficulty. As a matter of fact, for economic reasons, paving is being expedited where the cost of upkeep of a heavily trafficked macadam road is excessive. It has been found that during those week-ends when an additional public holiday is observed gravelled highways suffer considerable surface damage through the increased traffic which usually occurs. To meet these circumstances special arrangements are generally made to operate maintenance plant.

In the case of State highways with paved surfaces particular attention has been devoted to the proper upkeep of metalled shoulders, so as to protect the edge of the pavement from damage and by the correction of unevenness, not only to afford more comfort to travellers, but also to minimize impact damage.

Some of the pavements which were laid down several years ago have been showing signs of weakness, especially in the foundations, and on the uneven surfaces there has developed a glassy or polished finish. It has been necessary to carry out a considerable amount of top-dressing either by adding a bituminous seal coat with chips of approved size or by applying a bituminous plant-mix; in fact, bituminous smoothing coat work has become a feature in the improving of paved surfaces in the course of maintenance activities.

Where the width of existing pavement was found to be inadequate for traffic conditions, the shoulder formation has been suitably strengthened by the addition of metal, and extra pavement constructed.

In districts where pavements were constructed twenty years or so ago when dustless paving in New Zealand was in its infancy, the standard has become obsolescent and quite incapable of catering for present-day requirements. It was not possible to modernize these sections by building up the pavement, because in most instances the foundations showed signs of weakness or the alignment and grading demanded correction so as to conform to present standards of visibility. During the past year the entire reconstruction of this class of road has been commenced, and already a substantial amount has been practically completed except for the final paving, which can only be done during the summer months. It is intended to continue a steady programme of this work, and prior attention will be given to the most urgent sections.

On some of the State highways which were taken over by the Board there were indications that minor maintenance items had not received sufficient attention in the past. Water-tables had become overgrown and culverts had become partially or totally blocked, with the result that, in wet weather, damage occurred which could have been prevented. Regular maintenance operations have practically remedied these circumstances.

From its inception the Board has stressed the importance of bridge-maintenance and has impressed upon road-controlling authorities the urgent necessity for proper and regular inspections. Endeavours have been made to institute periodical inspections of structures so that small matters of maintenance could be attended to at little cost and the life of the bridge utilized to the full. It was generally found that where bridge-maintenance was neglected for a number of years the time came when costly major repairs were needed or a complete renewal became necessary earlier than was justified. Many controlling bodies recognized the wisdom of constant bridge-maintenance, but others did not appear to fully appreciate the position. During the past year particular attention was given to the reconditioning of bridges on State highways, and the following table gives some idea of the work carried out:—

Running planks added to full deck width on	200	bridges.
Wing or approach fences erected to give added safety on	160	„
Handrails repaired on	167	„
Structural repairs effected on	111	„
Painting carried out on	311	„

The structures which appeared to be most neglected were those built of steel or timber, although some concrete bridges were also included.

Throughout the past year the reconstruction of bridges on State highways has continued. A number of important structures were completed, and generally good progress was made with others in course of erection. A large number of single-way bridges still remain on the State highways system, and on heavily-trafficked sections they create dangers which must be removed as early as possible. Special attention is being given to this class of work, and every effort is being made to expedite replacement according to the order of urgency.

Further advance has been made in the direction of providing all-weather connections on State highways. In some localities low-lying sections are subject to flooding and after heavy rain traffic becomes blocked. In dealing with these sections it is usual, when preparing remedial measures, to investigate possible improvements to alignment, &c., so as to secure the maximum benefit. In some cases, deviations have been constructed on higher ground with considerable improvement in curvature, and in others additional filling has been placed to raise the road above flood level.

The continuation of dustless surfacing has proceeded, and during the past year a number of uncompleted gaps have been paved. Between Wellington and New Plymouth there is now a continuous pavement, although some of the paving laid down prior to the advent of the main highways system is undergoing reconstruction. With the exception of the Rangitata Deviation, which is well on towards completion, there is also a continuous paved surface on the State highway from Christchurch to Dunedin.

Paving has been extended in many other districts, the general policy being to continue outwards from centres of population. Owing, however, to the growing necessity for dustless surfacing on the arterial highways it is proposed to give early attention to the sealing of lengths in rural districts which do not require very much reconstruction. This will afford a certain amount of immediate benefit pending the completion of improvements where heavy reconstruction must be carried out before paving is attempted.

TRAFFIC CENSUS.

Last year it was reported that arrangements had been made for taking another census of traffic throughout the main highways system during the year 1937–38, and the opinion was expressed that the results would show substantial increases in many localities.

The census was taken at 444 tally-points for a complete week during the months of August, 1937, and January, 1938, respectively, these periods having been selected to obtain information relative to winter and summer conditions. At the more important stations records were kept throughout twenty-four hours each day, and at the less important stations for sixteen hours each day.

The results revealed an extraordinary increase in traffic volume when compared with the last census taken three years ago. The general conclusion may be stated as representing an increase of approximately 46·4 per cent., although in a few cases the volume of motor traffic increased by as much as 300 per cent. and 350 per cent. One locality showed an increase of 1,000 per cent., but this appears to be due to the fact that a connection between two highways had been established since the previous census where formerly both roads ran to a dead end.

The object of the census was to secure reliable information relative to the trend of developments in motor traffic so as to assist the Board in formulating proposals for highway improvements. It is obvious that in considering reconstruction schemes every possible provision must be made for the rapid rate of traffic growth, taking into account the finances available, otherwise the standard of construction will become inadequate within a comparatively short period.

In view of the traffic figures disclosed by the census it is apparent that the occasional criticism of the Board's improvement works cannot be sustained on the grounds that they provide a standard in excess of requirements. On the contrary, the facts merely point to the justification for adopting standards which make reasonable provision for present and prospective traffic development.

In order that the position may be readily appreciated, the following tabulation has been prepared showing the comparison between the former traffic census and that taken recently:—

Tally-point.	Traffic towards.	Average Daily Number of Motor-vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 1 District: North Auckland.</i>			
Awanui	Kaitaia	282	326
"	Kaiangaroa .. .. .	..	157
"	Waipapakauri	231	298
Kaitaia	Mangamuka	342	299
"	Awanui	280	299
"	Ahipara	99	86
Wainui Junction	"	64	74
"	Kaitaia	83	102
"	Herekino	30	42
Pamapurua Hill	Mangamuka	120	188
"	Mangonui	66	113
"	Kaitaia	162	212
Morts Bridge (Junction M.H.s 308 and 518)	Kaeo	47	54
"	Kaitaia	52	44
"	Mangonui	73	62
Junction M.H.s 308 and 306	"	56	70
"	Totara	80	57
"	Kaeo .. .. .	..	79
Junction M.H.s 308 and 6 (near Kaeo)	"	212	150
"	Whangaroa	70	84
"	Mangonui .. .. .	..	97
Kohukohu	Rangiahua	90	98
"	Rawene	100	71
"	Kaitaia .. .. .	..	90
Mohuiti Junction	Broadwood .. .. .	..	39
"	Kohukohu	113	49
"	Tutekehua	84	60
Horeke Road Junction and M.H. 1	Rangiahua .. .. .	..	119
"	Okaihau .. .. .	..	105
Kohukohu (M.H. 481)	In Kohukohu Township	130	175
Oue Junction	Kaikohe	71	77
"	Waimamaku	107	83
"	Rawene	116	100
Waimate Road Junction M.H.s 7 and 308	Kaeo	81	90
"	Okaihau	63	131
"	Ohaeawai	123	206
Ohaeawai Post-office	Kaikohe	169	215
"	Pakaraka	193	230
"	Waimate .. .. .	..	229
Otiria	Otiria Station Road	71	124
"	Pakaraka	165	232
"	Kawakawa	201	328
Junction M.H.s 5 and 483	Kaikohe .. .. .	..	152
"	Donnelly's	50	55
"	Taheke .. .. .	..	106
Te Pua	Ohaeawai .. .. .	..	203
"	Okaihau .. .. .	..	73
"	Kaikohe .. .. .	..	258
Kaikohe	Mangakahia .. .. .	..	196
"	Ohaeawai .. .. .	..	422
"	Kaikohe Township (M.H. 5) .. .. .	..	561
Waipoua Forest	Waipoua Forest	89	84
Whakapara	Russell	55	54
"	Ohaeawai	135	228
"	Hikurangi	150	200
Parakao	Kirikopuni	18	45
"	Maungatapere	59	75
"	Kaikohe	58	90
Kaihu	Waipoua Forest Road	58	87

Tally-point.	Traffic towards	Average Daily Number of Motor-vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 1 District : North Auckland—continued.</i>			
Kirikopuni	Whangarei	109	117
"	Dargaville	131	156
"	Parakao	56	92
Tangowahine Junction M.H.s 7 and 392	Dargaville	190	228
"	Whangarei	135	144
"	Tangowahine Valley M.H.	54	59
Dargaville	Mamaramui .. .. .	..	135
"	Bayley's Coast M.H.	119	152
Aratapu	Aratapu M.H.	270	381
Mititai	Ruawai	117	212
"	Maungonui Bridge (Upper)	61	104
"	Dargaville	153	282
Kamo	Hikurangi	401	753
"	Whangarei	519	908
"	Purua	127	142
Whangarei	Kiripaka	229	203
"	Whareora	129	135
Junction M.H. 301 and Onerahi Road	Tamaterau	142	149
"	Whangarei	177	160
Maungatapere	"	202	287
"	Kaikohe	129	149
"	Tangiteroria	109	158
Oakleigh	Long's Corner - Tauraroa M.H.	50	70
"	Waipu	184	388
"	Whangarei	197	453
"	"	198	391
Waipu	Maungaturoto	282	430
"	Ruawai .. .. .	..	209
Junction M.H.s 9 and 391	Paparoa	20	50
"	Dargaville	348	264
Paparoa	Paparoa Railway-station .. .. .	..	46
"	Oakleigh .. .. .	..	50
"	Paparoa Post-office .. .. .	..	97
Junction M.H. 1 and Doctor's Hill Road	Maungaturoto	198	392
"	Wellsford .. .. .	..	503
Maungaturoto Railway-station	Maungaturoto	190	259
"	Paparoa	182	248
"	Whakapirau	81	107
Wellsford	Whangaripo	118	184
"	Port Albert	104	180
"	Maungaturoto	204	486
"	Warkworth	183	356
"	Wharehine	51	47
Tauhoa	Kaipara Flats	32	33
"	Glorit	51	50
"	Tauhoa	60	103
Dome Valley (Junction M.H.s 1 and 12)	Warkworth .. .. .	..	452
"	Maungaturoto	255	364
Warkworth .. .. .	" .. .. .	..	490
"	Leigh	201	213
"	Waiwera	355	727
"	Kawakawa	453	470
Hikurangi	Whangarei	386	577
"	Marua	135	156
"	Moerewa .. .. .	..	236
Kaeo Road Junction and M.H. 7	Kaeo .. .. .	..	55
Junction M.H. 308 and Pakaraka Road	Ohaeawai .. .. .	..	30
"	Kaiwaka .. .. .	..	26
Junction M.H. 80 and Waipu Gorge Road	Mangawai	30	64
"	Auckland .. .. .	..	443
Waiwera	Helensville .. .. .	..	60
"	Maungaturoto .. .. .	..	451

Tally-point.	Traffic towards.	Average Daily Number of Motor-vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 2 District: Auckland.</i>			
Kaukapakapa	Helensville	148	212
"	Waiwera	117	195
"	Port Albert	157	210
Helensville	Auckland	227	336
"	Kaukapakapa .. .. .	..	520
"	Parkhurst	292	369
Junction M.H.s 1 and 476 near Silverdale	Auckland .. .. .	..	607
"	Maungaturoto	399	557
"	Kaukapakapa	110	58
Junction M.H.s 1 and 14 near Pukeatua	Auckland	381	575
"	Maungaturoto	376	594
"	Kumeu	76	134
Kumeu	Auckland	322	492
"	Helensville	338	534
"	Henderson	116	132
Junction M.H.s 13 and 494	Auckland .. .. .	..	602
"	Helensville .. .. .	..	481
"	Hobsonville .. .. .	..	171
Henderson	Auckland	952	1,423
"	Helensville	457	872
"	Kumeu	479	450
Mangere Bridge (south end)	Papatoetoe	1,104	1,762
Tamaki Bridge, Otahuhu	"	2,698	4,217
Panmure Bridge (west end)	Howick	1,000	1,257
Manurewa (Junction M.H.s 1 and 407)	Alfriston	176	239
"	Auckland	1,986	3,202
"	Papakura	1,879	3,030
Papakura	Clevedon	399	453
"	Hunua	300	279
"	Auckland .. .. .	..	572
Drury	Pokeno	936	1,778
"	Papakura	1,261	2,261
"	Pukekohe	391	579
"	Papakura	238	282
Hingaia Bridge	Kingseat	170	227
Titi	Puni .. .. .	..	147
"	Patumahoe	108	135
"	Waiuku	167	222
Junction M.H. 403 and Harrisville Road	Bombay	518	312
"	Pukekohe	528	256
Pokeno	Bombay	824	1,524
"	Paeroa	268	450
"	Mercer	697	1,324
Tuakau Bridge	Tuakau	239	340
"	Port Waikato	61	90
"	Pukekawa	119	178
"	Onewhero	77	108
Waerenga	Pokeno	174	271
"	Te Kauwhata	21	18
"	Paeroa	213	279
Waitakaruru	Dalgety's Corner .. .. .	..	470
Pipiroa	Waitakaruru	254	377
"	Ngatea	200	323
"	Kopu	80	113
Kopu	Paeroa	272	408
"	Thames	503	749
"	Pokeno	354	462
Tapu	Coroglen	52	66
"	Coromandel	77	112
"	Thames	125	162
Junction M.H.s 15 and 315, near Netherton	Turua	106	134
"	Ngatea	189	295
"	Paeroa	271	407
Mackaytown	Waihi	326	453

Tally-point.	Traffic towards.	Average Daily Number of Motor-vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 2 District: Auckland—continued.</i>			
Junction M.H.s 15 and 465 (Waihi)	Waihi	185	520
"	Tauranga	297	302
"	Waihi Beach Road	..	296
Mangaiti	Paeroa	270	505
Ohinewai	Tahuna	124	202
"	Pokeno	675	1,342
"	Ngaruawahia	660	1,329
Tahuna	Ngatea	74	143
"	Morrinsville	135	221
"	Ohinewai	149	269
Ngaruawahia	"	..	308
"	Waingaro	235	240
Horotiu	Hamilton	859	1,601
"	Ngaruawahia	848	1,598
Junction M.H.s 447 and 493	Morrinsville	..	312
"	Tahuna	200	242
"	Taupiri	..	78
Waitoa	Te Aroha	460	816
"	Morrinsville	506	838
"	Taupo	135	370
Waharoa	Matamata	318	560
"	Te Aroha	187	220
"	Morrinsville	..	396
Junction M.H.s 17 and 18	Cambridge	895	1,253
"	Morrinsville	480	989
"	Hamilton	1,204	2,218
Whatawhata	"	231	390
"	Pirongia	..	102
"	Raglan	199	307
Ohaupo	Te Awamutu	404	796
Karapiro Factory (M.H. 18)	Tirau	290	758
"	Cambridge	316	825
Junction M.H.s 19 and 312, near Hinuera	Te Poi	150	147
"	Hinuera	..	152
"	Matamata	300	330
"	Tirau	..	337
Tirau	Morrinsville	..	296
"	Putaruru	226	810
"	Cambridge	378	555
Railway-crossing south of Putaruru	Taupo	150	290
Pirongia	Te Awamutu	62	127
"	Otorohanga	126	195
"	Frankton	132	119
"	Cambridge	204	299
Junction M.H. 319 and Te Rahu Road	Te Awamutu	307	453
"	Arapuni	140	243
Junction M.H. 314 and Brotherhood Road	Kihikihi	134	242
"	Te Awamutu	329	657
Junction M.H.s 1 and 21	Hangatiki	289	674
"	Te Kawa	65	193
"	Wharepuhunga	48	110

No. 3 District: Tauranga.

Aongatete	Tauranga	..	242
Cambridge Road (M.H. 15, near Tauranga)	"	300	472
Barke's Corner	"	186	296
"	Rotorua	66	97
"	Ruahiri	120	417
Mangorewa Gorge	Tauranga	..	72
Junction M.H.s 18 and 324	Hamilton	..	392
"	Mamaku	33	74
"	Rotorua	..	439
Ngongotaha	"	..	1,197

Tally-point.	Traffic towards	Average Daily Number of Motor-vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 3 District : Tauranga—continued.</i>			
Rotorua (Junction M.H.s 18 and 535)	Rotorua	..	471
"	Taupo	..	322
"	Atiamuri	..	163
Junction M.H.s 19 and 535	Taupo	..	137
"	Rotorua	..	62
"	Waitoa	..	51
Boundary, Rotorua and Taupo Counties on M.H. 18	Wairakei	..	150
Junction M.H.s 18 and 19	Rotorua	..	199
"	Waitoa	..	70
"	Taupo	..	237
Junction M.H.s 18 and 328	"	..	212
"	National Park	..	309
"	Napier	..	178
Junction M.H.s 328 and 329	Taupo	..	113
"	National Park	..	87
"	Tokaanu	..	148
"	Tauranga	..	112
Hairini Bridge (near Tauranga)	"	..	97
M.H. 15 (north of M.H. 327)	Tauranga	..	436
"	"	..	576
"	Whakatane	..	464
Paengaroa	Rotorua	..	629
"	Whakatane	..	106
"	Te Puke	..	175
Te Ngae	Tauranga	..	139
"	Whakatane	..	243
"	Rotorua	..	412
Matata	Tauranga	..	171
"	Te Ngae	..	254
"	Whakatane	..	190
Junction M.H.s 15 and 24	Rotorua	..	317
"	Tauranga	..	336
"	Whakatane	..	493
"	Rotorua	..	123
Junction Wainui and Ohope Beach Roads	Tauranga	..	341
"	Whakatane	..	47
"	Wainui	..	172
"	Whakatane	..	814
Taneatua Township	Rotorua	..	1,128
Waimana Turnoff-Ruddick's Road	Tauranga	..	715
Waiotahi Bridge	Whakatane	..	435
South of Opotiki on M.H. 323	Whakatane	..	482
Junction M.H.s 15 and 26 (Waiau Bridge)	Whakatane	..	173
"	Wainui	..	361
"	Whakatane	..	23
"	Whakatane	..	269
"	Whakatane	..	395
"	Waimana	..	184
"	Waimana	..	252
"	Opotiki	..	185
"	Opotiki	..	262
"	Waioeka Gorge	..	56
"	Waioeka Gorge	..	65
"	Motu	..	36
"	Motu	..	56
"	Te Kaha	..	60
"	Te Kaha	..	94

No. 4 District : Gisborne.

Junction M.H.s 26 and 335	Te Araroa	..	29	45
"	Taurangakautuku	..	24	22
"	Gisborne	..	31	47
Te Puia	Waipiro Bay	..	48	57
"	Ruatoria	..	92	102
"	Tokomaru Bay	..	117	142
Mangatuna	"	..	..	142
Tolaga Bay	"	..	256	317
"	Gisborne	..	200	245
"	Tauwhareparae	..	126	161
M.H. 26 (4-mile peg)	Gisborne	..	310	510
Matawai	Motu	..	66	120
"	Puha	..	90	117
"	Koranga	..	96	68
Puha	Whatatutu	..	70	106
"	Matawai	..	..	152
"	Te Karaka	..	..	183
Kaiteratahi Bridge	"	..	..	298

Tally-point.	Traffic towards	Average Daily Number of Motor-vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 4 District: Gisborne—continued.</i>			
Quirk's Corner (Junction M. H.s 15 and 330) ..	Gisborne	265	391
.. .. .	Opotiki	320	445
.. .. .	Waiohika	102	122
Makaraka	Gisborne .. .. .	..	1,227
.. .. .	Wairoa .. .. .	..	834
.. .. .	Opotiki .. .. .	..	433
Junction M.H.s 27 and 331	Gisborne	309	411
.. .. .	Wairoa	335	221
.. .. .	Patutahi .. .. .	..	195
Junction Rere and Brunton Roads (M.H. 331)	Rere .. .. .	..	112
.. .. .	Patutahi .. .. .	..	46
Manutuke	Gisborne .. .. .	..	410
.. .. .	Wairoa .. .. .	..	354
.. .. .	Waingaki .. .. .	..	133
North of Tarewa (M.H. 15)	Gisborne	89	109
M.H. 27 (36-mile peg) .. .. .	.. .. .	22	51

No. 5 District: Napier.

Junction Nos. 15 and 523 M.H.s	Gisborne	206	338
.. .. .	Wairoa	191	232
.. .. .	Waikokopu	123	242
Te Reinga	Gisborne	20	40
.. .. .	Wairoa	32	51
.. .. .	Ruakituri	28	35
Frasertown	Gisborne	80	122
.. .. .	Wairoa	219	253
.. .. .	Lake House	180	242
Four miles south of Wairoa (M.H. 15) ..	Wairoa .. .. .	..	232
Kotemaori	Napier	125	172
Eight miles south of Putorino .. .. .	.. .. .	..	172
Tarawera .. .. .	.. .. .	53	70
Junction M.H.s 18 and 15, near Petane ..	Wairoa	240	252
.. .. .	Napier .. .. .	..	275
.. .. .	Eskdale .. .. .	..	54
Petane	Wairoa	354	344
.. .. .	Napier	392	404
.. .. .	Eskdale	137	320
Napier	Clive .. .. .	..	1,592
.. .. .	Westshore	836	1,469
.. .. .	Taradale	1,041	1,002
Clive	Napier	1,399	1,686
.. .. .	Hastings	118	128
.. .. .	Havelock North	1,315	1,655
Near Fernhill (Junction M.H.s 28 and 339) ..	Napier	518	412
.. .. .	Hastings	277	404
.. .. .	Takapau	48	52
Junction M.H.s 15 and 495	Napier .. .. .	..	149
.. .. .	Hastings .. .. .	..	393
.. .. .	Pakowhai .. .. .	..	302
Mangateretere	Napier	1,547	1,789
.. .. .	Hastings .. .. .	..	1,697
.. .. .	Havelock North	159	182
Tukituki	Clive .. .. .	..	362
.. .. .	Haumoana .. .. .	..	202
.. .. .	Te Awhanga .. .. .	..	125
Havelock North	Hastings	1,167	1,214
Pakipaki .. .. .	.. .. .	164	282
.. .. .	Waipawa	582	789
.. .. .	Napier	493	578
Junction M.H.s 31, 28, and 418 .. .. .	.. .. .	..	154
.. .. .	Elsthorpe	45	39
.. .. .	Waimarama	116	128

Tally-point.	Traffic towards	Average Daily Number of Motor-vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 5 District: Napier—continued.</i>			
Tikokino	Fernhill	87	69
"	Takapau	52	25
"	Waipawa	50	52
Waipawa (Junction M.H.s 15 and 33)	Waipukurau	552	665
"	Waipawa	637	793
"	Ongaonga	134	131
Near Moutere	Waipawa-Pourerere M.H.	95	209
Junction M.H.s 15 and 339	Waipukurau .. .. .	..	396
"	Wellington .. .. .	..	339
"	Ongaonga .. .. .	..	97
Wanstead	Waipukurau	128	155
Norsewood	Napier	301	444
"	Wellington	311	401
"	Whetakura	61	63
Matamau	Norsewood	437	462
"	Dannevirke	533	534
"	Waipukurau	107	104
Tahoraiti	Napier	689	879
"	Wellington	605	830
"	Woodville-Tamaki M.H. ..	92	105
Weber	Waipukurau	55	43
"	Dannevirke	79	77
"	Masterton	47	55
Waiohiki Golf Links	Napier .. .. .	..	399
"	Hastings .. .. .	..	326
"	Pakowhai .. .. .	..	266

No. 6 District: King Country.

Hangatiki	Otorohanga	269	437
"	Te Kuiti	269	417
"	East of Hangatiki	76	101
"	Waitomo	111	171
Junction M.H.s 1 and 23	Te Kuiti	247	443
"	Taumarunui	98	152
"	Piopio	198	315
Piopio	Te Kuiti	297	488
"	Mokau	214	361
"	Aria	128	191
"	Mangaohae	123	162
Six miles south of Mahoenui	Awakino .. .. .	..	173
Aria	Mokauiti	44	39
"	Piopio	62	74
"	Matiere	8	37
Tangitu	Waimiha	20	35
"	Taumarunui .. .. .	..	120
"	Te Kuiti .. .. .	..	125
Okahukura	Tangitu	96	210
"	Taumarunui	107	209
"	Ohura	4	7
Taumarunui	Okahukura	130	233
"	National Park .. .. .	..	552
"	Ohura	202	338
Tatu	Stratford	36	41
"	Ohura	46	102
"	Taumarunui	19	32
National Park	"	166	261
"	Taupo	144	227
"	Raetihi	116	192
Junction M.H.s 328 and 456	National Park .. .. .	..	199
"	Chateau .. .. .	..	80
"	Taupo .. .. .	..	160

Tally-point.	Traffic towards	Average Daily Number of Motor-vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 7 District : Stratford.</i>			
Mokau Bridge	New Plymouth	141	241
Between Awakino and Urenui .. .. .	" .. .. .	..	309
Urenui .. .. .	" .. .. .	..	452
Lepperton Junction	Inglewood	159	272
"	Awakino	586	640
"	New Plymouth	536	1,006
New Plymouth	Waitara	88	151
"	Okato	575	779
"	Inglewood .. .. .	..	712
Junction M.H.s 36 and 506	New Plymouth	335	354
"	Ngatimaru M.H.	162	99
Opunake	Opunake	340	331
"	Okato .. .. .	..	405
"	Manaia	178	265
M.H. 36 (south of Pihama)	Kaponga	171	143
Junction M.H.s 36 and 507	Manaia	200	199
"	Hawera	358	560
"	Ohawe-Skeet M.H.	93	116
Junction M.H. 1 and Whareroa Road	Manaia	210	480
"	Hawera	467	478
Egmont Village	Mokoia	455	681
"	Inglewood .. .. .	..	747
"	New Plymouth	717	794
"	Egmont Road (south)	79	84
"	" (north)	79	60
Junction M.H. 37 and Bristol Road	Inglewood	166	202
"	Kaimata	85	260
Tariki	Inglewood	726	892
"	Stratford .. .. .	..	876
Junction M.H. 360 and Cardiff Road	"	58	82
"	Upper Pembroke Road	43	62
Toko	Taumarunui	199	266
"	Toko M.H.	65	81
"	Stratford .. .. .	..	309
South of Stratford (M.H. 1)	"	726	894
"	Eltham .. .. .	..	899
Junction M.H.s 41 and 79	North of junction	52	81
"	Kaponga	75	87
"	Stratford	72	84
M.H. 39 (between Eltham and Kaponga)	Eltham	251	351
"	Kaponga	249	320
Ngaere	East of Ngaere	109	56
"	Eltham	116	72
Junction M.H.s 1 and 429	South of junction	503	668
"	North of junction	556	662
Junction M.H.s 41 and 359	Auroa	172	167
"	Manaia	185	150
"	Matapu	154	162
"	Kaponga	162	176
Okaiawa	Skeet	223	306
"	Normanby	286	400
"	Ohawe	210	285
"	Manaia	204	262
Whangamomona	Strathmore	64	196

No. 8 District : Wanganui.

Junction M.H.s 1 and 44	Kaharoa M.H.	142	153
"	Patea	423	559
"	Waverley	359	524
Junction M.H.s 1 and 475	Wanganui .. .. .	..	507
"	Waitotara Valley	40	50
"	Waverley .. .. .	..	534

Tally-point.	Traffic towards	Average Daily Number of Motor-vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 8 District : Wanganui—continued.</i>			
Westmere	Wanganui	563	1,013
"	Waverley .. .. .	..	888
"	Cheal M.H.	100	208
Junction M.H.s 365 and 430	Westmere	156	181
"	Wanganui	234	250
"	Waitotara	163	165
Junction M.H.s 23 and 48	Ohakune	38	108
"	Raetihi	66	224
"	Horopito	52	184
Raetihi	Ohakune	118	374
"	Pipiriki	50	570
"	Wanganui	69	223
"	Horopito	66	230
Waiouru	Ohakune .. .. .	..	97
"	Taihape .. .. .	..	105
Junction M.H.s 23 and 51	Napier .. .. .	..	104
"	Taihape	175	216
"	Waiouru .. .. .	..	118
Junction M.H. 23 and Otara Road	Mangaweka .. .. .	..	140
"	Ohingaiti .. .. .	..	179
"	Otara M.H. .. .. .	..	60
M.H. 48 (north of junction with M.H. 550)	Wanganui .. .. .	..	228
"	Raetihi .. .. .	..	191
"	Wanganui River (Right Bank) M.H. .. .. .	..	55
Fordell	Wanganui	120	254
"	Hunterville	122	300
Turakina	Marton	185	296
"	Bulls	375	600
"	Wanganui	544	923
Norwood Corner	Hunterville	181	299
"	Wanganui	65	154
"	Greatford	135	167
Junction M.H. 366 and Makirikiri Road	Marton .. .. .	..	219
"	Greatford	223	222
Bulls	Sanson	577	1,159
"	Feilding	328	635
"	Wanganui	552	900
Greatford	Hunterville	300	434
"	Feilding	71	142
"	Bulls .. .. .	..	160
Onepuhi Bridge	Hunterville	50	59
Junction M.H. 23 and Kawhatau Road	Mangaweka .. .. .	..	157
"	Taihape .. .. .	..	206

No. 9 District : Wellington West.

Junction M.H.s 52 and 53	Rangiwahia	65	74
"	Kimbolton	130	160
"	Apiti	77	106
Junction M.H.s 54 and 377	Hunterville	77	122
"	Stanway	115	139
"	Feilding	137	156
Raumai (Junction M.H. 438)	"	30	50
"	Ashhurst	121	201
"	Pohangina	69	193
Raumai (Junction M.H. 439)	Ashhurst	129	195
"	Pohangina .. .. .	..	102
"	Apiti	100	128
Ashhurst	Pohangina	338	445
"	Feilding	167	236
"	Palmerston North	320	421

Tally-point.	Traffic towards	Average Daily Number of Motor- vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 9 District : Wellington West—continued.</i>			
Junction M.H.s 55 and 58..	Woodville ..	592	881
" ..	Palmerston North ..	609	745
" ..	Ashhurst ..	162	160
Bunnythorpe ..	Feilding ..	545	968
" ..	Palmerston North ..	520	932
" ..	Ashhurst ..	162	313
Junction M.H.s 52 and 56..	Awahuri ..	..	195
" ..	Feilding ..	..	383
" ..	Stewarts' Line M.H. ..	138	202
Awahuri ..	Palmerston North ..	236	336
" ..	Rangiotu ..	136	212
" ..	Tangimoana ..	260	367
Junction M.H.s 57 and 376	Kairanga ..	..	212
" ..	Awahuri ..	611	979
" ..	Palmerston North ..	..	1,336
" ..	Bunnythorpe ..	262	351
Longburn ..	Rongotea ..	101	66
" ..	Himatangi ..	784	1,375
" ..	Palmerston North ..	792	1,198
Makerua ..	" ..	..	258
" ..	Shannon ..	..	175
Ihakara Hill ..	Levin ..	..	236
Junction M.H.s 1 and 473..	Koputaroa ..	29	36
" ..	Foxton ..	453	729
" ..	Levin ..	435	714
Manakau ..	Otaki ..	500	915
Waikanae ..	Paekakariki ..	576	910
" ..	Manakau ..	571	925
" ..	Reikorangi ..	139	218
Paekakariki ..	Paremata ..	..	878
" ..	Waikanae ..	..	914
Paremata ..	Porirua ..	..	1,373
" ..	Paekakariki ..	..	1,096
" ..	Plimmerton ..	..	442
Porirua ..	Wellington ..	959	1,854
" ..	Paremata ..	..	1,584
" ..	Titahi Bay ..	291	595
Silverstream Railway Bridge	Upper Hutt ..	1,168	1,842
Brown Owl ..	Kaitoke ..	800	687
" ..	Akatarawa ..	100	292
" ..	Upper Hutt ..	..	947
Pakuratahi Bridge (Kaitoke)	Rimutaka Hill Road ..	349	582
Sanson ..	Foxton ..	..	374
" ..	Palmerston North ..	459	734
" ..	Bulls ..	585	916
Himatangi ..	Foxton ..	506	915
" ..	Sanson ..	209	404
" ..	Palmerston North ..	360	654

No. 10 District : Wellington East.

Junction M.H.s 15 and 61..	Pongaroa ..	93	222
" ..	Woodville ..	461	752
" ..	Pahiatua ..	503	814
Makuri ..	Akitio ..	..	61
" ..	Pahiatua ..	..	65
" ..	Coonoor ..	10	32
Pongaroa ..	Weber ..	136	112
" ..	Akitio ..	87	62
" ..	Pahiatua ..	95	55
" ..	Masterton ..	107	76

Tally-point.	Traffic towards	Average Daily Number of Motor-vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 10 District: Wellington East—continued.</i>			
Nireaha Road, Newman	Eketahuna	244	458
Alfredton	Pahiatua	248	441
.. .. .	Masterton	36	50
.. .. .	Eketahuna	44	48
.. .. .	Tiraumea	70	84
Junction M.H.s 443 and 87	Mauriceville	39	71
.. .. .	North of Junction	40	39
.. .. .	East of Junction	32	39
Opaki	Eketahuna	271	410
.. .. .	Masterton	395	589
Tinui .. .. .	.. .. .	54	109
.. .. .	Castlepoint	40	73
Junction M.H.s 63 and 441	Bideford	60	43
.. .. .	Alfredton	40	45
.. .. .	Masterton	99	85
Junction M.H.s 64 and 65	Te Oreore	206	307
.. .. .	Tinui	136	219
.. .. .	Weraiti	79	110
Junction M.H.s 15 and 558	Masterton	742	1,072
.. .. .	Carterton .. .. .	..	1,109
.. .. .	Chester M.H. .. .. .	..	112
Junction M.H.s 66 and 67	Masterton	36	137
.. .. .	Westmere	38	55
.. .. .	Gladstone	80	134
Junction M.H.s 68 and 69	Carterton	83	136
.. .. .	Gladstone	67	145
.. .. .	Longbush	60	93
Greytown	Martinborough	301	330
.. .. .	Featherston	507	687
.. .. .	Carterton	771	994
Junction M.H.s 73 and 77	Kahautara	165	213
.. .. .	Martinborough	175	194
.. .. .	Featherston	258	314
Junction M.H.s 70 and 77	Greytown	144	157
.. .. .	Featherston	261	232
.. .. .	Martinborough	299	305
Junction M.H.s 71 and 72	Pirinoa	205	188
.. .. .	Martinborough	309	283
.. .. .	East Coast	146	119
Pope's Head	Martinborough	47	35
.. .. .	Hinakura	39	38
Junction M.H.s 72 and 73	Featherston	102	100
.. .. .	Martinborough	69	86
.. .. .	Pirinoa	112	221
Ngawapurua Bridge	Bridge across Manawatu River	310	576
Junction M.H.s 63 and 87	North of Junction .. .. .	..	32
.. .. .	South of Junction .. .. .	..	13
.. .. .	West of Junction .. .. .	..	31

No. 11 District: Nelson.

Fisher's Creek (Junction M.H.s 159 and 103)	Collingwood	162	151
.. .. .	Bainham	105	157
.. .. .	Richmond	64	70
Rockville	Collingwood .. .. .	..	126
Takaka (Junction M.H. 103 and Factory Road) .. .. .	.. .. .	195	240
.. .. .	Richmond	212	269
Takaka (Junction M.H. 154 and Factory Road)	Terakohe	87	223
.. .. .	Takaka	144	189
Junction M.H.s 103 and 601	Collingwood	205	175
.. .. .	Richmond	170	152
.. .. .	East Takaka	65	108

Tally-point.	Traffic towards	Average Daily Number of Motor-vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 11 District : Nelson—continued.</i>			
Lindsays	Richmond	52	67
"	Collingwood	44	82
"	Clifton	13	20
Riwaka	Richmond .. .. .	..	403
"	Collingwood .. .. .	..	294
Hau	"	279	330
"	Richmond	189	334
"	Kohatu	106	109
Jubilee Bridge	Collingwood .. .. .	..	347
"	Richmond .. .. .	..	286
"	Appleby	69	82
Motueka (Junction M.H.s 165 and 300)	Motueka .. .. .	..	149
"	Motueka Wharf .. .. .	..	96
"	Queen Victoria Street .. .. .	..	98
Woodstock	Motueka	30	32
"	Kohatu	37	44
"	Wakefield	25	32
Kohatu	Nelson	94	164
"	Hope Junction	97	195
"	Woodstock	59	88
Hope Junction	Nelson	60	96
"	Murchison	73	127
"	Tophouse	28	56
Murchison	Nelson	201	284
"	Inangahua Junction	96	161
"	Reefton	114	122
Tophouse	Hope Junction	33	42
"	Renwicktown	16	25
"	Kohatu	20	27
Mapua	Motueka	119	125
"	Appleby	99	224
Richmond	Nelson	582	918
"	Wakefield	329	534
"	Collingwood	232	482
Stoke	Richmond	1,035	1,478
"	Nelson (via Tahunanui)	422	833
"	Nelson (via Jenkins Hill) .. .. .	..	677
M.H. 102 (1½ miles east of Nelson)	Blenheim	290	385
Near Rai Valley Township	"	131	177
"	Nelson	88	119
Havelock	Blenheim .. .. .	..	173
"	Nelson .. .. .	..	200
"	Picton-Havelock via Grove M.H. .. .. .	..	46
Tuamarina	Picton	164	222
"	Blenheim	204	267
"	Kaituna	51	60
Spring Creek	Picton	270	319
"	Blenheim	307	414
"	Raranga	48	60
Renwicktown	Nelson	158	180
"	Blenheim	253	305
"	Hope Junction	99	92
Junction M.H. 250 and Dog Point Road	Summerlands	47	50
"	Renwicktown	41	44
Junction M.H. 101 and Redwood Pass Road	Blenheim	140	212
"	Seddon	121	145
Dashwood	Blenheim	120	164
"	Seddon	136	164
"	Upcot	31	46
Juntion M.H. 172 and Taylor Pass Road	"	17	16
"	Dashwood	14	18
Ward	Wharanui	95	156
Junction M.H. 658 and New Renwick Road	Blenheim .. .. .	..	188
"	Aerodrome .. .. .	..	87

Tally-point.	Traffic towards	Average Daily Number of Motor-vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 12 District: Greymouth.</i>			
Te Namu	Karamea	64	39
Junction M.H.s 105 and 602	"	27	34
"	Seddonville	46	62
"	Westport	59	64
Granity	Stockton	68	71
"	Westport	118	148
"	Karamea	152	148
Waimangaroa	Westport	132	186
"	Denniston	67	114
"	Karamea	115	178
Inangahua Junction	Reefton	73	144
"	Murchison	75	175
"	Westport	57	118
Junction M.H.s 104 and 166	Inangahua	50	105
"	Westport	115	182
"	Charleston	70	85
Brighton	Greymouth	36	60
Crushington	Reefton	48	105
Blackwater	Waiuta	69	61
"	Reefton	88	102
"	Greymouth	102	119
South of Rapahoe .. .. .	" .. .. .	..	186
Junction M.H.s 101 and 603	Hauptiri	109	66
"	Brunner .. .. .	..	172
"	Blackwater .. .. .	..	129
Dobson	Greymouth .. .. .	..	383
Junction M.H.s 106 and 102 at Kumara	"	105	209
"	Mitchells	79	72
"	Otira	43	187
Dillmanstown	Greymouth .. .. .	..	100
"	Hokitika .. .. .	..	43
Kanieri	Lake Kanieri M.H. .. .. .	..	82
"	Kokatahi .. .. .	..	124
"	Hokitika	150	183
Longford Hotel Junction	Upper Kokatahi	83	96
"	Koiterangi	93	80
"	Kanieri	108	111
Mont D'or	Ross	80	113
Harihari	Wataroa .. .. .	..	74
Waitangi River Bridge .. .. .	" .. .. .	..	58
Junction M.H.s 102 and 604	Waiho	35	39
"	Okarito	7	18
"	Greymouth .. .. .	..	45
North of Otira	Otira	31	61
South of Kanieri	Hokitika	284	186
"	Arthurstown Detour .. .. .	..	60
"	Ross .. .. .	..	199
Kumara Junction	Greymouth .. .. .	..	332
"	Hokitika .. .. .	..	257
"	Otira .. .. .	..	198

No. 13 District: Canterbury North.

Junction M.H.s 101 and 177	Kaikoura	83	203
"	Blenheim	74	191
"	Puhipuhi	13	18
Junction M.H.s 175 and 107	Seddon	13	39
"	Kaikoura	24	8
"	Waiiau	30	40
Junction M.H.s 175 and 101	"	27	53
"	Christchurch	89	187
"	Kaikoura	102	224

Tally-point.	Traffic towards	Average Daily Number of Motor-vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 13 District: Canterbury North—continued.</i>			
Parnassus	Kaikoura	83	181
"	Mackenzie	97	181
"	Waiau .. .. .	..	35
Waiau	Lyndon	59	46
"	Hurunui	97	108
"	Conway	85	67
Red Post Junction	Hurunui	127	230
"	Waiau	80	103
"	Hanmer	63	127
Motunau	Waipara	95	174
"	Scargill	45	64
"	Cheviot	125	213
Waikari	Motunau	52	69
"	Waipara	175	297
"	Hawarden	182	230
"	Waitohi	131	217
Waipara	Waikari	137	259
"	Motunau	161	263
"	Amberley	528	630

No. 14 District: Canterbury Central.

Amberley	Blenheim	528	630
"	Christchurch	423	630
"	Balcairn	194	314
Saltwater Creek	Christchurch	297	630
"	Blenheim	338	572
"	Sefton	53	71
Ashley	Loburn	176	247
"	Sefton	148	172
"	Rangiora	296	351
Half a mile east of Rangiora	Woodend	300	655
Bennetts	Horrelville	66	62
"	Rangiora	68	94
"	Oxford	101	139
Cass	Springfield	10	37
Waddington	Christchurch	141	135
"	Gorge Bridge	45	54
"	Springfield .. .. .	..	82
Junction M.H.s 101 and 141, near Chaney's	Christchurch .. .. .	..	1,749
"	Marshland Road	517	823
"	Kaiapoi	1,530	2,428
Junction M.H.s 101 and 204	Yaldhurst	200	192
"	Kaiapoi	1,101	2,039
"	Papanui	1,501	1,915
Junction M.H.s 204 and 200	Belfast .. .. .	..	107
"	Yaldhurst .. .. .	..	151
"	Christchurch .. .. .	..	102
Yaldhurst	Riccarton .. .. .	..	436
"	Sheffield	60	20
"	Aylesbury .. .. .	..	415
Junction M.H.s 101 and 106 (Church corner)	Riccarton	2,056	3,377
"	Sockburn .. .. .	..	2,521
"	Yaldhurst .. .. .	..	984
Sockburn	Hornby	1,060	1,356
"	Christchurch	1,366	1,809
"	Southbridge	324	532
Bridge over Avon River (M.H. 190)	Christchurch	1,076	1,248
"	Wainoni	400	567
"	Seaview Road	977	1,555
Junction M.H. 110 and Mount Pleasant Road	Sumner .. .. .	..	2,072
"	Heathcote Railway-station	100	210
Takahe	Dyers Pass	294	442

Tally-point.	Traffic towards.	Average Daily Number of Motor vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 14 District: Canterbury Central—continued.</i>			
Halswell	Christchurch	532	724
"	South of Halswell .. .. .	..	779
"	Sabys Road	144	127
"	Sparks Road	104	139
Junction M.H.s 101 and 158	Kiwi	50	224
"	Lyttelton	80	157
"	Governor's Bay .. .. .	..	242
Motukarara	Christchurch	154	278
"	Teddington	32	62
"	Little River	136	240
Hilltop	Akaroa	68	102
"	Summit Road	32	50
"	Little River .. .. .	..	138
Junction M.H.s 114 and 188	Christchurch	164	287
"	Lincoln	158	205
"	Springston	144	254
Springston	Leeston	184	306
"	Christchurch	41	22
"	Lincoln	180	284
Aylesbury	Selwyn River .. .. .	..	102
"	Christchurch	126	253
"	Kirwee	99	178
Darfield	Christchurch .. .. .	..	162
"	Springfield .. .. .	..	122
"	Glentunnel .. .. .	..	113
Hororata	Lake Coleridge	86	89
"	Coalgate	152	189
"	Christchurch	118	128
Windwhistle	Coalgate	17	26
"	Hororata	18	36
"	Methven	19	31
"	Lake Coleridge	11	17
Dunsandel	Hororata	83	118
"	Rakaia	424	639
"	Christchurch	411	635
North Rakaia	"	345	554
"	Leeston .. .. .	..	34
"	Ashburton	237	626
Junction M.H.s 184 and 114	Manuka	45	34
"	Sockburn	180	256
"	Rakaia Huts	172	246
Southbridge	Leeston	60	253

No. 15 District: Canterbury South.

Chertsey	Kyle	100	144
"	Rakaia	237	482
"	Ashburton .. .. .	..	556
Lauriston	North of Junction	80	50
"	Methven .. .. .	..	40
"	Rakaia .. .. .	..	65
Staveley	Mount Somers	57	78
"	Alford Forest	34	39
"	Ashburton	25	44
Digby's Bridge (Junction M.H.s 115 and 206)	Staveley .. .. .	..	157
"	Ashburton .. .. .	..	365
"	Methven .. .. .	..	280
Mayfield	Tinwald	80	73
"	Valetta	114	140
"	Mount Somers	109	133
"	Arundel	63	82
Tinwald Saleyards	Tinwald	100	131
"	Ashburton	326	737
"	Hinds	235	615

Tally-point.	Traffic towards.	Average Daily Number of Motor-vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 15 District: Canterbury South—continued.</i>			
Willowby Corner	Hinds	344	452
"	Tinwald	542	558
"	Arundel	130	102
Hinds	Ashburton	247	472
"	Rangitata	235	564
"	South of Hinds	84	144
"	Baling .. .. .	..	192
Rangitata Traffic Bridge	Peel Forest	50	102
"	Rangitata .. .. .	..	439
"	Hinds	168	348
Junction M.H.s 101 and 117	Geraldine	450	597
" 58 and 117	Peckham's Road	150	114
" 101 and 117	Winchester .. .. .	..	547
Gapes Valley	Hilton	15	44
"	Gapes Valley Road	35	67
"	Geraldine .. .. .	..	104
Fairlie	Cave	136	158
"	Geraldine	70	158
"	Tekapo	136	159
Pukaki	Hermitage	3	12
"	Omarama	13	18
"	Tekapo	17	25
Temuka	Pleasant Point	113	159
"	Timaru	651	1,032
Junction M.H.s 119 and 215	Arowhenua .. .. .	..	81
"	Pleasant Point	345	450
"	Washdyke	265	373
Washdyke	Timaru	1,140	1,522
"	Arowhenua	778	1,100
"	Pleasant Point .. .. .	..	485
Junction M.H.s 101 and 216	Pareora .. .. .	..	720
"	Otipua	201	210
"	Timaru .. .. .	..	932
Gleniti	Cave	367	409
Junction M.H.s 101 and 223	Timaru	439	583
"	Waimate	436	572
"	Cave	50	71
Junction M.H.s 101 and 120	Pareora	305	432
"	Studholme	140	214
"	Waimate	111	238
McNamara's Corner	Deek Creek .. .. .	..	239
"	Waimate	160	252
"	Pukeuri Junction .. .. .	..	452
South of Waimate	Waihao Downs	121	238
Cave	Tekapo	118	222
"	Martins Crossing	56	100

No. 16 District: Otago Central.

Pukeuri Junction	Waitaki River	303	458
"	Oamaru	389	666
"	Kurow	179	204
Kurow	Pukeuri	96	256
"	Omarama	98	138
"	Hakataramea	161	160
Omarama	Kurow	39	77
"	Pukaki	40	69
"	Tarras	38	72
Junction M.H.s 125 and 119	Havea Flat	23	34
"	Tarras	18	39
"	Cromwell	28	56
Junction M.H.s 119 and 262	Skippers	9	11
"	Queenstown	37	55
"	Arrowtown	26	46

Tally-point.	Traffic towards.	Average Daily Number of Motor-vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 16 District: Otago Central—continued.</i>			
Junction M.H.s 124 and 229	Queenstown	..	155
"	Cromwell	..	125
"	Kingston	..	91
Junction M.H.s 124 and 119	Arrowtown	..	33 52
"	Hawea Flat	..	10 19
"	Cromwell	..	57 87
Cromwell Railway-station	Clyde	..	186 162
"	Queenstown	..	189 279
Lowburn	Cromwell	..	108 142
"	Pembroke	..	.. 107
Clyde	Alexandra	..	176 136
"	Springvale	..	26 45
"	Cromwell	..	190 162
Alexandra	Roxburgh	..	83 105
"	Springvale	..	174 172
"	Clyde	..	96 221
Becks	Springvale	..	75 77
"	St. Bathans	..	38 40
"	Hills Creek	..	62 53
Junction Nos. 227 and 124	St. Bathans	..	37 40
"	Ranfurly	..	46 78
"	Moa Creek	..	50 40
Junction M.H.s 124 and 614	Middlemarch	..	26 34
"	Ranfurly	..	69 96
"	Dunback	..	52 76
Patearoa	Waipiata	..	.. 94
Junction M.H.s 124 and 126	Ranfurly	..	88 105
"	Palmerston	..	117 125
"	Middlemarch	..	28 27
Junction M.H.s 101 and 288	Oamaru	..	230 429
"	Palmerston	..	297 462
"	Bushey	..	76 76
Evansdale	Dunedin	..	426 644
"	Palmerston	..	286 502
"	Merton	..	138 151
Near Waitati	Dunedin	..	.. 680
"	Palmerston	..	.. 720
"	Port Chalmers	..	.. 20
Junction M.H.s 225 and 642	Dunedin	..	.. 362
"	Port Chalmers	..	.. 376
"	Waitati	..	.. 85

No. 17 District: Otago South.

Macandrew Bay	Dunedin	..	449	717
Junction M.H.s 156 and 233	Portobello	..	..	159
"	Highcliff	..	..	162
Mosgiel Junction	Dunedin	..	1,045	1,479
"	Mosgiel	..	487	712
"	Henley	..	563	808
Brighton	Taieri Mouth	..	277	450
Outram	Middlemarch	..	66	70
"	Mosgiel	..	116	129
"	Berwick	..	55	70
Clarendon	Gore	..	500	535
Clarksville	Balclutha	..	277	477
"	Milton	..	390	593
"	Lawrence	..	138	240
Balclutha	Kaitangata	..	202	297
"	Tuapeka Mouth	..	140	260
"	Dunedin	..	668	826
"	Invercargill	..	..	1,180
Junction M.H.s 150 and 646	Owaka	..	..	72
"	Balclutha	..	..	101

Tally-point.	Traffic towards.	Average Daily Number of Motor-vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 17 District: Otago South—continued.</i>			
South of Owaka (M.H. 150)	North of Junction	210	57
Waiwera "	South of Junction	..	29
" "	Balclutha	77	222
" "	Clinton	81	198
Waipahi	Clydevale	25	33
" "	Tapanui	27	56
" "	Clinton	128	33
Tapanui	McNab	134	241
" "	Waipahi	83	109
" "	Tapanui Railway-station	51	68
" "	North of Tapanui	130	165
Rae's Junction	Miller's Flat	102	152
" "	Lawrence	120	159
" "	Edievale	74	98
Roxburgh	North of Roxburgh	409	215
Middlemarch	Outram	150	115
" "	Dunback	181	185
" "	North of Middlemarch	192	133
<i>No. 18 District: Invercargill.</i>			
North of Te Anau	Te Anau	84	37
Junction M.H.s 134 and 248	Key	..	44
" "	Te Anau	70	34
" "	Manapouri	14	13
Mossburn	Wreys Bush	42	58
" "	Lumsden	111	127
" "	Te Anau	84	86
Castlerock	Mossburn	71	89
" "	Lumsden	58	126
" "	Winton	67	116
Lumsden	Castlerock	77	120
" "	Riversdale	104	163
" "	Kingston	40	86
Waiparu	Waikaia	58	73
" "	Pyramid	42	46
" "	Riversdale	27	33
Riversdale	Nine Mile	84	77
" "	Te Anau	192	195
" "	Gore	133	127
Willowbank	Edievale	77	95
" "	Waikaka	82	112
" "	McNab	131	192
McNab	Dunedin	188	332
" "	Waikaka	163	207
" "	Gore	341	520
Gore	Invercargill	399	652
" "	McNab	..	806
" "	Winton	120	184
Edendale	Gore	270	428
" "	Invercargill	..	514
" "	Seaward Downs	..	316
" "	Wyndham	70	271
Junction M.H.s 131 and 238	Waimahaka	51	81
" "	Mataura Island	46	85
" "	Glenham	39	52
Near Fortrose	Waimahaka	59	79
" "	Fortrose	114	151
" "	Invercargill	92	129
Junction M.H.s 131 and 615	Tokanui	..	79
" "	Papatowai	8	54
" "	Waikawa	..	67
South of Invercargill (M.H. 101)	Bluff	450	423

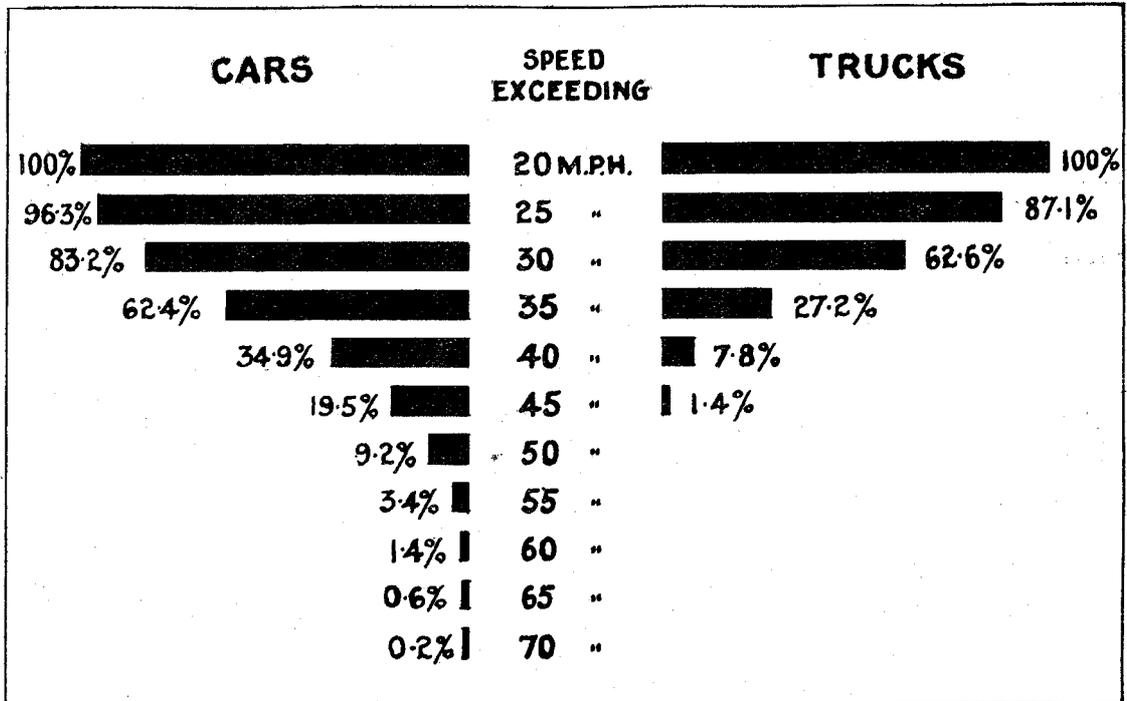
Tally-point.	Traffic towards.	Average Daily Number of Motor-vehicles as per Census.	
		1934-35.	1937-38.
<i>No. 18 District : Invercargill—continued.</i>			
Tisbury	Invercargill	129	157
"	Fortrose .. .. .	..	139
Kennington	Dunedin	395	614
"	Invercargill	487	762
"	Waikawa	201	263
Lorne	Invercargill	1,257	1,720
"	Riverton	870	1,256
"	Hedgehope	123	171
Hedgehope	Browns	79	114
"	Gore	97	123
"	Lorne	50	60
Winton	Makarewa	350	485
"	Oreti	181	232
"	Centre Bush	198	299
Argyle	Invercargill	398	569
"	Riverton	291	430
"	Tuatapere	161	199
Junction M.H.s 147 and 278	Riverton	186	274
"	Flint's Bush	83	116
"	Invercargill	259	358
Between Riverton and Orepuke	Riverton	85	106
Groper's Bush	Thornbury	56	79
"	Fairfax	111	162
"	Riverton	67	108
Fairfax	Calcium	78	96
"	Otautau	162	171
"	Riverton	141	196
Junction M.H.s 136, 244, and 656	Paulin's Bush .. .. .	..	17
"	Otautau .. .. .	..	64
"	Drummond .. .. .	..	32
"	Calcium .. .. .	..	44
Otautau Dairy Factory	Otautau	274	352
"	Nightcaps	134	171
"	Orawia	140	187
North of Tuatapere (M.H. 292)	Tuatapere	133	254
"	Clifden .. .. .	..	135
Orawia	Otautau	95	136
"	Tuatapere	52	80
"	Ohai	49	87
Nightcaps	"	179	303
"	Winton	139	201
"	Otautau	101	186
James Street (Junction M.H. 133)	Waihopai Bridge, Town Terminus .. .. .	..	2,438

SPEEDS ON MAIN HIGHWAYS.

The speed of motor traffic on main highways is often the subject of much comment, in which opinions differ as to what may be termed the prevailing speeds at which motor-vehicles travel. While this question usually stimulates considerable public interest because of its relation to the problem of road safety, it is also of great importance to roading authorities as a vital factor in determining matters relative to highway standards and design. In the absence of authentic data it has been necessary for technical staff to depend largely upon general observations and knowledge gained from years of practical experience.

However, in order to secure more reliable information on the matter, a number of speed tests were carried out during the year in each highway district throughout the Dominion. Although the results are not claimed to be absolutely conclusive, they provide an indication of the range of speeds at which motor-vehicles travel under certain conditions. In conducting these tests vehicles were carefully timed over selected paved sections of approximately one mile of main highway on which sight distances were good and no cross-roads existed. The sections comprised flat to easy grades, on straights, and the tests were taken when the pavement was dry and when no patrol officers were in evidence.

The diagram below shows the summarized results for motor-cars and motor-trucks respectively and supplies evidence as to the range of speeds at which these vehicles are operated under the most favourable circumstances. As the older models of vehicles disappear in the course of time it is probable that some increase will develop in the lower range of speeds. In the designing of highway requirements consideration must necessarily be given to the speed characteristics of traffic, and although this is by no means the governing factor it is of definite value when formulating standards which must provide every possible degree of safety.



MEASURES TO PROMOTE ROAD SAFETY.

In its last report the Board outlined certain suggestions, which it had submitted to the New Zealand Road Safety Council and which were considered to be of importance to road-controlling authorities in their activities for making roads safer to traffic.

Throughout the year under review attention has been given to many items in the course of highways operations, and the improved conditions have contributed towards the public campaign for safer roads.

Mention was made last year of the intention to erect protective fencing in dangerous localities. A certain amount of this class of work has been carried out, but owing to non-delivery of the cable required progress was somewhat retarded. In the meantime posts have been procured, and in some cases erected, in readiness for attaching the cable as soon as it is to hand.

In the course of reconstruction work, particularly in precipitous country where formation widths are limited, low concrete or stone walls have been built so as to afford a greater sense of security.

Prior to the last holiday season special instructions were issued requiring the clearing of natural growth where visibility at corners or bridge approaches was affected and where sign-posts were obscured. It was also directed that bridge-ends, approach fences, &c., were to be clearly marked by white painting and that indistinct centre-line markings were to be repainted. The beneficial effect of these measures was most marked, and steps have been taken to ensure that constant attention will be given to this requirement.

Further progress has been made with the erection of white-painted guide-posts on the sides of highways for the purpose of assisting motorists travelling at night. This type of direction marking has been much appreciated, especially in districts subject to fogs.

Considerable advance has been made by way of providing better superelevation at curves, particularly on gravelled roads. The increased amount of up-to-date grading equipment now in use on main highways has facilitated the work of correcting superelevation in the course of ordinary maintenance operations.

When submitting its last annual report the Board advised that investigations were being made into the question of providing footpaths on main highways in populous areas. Hitherto it had not been found possible to grant financial assistance towards this class of work except in the case of footways on bridges. However, the urgency of catering in some degree for the safety of pedestrian traffic was recognized, and as the result of inquiries it was decided that in specially approved cases a highway subsidy of £1 for £1 would be granted towards the construction and surfacing of footpaths. It appeared that in several localities paths had been formed, and sometimes metalled, but pedestrians were disinclined to make use of them when the adjacent highway was paved with a smooth surface. It has therefore been arranged that, wherever possible, footpaths be constructed with a paved surface in order to effectively separate pedestrian and vehicular traffic, and the cost of this type of surface is subject to the subsidy rate mentioned.

So far local authorities have not taken up to any great extent the subsidy available for footpaths, but a certain amount of work has been done and there are indications that applications for assistance towards this important class of improvement will become more general in the early future.

Recently it was suggested to the Board that when eliminating bends in the course of realigning main highways, it would be of advantage to retain short metalled portions of the old road so as to allow disabled vehicles to park with safety, or perhaps to allow a convenient space for sight-seeing. This suggestion was adopted, and it is now proposed that, unless circumstances render such a course inexpedient, portions of old road will be retained at suitable distances to provide spaces for traffic to park clear of the usual trafficable road. This policy will, of course, apply to rural rather than urban or suburban districts.

VISIT OF INSPECTION TO THE NORTH ISLAND AND CONTACT WITH LOCAL BODIES.

Towards the latter part of the financial year covered by this report the Board visited the North Island for the purpose of inspecting the main highways and conferring with local authorities relative to highway matters. As was the case with a similar visit paid to the South Island in the previous year, it was three years since the Board had travelled through the North Island, and the many improvement works carried out during that period were indicative of the progress which had been made, especially in the direction of dustless surfacing, realignment, the raising of sections subject to flooding, and bridging.

During recent years good progress has been made in the direction of extending dustless surfacing, and from its inspection of main highways, in both the North and South Islands, the Board feels that it is desirable, if at all possible, to accelerate paving operations. The great increase in traffic during recent years has made it difficult, if not almost impossible, in some cases to maintain gravelled surfaces in reasonably good condition. In addition, the dust nuisance, especially during the summer season, becomes most acute and creates conditions which do not promote safety on the highways. Also from time to time representations have been made by landowners that dust from an adjoining heavily trafficked highway is injurious to pastures used for grazing. In the opinion of the Board it is very desirable and necessary to extend dustless paving, especially on heavily trafficked routes. This matter is to receive special consideration during the present financial year.

During its conferences with local authorities the Board intimated that it would always be glad to consider suggestions from them in regard to the administration of State highways. Although the Board exercises control of the State system and endeavours to provide, as far as possible, for the requirements of both arterial and local traffic, it recognizes that local governing bodies may sometimes wish to submit representations regarding the special needs of a particular district.

COMPLAINTS DURING RECONSTRUCTION.

With the increased mileage of dustless paving and the improved alignment and visibility on several highways, there has been developed a degree of travelling comfort not hitherto enjoyed by motor traffic. From complaints which are given publicity from time to time it appears as if some travellers, having become accustomed to comfortable conditions, are not prepared to make allowances where temporary inconvenience has to be suffered during the progress of highway reconstruction.

It is not always possible to arrange for by-passes when, in the course of improvements, a section of road has to be disturbed, and consequently it is necessary for traffic to use the road under abnormal conditions. Generally speaking, the average motorist is careful in negotiating these sections and shows consideration for the workmen, but, unfortunately, there are some who dislike any impediment to easy travel, and it is this latter class which is prone to make unfair criticism.

As far as possible the Board provides reasonable right-of-way for traffic during reconstruction operations, and it appreciates the assistance of road-users during the temporary period of inconvenience until the full benefit of improvement work has been obtained.

In addition to adverse comment arising from working-conditions, there is a certain amount of criticism, frequently of an extravagant nature, against the standard of construction. This mostly happens when the work is being first opened up, and the full effects of the proposals cannot be visualized. In some localities paving which was laid twenty years ago on reasonably good horizontal alignment has become disintegrated under modern and fast heavy traffic. Not only does the surface require renewal, but the foundations need correction and strengthening, and to carry out this work to the original standards would merely perpetuate conditions which are a definite hazard to safety.

The method adopted in these cases is, firstly, to make an engineering survey and investigate the possibilities of improvement, and, secondly, to formulate proposals which will give the maximum benefit at reasonable cost. In order to obtain adequate sight-distance it is often necessary to lower the crown of the road on short gradients on sections constructed many years ago and also to realign portions where visibility is limited. By these means a more uniform standard, with safer road conditions, is obtained. It is significant that within a very short time after the completion of this class of work any suggestion of criticism quickly disappears, and the improvements are accepted as normal and reasonable.

IMPROVING VISIBILITY AT CORNERS AND INTERSECTIONS.

In quite a number of localities throughout the Dominion visibility for motor traffic is extremely restricted at corners, especially where buildings are in existence. Also at intersections of side roads, some of which carry only a small amount of traffic, dangerous conditions arise from the fact that neither main-road traffic, nor vehicles emerging from the side road, have adequate sight-distance.

In order to provide for present and future requirements in these cases the Board is investigating the possibility of acquiring land as early as possible, so that buildings or other obstructions will not be erected on the area needed for improvements. In fact, in several instances the necessary land has already been acquired. In cases of urgency the setting-back of the highway reserve will be undertaken immediately, but in other cases the land is to be reserved for road purposes in anticipation, so that actual improvements can be carried out as circumstances allow. At present the Board's investigations will apply principally to conditions on State highways, but it is prepared to co-operate with local authorities in control of main highways regarding similar action. As a matter of fact the Board has approved of a number of corner improvements submitted by local authorities and has granted assistance by way of subsidy in respect of the cost involved.

LIGHTING ON MAIN HIGHWAYS.

The steadily increasing motor traffic on main highways has created many problems for roading authorities, and one of the most important is that relating to safety for night travelling. Much has been done in the way of constructing wider roads, improving the alignment, and providing better visibility so as to obtain reasonably safe conditions. Notwithstanding the advances which have been made, however, the difficulties of night driving appear to have increased particularly where the density of traffic is comparatively high. The speed of modern motor-vehicles and their powerful lighting equipment combine to make night driving dangerous. In recent years many of the older countries of the world have made investigations and conducted extensive experiments in order to solve the problem of highway lighting. In New Zealand most of the road and street lighting is of the incandescent type and insufficient for the needs of modern traffic. Some improvement has been obtained by the adoption of the gaseous discharge type of lighting, but this has been confined mostly to urban streets.

Modern methods of street lighting involve considerable expense not only for the initial installation, but also for maintenance, which must include electricity-supply, and no doubt the financial aspect has been mainly responsible for the limited amount of flood lighting which has been carried out up to the present.

The New Zealand Road Safety Council prepared a report on the matter and recommended that steps be taken to adequately light sections of main highways where the average traffic amounted to 2,500 vehicles per day. These sections are confined to the suburban districts adjacent to the larger cities and are included in the State highways system. The Board agreed to adopt the Safety Council's proposals, and in order to formulate comprehensive plans for an adequate system of highway lighting obtained the services of a number of experienced electrical engineers, who agreed to act as a technical advisory committee. It is anticipated that in the near future plans will be completed for lighting certain sections of State highways so as to obviate the necessity of using strong headlights, and thus promote safer conditions.

STANDARDIZATION OF ROAD SIGNS.

Within recent years it was found that a variety of warning-signs were being used throughout the Dominion, especially in connection with reconstruction and repair work on roads and in denoting the existence of circumstances requiring special care on the part of motorists. It was common to find a sign purporting to give warning against dangerous conditions, when actually no particular danger existed, but conditions rather called for the exercise of greater caution. As the result of a conference of interested parties convened by the Transport Department proposals were prepared for simplifying warning-signs, and these were later included in the Traffic Sign Regulations, gazetted in April, 1937. This standardization of signs has been appreciated by roading authorities and the travelling public, and makes a further contribution towards the promotion of safety.

SIGNPOSTING, CENTRE-LINE MARKING, ETC.

The cost of signposting carried out on main highways by Automobile Associations during the year ended 31st March, 1938, was subsidized at the rate of £3 for £1, the cost to the Board being £4,215. The total amount contributed by the Board towards this work up to the date mentioned has been £18,619.

In cases where the Board or local authorities erected signs required by regulation, or for traffic safety, the cost was included as part of ordinary maintenance, and centre-line marking was also regarded as maintenance.

WORKING-CONDITIONS AND RATES OF WAGES.

The majority of main highways are under the immediate control of local authorities, which claim against the Board from time to time for subsidy payments. As these authorities paid varying rates for the different classes of labour, it has been the policy to fix wage-rates on which subsidy payments could be made.

In previous years when no industrial awards were operative the basic rates for subsidy purposes corresponded with those paid by the Public Works Department. At present most, if not all, classes of labour employed by local authorities on main highways are subject to Arbitration Court awards, and the rates and conditions prescribed therein are admissible in respect of subsidy claims.

Main highways controlled directly by the Board are administered through the Public Works Department, which has a separate agreement with the employees' union governing wages and conditions of employment.

Apart from regular maintenance activities and construction works let by public tender, the majority of the men employed by the Department are working under the co-operative contract system.

RESIDENTIAL ACCOMMODATION FOR REGULAR SURFACEMEN.

Special attention has been given to the improvement of housing accommodation for regular surfacemen on main or State highways controlled directly by the Board. Generally speaking, these employees make their own arrangements in the matter of housing, but in cases where it cannot be obtained convenient to a patrol length, and especially in isolated localities where it is necessary to station a surfaceman for maintenance-work, the Board provides suitable cottage accommodation, for which a reasonable rental is paid. In the past some of the accommodation has not been very satisfactory, largely because hutments from construction works have been used or remodelled. However, several permanent cottages have already been erected to replace accommodation which was found to be below present standards, and action in this direction will be continued until reasonable housing has been supplied. An endeavour has been made to provide facilities which will afford a degree of comfort not enjoyed previously. For example, up-to-date domestic installations are included in accommodation for married employees, and two- or three-roomed bach dwellings are supplied for single employees who are located a considerable distance from the amenities of civilization. In quite a number of cases cottages formerly owned by local authorities when in charge of main highways have been purchased and renovated by the Board, consequent upon these highways having been taken over as part of the State system.

BEAUTIFICATION OF HIGHWAYS.

Growing public interest is being shown in the beautification of highways, and during the past year several requests have been received from local authorities seeking the Board's permission and co-operation in schemes of this nature.

While the Board is sympathetic to the general principle of tree-planting on road reserves adjacent to main highways, the rights and safety of the travelling public are regarded as of paramount importance, and their interests would not, of course, be subordinated to tree-planting schemes. Where, therefore, road safety is likely to be adversely affected or where tree-planting would be likely to interfere with power or telegraph lines the Board does not sanction any scheme.

In localities where tree-planting could be undertaken without interference to traffic or detriment to the highway, every consideration will be given to any proposals formulated by interested bodies. In considering the type of trees most suitable for this purpose due regard must be given to those which do not attain any great height, for the reason that tall-growing trees in the passage of time tend to overshadow the road and create undesirable and dangerous conditions. Native trees and shrubs or other plants which on maturity are of medium height, would not, of course, create the same disadvantages as trees. Owing to the varying climatic conditions in the different provinces of the Dominion, the suitability of the various species needs to be considered according to local circumstances. In this connection the Board has requested the co-operation of the State Forest Service in the selection of trees. Care in laying out a scheme of planting is of great importance, as in most places it is necessary to occasionally remove vegetation by mowing or other methods, and the presence of trees and shrubs situated in close proximity to the roadway constitutes a hindrance to the efficient removal of undergrowth. Furthermore, the rights of stock traversing public roads must not be overlooked, and any obstacles to hinder the right of way would be undesirable. In the interests of motor traffic it is preferable for stock to travel as much as possible on the outside of the road-formation.

While every consideration will be given to any beautification scheme put forward, the Board cannot at present allocate any of its funds for the planting, maintenance, or trimming of trees on highway reserves by reason of the fact that all available finance is required for actual highways work to meet urgent traffic needs.

ADVANCES TO LOCAL AUTHORITIES.

During the past financial year the Board has, in pursuance of the powers conferred upon it by special legislation, continued its policy of advancing to those local authorities, which were unable to raise loans from other sources, their share of the cost of urgent works on main highways. The number of loan agreements entered into last year was twenty-one, covering an amount of £28,801 19s. 3d., as compared with twenty agreements, totalling £29,401 7s. 9d., for the previous year.

The total principal outstanding at 31st March, 1938, in respect of past advances was £103,932 7s. 8d.

PLANT.

Local authorities have continued to avail themselves of the facilities provided by the Board to enable them to acquire plant under the hire-purchase system, the purchases for 1937-38 amounting to £36,415, as compared with £15,694 for 1936-37 and £18,090 for 1935-36.

Since the inception of this scheme plant to the value of £241,333 has been purchased, of which sum £43,527 remained outstanding at 31st March, 1938.

The items purchased during the year under this system were : Graders, 18 ; trucks, 6 ; crushers, 2 ; tractors, 2 ; rotary granulator, 1 ; tractor shovel, 1 ; roller, 1 ; excavator, 1.

In addition to the above, the Board purchased the following items of plant for its own use : Motor-lorries, 71 ; tractors, 53 ; graders, 44 ; compressors, 16 ; crusher and elevator, 15 ; pump and engine, 14 ; planers, 14 ; sprayers, 9 ; excavators, 7 ; motor-cars, 6 ; scrapers, 6 ; pump and motor, 5 ; road-markers, 5 ; pumps, 4 ; mixers, 3 ; rollers, 5 ; trailers, 3 ; crushers, 3 ; hoists, 2 ; mower, 2 ; loader, 2 ; rock-rooter, 1 ; road-sweeper, 1 ; sand-drier, 1 ; sharpener, 1 ; snow-plough, 1 ; winch, 1 ; oil-engine, 1 ; crusher and pulverizer, 1 ; drill, 1 ; transformer, 1 ; machine hacksaw, 1 ; conveyor, 1 ; generator, 1 ; road-maintainer, 1.

CLASSIFICATION OF ROADS RELATIVE TO MAXIMUM GROSS LOADING.

In September, 1937, the Commissioner of Transport convened a meeting of representatives of roading authorities and of commercial transport interests for the purpose of discussing the question of road classification in relation to pay-loads for the transport of general goods. Representations had been made to the Government regarding difficulties being encountered in providing for economic loads and at the same time affording an adequate measure of protection to the roads. A further aspect was the desirability of encouraging the most efficient and economic type of vehicle, having regard to its effect upon the road and its load-carrying capacity. The Board was represented at the Conference.

General agreement was reached in the matter of maximum gross loading on Class V and Class IV roads, and it was decided to recommend an increase of one half of a ton in each class, making the maximum $3\frac{1}{2}$ tons and 5 tons gross respectively.

With regard to multi-axled vehicles, the Conference decided to recommend the elimination of the existing gross weight restrictions and the adoption of certain maximum axle-loads for the respective classes.

In the matter of raising the loading for Class III roads, the Board was unable to support the proposal to apply the extra half-ton to this class. No objection was raised to the increase for Classes V and IV for the principal reason that the general highways policy was to raise the standard of main highways to the existing Class III loading, and any cost involved in strengthening roads to that standard was regarded as part of the normal improvement programme. Furthermore, the additional half-ton on the lower class roads would allow of economic pay-loads to the advantage of transport and the country as a whole. It was considered that the time was not opportune for allowing extra weights on Class III roads, principally because the majority of rural main highways were not sufficiently developed. Eventually the proposed increased loading was sanctioned.

The Conference also agreed to recommend that all goods vehicles exceeding 2 tons gross weight should be restricted to a maximum speed of 25 miles per hour.

TESTING OF HIGHWAY MATERIALS.

As in former years, the Petrological Laboratory has continued the usual testing of rocks and metals, but it had been realized for some time that the standard tests for abrasion, hardness, and toughness were not entirely adequate to disclose the suitability or otherwise of metal and gravel for present-day roading. Some suitable tests for sealing chips crushed from water-worn gravel were also urgently required. A certain degree of success had been achieved in this direction by various loadings of the Deval abrasion machine, but it appeared that the Los Angeles abrasion machine, which has been successfully used in America and Australia, would adequately disclose the suitability or otherwise of road-metal and sealing-chips, whether water-worn or not. In this machine the stone is subjected to impact, so that the test resembles much more closely actual road conditions. A Los Angeles abrasion machine has been ordered, and should be in service for the approaching sealing season.

During the year arrangements were made for the Public Works Office in Wellington to undertake the necessary testing of top-course aggregates, subgrade materials, and sealing-chips. Many gravels, rocks, sands, clays, subgrade soils, and sealing-chips have been examined and reported upon. Full advantage is being taken by many districts of this testing service, although some other districts do much of the essential testing-work in their own offices, and forward occasional samples for check tests only. The examination and classification of road-surfacing materials has become an important function of the Board, and gratifying results are being achieved in road-construction as a result of the testing-work. As roading authorities become more conversant with the advances that have been developed in subgrade practice, and as the value of the stabilized top-course becomes more generally appreciated, soil and gravel testing will assume even greater importance.

The Dominion Analyst has examined and tested, on behalf of the Board, numerous bituminous materials for road surfacing. Owing to the shortage of certain tar products and asphaltic materials during the past season, the Dominion Analyst was often called upon to make the necessary tests and to suggest suitable mixtures to take the place of bituminous materials which were not available in the country.

As yet very little research work has been undertaken in connection with bituminous materials for New Zealand roading, but the time is opportune when some investigation, apart from routine testing, should be carried out as to the most suitable materials for the conditions obtaining in this country, and for the types of work developed by the Board. For instance, viscosity-temperature curves for road oils would be most valuable, as also would curves of viscosity or ductility plotted against age or period of service. This latter test would require the development of some form of accelerated weathering.

HIGHWAY ENGINEERING AND DESIGN.

The continually increasing volume of motor traffic over the past few years and the highway-accident rate have shown that existing standards of road design in New Zealand will not meet the requirements of future traffic. This is a world-wide problem which is being attacked no less energetically in New Zealand than in any other motoring country of the world. Research has been concentrated on the geometrical layout of the road and the building of the greatest measure of safety into the road surface itself.

The difficulties to be faced will be appreciated when it is realized that, owing to the comparatively short life of a motor-vehicle, it can be redesigned and improved every few years, whereas it would be quite out of the question to redesign our roading system even, say, every ten years. However, against

the bugbear of highway obsolescence it is found that although in some countries certain highways are being designed for speeds of 80 miles to 100 miles per hour, yet in these very countries limits as low as 45 miles per hour are being introduced.

This may be an indication, therefore, that the highways of the future will consist of a duplicate system. On the one hand will be the general-utility or service highway where comparatively low speed values will apply and, more or less, paralleling this highway will be built, when population warrants it, the superhighway possibly designed for 100 miles per hour, on which there will be no speed-limits.

The Board recognizes that in the meantime New Zealand, with its sparse population, will have to be content with the general-utility highway, designed as far as possible to meet safety requirements. In any case, on the grounds of cost, the physical characteristics of the country preclude the immediate introduction of super standards.

Of recent years, as opportunity has offered, the radius of curvature along the highways has been gradually increased. During the past year new standards were laid down as to superelevation with a view to making curves along distinct sections of highway of uniform speed value. Special consideration is also being given to the provision of transition curves more in keeping with the speed of modern traffic than those heretofore adopted.

Not more than ten or fifteen years ago it was considered that superelevation was the most important factor in connection with road curves, and more recently it has been realized that the radius of curves must be generally increased to accommodate modern road transport. It is now being recognized that in negotiating curves at present-day speeds the most important factor is the rate of change of direction, or, in other words, the rate at which centrifugal force is applied.

With the works of Professor Moyer, of United States of America, and Professor Royal-Dawson and Mr. Henry Criswell, of England, as a basis, the Board is carrying out investigations for New Zealand conditions, and already several highways are being laid out on the transition principle. In the near future it is hoped to issue general instructions on the matter.

In regard to road surfacing, as a result of research and experimental work, a type of surface sealing has been developed which has considerable merit over the older type of sealing, which was laid primarily as a dust-layer and which has been the standard practice until recently. The earlier sealing was a marked improvement on the gravel road, but, nevertheless, as traffic intensified and speeds increased it became apparent that these old bituminous surfaces were not meeting modern requirements. Firstly, the sealing had varying tendencies towards "bleeding" in hot weather and slipperiness under cold, wet, or frosty conditions, and, secondly, as soon as the bitumen began to flush over the surface of the chips bumpiness and corrugations inevitably followed.

The problem was attacked, and a type of initial sealing has been developed such that, by a method of logically proportioning the bituminous binder, the stone chips remain exposed to provide a durable non-skid surface. At the same time visibility for night driving, especially under wet conditions, is much improved, and there is no "bleeding" in hot weather, with its attendant discomfort and danger to motorists, and constant source of concern to the maintenance authority.

The method of proportioning the asphaltic binder is believed to be quite original, and is being very successfully applied in practice. It was found that a layer of sealing chips under rolling and the action of traffic soon compacts down with approximately 20 per cent. of voids. Since the chips have a tendency to lie on their flat, or, in other words, so that their least dimensions govern the compacted thickness of the aggregate layer, the ultimate thickness of the sealing carpet can be determined by ascertaining the average of the least dimensions of the chips by means of laboratory bar screens or by direct measurement. Knowing the final thickness of the layer of aggregate, which equals the average least dimension, and that there will be 20 per cent. of voids, it is a simple matter to calculate the amount of asphaltic binder to rise to any predetermined height round the stone fragments. It has been found in practice that there is sufficient working margin to ensure that chips are well held and yet remain exposed when chips of fairly uniform size with an average least dimension of $\frac{1}{2}$ in. or slightly greater are used, and the asphaltic binder is applied in sufficient quantity to rise to 60 per cent. of the height of the chips. This entails approximately 3/10ths gallon per square yard of road surface. In general, reasonably cubical chips from $\frac{3}{8}$ in. to 1 in. by circular screen measurements are of about $\frac{1}{2}$ in. average least dimension.

Immediately after rolling the layer of chips contains some 30 per cent. of voids, and therefore the binder does not rise to any appreciable height, which means that the stones are held almost entirely by interlocking and pure adhesion. As traffic compaction takes place the corners and sharp edges are crushed from the chips, until the voids are reduced, and the binder is squeezed up round the stone fragments, which are then held less by pure adhesion and more by embedment in the binder. When the binder becomes hard under winter conditions embedment is the important factor in holding the covercoat. As the binder is proportioned so that it does not rise sufficiently to flush the chips, there is no objection to a soft asphaltic material, and the softest non-volatile straight-run or residual asphaltic road oils which will hold the chips in the early stages are used.

Before the application of the road-oil seal, the road should be primed with a low-viscosity tar, so that there will be no loss of road oil into the macadam or gravel surface and to ensure strong adhesion of the seal coat.

This type of surfacing has now passed the experimental stage, and for the greater part has been adopted as the type of initial bituminous treatment on macadam roads. Some of the earlier experimental sections have been in service over seven years, and, where the chips were of good quality the surfacing is in excellent order, with no indication that further treatment will be required for many years to come.

Owing to the introduction of smooth-riding "plant-mix" and "road-mix" shortly after the development of the new type of sealing, the motorist began to be dissatisfied with any surface showing slight irregularities. While the exposed chip sealing in itself did not become wavy or irregular, the underlying macadam was not in all cases constructed to a very high standard of smoothness, and also the roller-compacted macadam continued to deform under traffic. This meant that the seal coat did not retain its smooth-riding qualities.

It is gratifying to report that, as a result of further research and experimental work, a smooth-riding stabilized gravel surface which does not readily deform can now be constructed, and therefore the exposed chip sealing which takes up the contour of the underlying macadam can be laid to provide a surface which retains its smooth-riding qualities.

The stabilized gravel crust is somewhat dusty and is not suitable for the direct application of ordinary thin bituminous courses. This led to the development and use of thin or low viscosity tar primers, which "kill" the dust, penetrate and bind the surface, and form a bituminous skin to which a light asphaltic treatment will strongly adhere.

The stabilized top-course has not only provided much smoother roads with inferior local materials, but also the development of this type of work has been of considerable benefit to local industry. Prior to the need for tar primers, the gasworks, especially those with vertical retorts, found it difficult to dispose of any appreciable quantity of their tar, and large quantities were simply burnt under the furnaces. Sales had fallen to a very low figure, but, so rapidly has the advantage of tar-priming work been recognized, that during last season the gasworks of New Zealand could not meet the demand for tar primers.

Much research has been conducted throughout the world into the construction of stable road foundations or subgrades, and the laying of durable metal crusts. Tests as developed in the United States of America have been used to some extent by the Board, but it is believed that for metal-crust work the tests developed in this country are more satisfactory.

The stabilized top-course as now adopted by the Board consists of a mineral aggregate densely graded from about 1 in. or $\frac{3}{4}$ in. in size down to and including some cohesive clay. This is well mixed and evenly spread out by long wheel-base power-graders. While grading and planing continue, the aggregate is sprinkled from water-carts to the plastic stage, and then compacted by pneumatic-tired vehicles and ordinary traffic. A very dense and smooth-riding surface results.

While it had been recognized to some extent that aggregates would not compact to a rigid mass unless a certain percentage of fine mineral material was incorporated it was not evident as to what quantity was required, or how fine the material should be, and there was no suitable method of determining the binding properties of the fines. By considerable laboratory research and road experimental work these problems have been sufficiently solved to allow the Board to lay down guiding principles and to adopt certain standards, subject to possible modification as continued experience in the various districts and under different climatic conditions throughout the Dominion may indicate.

A short description of the method of ascertaining the binding or cementing properties of the fine clayey portion of the aggregate may be of interest. The total sand-clay material passing the 50-mesh sieve (U.S. series) is moistened to a plastic state, packed into standard cement/sand moulds, and allowed to dry out to constant weight. The briquettes so formed are then tested for tension strength in an ordinary tension machine, or by other improvised means. It has been found that sand-clay binders with a tension strength of 10 lb. per square inch provide sufficient binding in a metal crust. Tests of over 150 lb. per square inch have been obtained in some instances.

In addition to the tension, the shrinkage of the binder fraction is determined by measuring the difference in length of the wet and dry briquette. The lineal shrinkage should not exceed 5 per cent of the wet length.

The Board has continued its policy of improving old and out-of-shape bituminous surfaces. Many of the existing sealed and paved highways which have become far too rough and irregular for the safety and comfort of modern traffic are gradually being brought up to standard by the application of thin "evener" or "smoothing" courses. For the most part these treatments have so far consisted of a mixture of densely graded aggregate and liquid asphaltic material mixed either on the road or in a central plant, and usually known as "road-mix" or "plant-mix." These mixtures are spread out and planed over the road with long wheel-base power-graders and road-planing machines, while ordinary traffic effects compaction. The surface provided is exceptionally smooth-riding, and besides making for increased safety it reduces to a minimum the damaging effect of impact on the road structure.

This densely graded, low bitumen content type of smoothing course depends for stability very largely upon the grading of the aggregate, and therefore does not have the flexibility of the bituminous carpets with heavier films of soft asphalts. As a consequence of this condition "plant-mix" or "road-mix," whether as initial treatment or as smoothing course, should not be laid on any base which is not uniformly firm and rigid. Bituminous surfaces which have starred and cracked, unless they can first be repaired and sealed up to provide a uniformly rigid crust, are unsuitable for the application of "plant-mix" or "road-mix." Rough, but sound, bituminous concrete (hot mix) and bituminous macadam (penetration) can be greatly improved by a "plant-mix" or "road-mix" smoothing course.

In the case of old, cracked, and starred thin-sealing courses in which the bituminous binder has become hard and brittle due to old age, instead of applying a smoothing course, it has generally been more satisfactory to scarify and remove the old sealing from out-of-shape and rough sections, reshape the gravel with power-graders, and apply an entirely new seal coat,

Some experimental sections of "drag-seal," which process has been developed to a high standard in Australia, have been laid. The Board is indebted to the Victorian Country Roads Board for particulars of this class of surfacing. Drag-seal work appears to remain somewhat open for a period after being laid, and as a consequence may not be entirely suitable in the colder districts of New Zealand, but where it is found to be satisfactory it will often serve a very useful purpose.

Drag-seal surfacing is somewhat similar to "plant-mix" or "road-mix," except that open graded chips lying between $\frac{1}{4}$ in. and $\frac{3}{4}$ in. circular screen dimensions are used instead of the densely graded aggregate. The asphaltic binder is a kerosene type of cutback with a comparatively soft residue or base. In other words, a non-volatile heavy road-oil containing between 90 per cent. and 95 per cent. of 80/100 penetration asphalt is cutback with a kerosene distillate in the proportion of 10 per cent. to 15 per cent. of the total product.

The chips and asphaltic binder are mixed together in a central plant or on the road, and then spread out to a true finish with long wheel-base graders, and rolled. After initial rolling, quarry grit or coarse sand is lightly spread over the surface to fill the voids. Further rolling and broom-dragging complete the work to a smooth riding finish.

Special mixing and spreading machines have been developed in Australia, but so far in New Zealand this work has been accomplished with power-graders.

Drag-seal will utilize chips which are unsuitable for the standard road-oil sealing, and which do not contain the necessary fines or filler for "plant-mix" or "road-mix."

Another type of bituminous surfacing which has been developed in New Zealand, and is proving very satisfactory either as initial treatment on primed macadam or as a smoothing course on old waved and corrugated pavements, is what has been designated "emulsion broom-drag coat." This consists of a light-tack coat of quick-breaking emulsion, followed by an application of about $\frac{5}{8}$ in. to $\frac{3}{4}$ in. loose depth of clean $\frac{1}{2}$ in. chips (passing $\frac{3}{4}$ in. or $\frac{5}{8}$ in. circular screen and retained on $\frac{3}{8}$ in. or $\frac{1}{4}$ in. circular screen) which are rolled, and then broom-dragged to a smooth and even surface. The chips are again thoroughly rolled, and, before any disturbance of the surface occurs, penetrated with quick-breaking emulsion so that the sum of the tack coat and the penetration coat is from 32 gallons to 36 gallons per cubic yard (loose) of chips with an emulsion containing from 52 per cent. to 55 per cent. of 200 penetration asphalt. Immediately following the second application of emulsion the surface is sanded and given a final roll.

The emulsion broom-drag coat is very suitable for initial surfacing when the weather is unfavourable for hot bituminous work, and when clean but only wet chips are available. This type of surface can also be laid as a smoothing course without heavy graders and planers, but it may be possible to further improve the surface finish by blading the chips into position either with or without broom-dragging.

Laboratory tests and road experiments are being conducted at the present time with a view to developing a cheap method of priming a gravel or macadam surface during the damp and cold winter months. The value of such a development will be obvious. The winter priming is required to hold the surface in good order until the summer, when the bituminous wearing-course can be applied. At the same time this priming coat must serve the functions of an ordinary tar primer when applied under suitable conditions. A type of road-mix with slow-setting emulsion has been laid with some degree of success, but the cost of such work precludes its general adoption.

A rather novel experiment was conducted some while ago with the object of overcoming the numerous complaints against slippery longitudinal timber-planking on bridge decks. Ordinary wire netting of about $1\frac{1}{2}$ in. mesh with 16-gauge to 18-gauge wire was stretched and securely stapled along the wheel-tracks. This appears to have been completely successful in providing a durable non-skid surface.

As far as possible advantage continues to be taken of the roading research and progress which is taking place overseas, but, unfortunately, much of the work as done in America and Europe, where different conditions prevail, is not applicable to New Zealand. While the Board is indebted largely to America, and especially the Bureau of Public Roads, for roading information, it has had to solve many of its own problems.

The Board is pursuing with all energy a policy of research and investigation into the many roading problems which remain to be solved, with safer, better, and cheaper roads always as the objective.

New Standard Specifications covering Formation, Preparation of Subgrade, Construction of Metal Crusts, Priming, and Road-oil Sealing have been recently distributed to the various roading authorities. An entirely separate specification for each class of work, covering a wider range of bituminous wearing-courses, together with various notes and instructions, are in course of preparation. These will be printed in the near future. Copies of the specifications will be available for inclusion in contract documents, while, in addition, the specifications, notes, and instructions will be bound together in loose-leaf form as general reference volumes.

OPERATIONS OF MAGNETIC TRUCK.

The Board's magnetic truck, which is used for clearing main highways of iron or steel puncture-producing articles, has been in operation in the North Island during the year. The length of road actually cleared during the year ended 31st March, 1938, was 4,427 miles, as against 2,139 miles for the previous year, while the weight of material picked up by the magnet was 3,783 lb., as against 7,125 lb. for the previous year. The average yield per mile was 0.85 lb., the corresponding figure for 1936-37 being 3.3 lb.

EXAMINATION FOR FOREMEN AND OVERSEERS OF ROAD-CONSTRUCTION.

The twelfth examination for Foremen and Overseers of Road-construction was held on the 2nd November, 1937. In all, fifty-one candidates presented themselves for examination, forty-four papers on general road construction and maintenance and twenty-two papers on tar, bituminous, and concrete road construction being returned. In paper No. 1 sixteen candidates were successful, while eight candidates passed paper No. 2. Two candidates passed the full examination, and a further six, who had previously secured a partial pass, completed the examination. Fourteen candidates who succeeded in one paper only were credited with a partial pass.

All candidates save one who passed or completed the examination have been awarded a certificate of competency, the recipients being W. G. Anderson, S. H. Bird, W. F. Harper, R. O. Kirk, J. A. Marris, J. Stevens-Jordan, and R. M. Walsh. The issuing of a certificate to one candidate has been held over until such time as he has gained further practical experience of tar, bituminous, and concrete road construction.

DECLARATIONS, REVOCATIONS, AND ADJUSTMENTS OF MAIN HIGHWAYS.

In accordance with the provisions of section 11 of the Main Highways Act, 1922, the usual annual review of main highways was made during the year.

Recommendations were received from District Highways Councils for the declaration of 590 miles of roads as additional main highways and for the revocation of 24 miles of existing main highways. Owing, however, to the heavy commitments against highway funds arising from the immediate requirements of the present main highways system the Board was not in a position to recommend any general extension.

In certain cases, however, in order to meet special circumstances and to give effect to desirable adjustments, a number of alterations were adopted.

The following list shows the lengths of main highways declared during the year ended 31st March, 1938, including formal adjustments :—

Main Highways declared.

	Miles.	Chains.
No. 1 Highway District—		
Lake Omapere—Maungaturoto via Whangarei	0	51
Dargaville—Tikinui	1	28
Hokianga Road	1	12
No. 2 Highway District—		
Auckland—Maungaturoto	0	35
Bryant Home	3	70
Huntly—Rotowaro	6	77
Horotiu—Whatawhata—Te Rore	0	42
Mangere Bridge—Papatoetoe	0	18
Pipiroa—Coromandel	0	12
Coromandel—Mercury Bay	0	4
No. 3 Highway District—		
Wainui	1	16
No. 4 Highway District—		
Opotiki—Te Araroa	13	12
Manutuke—Wairoa via Mangapoike Valley	1	60
No. 5 Highway District—		
Gisborne—Wairoa via Hangaroa	0	26
No. 6 Highway District—		
Bruce	2	40
No. 9 Highway District—		
Paraparaumu Beach	0	16
Foxton Beach	2	58
Western Hutt	4	52
Wellington—Auckland via Taranaki	0	23
No. 10 Highway District—		
Lake Ferry	0	20
No. 11 Highway District—		
Picton—Blenheim	0	5
Collingwood—Bainham	0	27
Richmond—Collingwood	0	53
No. 12 Highway District—		
Ross Railway-station	0	62
Inangahua Junction—Weheka	0	43
No. 14 Highway District—		
Cashmere—Ferry Bridge via Heathcote	1	36
No. 15 Highway District—		
Temuka—Pleasant Point	0	73
No. 16 Highway District—		
Alexandra—Clyde	6	0
Wedderburn—Omakau via Ida Valley	23	33
Ida Valley Railway-station	0	67
Dunedin—Port Chalmers	0	60

Main Highways declared—continued.

						Miles.	Chains.
No. 17 Highway District—							
Dunedin-Portobello-Otakou	..	..	..	..	..	1	6
Balelutha - Kaka Point via Otanomomo	..	..	..	..	..	0	73
Dunedin-Harrington Point	..	..	..	..	..	16	30
No. 18 Highway District—							
Queenstown-Invercargill	..	..	..	..	..	49	37
						<u>144</u>	<u>67</u>

The following list shows the lengths of main highways revoked during the year ended 31st March, 1938, including adjustments :—

Main Highways revoked.

						Miles.	Chains.
No. 1 Highway District—							
Lake Omapere - Maungaturoto via Whangarei	..	..	..	..	..	0	50
Whangarei-Dargaville	..	..	..	..	..	1	28
Dargaville-Kaihu	..	..	..	..	..	1	12
No. 2 Highway District—							
Auckland-Maungaturoto	..	..	..	..	..	0	35
Huntly-Rotongaro	..	..	..	..	..	6	27
No. 3 Highway District—							
Wainui	..	..	..	..	..	1	12
No. 5 Highway District—							
Napier-Gisborne via Wairoa	..	..	..	..	..	0	7
No. 9 Highway District—							
Paraparaumu Beach	..	..	..	..	..	0	26
Foxton Beach	..	..	..	..	..	2	0
Wellington-Auckland via Taranaki	..	..	..	..	..	0	32
No. 11 Highway District—							
Collingwood-Pakawau	..	..	..	..	..	0	27
Collingwood-Bainham	..	..	..	..	..	0	50
No. 14 Highway District—							
Christchurch-Motukarara via Sumner and Lyttelton	..	..	..	..	..	1	36
No. 15 Highway District—							
Temuka - Pleasant Point	..	..	..	..	..	1	30
No. 16 Highway District—							
Alexandra-Clyde	..	..	..	..	..	7	50
Ida Valley Railway-station - Moa Creek School	..	..	..	..	..	16	0
Junction near Wedderburn - Moa Creek School	..	..	..	..	..	7	70
Port Chalmers - Waitati	..	..	..	..	..	1	3
No. 17 Highway District—							
Balelutha - Kaka Point via Otanomomo	..	..	..	..	..	12	40
Dunedin-Portobello (Low Road)	..	..	..	..	..	10	16
Portobello-Otakou	..	..	..	..	..	5	32
Dunedin-Portobello-Otakou	..	..	..	..	..	1	6
No. 18 Highway District—							
Queenstown-Invercargill	..	..	..	..	..	49	37
						<u>128</u>	<u>16</u>

On the 1st April, 1938, the boundaries of the No. 2 Highway District were altered to include the Rodney County, which had previously formed part of the No. 1 Highway District.

APPEAL OF LOCAL AUTHORITY AGAINST DECISION OF BOARD AS TO APPORTIONMENT OF COST OF WORK.

Section 6 of the Main Highways Amendment Act, 1936, provides that any local authority dissatisfied with any final decision of the Board, fixing the proportions of the cost of any work on a main highway, may appeal to the Minister of Public Works within one month after receiving such decision.

Early in the past financial year the Hauraki Plains County Council appealed against the decision of the Board in respect of the county's share towards the cost of the proposed new bridge over the Piako River at Pipiroa.

The Board was requested to submit its report on the case, which was considered along with the representations made by the County Council, and, after consideration, the Board's decision was confirmed and accepted by the local authority.

The fact that, since this special legislation was passed, only one appeal has been lodged is an indication of the manner in which the Board considers all the circumstances in apportioning the costs of main highway works, and of the general acceptance, by local authorities, of the Board's decisions as being reasonable and fair.

PROGRESS REPORT.

The following statement shows the more important construction work carried out under the control of the Board during the year ended 31st March, 1938:—

Whangarei-Awanui via Kawakawa:—

Kamo-Hikurangi: The Snake Hill Deviation, which was carried out in conjunction with the formation of the approaches of the Kamo Overbridge, was completed, 54 ch. being formed and metalled. The overbridge, of three 30 ft. spans, was completed and opened to traffic. 9 ch. of the Springs Flat length was also formed and metalled, and the erection of two short-span bridges and one large culvert completed.

A contract was let for the reconstruction and sealing of 1 m. 25 ch. between Kauri and Hikurangi. The Kauri Overbridge Deviation was continued, 12½ ch. being formed. The bridge itself has now been put in hand.

Hikurangi-Waiotu: 50 ch. of deviation on improved alignment was completed.

The erection of the Whakapara Bridge of six 40 ft. spans, is well in hand. The new bridge will have ample water-way, with a view to reducing local flooding.

Hukerenui Flood Alleviation: The original work has been extended by 16 ch., and during the year 25 ch. was formed and 39 ch. metalled.

The 90 ft. embankment bridge has been completed, and the approaches are being formed and metalled. The deviation is now available for use.

Waiomio Flood Alleviation: The formation has been carried up to grade level, but has yet to be widened.

A concrete bridge of three 30 ft. spans has been nearly completed.

Milne's Flood Alleviation: The embankment has been metalled and is in use.

Kawakawa-Waiomio: This section was reconstructed over a distance of 1¼ m., of which 1 m. has been metalled.

Kawakawa Flood Alleviation: With the exception of the approaches to the bridges, the embankment has been completed and base-course metal applied.

A contract has been let for the three permanent bridges, totalling 390 ft., and work is in hand.

Moerewa Village (Reconstruction and Sealing): The reconstruction of 1½ m. preparatory to sealing has been commenced.

Rangiahua and Mangamuka Flood Alleviations: The formation has been put in hand.

Whangarei-Dargaville:—

Kirikiri Bridge: The replacement of the existing one-way structure with a concrete bridge of 30 ft. span and 24 ft. roadway was completed.

Steven's Hill: This deviation of 34 ch. is nearing completion. Besides shortening the distance, the new alignment eliminates a series of sharp reverse curves. The main cutting is in volcanic rock, some of which has been crushed for maintenance and construction metal.

Dargaville-Maungaturoto:—

Ruawai (Reconstruction and Sealing): Reconditioning and widening of 6½ m. was completed, and a contract let for 2 m. of top-course metalling and sealing. Reconstruction will continue throughout the winter.

Skelton's and Cliff's Bridges: A contract has been let for the erection of these bridges (170 ft. and 45 ft. long respectively), and work is in hand.

Maungaturoto Village (Reconstruction and Sealing): This work is in hand over a length of 40 ch.

Whangarei-Maungaturoto via Waipu:—

Whangarei-Oakleigh: The realignment of this section is proceeding, 1 m. 44 ch. being formed and 1 m. 12 ch. metalled during the year. The principle reconstruction work between Oakleigh and Portland Junction is now completed.

The construction of two small bridges, at Portland Junction and at 5 m. 73 ch., is well in hand, and a third, over Te Wai-iti Stream, has been completed, eliminating a well-known danger spot.

Oakleigh Overbridge: The approaches have been carried up to the bridge-site, and the erection of the structure is in hand.

Oakleigh-Waipu: Widening and shouldering of the existing narrow sealed surface were carried out over 1½ m.

Mata Bridge: This bridge is being constructed in half-width sections, the first of which has been completed. The approaches are in hand.

Waipu, Sealing: 30 ch. of reconstruction through the township was carried out.

Birkenhead-Maungaturoto (No. 1 District):—

Massey Road - Orewa: A length of 1 m. 43 ch. between Silverdale and Orewa Bridge has been metalled, primed, and sealed.

North of Massey Road, 3 m. 30 ch. of second-coat sealing was carried out.

McKeown's Bridge: A two-span structure 60 ft. in length, with a 24 ft. roadway, was completed, and the approaches formed and metalled.

The addition of a footbridge to the Wade Bridge at Silverdale has been recently completed.

Orewa-Waiwera—Waiwera Hill: 9 ch. of new formation and 8 ch. of widening were carried out, and the metalling of this length completed the deviation for Christmas traffic.

The Waiwera Subway Bridge, of three 30 ft. spans, was completed.

Reconditioning and first-coat sealing were carried out over 2 m. 11 ch., and a further 75 ch. received a second-coat seal.

Waiwera-Puhoi: $1\frac{1}{2}$ m. of formation, including the deviation known as Johnstone's Hill, was completed and opened to traffic; a further 85 ch. was primed and sealed.

Titford's Bridge: This 40-ft.-span concrete structure was erected.

Puhoi-Warkworth: Reconditioning and priming were carried out on sections at Puhoi Bridge Approach, 12 ch.; Schedewy's Hill, 52 ch.; Schedewy's Slip, 9 ch.; and Barker's Deviation, 20 ch.

Wilson's Bridge: A concrete bridge of three 30 ft. spans, on improved alignment, was completed.

Warkworth Town District: $7\frac{1}{2}$ ch. in the business area and 40 ch. on the northern approach to the town have been reconstructed and sealed. Concrete footpaths and channels were included in the former length.

Warkworth-Dome Valley: 1 m. 59 ch. of this length was primed and sealed. 18 ch. of formation in connection with the Hoteo flood alleviation has been completed. A temporary bridge 90 ft. long, has also been constructed. This has eliminated the most frequently-flooded section of highway between Whangarei and Auckland. Falls Bridge, of one 35 ft. span, replacing the former single-way wooden structure on a dangerous bend, was erected.

Wellsford-Te Hana: Through Wellsford Village the existing 15 ft. bitumen surfacing was reshaped to 46 ft. width, primed, and sealed, over a length of 15 ch. On the Te Hana section priming has been carried out over 27 ch., and this length, together with a further 73 ch. already primed, was sealed.

Topuni-Maungaturoto via Brynderwyn: Work on this length has been accelerated, formation and culverting being completed over 3 m. 43 ch., and 2 m. 2 ch. of base-course metal laid.

Two small bridges are under construction, and a contract for a third has been let.

Warkworth-Tauhoa via Kaipara Flats.—Hoteo Crossings Deviation: The formation and metalling of the deviation have been completed. Hudson's Bridge, of three 25 ft. spans, and the Kaitoto Bridge, of three 45 ft. spans, have also been completed, and the deviation is in use by traffic.

Waimamaku-Ohaeawai :—

Lowe's Bridge: The erection of this bridge is in hand, two of the three spans being concreted.

Taheke Bridge: This structure, of three 50 ft. and two 30 ft. spans, has been completed.

Kaukapakapa-Port Albert.—Makarau Hill: This 54 ch. deviation has now been completed.

Hokianga (Ex Dargaville-Kaihu) Highway.—Dargaville Borough: The 1 m. 13 ch. section was reconstructed, primed, and sealed.

Hikurangi-Marua.—Hikurangi Town District: This half-mile length was reconstructed, primed, and sealed.

Kaitia-Motukaraka via Broadwood :—

Slaughterhouse Bridge: The renewal of this bridge is in hand.

Kaikohe-Donnelly's Crossing—Upper Mangakahia Bridge: This bridge, of five 55 ft. spans, has been completed and opened to traffic.

Pamapurua-Mangonui :—

Fisher's Bridge: The renewal of this bridge is in hand.

Oruru Flood Alleviation: The partial raising of the approach embankments to the present bridge has been completed, as the first stage of a proposal comprising also the renewal of the bridge, and further raising of the embankments, together with river improvement.

Lake Omapere-Maungatapere.—Te Pua Section, Improvements: This work has been commenced.

Birkenhead-Maungaturoto (No. 2 District) :—

Day's Bridge, 95 ft. long, with 22 ft. carriage-way and two 4 ft. footways, has been completed. 13 ch. was sealed at the Albany Bridge.

On the Albany Hill-Dairy Flat section a 5 ft. by 4 ft. 6 in. concrete culvert, 80 ft. long, and 1,400 ft. of pipe-culverts have been completed. 3 m. of clearing and 2 m. of heavy formation have been completed, and a further 50 ch. partly completed. 2 m. of base-course metal was laid.

Auckland-Helensville :—

On the Lincoln Road section, 1 m. 63 ch. of formation and base-course metalling was completed.

Reconstruction and sealing were carried out between Foster's Road and Woodhill, a length of 4 m.

Plant-mix has been applied on the Lincoln Road Extension, Anderson's Deviation, Kumeu-Huapai, and Vercoe's Culvert-Helensville sections, totalling 5 m. in length.

The elimination of the level crossing at Huapai was carried out by the erection of an overbridge consisting of three skew spans (two 24 ft. and one 32 ft.), the overall length being 80 ft., with a 22 ft. carriageway and one 4 ft. footway. 32 ch. of approaches were formed, and base-course metalling has been completed.

Auckland-Hamilton :—

The Newmarket section was resurfaced with plant-mix, and extra widening of shoulders in the Mount Wellington Road District was carried out to form a cycle-track.

Franklin County: A length of 6 m. 60 ch. over the Bombay Hills received a coat of plant-mix.

The Pokeno Overbridge, 125 ft. long and 24 ft. wide, was completed.

Plant-mix smoothing-coat was placed on the Ohinewai-Hamilton length over a distance of 6 m. 77 ch., and Tilsley's Deviation, 35 ch., was surfaced with salvaged bituminous material from the original alignment.

Hopu Hopu Overbridge: This bridge, comprising two 56 ft. 6 in. spans, was completed and opened for traffic, the approaches having been metalled and sealed.

Huntly Borough: Plant-mix smoothing coat was applied over a distance of 1 m. 61 ch.

Hamilton—Te Kuiti :—

Waipa County : The reconstruction, metalling, and sealing of this section was practically completed during the year, and a final coat of plant-mix laid over the greater part of the one-coat sealing. Sealing was completed over a length of 6 m. 7 ch., and plant-mix laid over 8 m. 33 ch.

The Mangapiko Bridge, 90 ft. long, was erected.

Otorohanga County : The reconstruction of 6 m. 70 ch. has been completed, and 4 m. 5 ch. of base-course metal laid. A 7 ft. by 7 ft. concrete culvert was built, and a 5 ft. arched culvert lengthened. Tenders have been invited for the top-course metalling and sealing of the 6 m. 70 ch.

Pokeno—Paeroa via Ngatea :—

Franklin County : Formation and cushion-course metalling have been completed for 6½ m., and further work is in hand. A contract has been let for the metalling and sealing of 6 m. 30 ch. in Mangatawhiri Village.

The Mangatawhiri Bridge, 144 ft.; Mangatangi Bridge, 100 ft.; and an 8 ft. by 8 ft. culvert were completed.

Five miles of fencing has been erected.

Hauraki Plains County : 72½ ch. at Netherton has been reconstructed, widened, and sealed. A further length of 3 m. 28 ch., between Waitakaruru and Haley's Corner, was reconstructed and sealed, and 63 ch. between Haley's and Mangatarata Junction was formed and metalled in readiness for sealing. The width of the original sealing has proved quite inadequate for modern traffic.

Thames—Paeroa :—

Thames County : Second-coat sealing was applied over 4¼ m. between Kopu and Puriri, and a contract let for the remaining length of this section. The total length under reconstruction is 4 m. 36 ch. The replacement of the timber bridge at Waikoropuru Stream by a twin 6 ft. by 6 ft. concrete culvert is in hand. The completion of this work will give a continuous sealed highway between Thames and Hamilton via Paeroa, Te Aroha, and Morrinsville.

Ohinemuri County : At Hikutaia Bridge two piled groynes have been constructed to check serious erosion, and the bridge at Puriri Stream has been replaced by a 21 ft. concrete span.

Paeroa—Whakatane (No. 2 District) :—

Waihi Borough : One mile, south of the Ohinemuri River Bridge, has been widened by 6 ft.

Ohinemuri County : The reconstruction over the first 3 m. from Turner's Hill to the Rahu Road was practically completed. The new alignment involved heavy earthworks, and masonry walls on lengths exposed to scour by the river. Excavation was handicapped by the necessity of keeping the highway open for traffic, but at no stage was it closed. Excavation totalled 24,500 cubic yards of clay and rock, 2,850 square yards of stone pitching was completed, and 1,200 cubic yards of stone placed in masonry walls. Further reconstruction is in hand. A heavy coat of metal was placed from Waihi Borough to the Tauranga County boundary, to prepare for sealing. Contracts have been let for 5½ m. of the latter work.

Hamilton—Paeroa :—

Waikato County : Reconstruction, metalling, and sealing were carried out over 3 m. 54 ch., between Eureka and the county boundary, thus completing the sealing between Hamilton and Paeroa.

In addition, 70 ch. of plant-mix was laid over the sealed surface of Hinton's Gully Deviation. Plant-mix smoothing coat was also laid over a further 2 m. 35 ch. of existing sealing.

Morrinsville Borough : 30 ch. from the Saleyards Culvert to the western boundary has been widened. A contract has been let for an overbridge at Piako Station, and the casting of piles is in hand.

Ohinemuri County : The erection of a 32-ft.-span concrete bridge at the Waitoke Stream has been completed, together with approaches.

Hamilton—Rotorua (No. 2 District) :—

Waikato County : 60 ch. at the Hamilton end was surfaced with plant-mix.

Cambridge Borough—Karapiro Bridge : One pier has been completed to water-level, and at the other, half the piles are driven. Piles for the eastern abutment are driven, and some staging piles are also in position.

Matamata County : Drag-coat sealing has been carried out near Cambridge, 50 ch. being completed, and further work in hand.

Karapiro—Tirau : Reconstruction, metalling, and sealing have been carried out during the year. Formation is nearing completion. 7 m. 66 ch. of base-course metalling, 3 m. 50 ch. of top-course, and 1 m. 74 ch. of priming-coat have been completed.

Tirau Subway : Excavation of the approaches was carried out to a stage enabling the Railways Department to construct the bridge, and the whole work is nearing completion.

Tapapa—Mamaku : Reconstruction, metalling, and sealing were carried well towards completion. 11 m. 63 ch. of metalling, 11 m. 14 ch. of priming, and 8 m. 62 ch. of sealing have now been accounted for.

Helen'sville—Waiwera.—A length of 23 ch. near Waiwera was sealed.

Pipiroa—Coromandel :—

Thames County : Masonry walls totalling 1,039 square yards were built, and widening carried out to 24 ft. over a length of 42 ch.

Tapu Stream Bridge : A contract was let for a concrete structure 138 ft. long, and the work is in hand.

33 ch. of sealing was completed.

Coromandel County—Coromandel Township: Carroll's Creek was widened and deepened over a length of 28 ch. A contract was let for the reconstruction and sealing of 2 m. 37 ch., 1 m. 21 ch. of which was completed.

The construction of a 47 ft. concrete bridge over the Otakeao Stream was completed.

Hamilton—Raglan :—

Waipa County: A contract has been let for the second-coat sealing of the 5 $\frac{3}{4}$ m. section.

Raglan County: A contract is in hand for the reconstruction of 4 m. 25 ch., and 3 m. 68 ch. of metalling has been completed. A further contract has been let for the sealing.

Waitoa—Taupo (No. 2 District) :—

Matamata County: The sealing commenced last year was continued, and a total of 13 $\frac{1}{2}$ m. completed.

Tokoroa—Atiamuri: During the year 5 m. 73 ch. of formation and 4 m. 74 ch. of base-course metalling were completed on this section.

Matamata—Tauranga (No. 2 District).—Matamata County: A second-coat sealing was applied on the Waihou Deviation for a length of 24 ch.

Kawhia—Wharepungu via Kawa.—Otorohanga County: The construction of the 28 ft. span Waikeria Bridge was completed.

Papakura—Clevedon—Kawakawa.—Manukau County—Clevedon Township: The reconstruction of 21 ch. is in hand.

Drury—Awhitu via Pukekohe.—Franklin County: Fallows' Bridge, a 14 ft. concrete span, was completed. A contract was let for the sealing of 1 m. 26 ch., from Pukekohe Borough towards Lucas' Corner, and work is in hand.

Coromandel—Mercury Bay :—

40 ch. was widened, making a total of 4 $\frac{1}{2}$ m. on which improvements have been effected. A contract has been let for reconstruction and sealing, and to date 1 m. has been metalled, and realignment of all curves is in hand.

The erection of McKenzie's Bridge, consisting of one 40 ft. span, was completed.

Tahuna—Ohinewai.—Waikato County: The Ohinewai Overbridge, consisting of one 40 ft. and two 30 ft. spans, was completed and opened for traffic.

Te Aroha—Waharoa.—Piako County: A length of 2 m. received a tar-sealing coat and 2 m. a second coat of bitumen. The metalling and sealing of 8 $\frac{3}{4}$ ch. at the Wardville corner was completed.

Kihikihi—Arapuni—Putaruru.—Waipa County: A contract was let for reconstruction and sealing between Kihikihi and Parawera.

Te Awamutu—Cambridge.—Waipa County: The reconstruction and sealing of 4 m. 58 ch. is in hand, and 4 m. 54 ch. of formation and base-course metalling have been completed.

Pukekohe—Glen Murray via Tuakau.—Tuakau Town District: 31 ch. was sealed, completing the sealing of the section.

Cambridge—Eureka :—

Waikato County: 1 m. 25 ch. was sealed, from Cambridge Borough towards Hautapu.

A contract for the erection of the Mangaonua Stream Bridge is in hand.

Otorohanga—Honokiwai.—Otorohanga Town District: A contract was let for the reconstruction and sealing of a length of 50 ch.

Henderson Valley Highway.—Henderson Town District: The elimination of the level-crossing by a subway was put in hand, and the approaches are in progress.

Waikumete—West Coast.—Waitemata County: Reconstruction and sealing were carried out over a length of 66 ch.

Puni—Otara—Waiuku.—Franklin County: Parkinson's Bridge was replaced with an 8 ft. by 6 ft. concrete culvert 53 ft. long.

Papatoetoe—Howick.—Manukau County: An additional 62 ch. was sealed during the year.

Matamata Station Highway.—Matamata Borough: Two-coat sealing was carried out over 20 $\frac{1}{2}$ ch., which completes the sealing of this highway.

Ngatea—Waharoa via Morrinsville.—Piako County: The metalling and sealing of a 6 m. length south of Tahuna was completed. Between Kiwitahi and Walton a contract has been let for the reconstruction and metalling of 2 m. 64 ch., and earthwork completed over 1 m. 20 ch.

Papakura—Titi.—Franklin County: The renewal of the Whatapara Bridge is in hand.

Frankton—Pirongia.—Waipa County: A contract has been let for the reconstruction and sealing of 2 m. 69 ch.

Tapu—Kaimarama.—Thames County: Light reconstruction and metalling over the 14 $\frac{1}{2}$ m. section were commenced. Widening was completed over 1 m. 42 ch., and the metal top-dressed over 3 m. 44 ch.

Putaruru—Tapapa.—Matamata County: A concrete bridge of 40 ft. span was completed over the Purere Stream.

Hubbard's Highway.—Ohinemuri County: Widening over a length of 40 ch. has been completed.

Morrinsville—Ngarua.—Piako County: A further length of 1 m. 23 ch. was sealed in two coats.

Taupiri-Morrinsville via Tauhei :—

Waikato County : A contract was let for the reconstruction, metalling, and two-coat sealing of 2 m. 75 ch., and formation is in progress.

The reconstruction of Crockett's Bridge over the Tauhei Stream is in hand.

The elimination of the level crossing at Taupiri is being carried out by the erection of an overbridge of two 32 ft. and two 22 ft. spans.

Hobsonville Highway.—Reconstruction and metalling were carried out near the aerodrome.

Horotiu - Whatawhata - Te Rore :—

Waipa County : A contract was let for the second-coat sealing of 14 ch. near the Whatawhata Post-office, and 8 ch. at Te Kowhai School was sealed in two coats.

Raglan County : A contract was let for the construction of a five-span concrete bridge over the Kaniwhaniwha Stream, and the work is well in hand.

Coromandel Wharf Highway.—The whole length, 70 ch., was primed and sealed.

Buckland's Beach Highway.—Manukau County : The sealing of 2 m. 60 ch. was carried out.

Carruth Highway.—Papatoetoe Town District : The full length of 31 ch. has been sealed.

Hamilton-Tauhei via Gordonton.—Waikato County : The reconstruction and sealing of 40 ch. is in hand, and a tender has been received for reconstruction and metalling of a further 3 m. 30 ch.

Paeroa-Whakatane (No. 3 District) :—

Three deviations near Kaituna were completed and metalled, cutting out bad corners and a flood area, and, in addition, 7 m. of shoulders were widened and sealed between Tauranga and Papamoa.

In the vicinity of Matata and Otamarakau, 3½ m. was realigned and formed 26 ft. wide.

Hamilton-Rotorua (No. 3 District).—55 ch. of sealing was carried out on the approaches to the Tarukenga Overbridge.

Rotorua-Whakatane.—The Western Drain Bridge was completed. During the year 3½ m. of heavy construction was carried out on the Rotoma Hill.

Whakatane-Gisborne via Waioeka (No. 3 District) :—

Safety-fencing was erected in the Waimana Gorge, and stone-walling for the same purpose in the Waioeka Gorge.

In the latter gorge many open water-courses were replaced by culverts.

The Upper Opato Bridge, Mill Stream Bridge, and Clayton's Bridge were completed, and the construction of Grahame's Bridge is well in hand.

Rotorua-Taupo.—A further 4½ m. of two-coat sealing was completed near Waiotapu, and 2 m. of reconstruction near the Huka Falls.

Waioa-Taupo (No. 3 District).—4½ m. of formation, metalling, and sealing were completed south from the Matamata County boundary.

Matamata-Tauranga (No. 3 District).—Kaimai Hills : Extensive work has been carried out on this section, 3 m. 30 ch. of formation, 2 m. of metalling, and a twin culvert, two 7 ft. by 7 ft. by 90 ft. long, being completed.

Te Ngae - Paengaroa.—2½ m. of two-coat sealing was completed adjacent to Paengaroa.

Opotiki-Te Araroa (No. 3 District) :—

3½ m. of reconstruction and metalling were carried out, and the eastern approach to the Raukokore Bridge, 2 m. in length, was also completed and metalled. The construction of the bridge has been commenced.

This highway suffered severely on two occasions from heavy floods, portion of the Kereu low-level bridge being washed out.

Papamoa - Mount Maunganui.—The reconstruction of the Mount Maunganui Town District section of 2 m. 5 ch., in preparation for sealing, is in progress.

Whakatane-Gisborne via Waioeka (No. 4 District) :—

Kaiteratahi Bridge : The construction of the new bridge has been commenced.

Widening 28.5 m. to 31 m. : 34 ch. of widening and metalling were completed.

Puha Level Crossings Nos. 78 and 79 were eliminated by a deviation 39 ch. in length.

Waikohu Crossing No. 81 : A concrete bridge, 200 ft. long with 20 ft. roadway, over the Waihuka River was erected, and work on the Waikohu Bridge commenced. These two bridges are located on a deviation 1 m. 27 ch. in length, which will eliminate level crossing No. 81 and the unsatisfactory Waikohu suspension bridge.

Gisborne - Te Araroa :—

Reconstruction and Sealing, 6 m. to 12 m. : 3 m. of formation and 1 m. 20 ch. of metalling and one-coat sealing have been completed.

Turehau Bridge : This concrete bridge, 180 ft. long with a 24 ft. roadway, was completed.

12.5 m. to 14 m. : The four deviations on this section were sealed in one coat, the total length being 42 ch.

Uawa River Bridge : A concrete bridge of ten 50 ft. spans, with a 22 ft. roadway and a 4 ft. footway, was completed. A contract was let for the approaches.

Widening 43 m. to 43.3 m. : 12 ch. was completed and the spoil used in the approaches to the proposed new Raponga Bridge at 43.75 m. This eliminates a dangerous corner.

Sherwood Hale's Bridge at 62.4 m. : The erection of this bridge is in hand.

Mangakino Deviation : Tenders have been called for this work, which will eliminate the present route via the Mangakino River bed.

Reconstruction at 109.5 m. : 10 ch. of widening was carried out on the Hospital Hill.

Gisborne-Napier via Hangaroa (No. 4 District) :—

Reconstruction and Sealing: Progress is as follows—

15 m. to 17 m.: 2 m. 30 ch. of two-coat sealing was completed.

17 m. to 19 m.: 20 ch. of reconstruction was completed.

21.68 m. to 25.8 m.: 2 m. 20 ch. received a one-coat seal.

25.8 m. to 27.8 m.: 2 m. received a one-coat seal.

27.8 m. to 30.1 m.: 1 m. of reconstruction was carried out.

Glassford's Bridge at 42.3 m.: A concrete bridge, 75 ft. long, was completed.

Gisborne-Wairoa via Morere (No. 4 District) :—

Wairekaia Bridge at 15 m.: Tenders were called for the erection of this bridge.

Wharerata Hill: 20 ch. of metalling was carried out.

Flood Damage: A major flood on 19th February carried away two bridges over the Maraetaha River at 17½ m. and 18½ m. A temporary low-level bridge was constructed at 17½ m. and a ford opened up at 18½ m. pending the erection of a temporary bridge. Through traffic was resumed on 1st March.

Opotiki—Te Araroa (No. 4 District) :—

Widening at 141.5 m.: 10 ch. was completed.

Karakatuwhero River Bridge: This concrete bridge, 300 ft. long with a 10 ft. roadway, was completed. This bridge eliminates a very troublesome ford, greatly improving the communications in this district.

Whangaparaoa River Bridge: The casting of piles for this bridge was commenced.

Patutahi-Rere: 10 ch. of reconstruction and metalling was completed at 11 m. A bridge at 20.3 m. was replaced by a 4 ft. concrete pipe and filling.

Taupo-Napier :—

Waikato's Corner - Waipunga Road: 1 m. 65 ch. was metalled and sealed.

Runanga Deviation: Except for one block-cutting and an adjoining fill, and a bridge-site at 1 m. 30 ch., this deviation is now formed to 1 m. 40 ch., and work is in hand to 2 m. Metalling has been commenced.

Baker's Deviation: This 30 ch. deviation was completed, and widening with improved alignment was continued northward for another mile.

Glengarry Section: Widening and metalling have been continued, 3 m. being completed during the year, which makes a total of 7 m. 30 ch.

Gisborne-Napier, via Hangaroa (No. 5 District) :—

Wairoa Borough: The reconstruction and sealing of First Street, 19 ch., was completed.

Mohaka River-Napier: Widening has been completed up to McKenzie's Deviation (1 m. north of the Waikare Bridge), and work is in hand up to Kotemaori, 50 m. from Napier.

McKenzie's Deviation is three-quarters finished, and Begley's Fill Deviation is well in hand. Widening between these points is completed, except for a proposed deviation and water-drive at McKenzie Creek.

King's Creek Bridge, near the foot of the Waikare Gorge, was widened from 12 ft. to 24 ft. The January and February floods necessitated continuous clearing of slips all through February and the greater part of March. (A further record flood has since been experienced.)

Napier - Palmerston North (No. 5 District) :—

Whakatu Overbridge: A contract was let for the erection of this bridge, which consists of four 50 ft. spans. The casting of piles has been completed and twelve have been driven.

The reconstruction and sealing of 4 m. 33 ch., from the Hawke's Bay County Boundary to Otane Turnoff, was put in hand. Priming has been completed over 4 m. and sealing over 1 m. 72 ch.

Overbridge North of Waipukurau: A contract was let for the erection of this bridge, of four 50 ft. spans, and the work completed. The approaches are in hand.

Manawatu Hill Deviation: A length of 66 ch. was primed and sealed. 24 ch. of safety-fencing was erected.

Manawatu River Bridge: This concrete structure, of two 30 ft. spans, was completed, together with its approaches.

Butcher Creek Bridge: This 25 ft. span bridge was completed.

Otamaraho Stream Bridge: This bridge, of one 40 ft. span, was put in hand and completed during the year.

Kumeti Stream Bridge: This bridge, of two 25 ft. spans, was also erected.

The above four bridges are all 24 ft. wide, and the approaches to the last two have a total length of 24 ch.

Oringi North Overbridge and Deviation: This bridge, consisting of three 45 ft. spans, was completed, and the 48 ch. deviation formed and metalled.

Maharahara Deviation and Bridges: The greater part of the work on this 1 m. 72 ch. deviation, which eliminates two crossings on the State highway and one on Heretaunga Road, was completed in the previous year. During the year formation was completed up to the bridge-sites and metalling was continued.

Bridges: The deviation eliminating the Heretaunga Road crossing required a bridge over a creek-diversion. This bridge was put in hand and completed, being a 27 ft. concrete span with a width of 12 ft.

Raparapawai Stream Bridge: This bridge, of two 40 ft. concrete spans, is in hand.

Bridge over Creek Diversion at 1 m. 49 ch. : This 30 ft. span bridge has been practically completed.

Papatawa Overbridge : A contract was let for the bridge, and the approaches, which involve some 20,000 cubic yards of filling, are in hand.

Mangamanaia Overbridge, Stream Bridge, and Deviation : The deviation, including the overbridge approaches, is 57 ch. long, and involves 23,000 cubic yards of earthwork. In February work was suspended pending the erection of the bridges, but 18,950 cubic yards of spoil had then been placed.

Overbridge : This bridge of three 40 ft. spans, is in progress. Concrete is being placed in the footings.

Stream Bridge : This bridge, of two 40 ft. spans, has been commenced, pile-driving being in progress.

Woodville-Masterton (No. 5 District).—Manga-atua Stream Bridge : The approaches, 16 ch. long, have received a priming coat.

Napier Park - Rissington.—1 m. 27 ch. was metalled, primed, and sealed.

Otane-Tukituki via Elsthorpe.—Patangata County : 1½ m. near Otane was widened and metalled in preparation for sealing. A contract for the sealing was let.

Waipawa - Onga Onga.—The reconstruction and sealing of 1 m. near Waipawa was completed, also the sealing of 90 ch. at Ruataniwha.

Dannevirke-Waipukurau via Porangahau :—

Patangata County : A concrete culvert 7 ft. by 7 ft. by 40 ft. in length, with 12 ft. of filling, was constructed.

The widening of the Wanstead Hill length was completed, and metal applied in preparation for sealing.

Dannevirke County : A length of 2½ m. between 7 m. and 10 m., which had been primed, received a sealing coat.

Hastings-Maraekakaho.—3 m. 52 ch. from Bridge Pa to Washpool was metalled and sealed.

Frasertown - Lake House.—The 32 ch. section through Frasertown was sealed.

Fernhill-Takapau via Maraekakaho :—

Hawke's Bay County : The Mangaonuku Stream Bridge of three 40 ft. concrete spans was completed, together with 20 ch. of approaches.

Waipawa County : 1 m. through Tikokino was reconstructed and sealed.

Waipawa-Pourerere :—

The reconstruction and sealing of 1 m. at Waipawa were completed.

Patangata County : Metalling in preparation for sealing was carried out over 2½ m., and the priming commenced.

Woodville-Tamaki.—Dannevirke County : A further length of 1 m. 56 ch. is being prepared for sealing.

Waipukurau-Matamau via Hatuma.—Waipukurau County : A length of 1 m. 50 ch. was primed and sealed.

Mangateretere - Te Awhanga :—

A further length of 3 m. 27 ch., between Haumoana and Clifton, was reconstructed, metalled, primed, and sealed.

Two concrete culverts were put in, one 11 ft. by 7 ft. at Clive Grange, and one 11 ft. by 5 ft. near Clifton.

Waiohiki-Pakowhai.—3 m. 29 ch. was metalled, and sealed in two coats.

Freelands Highway.—Woodville County : Stone-and-netting groynes were put in to protect the bridge over the Raparapawai Stream.

Rotorua-Waikaremoana.—Hopuruahine - Lake House : Reconstruction on improved alignment and width is in hand on lengths centred on Mokau Falls and Aniwaniva respectively. At the end of the year 2 m. 24 ch. had been widened ready for metalling.

Hastings-Waimarama :—

Hawke's Bay County : From the Havelock North Town Boundary, 1 m. 61 ch. was reconditioned, and a further 1 m. 30 ch. from near the Tuki Tuki River Bridge towards Havelock was reconstructed and metalled. Both these sections were sealed in two coats.

A 10 ch. deviation on the Te Mata Section, easing two sharp curves, was carried out.

Cole Highway.—Dannevirke Borough : 17 ch. of two-coat sealing was completed, and a further length of 10 ch. prepared for sealing.

Tuki Tuki - Haumoana Beach.—The whole of this 46 ch. length was metalled, primed, and sealed.

Waipukurau-Racecourse :—

Waipukurau County : A 69 ch. section was primed and sealed.

A further 65 ch. section was reconstructed, and a contract let for sealing.

Hamilton - Te Kuiti (No. 6 District).—Te Kuiti Borough : In the widening of Rora Street, 19 ch. of formation and metalling were completed.

Te Kuiti - New Plymouth (No. 6 District) :—

Te Kuiti - Pio Pio Section : 7 m. to 10 m. : 1 m. 23 ch. of 30 ft. formation and 3 m. of base-course metalling were completed.

12 m. to 14 m. : 1 m. 6 ch. of formation and base-course metalling were completed.

14 m. to 15 m. : 45 ch. of formation and base-course metalling were completed.

Te Kuiti - National Park :—

Ohura Turnoff - Ongarue Turnoff : 54 ch. of heavy rhyolite, papa, and sandstone formation, and 12 ch. of base-course metalling were completed.

Manunui Town District : 2 m. of prime coat was applied.

Taumarunui - National Park : 10,056 cubic yards of material was removed from a major slip at Piriaka.

Oio-Owhango : This section, 4 m. in length, received a top-course of metal chips.

Piriaka Overbridge : This concrete bridge, comprising three 45 ft. spans, with a 24 ft. roadway, together with 25 ch. of approaches, was completed.

Oio Overbridge : This bridge comprising one 50 ft. and two 40 ft. spans, with a 22 ft. roadway, together with 37 ch. of approaches, was completed.

Spiral Overbridge : Contracts have been let for this bridge and its approaches. The foundations of the step-over pier, the north pier, and abutment have been concreted, and the south pier is in hand.

Stratford-Taumarunui (No. 6 District).—Tokirima Hill : 46 ch. of formation and 26 ch. of metalling were completed, in connection with widening at dangerous corners.

Pio Pio-Tatu :—

Waitewhena Road : The reconstruction of the remaining 9 m. of clay surface on this highway is well in hand, 1 m. 60 ch. of earthwork being completed.

Ohura Township—Mangaroa River Bridge : This concrete bridge, comprising one 48 ft. and two 36 ft. spans, with 10 ch. of approaches, was completed and opened to traffic. It has a 20 ft. roadway and one 4 ft. footway.

Te Maire-Mangaohutu.—29 ch. of heavy papa formation was completed, in connection with the cutting-back of dangerous corners.

Okupapa Highway.—Omanawa Bridge : This concrete bridge, 45 ft. in length, together with its approaches, was completed.

Manunui-Owhango.—1 m. of formation and metalling was completed, in connection with the elimination of dangerous bends in the Hikimutu Valley. A 6 ft. concrete culvert was installed near Owhango.

Kururau-Taumarunui :—

Lyons Bridge : This 90 ft. concrete bridge was completed.

Bloomfield's Bridge : This 93 ft. concrete bridge is in hand, the abutments and piers being completed.

Taumarunui-Ongarue :—

Taumarunui County : Heffernan's culvert, 7 ft. 6 in. by 7 ft. 6 in. in concrete, together with 12 ch. of filling, was completed.

Taumarunui Borough—Short St. Subway : 20 ch. of formation of the approach cutting, 6 ch. of metalling, and 7 ch. of concrete crib-wall were completed, also the abutments of the railway-bridge.

Te Kuiti - New Plymouth (No. 7 District) :—

In the Mimi Valley, a further 14 ch. of deviation has been formed, 15 ch. metalled, and 23 ch. of stream diverted. A concrete bridge, 42 ft. long, with a 24 ft. roadway, has been completed on the deviation. The formation is nearing completion.

From the junction with the Pukearuhe Highway to the Mangamaeho Road, a deviation is being formed, 1 m. 58 ch. in length. 1½ m. of formation has been completed, and the remainder is in hand.

On the Urenui Pa Hill, from the Urenui Stream north, the earthwork of a deviation 13½ ch. long has been completed.

At the Waitara Pound Corner, the metal has been lifted and the formation widened.

The Mangaoraka Deviation has been metalled.

New Plymouth - Hawera :—

A contract has been let for the erection of a concrete bridge, 150 ft. long, over the Waiwakaiho River.

A contract has also been let for the realignment and metalling of 73 ch. west of Inglewood. The Tariki-Waipuku Deviation, which avoids two level crossings, has been completed except for bituminous surfacing. This deviation includes a concrete bridge of three 40 ft. spans over the Waipuku Stream.

The Midhirst railway-crossing is being eliminated by an overbridge, and a concrete bridge over the Manganui Stream is also in hand.

The 6 m. length between Waipuku and Stratford is being entirely reconstructed.

A tender has been accepted and work has commenced on the erection of a concrete overbridge at Ngaere.

On the Boylan Road section, in the Eltham County, alignment, widening, and metalling, over a distance of 3½ m., are being undertaken.

The Normanby Overbridge has been completed, except for the sealing of the approaches, and is in use by traffic.

Hawera-Wanganui (No. 7 District) :—

Between the Hawera Borough and the approaches to the Mokoia Overbridge, a distance of 6 m., reconstruction is in progress over 3 m. That portion known as Lillierap's Hill, and also the northern approach to the new Tangahoe Stream Bridge, are being straightened, regraded, and widened.

The highway has now been diverted from the dangerous railway-crossing at Mokoia by an overbridge over a cutting south of Mokoia, and the construction of a deviation. The work is complete, except for the sealing of the approaches, and is in use by traffic.

A contract has been let and work commenced on the erection of a concrete bridge, 150 ft. long, on new alignment, over the Manawapou Stream, south of Mokoia.

New Plymouth-Hawera via Opunake :—

At the intersection of the highway with the Wairau Road, visibility is being improved by the cutting-back of the corners and the regrading of both roads.

Over the Okahu Stream, between Rahotu and Opunake, a new concrete bridge, 112 ft. long, with a 20 ft. roadway, is nearing completion.

Opunake Borough: Widening and resealing have been carried out through the Borough.

Junction Highway :—

Inglewood County: 3 m. of road-mix emulsion sealing has been undertaken.

Preparatory work is in hand in connection with the subway, which is to eliminate the level crossing at Egmont Road.

Opunake-Eltham.—Egmont County: A concrete bridge, 219 ft. long, has been erected over the Punehu Stream. This bridge replaces that badly damaged during the flood of February, 1936. Groynes have been built to control the stream.

Stratford-Taumarunui (No. 7 District).—79 ch. of metalling has been carried out at the Moki Tunnel, also 3 m. 50 ch. of formation and 2 m. 50 ch. of metalling between the Moki and Mangapapa Roads.

Normanby-Manaia.—Normanby Town District: 10 ch. of widening was carried out.

Ngatimaru Highway.—Clifton County: The reconstruction and two-coat sealing of 1 m. 18 ch. were completed.

Skeet Highway.—Waimate West County: 2½ m. has been widened.

Pembroke Highway.—The first sealing-coat has been applied to 94 ch. of this highway.

Inland North Highway.—Reconstruction and two-coat sealing have been carried out over a distance of 63 ch.

Inglewood-Everett Highway.—Realignment, regrading, and metalling preparatory to sealing have been carried out over a length of 2 m.

Rahotu-Kahui.—Reconstruction has been commenced over a distance of 1 m.

Ohawe-Skeet.—Widening, preparation, and sealing are being carried out over a distance of 3½ m., from Okaiawa northwards.

Opunake Beach Highway.—Opunake Borough: The highway has been reconstructed and sealed.

Hawera-Wanganui (No. 8 District).—24 ch. was sealed on the Whenuakura Hill, 62 ch. at Westmere, and a contract let for 53 ch. on the Waitotara Hill. Second-coat sealing was applied on 30 ch. on the Manawapou Hill. The construction of the Kai Iwi Overbridge and approach ramps is well advanced.

Wanganui-Levin (No. 8 District).—Second-coat sealing was applied on 60 ch. in the Bulls Town District, and 27 ch. between the town district and the Rangitikei River.

National Park-Wanganui (No. 8 District).—Wanganui County: Works carried out on the hill section included 4 m. 18 ch. of reconstruction and metalling, with extensive deviations from the old alignment, 1,600 ft. of concrete-pipe culverts, and 473 ft. of water-tunnels. 2 m. 5 ch. of two-coat and 2 m. 35 ch. of one-coat sealing were completed between the Wanganui City and Upokongaro; the construction of the Waimatao Stream culvert was commenced, and tenders were invited for the Mangotai Stream culvert.

Horopito-Bulls via Taihape :—

Contracts were let for new bridges over the Mangawhero River in the Ohakune Borough, and the Mangaehuehu and Turangarere Streams; also a concrete culvert at the Waiakake Stream.

The sealing of Clyde Street, in Ohakune Borough, was extended by 10 ch.

The Waiouru Deviation, 1 m. 36 ch. in length, was completed, eliminating a level crossing and an obsolete overbridge.

The sealing of two lengths, totalling 1 m. 46 ch., in Taihape, was carried out, thus completing the bituminous surfacing of the borough section.

The reconstruction of the Mangaweka-Utiku section is proceeding in heavy formation; 1 m. 54 ch. of earthwork and 6½ m. of metalling were carried out.

The Mangatewaka Stream Bridge, of one 30 ft. concrete span, was completed.

The reconstruction of the Vinegar Hill length was continued, being retarded by heavy slips. The work completed included 1 m. 15 ch. of formation, 55 ch. of metalling, and 6 ch. of creek-diversion.

The elimination of the Cliff Road level crossing by a subway is in hand, and the excavation of the approaches nearing completion.

The Greatford Overbridge, of three 30 ft. spans, was completed, and the formation of the approach ramps is in progress.

3½ m. of the Greatford-Bulls section was sealed, making the dustless surface continuous from Bulls to near Greatford, and a second coat of bitumen was applied to 29 ch. in the Bulls Town District.

Kaharoa Highway.—The sealing of this highway was extended by 40 ch.

Kohi Highway.—57 ch. of new metalling was carried out.

Momahaki-Mangawhio.—25 ch. was sealed.

Wanganui-Kauangaroa.—Wanganui County: 1 m. of reconstruction and a further mile of sealing were completed.

Taihape-Napier.—Rangitikei County: A concrete culvert, 44 ft. long by 8 ft. by 8 ft. was constructed at Moawhango, and the approaches formed.

Greatford-Ashhurst.—The deviation at Kakariki, conforming to the railway realignment and grade-easement, was completed. The deviation is 1 m. 26 ch. long and eliminates a level crossing.

Waverley Beach Highway.—Patea County: 17 ch. of metalling and 40 ch. of sealing were carried out.

Springvale-Francis.—Waitotara County: 82 ch. of two-coat sealing was applied.

Curls Bridge - Upper Tutaenui.—A subway to eliminate the Wellington Road level crossing in Marton was practically completed as to the approaches. The railway-work is in hand.

Turakina - Cliff Road via Marton.—

Rangitikei County: The Bonny Glen Overbridge and approaches are nearing completion.

The second-coat sealing of 8 m. 24 ch. of the Turakina-Marton section was carried out, and contracts let for the reconstruction and sealing of 2 m. 7 ch. on the Calico Line section. A 10 ft. by 4 ft. concrete culvert was built at Folly Stream.

Taihape - Murray's Track.—The Namanui Stream Bridge was replaced by a water-tunnel 123 ft. long, with 11 ch. of approaches.

Ongo Highway.—A contract was let for the reconstruction of 28 ch. of Kilmister's Hill.

Waitotara Valley Highway.—Waitotara County: 15 ch. of approaches to the Makakako Stream Bridge were formed and metalled, and some widening carried out between the Makakako and Manganuiopo Bridges.

Wanganui River (Left Bank) Highway.—

The restoration of flood damage on this highway was continued, the following work being carried out: Widening formation, 54 ch.; metalling, 13 m. 15 ch.; water-tunnels, 643 ft.; pipe-culverts, 900 ft.

In addition to this work, the Operiki Stream Bridge, consisting of one 30 ft. steel-joist span, was completed; extensive repairs to the Mangoihe Stream Bridge at Jerusalem carried out, and a temporary bridge erected over the Kaukore Stream at Pipiriki.

Wanganui-Levin (No. 9 District).—

Manawatu County.—Himatangi-Sanson: The reconstructed length of 7 m. 65 ch. was sealed, thus completing the dustless surfacing of the 20 m. Foxton-Sanson section.

Foxton Borough: The reconstruction of a 60 ch. section of original sealing was put in hand near the end of the year. At the north end, 11 ch. was reconstructed, primed, and sealed.

Whirokino Deviation: The formation of this 2 m. 62 ch. deviation is well towards completion, 53 ch. being formed, 23 ch. metalled, and 1 m. 6 ch. sealed during the year. The concrete trestle-bridge of ninety-three 40 ft. spans is in progress, all piles being driven, column steel placed, and footings concreted. An isolated three-span section is nearing completion.

Levin-Porirua.—

Horowhenua County: Between Waikanae and Te Horo, a road-mix smoothing-coat was laid on existing corrugated penetration pavement for a distance of 4 m. 33 ch.

Manakau Overbridge: This bridge, of six 40 ft. and two 30 ft. concrete spans, is in hand.

Otaki Overbridge: This bridge, consisting of three 45 ft. concrete spans and 31 ch. of approaches was completed. The approaches were primed and sealed.

Hutt County: Widening of the paved surface was completed over 30 ch. between McKay's Crossing and Paekakariki.

Between Waikanae and McKay's Crossing, 3 m. 14 ch. of road-mix smoothing-coat was applied on the existing sealed surface, and 82 ch. between Horokiwi and Pahautanui.

Paraparaumu Overbridge: This overbridge, consisting of two 40 ft. and one 50 ft. concrete spans, with 28 ch. of approaches, is in progress.

Makara County: Between Paremata and Porirua, 26 ch. of emulsion sealing was applied on a primed surface.

Porirua Overbridge: This work consists of six 40 ft. and two 35 ft. concrete spans, with 34 ch. of approaches, and a concrete bridge of four 40 ft. spans over the Porirua Stream. The concreting of the overbridge and stream bridge was practically completed, and the approaches are in hand.

Napier - Palmerston North.—

Manawatu Gorge Section: Culvert-renewals and sub-grade drainage are in progress preparatory to improvements to the surface sealing.

Kairanga County: Between Palmerston North and Whakarongo, 44 ch. of road-mix smoothing-coat was laid. A further length of 30 ch. of old sealing was scarified, reconstructed, primed, and sealed.

Masterton - Upper Hutt (No. 9 District).—Hutt County: Widening was carried out over a distance of 70 ch. on the Mungaroa and Rimutaka Hills.

Sanson—Palmerston North :—

Manawatu County : On Mount Stewart, 60 ch. of old sealing was scarified, primed, and sealed.

Kairanga County—Awahuri Bridge, Oroua River : Pile-driving has been completed and all piers concreted, except the western abutment; the girders and transoms over half the bridge have also been concreted.

Awahuri—Mangaweka via Kimbolton :—

Kiwitea County : Between Cheltenham and Coulter's Line, 40 ch. of sealing was carried out, completing last year's contract.

Between Coulter's Line and Kimbolton a contract is in hand for 5 m. of reconstruction and sealing.

Two-course metalling and priming have been completed, and 40 ch. of seal-coat applied.

North of Rangiwahia, widening was completed over a length of 28 ch.

Ireland's Bridge was renewed by a 6 ft. by 6 ft. concrete culvert.

Feilding—Cliff Road via Stanway.—Oroua County : 3 m. of sealing was applied on the section recently primed, and on the adjoining section reconstruction, priming, and sealing were completed over 1 m. 60 ch.

Greatford—Ashhurst :—

Oroua County : At Bunnythorpe 18 ch. was reshaped, primed, and sealed.

Feilding Borough : 6 ch. was sealed.

Palmerston North—Himatangi :—

South of Palmerston North, 72 ch. of old sealing was scarified, reshaped, and primed. The original sealing was put down some eighteen years ago.

Horowhenua County—Levin—Shannon : On the Ihakara Hill, 55 ch. was reconstructed and primed.

South of Shannon, smoothing-coat work on existing sealing was completed over a length of 68 ch.

Makerua—Tokomaru : On the Makerua Hill, formation was carried out over 30 ch. and base-course metal for 42 ch., completing this work on the deviation.

Between Makerua Hill and Tokomaru, widening and realignment were completed for 1 m. 70 ch., and base-course metalling for 1 m. 50 ch.

The widening of the Waterfall Creek Bridge is in hand.

Kairanga County—Tokomaru—Palmerston North : On this section widening and realignment have been completed, except for metalling over 4 m. 17 ch. Work is in hand on a further length.

Ashhurst—Pohangina :—

Oroua County : 1 m. 50 ch. of reconstruction was carried out and 1 m. 20 ch. primed.

Pohangina County : Tenders are being called for the Raumai Deviation, 26 ch. long.

Upper Hutt—Waikanae :—

Hutt County : 3 m. 50 ch. of widening was carried out.

Reconstruction, priming, and sealing were completed over a length of 1 m. 44 ch.

Horowhenua County : At the Waikanae end, reshaping and priming were completed for 2 m. 17 ch.

Waikanae—Waimaha.—Reconstruction was carried out over 2 m. 60 ch., and of this length 1 m. 60 ch. was primed.

Longburn—Rongotea.—Kairanga County : 3 m. 12 ch. of reconstruction, 2 m. of priming, and 50 ch. of sealing were undertaken.

Foxton Beach Highway.—Manawatu County : A tender was accepted for the reconstruction and sealing of the whole length of 2 m. 58 ch.

Pohangina Valley—Apiti.—Church Hill Deviation : This deviation was completed by the construction of 9 ch. of formation. The Church Hill Bridge, comprising three 40 ft. concrete spans, was erected.

Paraparaumu Beach Highway.—Reconstruction, priming, and sealing were completed over the whole length, 2 m. 11 ch.

Milson's Line.—75 ch. of priming was applied, and the whole length of 2 m. 35 ch. sealed.

Khandallah—Johnsonville :—

Johnsonville Town District : A road-mix smoothing-coat was applied over 33 ch.

Western Hutt Highway : Priming and sealing were carried out over 4 m. 52 ch., being the whole length of this highway.

Woodville—Masterton (No. 10 District) :—

Pahiatua Borough : The section has been reconstructed, primed, and sealed. The length treated was 1 m. 10 ch. and the width 64 ft.

Eketahuna County : 4 m. 10 ch. was sealed north of Eketahuna.

Eketahuna North Subway : The formation of the approaches is in hand, 6 ch. of formation being completed. The construction of the railway-bridge is in progress.

Masterton County—Opaki Overbridge : This bridge, comprising four 50 ft. concrete spans, with 30 ch. of approaches, has been completed.

Masterton—Upper Hutt (No. 10 District) :—

Carterton Borough : On this section 1 m. 70 ch. was scarified, primed, and sealed.

Rimutaka Hill Bridges : Bridges Nos. 2 and 3 are being widened in concrete to 24 ft. and 30 ft. respectively, the latter being on curved alignment. The lengths are 100 ft. and 24 ft.

Masterton-Weber via Alfredton :—

Masterton County: Reconstruction and sealing were completed over 1 m. 70 ch. The Wangaehu Bridges at 4 m. 5 ch. and 4 m. 34 ch. were erected, the total length being 98 ft.

Eketahuna County: Flat Bush Bridge of one 28 ft. and Didsburys Bridge West of one 40 ft. concrete span were completed.

*Masterton-Castlepoint.—*Masterton County: 1 m. of reconstruction and priming was carried out.

*Masterton-Stronvar.—*Masterton County: The 20 ft. Wangaehu Overflow Bridge at 0 m. 69 ch. was erected. On the Weraiti Hill, 30 ch. was widened, and a 26 ch. deviation near 7 m. completed.

Martinborough-Masterton :—

Wairarapa South County: 2 m. 38 ch. of reconstruction and sealing was completed.

Masterton County: 1 m. 28 ch. was sealed, completing the sealing of this section.

*Tupurupuru - Te Wharau.—*Wairarapa South County: 64 ch. of widening was carried out, and a contract let for the Wainuioru River Bridge of one 75 ft. and two 47 ft. concrete spans.

*Carterton-Longbush.—*Wairarapa South County: 2 m. 27 ch. was sealed.

*Martinborough-Awhea.—*Featherston County: 2 m. of sealing was completed.

*Martinborough - Lake Ferry.—*Featherston County: 40 ch. of sealing was completed, and a further 6 m. has been reconstructed of which 4 m. has been primed.

*Kahautara Highway.—*Featherston County: 2 m. 30 ch. was sealed.

*Pahiatua Station Highway.—*Pahiatua County: A 12 ch. stop-bank, to prevent flooding of the highway, was constructed.

*Makuri-Ongaha.—*Pahiatua County: 12 ch. of widening and metalling was carried out.

*Mangaone Valley Highway.—*Eketahuna County: A small bridge was replaced by a twin-pipe culvert, with 8 ch. of approaches.

*Eketahuna-Nireaha.—*Eketahuna County: Tyler's Bridge, a 55 ft. arched concrete span, was completed, together with 36 ch. of widening on the western approach.

Picton-Christchurch (No. 11 District) :—

Picton Borough—Wairau Road: 48 ch. has been prepared for sealing.

Elevation Crossing: The elimination of this crossing involves the construction of a 39 ch. deviation, and a concrete bridge of one 45 ft. and two 30 ft. spans. The formation of the deviation was practically completed, and the bridge is in hand.

Tuamarina and Spring Creek Crossings: These crossings will be dealt with by a 2½ m. deviation, including a bridge 900 ft. long over the Wairau River and a 140 ft. bridge over Spring Creek. Work on the deviation is in hand.

Marlborough County—Spring Creek - Blenheim: A contract has been let for the preparation and sealing of 2 m. 62 ch. The preparation has been practically completed.

Koromiko Culvert: This 9 ft. by 4½ ft. concrete box-culvert has been completed.

Blenheim Borough: First-coat sealing has been applied on a length of 9 ch. recently widened.

Awatere County—Seddon Township: Preparation and base-course metalling have been completed over a length of 12 ch., being part of a 48 ch. proposal which includes the northern approach to the railway overbridge.

Mirza Creek Bridge, Approaches, and Deviation: A contract for the whole of these works was let towards the close of the year.

Blenheim-Nelson :—

Blenheim - Renwicktown: A contract was let for the preparation and sealing of this section, covering 6 m. 33 ch. The base-course metalling has been completed, and top-course is in hand.

Havelock Township: The preparation and sealing of this 30 ch. section have been completed.

Rai Valley Township: 28 ch. was sealed.

Rai Hill, Wangamoa Valley, and Wangamoa Hill: With the exception of isolated sections on Rai Hill and Wangamoa Valley, the major work for the year has been on the Wangamoa Hill. The total length widened and improved amounts to 2 m. 1 ch. Base-course metal has been laid over 1 m. 60 ch., and top-course over 1 m. 48 ch.

Lud Bridge - Nelson: Plant-mix surfacing over a length of 5 m. 37 ch. has now been completed.

Richmond-Collingwood :—

Appleby Overbridge: A contract has been let for a bridge of three 30 ft. spans, with 14 ch. of approaches.

Moutere Hill - Motueka: The reconstruction of a 9 m. 54 ch. section is in hand, 3½ m. being completed, and a contract for sealing has been let. On the Moutere Hill section, 4 m. 4 ch. is in progress, of which 1 m. 74 ch. of formation has been accounted for.

Harley's Road Junction: 7 ch. was realigned and regraded, materially improving this intersection.

Takaka Hill: Reconstruction has been continued over a total distance of 1 m. 35 ch. Base-course metal has been laid over 1 m. 62 ch., and top-course over 6 m. 50 ch.

Nelson-Westport (No. 11 District) :—

Richmond Borough—Salisbury Road Culvert: This work has been completed.

Glenhope - 8 Mile Section: The widening and improvements to grade and alignment have been continued, the work completed amounting to 4 m. 35 ch. Base-course metal has been laid over 3 m. 76 ch., and top-course over 4 m. 6 ch.

Glenhope - Kawatiri: Stone-crate protective work was carried out near Glenhope and at Wooden Bend.

Matakitaki Bridge—Four River Plain : A length of 38 ch. has been straightened, and raised above flood level.

Washout Creek Bridge and Deviation : The 23 ch. deviation and 40 ft. bridge, now completed, have eliminated a narrow bridge on the crest of a vertical curve of poor visibility.

Matakitaki Bridge : The right-bank abutment, which was damaged during the 1929 earthquake, and subsequently by scour during floods, has been renewed in reinforced concrete, and has been protected by the placing of four large concrete blocks, 108 cubic yards of crates, and 400 cubic yards of stone-work.

Whales Creek Bridge : This bridge, of one 34 ft. and two 16 ft. spans, is in progress.

Appleby—Motueka—Waimea County : A low-lying section of 31 ch., subject to flooding, was raised and metalled.

Dashwood—Upcot—Awatere County—Hodder River Bridge : A contract has been let and work is in hand on the erection of this bridge, of one 210 ft. suspension span and two 17 ft. approach-spans, with concrete deck ; and the formation of 14 ch. of approaches. At Woodman's Bend, 5 ch. of new formation has been made necessary, owing to river-encroachment. Nine narrow corners in rock between Jordan and Cam Creek have been widened, also 3 ch. of block-cutting ; three open curves have been widened, and 50 ch. between Birch River and Altimarloch realigned and metalled.

Wakefield—Woodstock—Dove Creek and Hodgen's Creek Bridges : These two bridges, of 40 ft. and 35 ft. span respectively, have been completed.

Korere—Tophouse :—

Waimea County—Motupiko River Bridge at Tophouse : This bridge, of one 35 ft. span, has been erected.

Korere Bluffs : A contract has been let for widening to 24 ft. over a length of 5 ch., and the placing of 470 cubic yards of crate-protection.

Blenheim Aerodrome Highway—Marlborough County—Taylor River Bridge : A contract has been let for the construction of a bridge of five 50 ft. and two 40 ft. spans, with a 24 ft. roadway ; and the formation of 23 ch. of approaches.

Spring Creek—Raranga—Marlborough County : 2 m. 10 ch. of widening and metalling has been carried out.

Kaituna—Tuamarina.—On this section, which is an alternative route to Blenheim, avoiding the Wairau Bridge, widening to 22 ft. has been carried out over a length of 20 ch., and a commencement made with raising lengths subject to flooding.

Renwicktown—Hope Junction :—

Marlborough County : A 4 m. length has been widened, with improvement to grade and cross-fall.

Protection at Harley's Rock Bridge : This work, which necessitated the placing of two gabions comprising 190 cubic yards of stone-crate work, with stone-pitching and filling, has been completed.

Renwicktown—Summerlands.—2 m. has been widened.

Wakefield—Woodstock.—On the Dovedale Hill, a deviation and a 36 in. concrete pipe-culvert have improved the alignment, and replaced a crib-logged filling 23 ft. deep. Between Wakefield and Dovedale Hill a deviation 8 ch. in length has been formed, eliminating two creek crossings.

Pictou—Havelock via The Grove.—Marlborough County : 23 ch. of the foreshore road has been widened to 22 ft.

Nelson—Stoke via Jenkins Hill.—Bishopdale and Wakatu Level Crossings : The 60 ch. deviation has been completed, together with 9 ch. of access roads, and the erection of Jenkins Creek Bridge, of one 35 ft. span.

Nelson—Wesport (No. 12 District) :—

Improvements, 6 m.—9 m. : The widening and realignment which were carried out between 7 m. and 8 m. last year have been extended, and have considerably improved this narrow tortuous section.

Inangahua Junction, Preparation for Sealing : Realignment, widening, and metalling are in hand on the 84 ch. length through the township.

Buller Gorge, Improvements : Widening has been continued at various points, and a total length of 1 m. 9 ch. of formation, nearly all in heavy rock, has been completed.

Ohika-iti Bridge : This bridge, of two 45 ft. and two 30 ft. concrete spans, was completed, and filling of the approaches is in hand.

Big Grey River Protective Works : Further stone-gabion protection was placed on the north bank, near the bridge approach.

Inangahua—Reefton : Preparation for sealing is in hand between Inangahua Junction and Station Road.

Johnnie Walker Creek Bridge : This bridge, consisting of one 50 ft. skew span, was completed, and formation of the approaches is in hand.

Blacksand Creek Culvert : A culvert, 12 ft. 6 in. by 5 ft., replacing a timber bridge, was completed.

Murcott's Creek Culvert : A 5 ft. by 5 ft. concrete culvert was constructed, together with its approaches.

Tawai and Reefton Tunnel Crossings Elimination : This 1 m. 53 ch. deviation was completed and opened for traffic.

Tawhai to Maimai, Improvements: This work, which comprises the widening and regrading of 2 m. of narrow road, is a continuation of the above deviation. 1 m. of clearing and 52 ch. of widening have been carried out.

Ikamatua School - Big Grey: A length of 2 m. from the Big Grey Bridge, through Ikamatua Township, has been widened, metalled, and prepared for sealing.

Ahaura Township: 29 ch. through the township has been primed.

Ngahere Northward, Improvements: This work comprises several deviations to eliminate narrow tortuous descents into gullies. Deviations at German Gully and near Ahaura have been commenced, and the work completed includes 2 m. 10 ch. of clearing, 1 m. 31 ch. of formation, 1 m. 18 ch. of base-course, 15 ch. of top-course metalling, and the construction of a 7 ft. by 7 ft. concrete culvert.

Stillwater - Ngahere: Formation, widening, and base-course metalling are practically completed, the length being 3 m. 28 ch., and 1 m. 34 ch. of this has been sealed. Two concrete culverts were constructed.

Kamaka and Spring Creek Crossings: These two crossings have been eliminated by a deviation 1 m. 39 ch. in length, which includes concrete bridges over Spring Creek, Notown Creek, and Mullins Creek of one 40 ft., two 30 ft., three 40 ft., and one 40 ft. span respectively. The work is nearing completion.

Kiwi Crossing: This crossing has been eliminated by a deviation 30 ch. long, and a concrete overbridge of five 50 ft. spans. This work is complete, including a priming-coat on the deviation.

Greymouth-Brunner: The sealing of this 4 m. 12 ch. section was practically completed.

South Beach Crossings Elimination: This deviation, 58 ch. in length, was completed, except for the curve at the south end, and was opened to traffic.

Nelson Creek Crossing Elimination: This deviation, 36 ch. long, includes a concrete bridge of two 20 ft. spans over Nelson Creek, the construction of an overbridge, and the lowering of the railway grade to give headroom. Half the formation has been completed, the Nelson Creek Bridge is in hand, and the lowering of the railway grade has been commenced.

New River Bridge: The construction of a bridge of four 40 ft. concrete spans, replacing the combined road-rail bridge, was completed. The approaches were also completed, and received a priming-coat.

Kumara - Flowery Creek Deviation: This 8 m. 5 ch. deviation was completed, and sealed in one coat.

Kaihinu Crossing: The construction of a reinforced-concrete overbridge, of one 50 ft. and two 35 ft. concrete spans, has been commenced, pile-driving being in progress. The formation of the approaches has been carried to the bridge-site.

Hokitika River Bridge at Kanieri: This bridge, of thirteen 62 ft. concrete spans, with a 22 ft. deck, was completed and opened to traffic. Dismantling of the old timber truss bridge is in hand.

Hokitika-Ross, Improvements: This work is a continuation of the improvement of the highway southward from Hokitika, and involves heavy regrading with some small deviations. Work is in hand on the 5 m. length between the Kanieri River Bridge and Deep Creek, 3 m. of formation being completed.

Deviation near Kokatahi Track: This deviation, 37½ ch. in length, eliminates a very tortuous and dangerous length on the north side of Totara Bridge. Formation and base-course metalling are practically completed.

Ross Borough: The total length of 74 ch. has been widened and prepared for sealing.

Mont d'Or Deviation: This 75 ch. deviation will eliminate the steep grade over Mont d'Or Hill, south of Ross Borough. A contract has been let for the formation, and the work has been commenced.

Improvements through Harihari: A contract has been let for the regrading and widening of a narrow length of 2 m. 14 ch. through the township, and the cuttings are practically completed.

Angle Creek Bridge: The construction of a concrete culvert replacing this bridge, and the improvement of 27 ch. of highway, were completed.

Cedar Creek Bridge: A concrete culvert replacing this bridge, and the construction of 8½ ch. of approaches, were completed.

Hare Mare Creek Bridge: The construction of a bridge, of one 50 ft. steel-joist span, is in hand, together with filling of approaches.

Christchurch-Kumara Junction (No. 12 District):—

Rough Creek Bridge: This bridge, of six 44 ft. concrete spans, replacing a bad ford in Arthurs Pass Township, is in hand.

Goat Creek Bridge: This bridge, of two 40 ft. steel-joist and two 20 ft. timber spans, was completed, and formation of the approaches is nearing completion.

Kelly's Creek and Aickens Crossings: A deviation, 70 ch. in length, to eliminate these two level crossings, was completed, and metalling is in hand.

Westport-Karamea:—

Westport Borough: A length of 144 ch. was reconstructed and sealed.

Mokihinui River Bridge Approaches: The approaches to this bridge have been regraded and widened for a length of 11 ch.

Ngakawau River Bridge: The construction of this concrete bridge, of nine 40 ft. spans, has been seriously delayed by shortage of steel. The casting of piles is now in hand.

Waimangaroa Station Overbridge: The erection of this concrete bridge, of one 45 ft. and two 35 ft. spans, with a 22 ft. roadway and 4 ft. footway, is complete; and formation of the approach fillings is well in hand.

Waimangaroa-Birchfield Deviation: This 79 ch. deviation, to eliminate two level crossings, is in hand. Formation, principally across a swamp, has been carried out over the full length, and base-course metalling partly completed.

Improvements 21 m. 18 ch.—23 m. 48 ch.: This work involves realignment, regrading, and widening of a narrow and dangerous length of highway, and is well in hand.

Orowaiti River Bridge: The erection of this bridge, of twelve 40 ft. concrete spans, is in progress, eight spans being completed.

0 m. to 1 m. 36 ch.: Two-coat sealing has been applied on this length.

Westport-Greymouth Coast Highway:—

Charleston-Punakaiki: 29 ch. of widening has been completed at White Horse, and 73 ch. north of the Punakaiki River. Further lengths are in hand.

Barrytown Sea Erosion: The stone protection work along the beach was extended to a total length of 44 ch.

Coal Creek - Runanga: The whole of this section, exclusive of the approaches to Camp Creek Overbridge, has been regraded, widened on improved alignment, and prepared for sealing. The length is 3 m. 54 ch.

Camp Crossing Overbridge: This bridge, of four 50 ft. and two 30 ft. concrete spans, is in progress, three spans being completed. Formation of the approaches, 21 ch. in length, is well advanced.

Cobden Bluff Crossing: An overbridge, of four 40 ft. concrete spans, has been constructed on a deviation, and the narrow length round the bluff widened. The overbridge approaches are in progress.

Lake Kanieri Highway.—Preparation for sealing is in hand, formation being completed over 38 ch.

Reefton-Maruia.—Improvement works have been continued, a total length of 2 m. 65 ch. of formation and widening and 2 m. 14 ch. of base-course metalling being completed. The approaches to the Right Hand Branch Bridge were completed, two large concrete box-culverts constructed, and two others commenced.

Mokihinui Bridge - Seddonville.—Chasm Creek Bridge: This bridge, of one 35 ft. concrete span, is in progress, and the approaches are practically completed.

Picton-Christchurch (No. 13 District).—Motunau-Domett: The reconstruction of 2½ m. is in progress, deviations and improvement of the worst bends and grades being in hand over 1 m.

Waipara-Kaikoura via Culverden:—

Pahau River Bridge: 15 ch. of a new approach to this bridge was completed.

Conway River Bridge: This bridge, consisting of eight 48 ft. concrete spans, was completed, and the approaches formed.

Weka Pass: 3 m. 6 ch. of one-coat sealing was applied.

Weka Pass Deviation: Earthwork over the whole deviation of 1 m. 4 ch. was nearly completed, and a concrete crib-wall erected.

Mina - Gore Bay.—Further shore-protection work has been undertaken. A length of 2 m. 5 ch. was prepared for sealing.

Picton-Christchurch (No. 14 District):—

Ashley River Bridge: This bridge, comprising fifteen 52 ft. and ten 41 ft. continuous concrete spans, with 22 ft. roadway, has been completed.

Kaiapoi Borough - Ashley River: Plant-mix surfacing was applied to 6 m. 52 ch. of shoulders.

Christchurch - Kumara Junction (No. 14 District):—

Church Corner - Russley Road: A bituminous smoothing-coat was applied over 2 m. 3 ch.

Sandy Knolls - Darfield: Plant-mix surfacing was applied over 2 m. 26 ch., and one-coat seal followed by plant-mix over 2 m. 54 ch.

Porter's Pass: Widening was carried out over 4 m. 4 ch.

Craigieburn Deviation: 70 ch. of formation was completed.

Bruce Creek Bridge: This bridge, of six 44 ft. spans, was erected.

Cass River Bridge: This bridge, of four 44 ft. spans, was completed.

Christchurch - Timaru (No. 14 District).—Templeton-Rolleston: A contract has been let for sealing the shoulders on this section.

Christchurch-Akaroa:—

Birdling's Bridge: This bridge, 22 ft. long, was completed.

Tai Tapu - Motukarara: Two-coat sealing was applied over 4 m. 44 ch.

Waikare County Section, Widening: Improvements at Ataahua have replaced the winding road, extending over 1 m. 10 ch., with new alignment of less curvature, having a total length of 70 ch.

Near Lake Forsyth, 45 ch. of widening has been completed.

Christchurch-Motukarara:—

Sunmer-Evans Pass: 78 ch. of deviation and widening were completed.

Evans Pass - Lyttelton: Widening was carried out over 1 m. 44 ch. and retaining-walls built where required.

Lyttelton - Governor's Bay: Improvements to width, grade, and alignment were undertaken over 2 m. 30 ch.

Kaiapoi-Waddington.—Rangiora-Southbrook: Two-coat sealing was applied over 56 ch.

Sockburn—Southbridge—Rakaia Huts :—

Prebbleton—Springston: Two-coat sealing was applied over 3 m. 40 ch., and primer-coat followed by one-coat sealing over 5 m.

Prebbleton Overbridge: A contract has been let for this work, comprising a concrete bridge of four 50 ft. and two 30 ft. spans, with approaches.

Christchurch—Governor's Bay.—Kiwi—Governor's Bay: Formation and preparation for sealing was completed over 1 m. 75 ch.

Cashmere—Ferry Bridge via Heathcote.—1 m. of two-coat sealing was applied.

Ashley—Balcairn.—Stoney Creek Bridge: This concrete bridge, of two 50 ft. spans, was completed.

Marshland—New Brighton.—The preparation of a 27 ch. length for sealing was carried out.

Woodend—Pound.—56 ch. of two-coat sealing was applied.

Teddington—Port Levy—Lyttelton Borough: 1 m. 64 ch. of one-coat sealing was completed.

Kaiapoi—Tuahiwi.—Kaiapoi Borough: One-coat sealing, followed by plant-mix, was applied over 1 m. 11 ch.

Summit Highway.—The metalling of the 9 m. 36 ch. highway was completed, and one-coat sealing applied.

Christchurch—Timaru (No. 15 District) :—

Rangitata Deviation—Rangitata River Bridge—North Branch: The erection of this concrete bridge, of fifty-one 40 ft. and two 41 ft. spans, is in progress; the piles of twenty-five piers were driven, fifteen capped, and columns concreted for fourteen piers. Concrete has been placed in twelve spans, and kerbs and handrails in eleven spans.

Rakaia River Bridge: The erection of this concrete bridge, of one hundred and forty-four 40 ft. spans, is well advanced. At the end of the year piles had been driven for fifty-two spans at the north and twenty-four at the south end, forty piers had been concreted and capped, and twenty-nine deck-spans concreted.

Timaru—Dunedin (No. 15 District).—Deep Creek—McNamara's Corner: A seal-coat was applied over 4 m. 40 ch.

Timaru—Cromwell via Lindis (No. 15 District).—Pleasant Point—Cave: Preparation for 2 m. of sealing has been carried out.

Ashburton—Junction Darfield—Arundel Main Highway :—

Ashburton—Winchmore: One-coat sealing, followed by plant-mix, has been applied over 4 m. 25 ch.

Ashburton Borough: 53 ch. of second-coat sealing was applied.

Deep Creek—Waihao Downs—Dip Creek.—Waimate County: 9 m. of one-coat sealing was completed.

Geraldine—Orari.—Geraldine County: A length of 42 ch. received a one-coat seal.

Lake Pukaki—Hermitage.—Whale Creek Bridge: All piles (forty-four) have been driven for this bridge, a 200 ft. concrete structure on steel piles. 65 ch. of approaches have been formed.

Walnut Avenue.—Plant-mix surfacing was laid over 54 ch.

Timaru—Dunedin (No. 16 District) :—

The Waianakarua Overbridge and approaches were practically completed, and have now been opened for traffic.

The improvements between Hillgrove and Shag Point were completed, except for 1 m. of top-course metalling.

4 m. 70 ch. between Shag Point and Palmerston was sealed in one coat of tar, followed by a bituminous drag-seal coat.

Palmerston Overbridge: A contract has been let and the work commenced.

Metalling was completed on a length of 12 m. 33 ch. between Palmerston and Merton, and the first-coat sealing applied.

A contract was let for the renewal of Munro's Bridge over the Pleasant River, a concrete structure of two 36 ft. spans, and work commenced.

Timaru—Cromwell (No. 16 District) :—

Lindis Pass—Tarras: Improvement-works were continued on the section leading to Lindis Pass, where 2 m. 73 ch. of formation and 2 m. of base-course metalling were completed. Except for a length of 1 m., the work on this side of the Pass is now nearly complete.

Lindis Downs: Work was commenced on a 6 m. deviation which will eliminate a tortuous hill section of highway. 57 ch. of formation was completed, and a further 14 ch. in heavy cutting well advanced.

Milton—Queenstown (No. 16 District) :—

Alexandra Borough: 54 ch. has been primed.

Clyde Township: 45 ch. has been prepared for sealing, and 20 ch. of footpath formation and kerbing carried out.

The construction of the 12½ m. section between Clyde and Cromwell has been completed, except for the erection of the Leaning Rock Bridge, and 5½ m. of top-course metalling. The work completed comprised 5 m. of formation, 9½ m. of base-course, and 7 m. of top-course metalling, the construction of six concrete bridges, each 27 ft. long, the widening of two existing concrete arch bridges of 20 ft. and 26 ft. span, and the elimination by deviation of two level crossings.

A length of 5 m. 26 ch. from Clyde towards Cromwell has been prepared for sealing. The application of the priming-coat was in hand at the end of the year.

From Cromwell to the Hospital turnoff, 1 m. 60 ch. has been reconstructed and prepared for sealing.

Reconstruction of the Kawarau Gorge section was commenced from the Cromwell end, 2 m. 26 ch. of formation being completed. A further 3 m. is in progress.

Tarras-Queenstown.—The construction of a $\frac{1}{2}$ m. deviation has been completed near Albert Town

Pukeuri-Kurow-Omarama.—A commencement was made with the reconstruction and sealing of the Pukeuri-Kurow section, a length of some 40 m. The first 4 m. 65 ch., from Pukeuri to Horse Gully Road, was completed.

Waiareka-Ngapara-Duntroon.—2 m. 25 ch., from Waiareka Junction to Weston, was reconstructed and sealed.

Palmerston-Clyde :—

Four open fords between Waihemo and Shingle Creek were culverted, as a result of which the flooded condition which has frequently interrupted traffic is now removed.

The construction of the 49 ch. Red Cutting Deviation was substantially completed by the end of the year, and is now available for traffic.

The replacement of a timber bridge at Beck's Creek by a 20 ft. concrete span has been completed.

St. Bathans Loop.—The construction of a large reinforced-concrete pipe-culvert and filling has been completed at Muddy Creek.

Dunedin-Waitati via Leith Valley.—During the year the construction of this alternative northern approach to Dunedin was commenced. The route follows the existing Leith Valley Highway for $1\frac{1}{4}$ m., thence a new route through Pigeon Flat is adopted, regaining the present highway at the Saddle. The length of the reconstruction and deviation is 5 m. 46 ch., and 56 ch. was completed during the year. A further 1 m. has been culverted, fenced, and opened up.

Kyeburn-Middlemarch.—An old bridge at the Six-mile Creek has been replaced by a 15 ft. span in concrete.

Dunedin-Gore (No. 17 District) :—

The programme of major improvements from Milton southward was continued. With the exception of a $\frac{1}{2}$ m. deviation, the Milton-Balclutha section of 14 m. 3 ch. was completely constructed and metalled, and a further length of 7 m., south of Balclutha, is in progress.

4 m. 61 ch. was primed and sealed.

The Tokomairiro River Bridge, of one 28 ft. and three 18 ft. concrete spans, was completed.

The Lovell's Flat Overbridge was completed and opened for traffic.

Milton-Queenstown (No. 17 District) :—

The Clarksville Overbridge and its approaches were completed.

At Manuka Gorge, 6 m. from Milton, a length of $1\frac{1}{2}$ m. was reconstructed, and a further 30 ch. is in progress. The work involves heavy formation, principally in rock, and considerable lengths of stone-walling.

Stewart's Memorial Bridge, at Island Block, was widened to 24 ft. A contract was let for sealing in Roxburgh and a portion of Lawrence Borough.

Mosgiel-Middlemarch-Dunback.—Taieri County: A contract was let for improvements and sealing over a length of 7 m. 48 ch. At the end of the year the formation was substantially completed, also 6 m. of metalling, 4 m. of tar-priming, and 3 m. of sealing.

Dunedin - Dukes Road Railway-station.—On this highway, which provides an alternative route to the Taieri Aerodrome, $5\frac{1}{2}$ m. of reconstruction was commenced, and 1 m. of formation has been substantially completed.

Green Island - Taieri Mouth :—

Reconstruction and two-coat sealing were completed from Green Island to Brighton, a length of 5 m. 57 ch.

The Kaikorai Stream Bridge, of four 30 ft. spans in concrete, was completed. The new structure is on improved alignment, eliminating two sharp curves.

Waikawa-Papatowai.—On a narrow section, between the Fleming River Bridge and Chaslands, widening was carried out over a length of 1 m. 60 ch.

Dunedin-Gore (No. 18 District).—The Pukerau - McNab Deviation, 5 m. 27 ch. in length, is well advanced, 4 m. of formation and 3 m. 13 ch. of metalling being completed. The balance, including three bridges, is in progress. The overbridge at Otikerama has been commenced.

Gore-Invercargill.—The reconstruction of 10 m. 45 ch., from Bridge Inn to Dacre, was completed, and 9 m. 73 ch. received a priming-coat. A contract has been let for a further 12 m. of reconstruction between Dacre and Brydone, and work is in progress.

Invercargill-Bluff.—Reconstruction is in hand on two sections totalling 13 m. 66 ch., of which 3 m. 70 ch. has been reformed and 3 m. 65 ch. metalled.

Queenstown-Invercargill :—

Lowther Deviation : 3 m. 7 ch. was formed and metalled. An 8 ft. bridge and two culverts have been completed, and the Dome Creek Bridge is in progress. This deviation eliminates two level crossings.

Lumsden Town District : A length of 42 ch. was reconstructed for sealing.

Caroline-Dipton : A length of 4 m. 32 ch. was partly reconstructed in preparation for sealing, and 38 ch. of plant-mix smoothing-coat applied to existing sealed surfaces.

Branxholm Overbridge : This bridge and approaches were completed.

Lorne-Buxton Corner : A second sealing-coat was applied over this length of 2 m. 2 ch.

Gore-Lumsden.—Lumsden Town District : Reconstruction in preparation for sealing was completed over 20 ch.

Lumsden - Te Anau - Milford Sound :—

Mossburn - Te Anau : A gravel base-course was applied over 4 m. 65 ch.

The Mararoa Bridge, 280 ft. long, and Mount Hamilton Creek Bridge, 59 ft., were renewed in concrete.

Te Anau - Hollyford Valley : Work on the Homer Tunnel and approach road was discontinued early in May, 1937, and recommenced in November. The tunnel was excavated to full size over 89 ft., making a total of 462 ft., and the 12 ft. by 9 ft. heading was carried a further 610 ft. A reinforced-concrete avalanche-protection is being constructed at the tunnel portal, 180 ft. being completed. The construction of the highway from 57 m. to the tunnel portal at 62 m. 49 ch. has consisted of completing narrow formation, widening, metalling, and bridge construction. 60 ch. of formation, 2 m. of metalling, and 100 ft. of bridging have been completed.

Milford End : 2 m. of bush clearing, 1½ m. of formation, 517 ft. of bridging, and 4½ m. of base-course gravelling have been completed. Bridging includes suspension spans of 175 ft. over the Tutoko River, 100 ft. over the Don River, and 100 ft. over the Gulliver.

Lorne-Tuatapere :—

The Lorneville overbridge and approaches have been completed.

McInerney's Bridge, of one 19 ft. span, was renewed in concrete.

Edendale-Wyndham.—Edendale Township : 21 ch. was reconstructed prior to sealing.

Edendale - Seaward Downs.—Edendale Township : 20 ch. was reconstructed prior to sealing.

Winton-Gore :—

A ½ m. length at Ram's Creek was raised above flood-level.

The Winton Channel Bridge, 36 ft., and Egerton's Bridge, 12 ft., were renewed in concrete.

Argyle-Tuatapere.—The Middle Creek and Merry Creek Overflow Bridges, of 17 ft. and 18 ft. spans respectively, were constructed.

Lorne-Hedgehope.—92 ch. of second-coat sealing was completed.

Dunn's Highway.—1 m. 72 ch. of second-coat sealing was completed.

The Board acknowledges the continued co-operation of the Public Works Department in matters relating to main highways administration and records its appreciation of the valuable services rendered by officers of the Department in carrying out an extended programme during the period under review.

The accompanying tables contain statistical information relative to finance, construction, maintenance, &c., in respect of the main highways system.

Signed on behalf of the Main Highways Board,

J. WOOD, M.Inst.C.E.,
Chairman.

TABLE 1.—MAIN HIGHWAYS ACCOUNT.
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 1938, AND TOTAL TO DATE.

EXPENDITURE.	Total for Year 1937-38.	Total since Inception of Main Highways Act, 1922, to 31/3/38.		INCOME.	Total for Year 1937-38.	Total since Inception of Main Highways Act, 1922, to 31/3/38.	
		£	s. d.			£	s. d.
Net expenditure on construction and improvement of main highways—							
Highway District—							
No. 1	127,780	8	5	893,090	17	8	
No. 2	409,083	1	9	1,493,192	14	6	
No. 3	138,633	18	1	362,342	14	10	
No. 4	40,415	0	3	493,039	15	10	
No. 5	100,237	17	2	451,562	7	7	
No. 6	57,119	15	0	444,407	19	9	
No. 7	95,907	7	9	502,245	7	1	
No. 8	108,078	2	0	415,542	15	8	
No. 9	145,883	11	4	846,717	4	1	
No. 10	47,406	16	2	329,343	19	9	
Totals for North Island	1,270,545	17	11	6,231,485	16	9	
No. 11	154,209	16	9	424,358	13	9	
No. 12	189,514	11	8	498,541	18	1	
No. 13	15,680	16	2	194,824	10	8	
No. 14	98,048	0	1	534,548	13	7	
No. 15	73,972	2	4	277,794	6	3	
No. 16	119,470	1	1	428,799	3	6	
No. 17	100,384	17	6	514,209	9	11	
No. 18	158,501	6	1	449,116	16	0	
Totals for Dominion	2,180,327	9	7	9,553,679	8	6	
Net expenditure on renewals of main highways:—							
Highway District—							
No. 1	14,540	18	4	20,466	5	11	
No. 2	30,721	17	11	51,790	12	1	
No. 3	3,261	12	1	8,650	2	6	
No. 4	24,837	12	1	33,616	18	4	
No. 5	4,219	0	8	16,590	5	4	
No. 6	4,086	6	9	5,959	0	5	
No. 7	3,114	11	2	12,249	19	0	
No. 8	2,778	6	7	3,159	18	5	
No. 9	4,058	7	6	5,489	1	5	
No. 10	3,766	13	0	13,528	16	10	
Totals for North Island	95,385	6	1	170,501	0	3	
No. 11	1,420	16	7	2,549	6	10	
No. 12	31,756	2	7	55,203	13	9	
No. 13	Cr. 627	10	10	192	6	4	
No. 14	1,635	0	4	2,166	8	7	
No. 15				11	16	8	
No. 16	985	2	9	3,577	14	4	
No. 17	1,739	18	0	3,248	19	10	
No. 18	5,978	15	9	7,226	1	3	
Totals for Dominion	138,273	11	3	244,677	7	10*	
Carried forward	2,318,601	0	10	9,798,356	16	4	
INCOME.							
Loans raised under Main Highways Act, 1922—							
Stock and Debentures issued—							
At 3 per cent. interest	1,600,000	0	0	2,265,365	0	0	
At 3½ per cent. interest	76,800	0	0	686,305	0	0	
At 3¾ per cent. interest				190,895	0	0	
At 4 per cent. interest				1,295,185	0	0	
At 4½ per cent. interest				542,004	10	10	
Securities redeemed, Loans Redemption Account				649,440	0	0	
Consolidated Fund—Public Debt Repayment Account				55,720	0	0	
	1,676,800	0	0	5,684,914	10	10	
Receipts under section 15, Finance Act, 1923, from Public Works Fund, General Purposes Account (at 5 per cent. interest)							
				1,226,000	0	0	
Income from—							
Motor-registration licenses, fees, and fines (section 24, Motor-vehicles Act, 1924)	556,479	8	5	5,064,959	16	9	
Less Commission on collection by Post and Telegraph Department—							
Motor-registration fees and licenses				22,248	16	0	
Fees for registration of change of ownership	32,626	6	6	10,377	10	6	
	528,853	1	11	4,802,363	15	5	
Interest from investments				216,452	4	2	
Interest from local authorities on plant purchased on their behalf	1,927	14	11	24,402	1	10	
Interest on advances to local authorities	3,574	7	10	30,068	13	7	
Mileage Tax (Finance Act, 1931-32 (No. 2), section 19)	6,161	13	1	13,484	16	9	
Miscellaneous receipts				524	11	6	
Motor-spirits tax (section 9, Motor-spirits Taxation Act, 1927)	1,918,485	17	9	11,534,708	2	7	
Tire-tax (sections 13 and 14, Main Highways Act, 1922)	158,526	7	2	2,213,662	11	4	
Transfer from Consolidated Fund (section 14, Main Highways Act, 1922)				210,000	0	0	
Rent of and tolls from ferries				2,081	10	6	
Carried forward	4,289,853	14	2	25,965,401	15	2	

* Expenditure from 1/4/36 only. Previously included under maintenance, repairs, &c.

TABLE 1.—MAIN HIGHWAYS ACCOUNT—continued.
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 1938, AND TOTAL TO DATE—continued.

EXPENDITURE.	Total for Year 1937-38.			Total since Inception of Main Highways Act, 1922, to 31/3/38.			INCOME.	Total for Year 1937-38.			Total since Inception of Main Highways Act, 1922, to 31/3/38.		
	£	s.	d.	£	s.	d.		£	s.	d.	£	s.	d.
Brought forward	2,318,601	0	10	9,798,356	16	4	..	4,289,853	14	2	25,965,401	15	2
Net expenditure on maintenance, repairs, &c., of main highways:—													
Highway District—													
No. 1	101,410	17	8	749,111	18	9	..						
No. 2	137,496	9	0	1,319,542	0	7	..						
No. 3	89,117	0	5	611,996	5	10	..						
No. 4	79,048	17	7	494,523	11	5	..						
No. 5	63,618	17	2	738,544	5	8	..						
No. 6	51,082	17	0	507,884	18	7	..						
No. 7	40,587	18	9	528,599	13	5	..						
No. 8	71,758	16	4	501,620	0	9	..						
No. 9	44,718	1	10	639,884	12	9	..						
No. 10	35,041	17	1	545,266	0	1	..						
Totals for North Island	713,881	12	10	6,636,973	7	10	..						
No. 11	61,466	10	10	559,955	1	6	..						
No. 12	73,406	12	1	951,264	4	3	..						
No. 13	26,983	12	8	247,275	7	7	..						
No. 14	39,880	10	0	401,858	1	7	..						
No. 15	36,122	10	4	486,273	8	9	..						
No. 16	37,807	5	1	336,966	9	2	..						
No. 17	32,044	3	3	331,790	19	3	..						
No. 18	52,518	14	2	398,249	4	1	..						
Totals for Dominion	1,074,111	11	3	10,350,606	4	0	..						
Total expenditure by Highways Districts	3,392,712	12	1	20,148,963	0	4	..						
Administration—													
Administration expenses (including salaries, travelling expenses, office rents, printing, stationery, postages, and miscellaneous expenses)	£	s.	d.										
Fees and travelling expenses of members of the main Highways Board other than Government members	148,868	5	5	629,355	5	8	..						
Miscellaneous expenses—													
Advertising, maps, rent of halls, traffic tallies, transport of samples, depreciation of furniture, &c.	1,406	6	2	17,128	1	2	..						
Compassionate grants to widows and relatives of deceased employees	198	7	9	5,717	10	9	..						
Compensation under section 3, Public Works Amendment Act, 1925	4,000	0	0	4,000	0	0	..						
Exchange on remittances	1,602	18	11	1,015	1	6	..						
Grant to Transport Department towards Traffic Inspection	17,906	0	5	17,906	0	5	..						
Petrological laboratory and other experimental work, Expenses of	1,330	5	9	10,683	0	2	..						
Total administration	175,312	4	5	692,074	14	8	..						
Carried forward	3,568,024	16	6	20,841,037	15	0	..	4,289,853	14	2	25,965,401	15	2
							..						
							Carried forward ..						

TABLE 1.—MAIN HIGHWAYS ACCOUNT—continued.
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH, 1938, AND TOTAL TO DATE—continued.

EXPENDITURE.	Total for Year 1937-38.		Total since Inception of Main Highways Act, 1922, to 31/3/38.		INCOME.	Total for Year 1937-38.		Total since Inception of Main Highways Act, 1922, to 31/3/38.		
	£	s. d.	£	s. d.		£	s. d.	£	s. d.	
Brought forward .. .. .	..	..	..	..	Brought forward .. .. .	..	..	..	..
Loan charges—	£	s. d.	3,568,024	16 6	20,841,037	15 0	4,289,853	14 2	25,965,401	15 2
Charges and expenses of raising loans, management charges of Consolidated Stock on account of Construction Fund, &c.	489	11 4	..	..	68,971	3 9	..	..	..	..
Interest on amount appropriated out of Public Works Fund and paid into Main Highways Account Construction Fund	61,300	0 0	..	..	490,400	0 0	..	..	..	..
Interest on loans, recoupment to Consolidated Fund (section 4, Finance Act, 1919)	150,758	12 5	..	..	1,111,300	4 9	..	..	..	..
Transfer to reserve for redemption of main highway securities	99,992	0 0	..	..	693,194	0 0*	..	..	..	..
Payment to local authorities in commutation of toll-gate charges (Finance Act, 1925, section 20)	1,451	18 4	..	..	27,204	5 9	..	..	..	..
Payment to Wellington City Council in commutation of fees chargeable in respect of motor-vehicles using Hutt Road (Finance Act, 1927 (No. 2), section 33)	24,501	11 7	..	..	230,586	7 5	..	..	..	..
Total loan charges	338,493	13 8	..	..	2,621,656	1 8	..	..	..	..
Subsidies, &c., in respect of other than main highways—	..	..	..	..	..	..	..	..	..	..
Municipal Corporations (Municipal Corporations Act, 1933, section 71)	31,330	9 2	..	..	210,481	6 3	..	..	..	..
County Councils and other local authorities (Finance Act, 1930, section 37)	175,214	15 3	..	..	1,306,641	18 10	..	..	..	..
Subsidies to County Councils for rebate to ratepayers (Finance Act (No. 4), 1931, section 45) .. .. .	..	..	..	..	253,892	12 1	..	..	..	..
Subsidy on rates levied on farming land (Finance Act (No. 3), 1934, section 28)	Cr. 17	8 6	..	..	364,583	19 9	..	..	..	..
Maintenance and construction of roads giving access to outlying areas (Finance Act (No. 3), 1931) .. .. .	..	..	..	..	45,918	8 8	..	..	..	..
Total subsidies	206,527	15 11	..	..	2,181,518	5 7	..	..	..	..
Balance, being excess of income over expenditure, carried to general balance-sheet	4,113,046	6 1	176,807	8 1	25,644,212	2 3	4,289,853	14 2	25,965,401	15 2

* Excludes £60,408 10s. 7d. interest credited.
NOTE.—No charge for the cost of exchange on interest payments made in London is included in the accounts.

TABLE 2.—LENGTHS OF MAIN HIGHWAYS AT 31st MARCH, 1938.

Highway District.	Type of Surface.			Total.
	Dustless.	Gravel or Macadam.	Pumice or Clay.	
	M. ch.	M. ch.	M. ch.	M. ch.
1. Auckland North	73 53	903 9	..	976 62
2. Auckland South	445 17	847 27	5 52	1,298 16
3. Tauranga	84 71	343 66	292 38	721 15
4. Gisborne	82 74	311 31	..	394 25
5. Napier	206 69	530 77	..	737 66
6. King Country	28 75	560 5	13 0	602 0
7. Taranaki	334 39	127 66	10 75	473 20
8. Wanganui	120 50	408 40	1 15	530 25
9. Wellington West	233 76	270 23	..	504 19
10. Wellington East	144 45	359 74	..	504 39
Totals, North Island ..	1,756 9	4,663 18	323 20	6,742 47
11. Nelson	53 12	610 54	8 67	672 53
12. West Coast	42 2	501 12	..	543 14
13. Canterbury North	50 17	283 47	..	333 64
14. Canterbury Central	183 76	566 28	..	750 24
15. Canterbury South	137 44	683 61	..	821 25
16. Otago Central	88 51	752 17	..	840 68
17. Otago South	63 13	460 60	..	523 73
18. Southland	40 38	867 4	..	907 42
Totals, South Island ..	659 13	4,725 43	8 67	5,393 43
Totals, Dominion	2,415 22	9,388 61	332 7	12,136 10
<i>Summary.</i>				
State highways	1,449 44	2,298 41	192 47	3,940 52
Main highways	965 58	7,090 20	139 40	8,195 38
Totals	2,415 22	9,388 61	332 7	12,136 10

TABLE 3.—CONSTRUCTION WORK COMPLETED DURING YEAR 1937-38.

Highway District.	Formation and Widening.	Gravelling and Metalling.	Tar and Bituminous Sealing.	Road and Plant-mix Bituminous Surfacing.	Bituminous Macadam (Penetration).	Portland Cement Concrete.	Bridges.	Engineering Surveys.
	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	M. ch.	Ft.	M. ch.
1. Auckland North	12 60	12 14	11 55	..	..	..	1,170	47 40
2. Auckland South	70 31	43 25	59 51	21 27	..	..	908	100 56
3. Tauranga	28 45	19 15	8 55	..	..	..	99	10 0
4. Gisborne	6 19	2 9	10 56	..	..	..	1,255	4 32
5. Napier	15 76	31 44	26 6	..	..	..	709	59 0
6. King Country	9 39	7 26	..	..	..	..	534	..
7. Taranaki	7 22	5 70	2 34	6 0	..	..	412	..
8. Wanganui	9 61	3 41	16 4	..	..	..	150	30 72
9. Wellington West	31 26	1 16	27 15	..	..	..	384	28 77
10. Wellington East	16 67	3 30	20 3	..	..	..	565	12 51
11. Nelson	31 7	28 46	0 68	5 37	..	..	240	70 47
12. West Coast	23 29	22 64	13 70	..	..	..	2,186	63 46
13. Canterbury North	3 32	3 5	3 6	..	..	..	384	4 38
14. Canterbury Central	12 23	10 18	30 56	9 20	..	..	562	32 2
15. Canterbury South	0 65	2 0	13 40	4 79	..	..	..	10 60
16. Otago Central	19 63	13 20	22 8	2 25	..	..	589	26 2
17. Otago South	5 3	4 3	13 38	..	..	..	476	42 57
18. Southland	24 58	27 13	2 2	..	..	..	483	34 7
Totals	329 6	240 59	282 7	49 28	..	..	11,106	578 27

TABLE 4.—LENGTHS OF MAIN HIGHWAYS METALLED AND SURFACED SINCE INCEPTION OF BOARD'S OPERATIONS (9TH JUNE, 1924).

At close of Period ending	Total Main Highways.	Type of Surface.			Dustless Surfacing added during Year.	Percentage of Dustless Surfacing to Total Main Highways.
		Pumice and Clay.	Gravel and Macadam.	Dustless Surfacing.		
	Miles.	Miles.	Miles.	Miles.	Miles.	Per Cent.
9th June, 1924 ..	5,954	1,535	4,171	248	..	4.2
31st March, 1925 ..	5,954	1,472	4,222	260	12	4.4
" 1926 ..	6,272	1,384	4,557	331	71	5.3
" 1927 ..	6,391	1,233	4,726	432	101	6.8
" 1928 ..	6,608	1,100	4,953	555	123	8.4
" 1929 ..	10,403	915	8,735	753	198	7.2
" 1930 ..	10,408	736	8,705	967	214	9.3
" 1931 ..	10,419	608	8,685	1,126	159	10.8
" 1932 ..	10,846	539	9,009	1,298	172	12.0
" 1933 ..	10,878	494	9,005	1,379	81	12.7
" 1934 ..	10,974	466	9,047	1,461	82	13.3
" 1935 ..	11,557	397	9,494	1,666	205	14.4
" 1936 ..	12,048	390	9,715	1,943	277	16.1
" 1937 ..	12,114	353	9,634	2,127	184	17.6
" 1938 ..	12,136	332	9,389	2,415	288	19.9
Percentage at 31st March, 1938	100	2.7	77.4	19.9	..	..

TABLE 5.—MAINTENANCE OF MAIN HIGHWAYS (INCLUDING BRIDGES).

Highway District.	Length Maintained.	Expenditure.												
		Board.	Local Authorities.	Total.	Average per Mile per Annum.									
					1927-28.	1928-29.	1929-30.	1930-31.	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.	
	M. ch.	£	£	£	£	£	£	£	£	£	£	£	£	£
1. Auckland North	976 62	101,411	10,996	113,407	115.1	93.2	110.1	97.9	71.6	61.2	79.2	83.4	115.7	90.3
2. Auckland South	1,298 16	137,496	26,293	163,789	126.2	119.3	181.4	141.1	124.6	106.9	145.3	175.8	214.3	183.0
3. Tauranga	721 15	89,117	3,448	92,565	128.4	84.3	153.1	87.1	72.9	61.9	70.7	80.4	90.7	74.5
4. Gisborne	394 25	79,049	5,788	84,837	215.2	182.9	178.1	164.9	106.4	96.3	117.3	163.5	189.5	124.9
5. Napier	737 66	63,619	9,853	73,472	99.6	82.4	138.9	117.7	81.4	79.3	75.9	121.2	146.7	120.3
6. King Country	602 0	51,083	6,290	57,373	95.3	116.5	89.2	99.7	70.8	57.1	70.0	85.8	115.7	61.4
7. Taranaki	473 20	40,588	4,217	44,805	94.7	104.1	123.4	102.5	83.8	84.5	125.2	136.0	172.8	155.9
8. Wanganui	530 25	71,759	9,140	80,899	152.5	115.9	122.0	87.5	80.8	66.0	101.0	126.7	176.1	88.5
9. Wellington West	504 19	44,718	7,172	51,890	102.9	121.9	164.1	124.7	106.0	110.8	149.8	179.0	224.3	185.6
10. Wellington East	504 39	35,042	10,039	45,081	89.4	108.0	175.3	181.3	114.9	91.4	128.6	141.6	159.0	138.4
Totals, North Island	6,742 47	713,882	93,236	807,118	119.7	109.0	143.2	118.3	91.3	81.0	104.5	124.8	155.8	119.9
11. Nelson	672 53	61,467	5,253	66,720	99.2	80.3	116.8	101.1	74.1	66.6	103.6	82.0	112.8	88.7
12. West Coast	543 14	73,407	5,644	79,051	145.5	141.8	214.5	142.6	110.8	104.1	136.7	122.4	166.8	144.9
13. Canterbury North	333 64	26,984	3,977	30,961	92.8	64.3	62.8	55.7	58.3	50.0	55.4	72.6	99.7	81.1
14. Canterbury Central	750 24	39,880	7,495	47,375	63.1	54.6	81.1	55.2	50.9	50.2	76.5	75.2	77.3	68.8
15. Canterbury South	821 25	36,122	7,055	43,177	52.6	54.0	96.7	66.9	59.3	67.0	78.7	88.0	89.6	66.3
16. Otago Central	840 68	37,807	7,406	45,213	53.8	49.5	70.1	75.1	50.3	46.4	52.8	36.4	73.9	47.7
17. Otago South	523 73	32,044	8,043	40,087	76.5	62.8	97.8	84.6	73.8	72.8	99.5	90.8	108.1	77.1
18. Southland	907 42	52,519	15,334	67,853	74.8	57.2	57.1	53.9	44.4	41.6	43.2	58.7	57.9	49.9
Totals, South Island	5,393 43	360,230	60,207	420,437	77.9	67.5	96.2	77.6	62.7	60.3	77.4	75.8	94.1	75.0
Totals, Dominion	12,136 10	1,074,112	153,443	1,227,555	101.2	90.5	122.4	100.3	78.5	70.7	92.5	103.1	128.6	100.1

TABLE 6.—TESTS OF STONE COMPLETED DURING THE YEAR ENDED 31ST MARCH, 1938.

No.	Locality.	Weight in Pounds per Cubic Foot.	Absorption of Water in Pounds per Cubic Foot.	Abrasion.		Hardness.	Toughness.	Geological Classification.
				Percentage of Wear.	French Co-efficient.			
309	Te Kuiti, No. 1 sample ..	159.3	0.80	5.06	7.00	15.30	10.0	Limestone.
310	Te Kuiti, No. 2 sample ..	163.4	0.40	3.87	10.30	13.90	16.0	Limestone.
311	Kirkley's Quarry, Taneatua ..	164.6	0.90	3.10	12.90	16.90	19.0	Greywacke.
312	Waimana Gorge, Taneatua ..	176.5	1.50	5.80	6.90	..	..	Serpentine.
313	Taneatua	159.0	1.05	4.00	10.00	17.70	14.0	Greywacke.
314	Stony Hill, Green Island ..	183.9	0.40	4.80	8.40	18.90	49.0	Basalt.
314A	Borough Quarry, Birkenhead ..	187.4	0.75	3.20	12.50	18.93	27.0	Basalt.
315	Wairoa River, Nelson ..	207.1	0.30	3.64	11.00	19.31	19.0	Harzburgite.
316	Maungaongaonga, Rotorua ..	147.2	0.30	6.64	6.10	16.50	16.5	Trachyte.
317	Riponui, Whangarei ..	170.0	0.15	5.24	7.60	19.50	15.0	Greywacke.
318	Otonga, Whangarei ..	167.4	0.60	5.29	7.60	19.50	48.0	Greywacke.
319	Wheki, Whangarei ..	172.1	0.25	2.86	14.00	15.30	21.0	Diabase.
320	Dwyer's Quarry, Whangarei ..	167.4	0.04	3.01	13.20	19.30	27.0	Greywacke.
321	Hikurangi Quarry, Whangarei	175.2	1.25	7.77	5.10	18.80	9.0	Basic tuff.
322	Albert's Cap, Waiwera, Clutha County	159.6	1.00	3.82	10.40	17.70	19.5	Greywacke.
323	Kaihiku, Clutha County ..	164.3	0.55	3.04	13.10	19.30	25.0	Fine conglomerate.
324	Miller's Quarry, Naumai, North Auckland	159.0	0.35	3.36	11.90	18.30	29.5	Trachyte.
325	Ditto	155.5	2.35	5.22	7.60	18.10	19.0	Trachyte; slightly weathered.
326	Donovan's Quarry, Tokatoka, North Auckland	169.4	..	5.14	7.80	17.40	10.5	Diabase.
327	Ditto	167.3	..	5.50	7.20	..	..	Diabase; 2nd grade.
328	Donovan's Bluff, Tokatoka, North Auckland	146.0	2.80	..	..	(Soft)	..	Diabase; partly weathered.
329	Maungaongaonga, Rotorua ..	157.3	1.16	4.74	8.40	17.57	15.5	Trachyte.
330	Wanstead Quarry, Dannevirke	166.8	0.20	5.92	6.70	15.90	8.5	Arenaceous limestone.
331	Piha, Auckland ..	168.0	0.31	3.87	10.34	17.35	13.0	Melaphyre (altered basalt).
332	Hursthose Street Pit, Motueka	165.2	1.14	..	..	14.52	11.0	Granite (white).
333	"	168.4	0.58	..	..	16.30	37.5	Greywacke.
334	Hunter's Quarry, Waitakerei, Auckland	145.6	7.78	7.25	5.51	11.70	6.0	Altered tuff.
335	Papamoa, Tauranga ..	165.5	0.75	2.30	17.40	18.90	18.5	Hypersthene andesite.

Other tests were made by sieve analysis, gravitation, microscopic examination, tension, and lineal shrinkage of top-course materials, and soil constants of subgrades.

Approximate Cost of Paper.—Preparation, not given; printing (1,092 copies, including maps and graphs), £625.

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Price 7s.]



MAIL-CAR TO NAPIER CAUGHT IN LARGE SLIP DURING FLOODS, MAY, 1938.



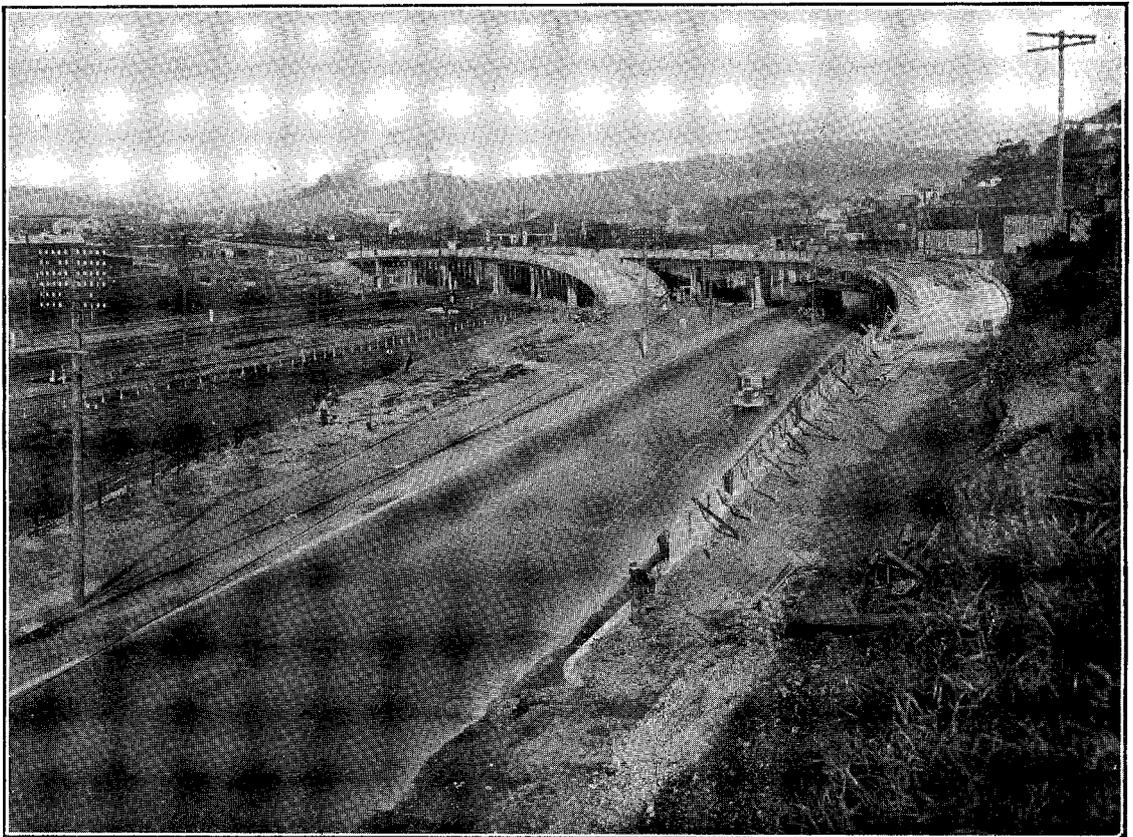
TYPICAL SILTATION DURING FLOODS, MAY, 1938.
GISBORNE-NAPIER VIA HANGAROA STATE HIGHWAY.

D.—1.

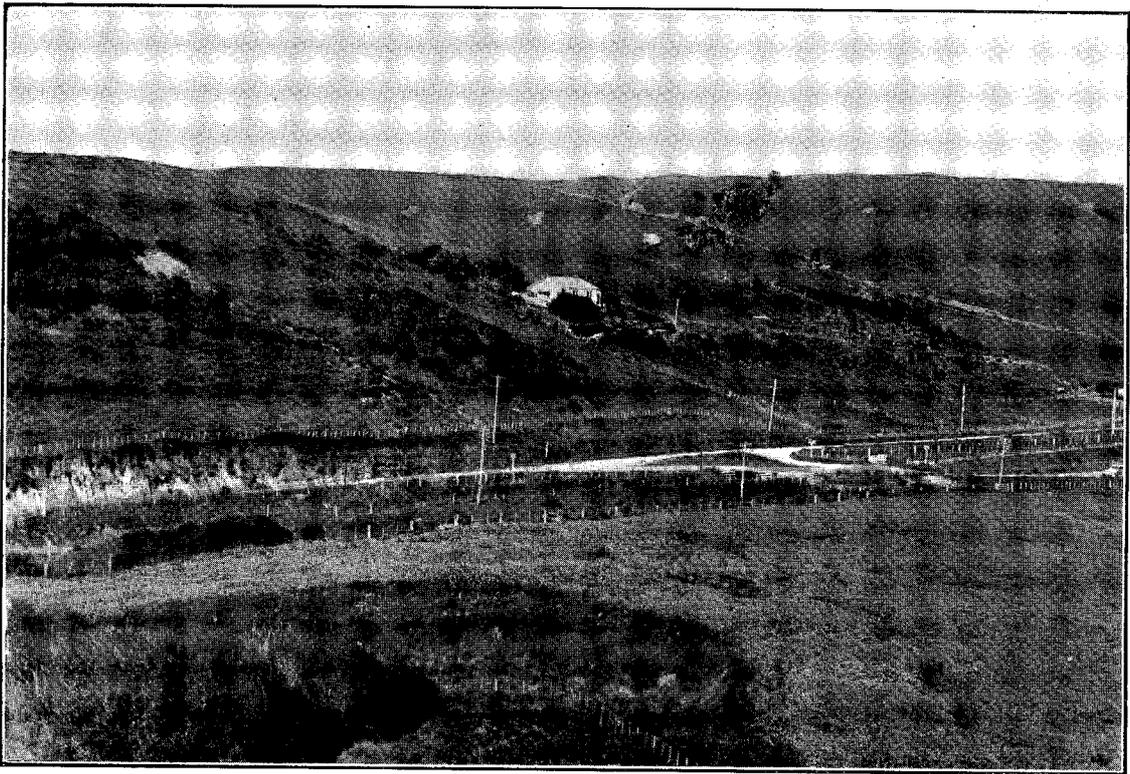


VIEW SHOWING EXTRAORDINARY FLOOD CONDITIONS, APRIL, 1938. RISE ABOVE PREVIOUS HIGHEST KNOWN HIGH FLOOD-LEVEL APPROXIMATELY 16 FT.

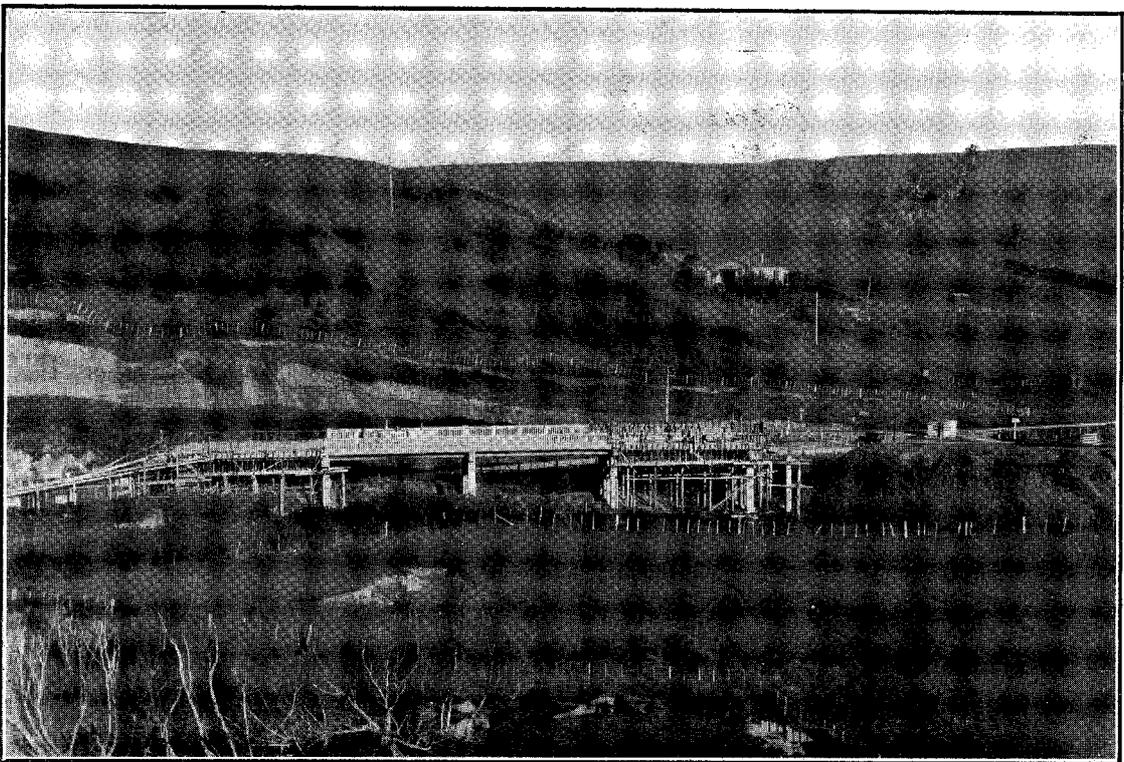
MOHAKA RIVER BRIDGE.



GENERAL VIEW, SHOWING PROGRESS OF CONSTRUCTION.
THORNDON OVERBRIDGE, WELLINGTON CITY.

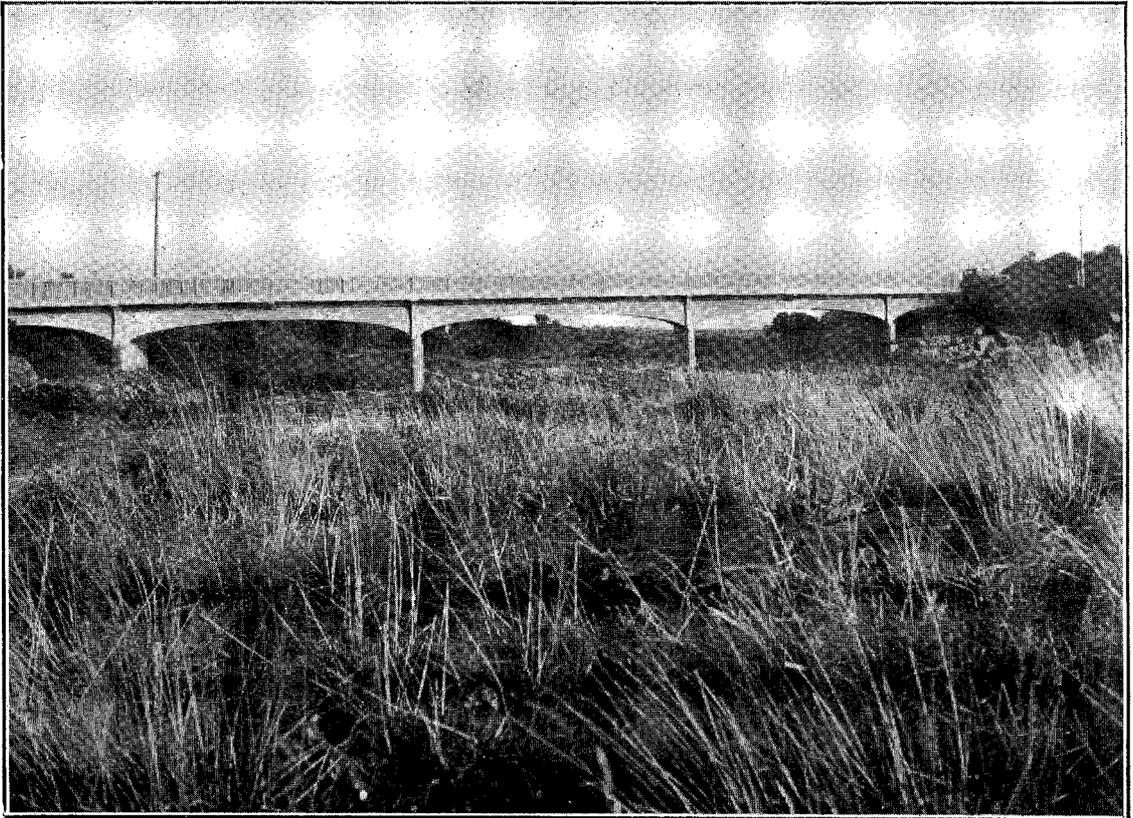


LEVEL CROSSING AT KAI IWI BEING ELIMINATED BY CONSTRUCTION OF OVERBRIDGE SHOWN BELOW.

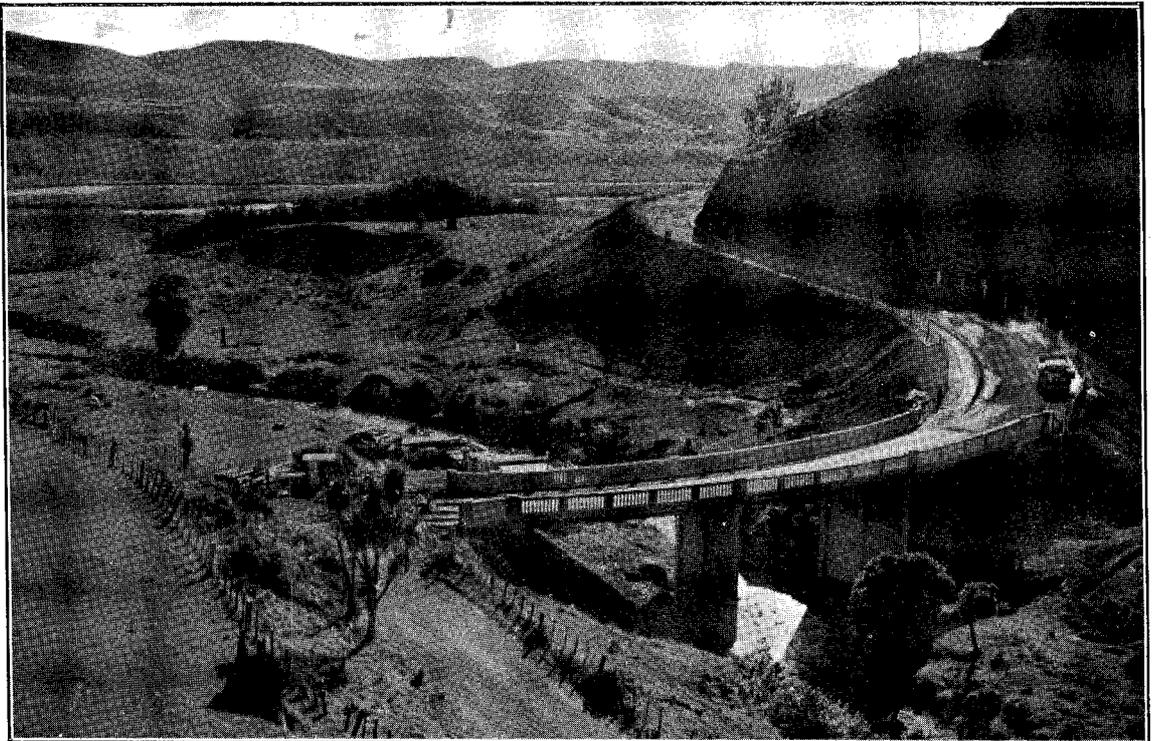


KAI IWI OVERBRIDGE, IN COURSE OF CONSTRUCTION, ELIMINATING LEVEL CROSSING SHOWN IN TOP VIEW.

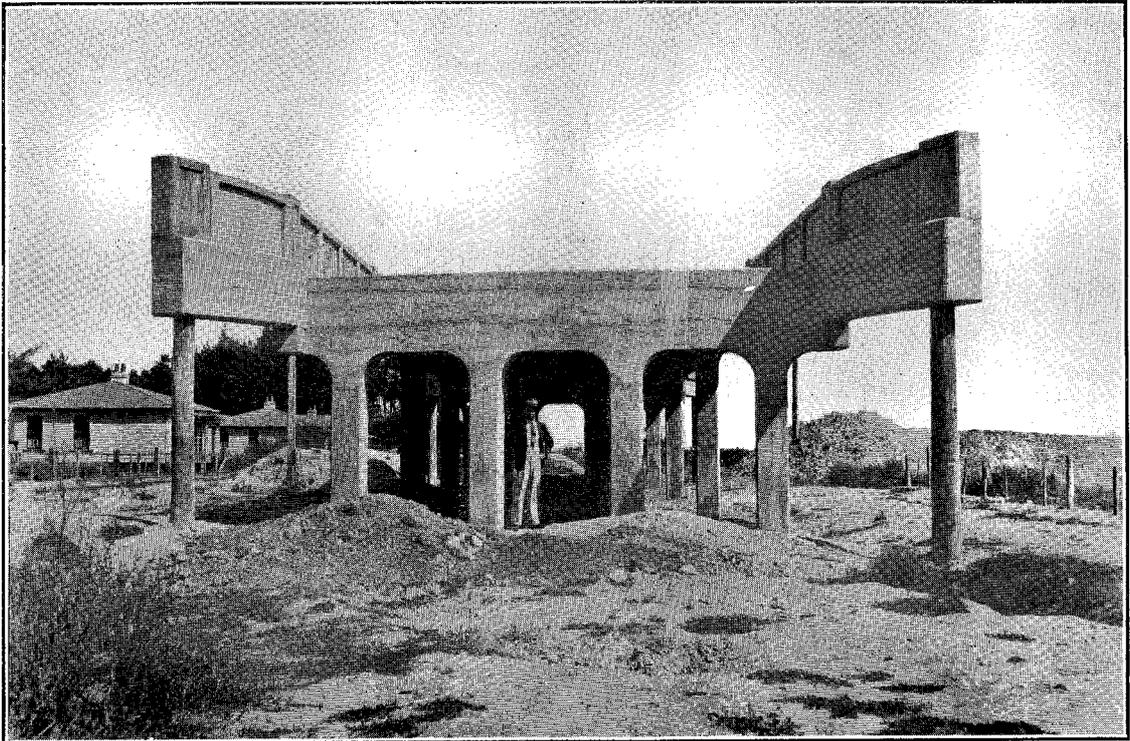
HAWERA-WANGANUI STATE HIGHWAY.



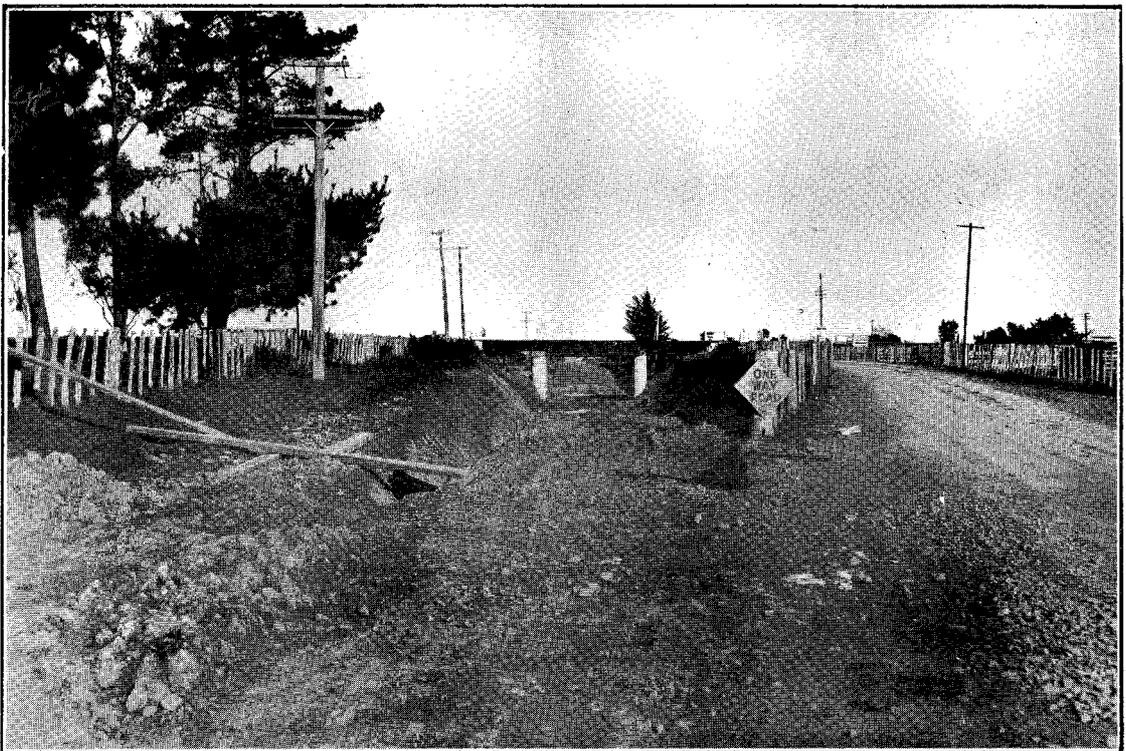
PUNEHU BRIDGE. ONE 65 FT., TWO 57 FT., AND TWO 20 FT. SPANS; 20 FT. ROADWAY.
ELTHAM-OPUNAKE MAIN HIGHWAY.



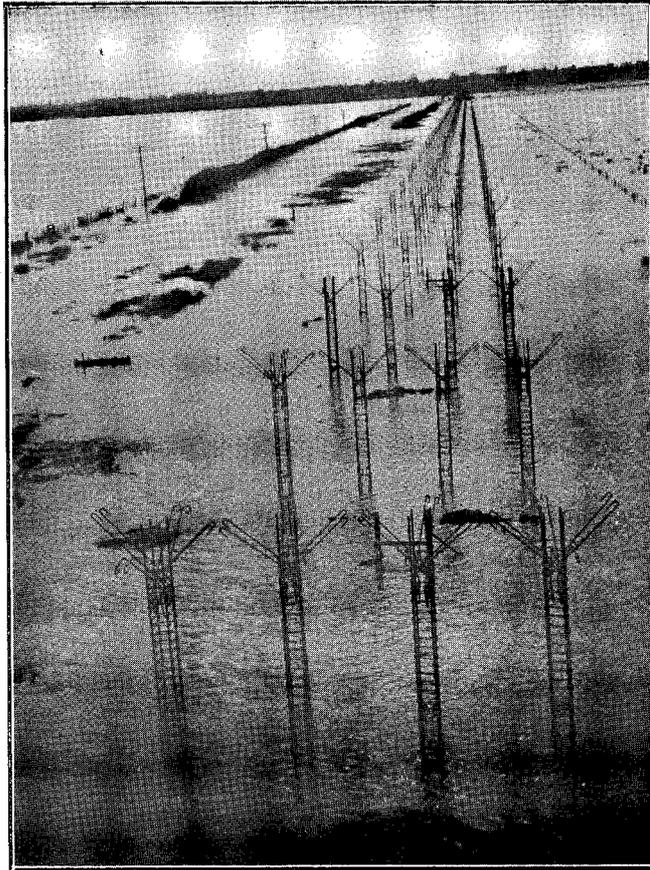
CHURCH HILL DEVIATION AND BRIDGE; THREE 40 FT. SPANS, 24 FT. ROADWAY.
POHANGINA VALLEY MAIN HIGHWAY.



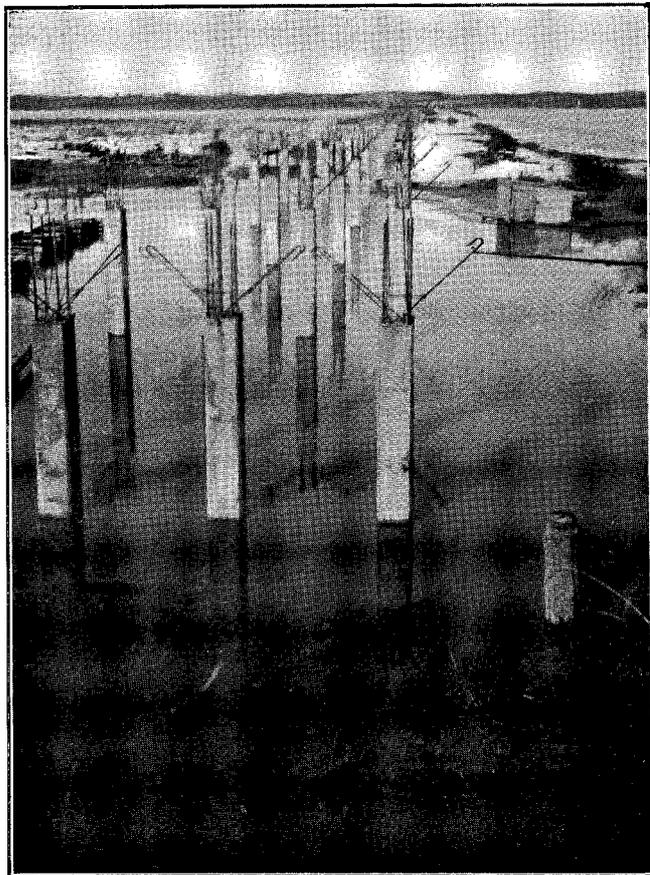
GREATFORD OVERBRIDGE UNDER CONSTRUCTION. END VIEW BEFORE PLACING APPROACH BANKS.



CLIFF ROAD SUBWAY. VIEW LOOKING SOUTH SHOWING TEMPORARY ROAD ON RIGHT. HOROPITO-BULLS VIA TAIHAPE STATE HIGHWAY.

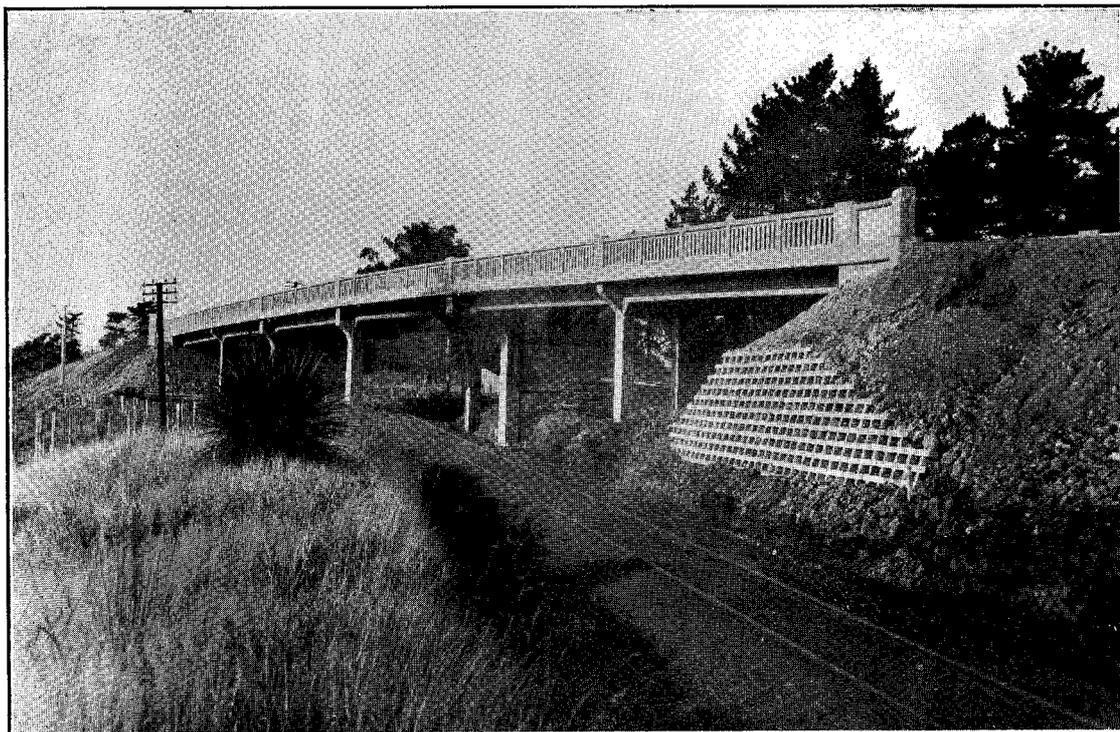


VIEW LOOKING NORTH, SHOWING REINFORCING FOR CONCRETE COLUMNS.

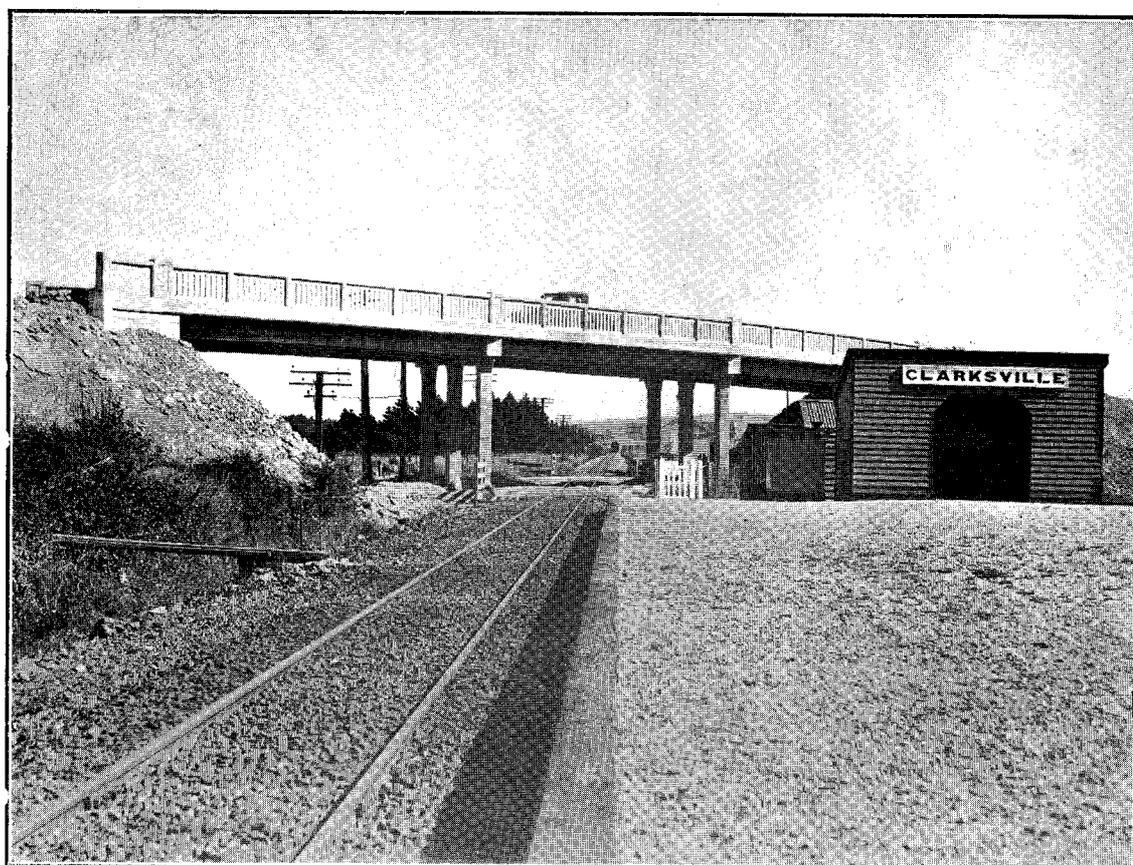


VIEW LOOKING SOUTH, SHOWING COLUMNS CONCRETED.

FLOOD CONDITIONS AT WHIROKINO
TRESTLE, MANAWATU RIVER OVER-
FLOW, WANGANUI-LEVIN STATE
HIGHWAY.

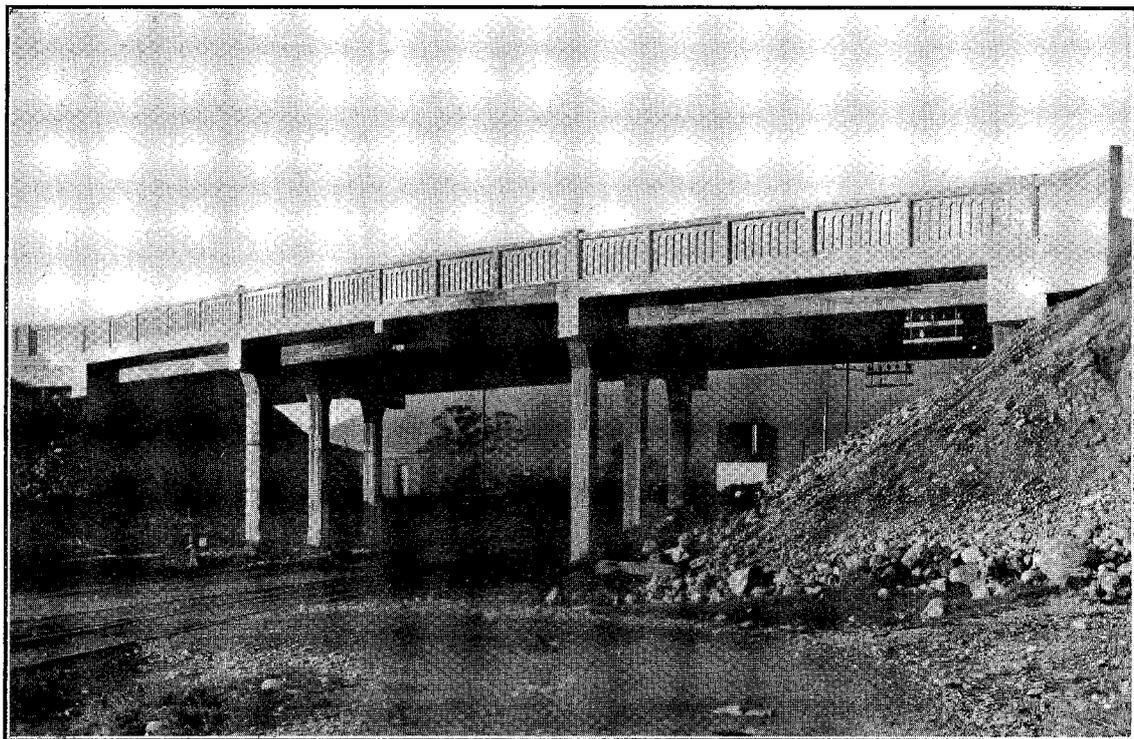


BONNY GLEN OVERBRIDGE. FOUR 40 FT., TWO 45 FT. SPANS, 24 FT. ROADWAY.
BRIDGE SKEWED 72° FROM NORMAL, NECESSITATING "STEPOVER" PIER.
TURAKINA-CLIFF ROAD VIA MARTON MAIN HIGHWAY.

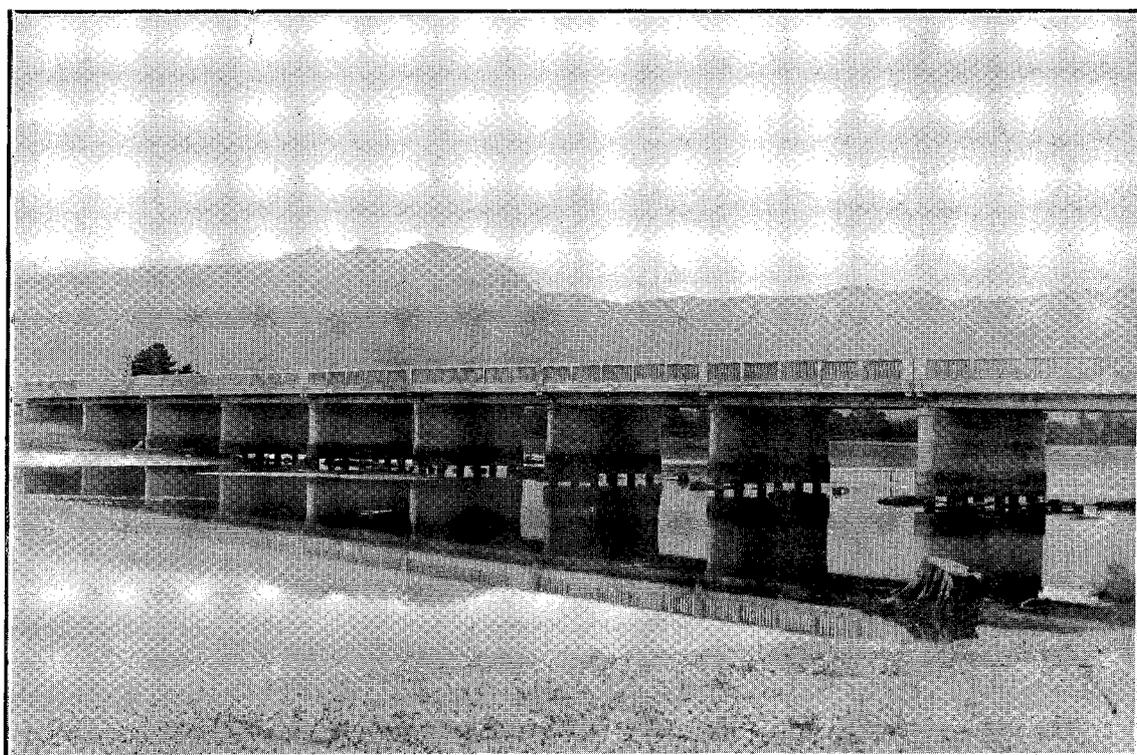


CLARKSVILLE OVERBRIDGE. THREE 45 FT. SPANS, 24 FT. ROADWAY, SKEWED 53°
FROM NORMAL.

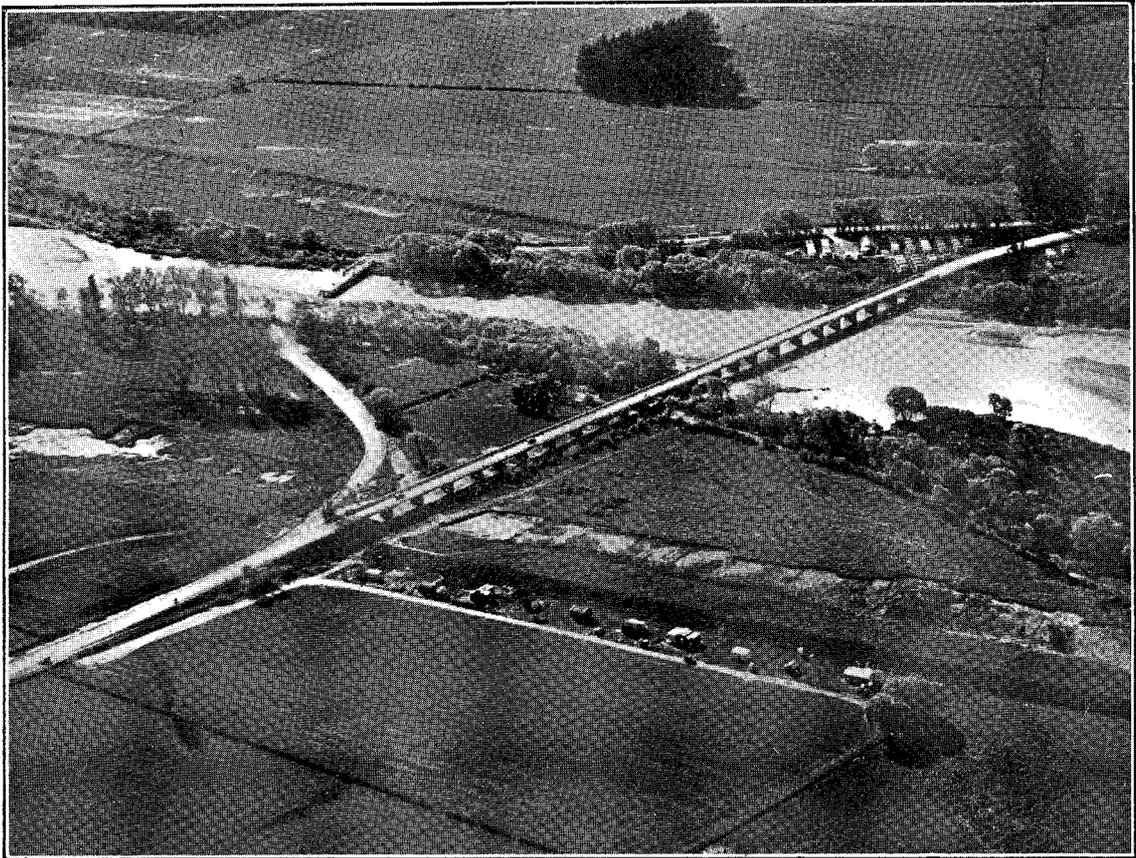
MILTON-QUEENSTOWN STATE HIGHWAY.



WAIMANGAROA OVERBRIDGE. THREE 45 FT. SPANS, 22 FT. ROADWAY, 4 FT. FOOTWAY.



OROWAITI RIVER BRIDGE. TWELVE 40 FT. SPANS, 20 FT. ROADWAY, 4 FT. FOOTWAY.
WESTPORT-KARAMEA MAIN HIGHWAY.



AERIAL VIEW SHOWING OLD AND NEW ASHLEY RIVER BRIDGES, ALSO SHOWING
NEW STOP-BANKS.

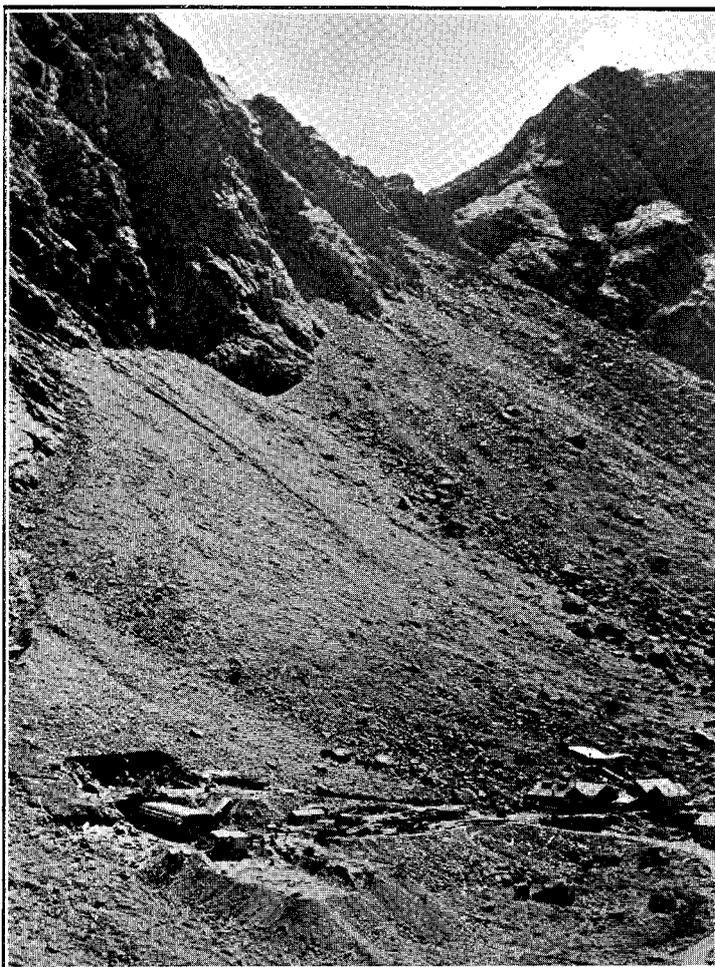
PICTON-CHRISTCHURCH STATE HIGHWAY.



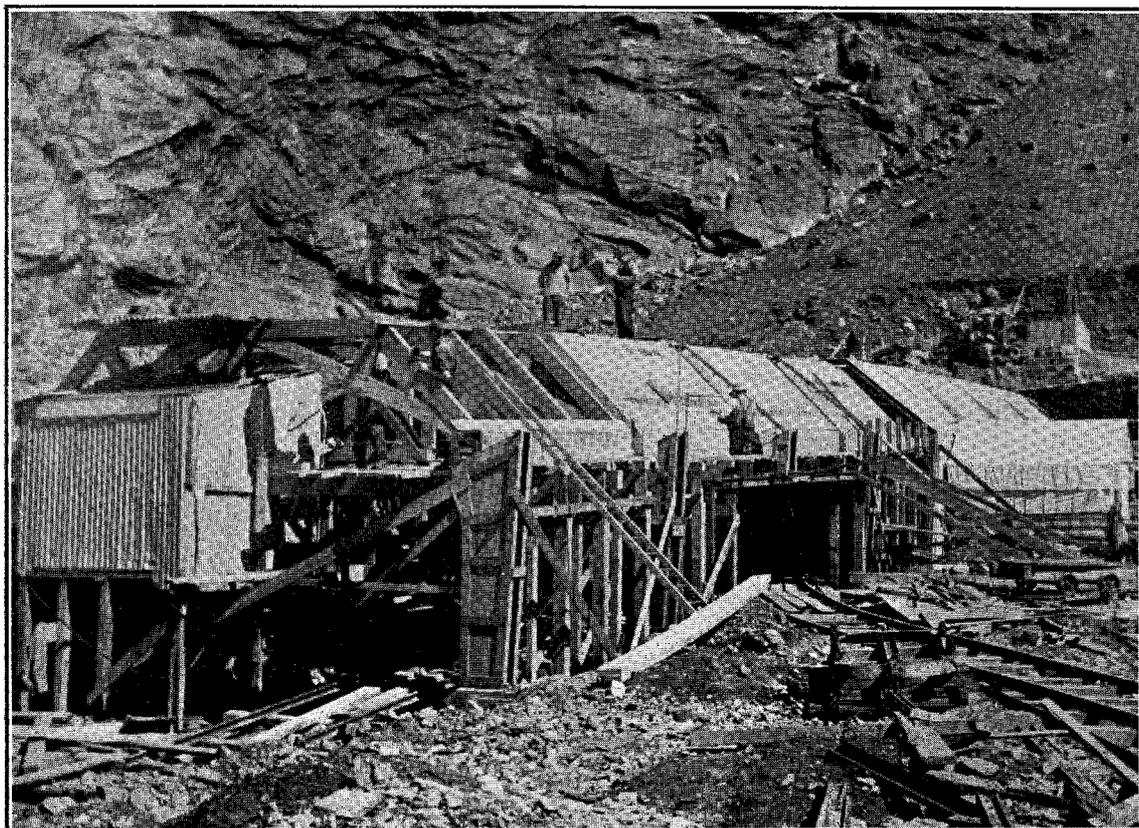
RAKAI RIVER ROAD BRIDGE, 5,760 FT. IN LENGTH, 24 FT. ROADWAY, UNDER
CONSTRUCTION ON RIGHT. NOTE NEW RAILWAY-BRIDGE UNDER CONSTRUCTION
ON EXTREME LEFT AND EXISTING COMBINED ROAD AND RAILWAY BRIDGE IN
CENTRE.

CHRISTCHURCH-TIMARU STATE HIGHWAY.

2—Main Highways.



VIEW SHOWING BUILDINGS, AND AVALANCHE-PROTECTION WORKS UNDER CONSTRUCTION, AT TUNNEL PORTAL AT HOMER SADDLE.



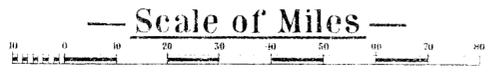
COVERED WAY IN REINFORCED CONCRETE FOR AVALANCHE PROTECTION AT TUNNEL PORTAL, HOMER SADDLE (UNDER CONSTRUCTION).

THE ANAU-MILFORD SOUND MAIN HIGHWAY.




 PUBLIC WORKS
 Department
 NEW ZEALAND.
 J. WOOD, M. INST. C.E.
 ENGINEER-IN-CHIEF.

PUBLIC WORKS MAP
SHOWING THE RAILWAYS
NORTH ISLAND
OF
NEW ZEALAND
1938



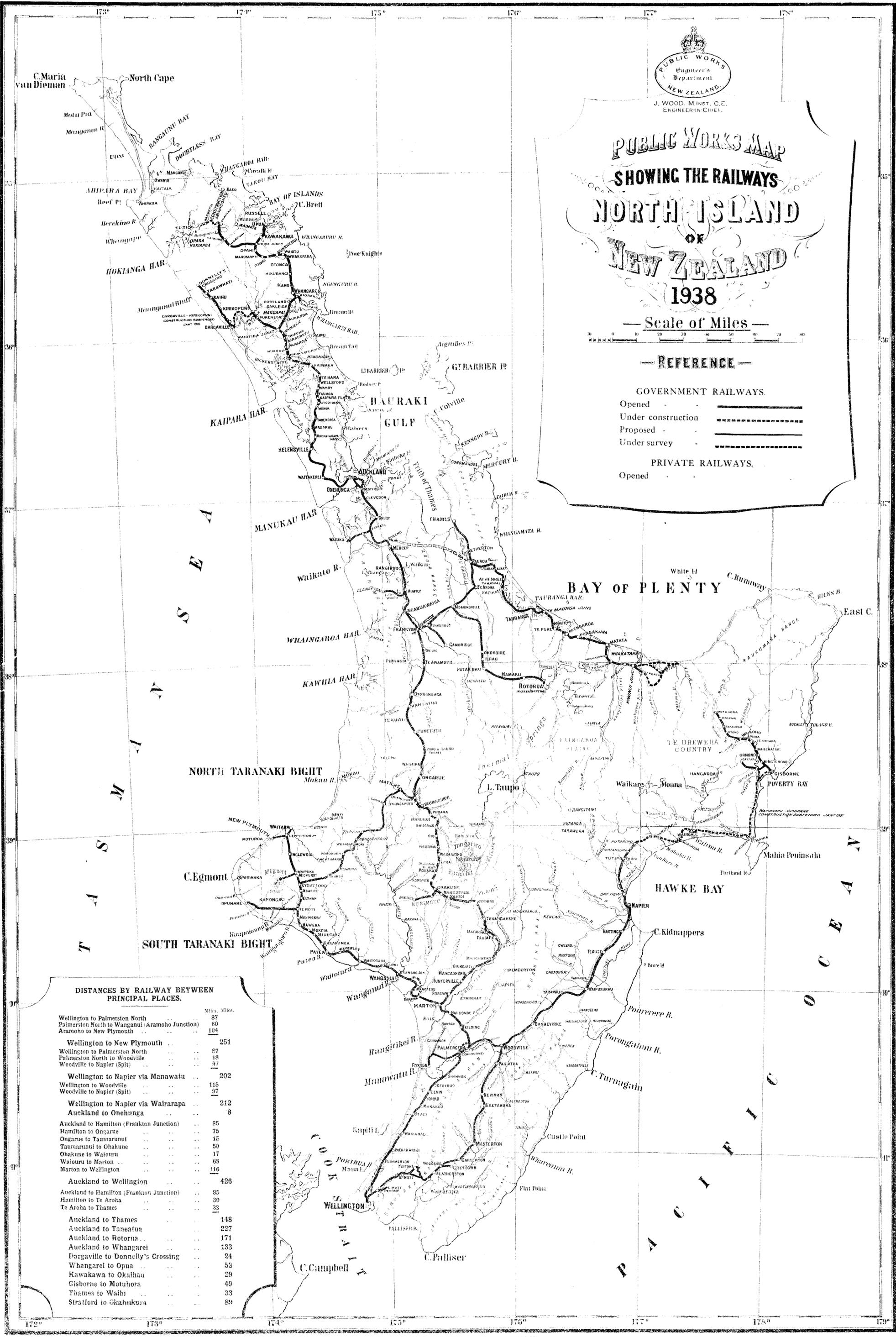
— REFERENCE —

GOVERNMENT RAILWAYS
 Opened —————
 Under construction - - - - -
 Proposed
 Under survey - - - - -

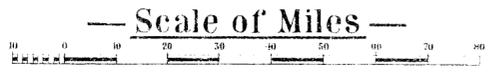
PRIVATE RAILWAYS
 Opened —————

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 Wairoa	17	
Wairoa 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 Opuā	53	
Kawakawa to Okaihau	29	
Gisborne to Motuhora	49	
Thames to Waikā	33	
Stratford to Okahukura	89	



PUBLIC WORKS MAP
SHOWING THE RAILWAYS
NORTH ISLAND
OF
NEW ZEALAND
1938



- REFERENCE**
- GOVERNMENT RAILWAYS**
- Opened -
 - Under construction -
 - Proposed -
 - Under survey -
- PRIVATE RAILWAYS**
- Opened -

DISTANCES BY RAILWAY BETWEEN PRINCIPAL PLACES.

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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 Wairoa	17	
Wairoa to Marton	68	
Marton to Wellington	116	
Auckland to Wellington	426	
Auckland to Hamilton (Frankton Junction)	85	
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Dargaville to Donnelly's Crossing	24	
Whangarei to Opuha	53	
Kawakawa to Okaihau	29	
Gisborne to Motuhora	49	
Thames to Waikato	33	
Stratford to Okahukura	89	