1954

VICTORIA

COUNTRY ROADS BOARD

FORTY-FIRST ANNUAL REPORT

FOR YEAR ENDED 30TH JUNE, 1954

PRESENTED TO BOTH HOUSES OF PARLIAMENT PURSUANT TO ACT No. 3662.

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Her Majesty Queen Elizabeth II. and H.R.H. Duke of Edinburgh travelling on Woods Point Road east of Warburton.

COUNTRY ROADS BOARD

FORTY-FIRST ANNUAL REPORT, 1954

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COUNTRY ROADS BOARD

FORTY-FIRST ANNUAL REPORT

Exhibition Building,
Carlton, N.3.
25th October, 1954.

The Honorable S. Merrifield, M.L.A.,
Minister of Public Works,
Department of Public Works,
Melbourne, C.2.

SIR,

In accordance with the requirements of Section 96 of the *Country Roads Act* 1928 (No. 3662), the Board has the honour to submit to you, for presentation to Parliament, a report of its proceedings for the year ended the 30th June, 1954.

FINANCE.

Although with increasing vehicles funds available to the Board rose slightly, the net receipts were again quite inadequate to meet the cost of a large volume of urgent and necessary works. The allocations for works both under municipal supervision and under the direct supervision of the Board had to be limited to provide only for a minimum of routine maintenance of existing assets and a token volume of reconstruction which is so generally needed.

It was also necessary carefully to review expenditure month by month throughout the year so as to ensure that there would be neither an "overdraft" (which is not permitted under the Country Roads Acts) nor on the other hand any appreciable surplus unspent.

After making allowance for costs of collection, refunds, &c., the amount actually received by the Board from motor registration fees and fines and half the drivers' licence fees for the financial year was £3,970,528 as compared with £3,861,533 in the financial year 1952–53, an increase of £108,995. The receipts from petrol tax were £2,741,608 as compared with £2,446,029 in 1952–53, an increase of £295,579.

The fact is that, while receipts have increased a little, road construction and maintenance costs are still very high and the weight and volume of traffic using the State's road system continue to increase rapidly. The net result is that while a mile here and there is being improved many other sections are breaking up, so that the Board is actually falling further into arrears in the struggle to maintain and improve the road system. As has been stressed in earlier reports, the only possible solution to the problem is a substantial increase in the revenue funds available to the Board. In the meantime a rather wasteful policy of patching and repatching is forced upon the Board. Typical deficiencies are illustrated in Plates 1 to 3.

Bridge reconstruction is in a similar plight. Some essential materials are not readily available and there is a shortage of skilled tradesmen, so that with certain types of construction progress has been limited. However, additional contractors have entered the field, and the principal reason why it is necessary to retain load limits on structures

DEFICIENCIES

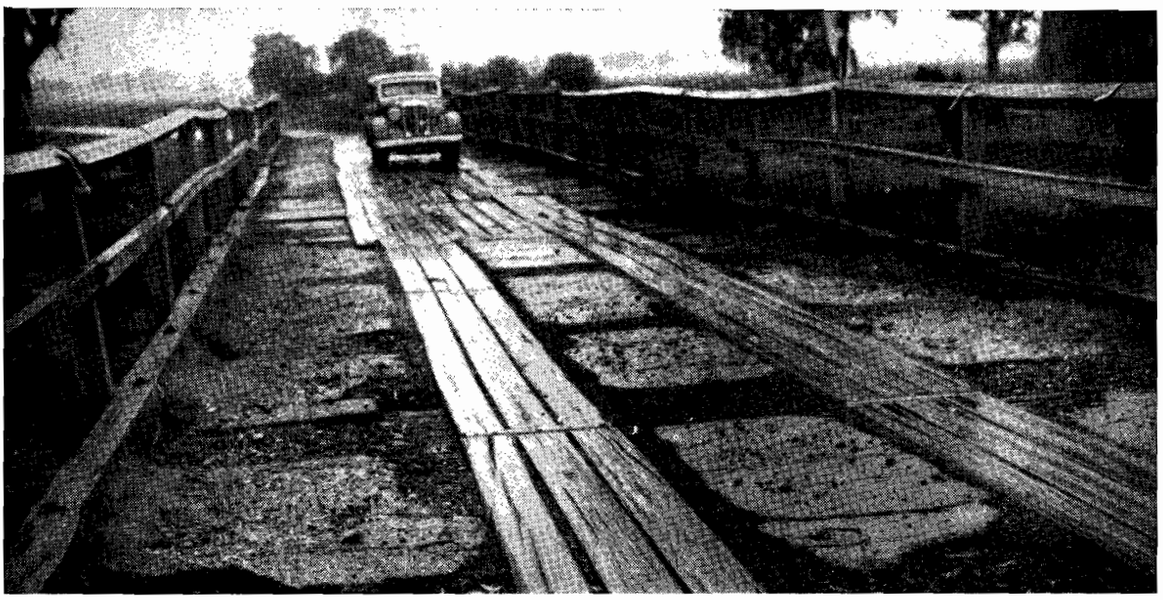

Plate No. 1.—Decrepit bridge over Corryong Creek on Corryong Road.

Plate No. 2.—Corrugated surface of Tallangatta-Corryong Road.

Plate No. 3.—Heavy patching on Portland-Casterton Road near Henty.

on very important roads is because funds to replace worn out structures are not available. These conditions have forced the Board to adopt in many cases the same uneconomical policy of extensive patching and repair to structures as for road pavements, instead of taking the obvious course of constructing new bridges. It is regrettable that this policy must apparently continue until bold measures are adopted, which would support a really progressive policy.

During the financial year 1953–54, the municipal councils and the Board's engineers applied for a total sum of £17,681,596 for expenditure on both classified and unclassified roads. Although the Board, having carefully examined these applications item by item, was satisfied that they were generally for urgent and necessary works, the total amount which it could reasonably allocate for road works was only £8,783,864, or 49·7 per cent. of the total applications.

The actual expenditure for the year, namely, £6,440,549 representing 73·3 per cent. of the allocation, was an indication of the capacity of both the municipalities and the Board's organization to undertake the works involved and to expend a high percentage of the amount made available.

In making its allocations, the Board has endeavoured to provide first as much as possible for patrol and general maintenance, but it is a matter for regret that it has not always been possible to provide adequately even for these items, especially as over the years the Board has encouraged the municipal councils to set up efficient organizations for maintaining and restoring declared roads and the more important secondary roads.

Some years ago, the Board set up a finance committee, comprised of senior officers of various sections of its organization, for the purpose of maintaining a close watch on the trends both of receipts and expenditure, and submitting very full and comprehensive statements at monthly intervals. After consideration of the conditions reported as at the 30th November last, it appeared that there might be a substantial debit balance at the 30th June, 1954, unless special measures were taken to control expenditure in the meantime. Municipal councils were accordingly asked in December, 1953, so to arrange their programmes of work that not more than 65 per cent. of the amount allocated for main roads for the financial year, including commitments from 1952–53, would be claimed for reimbursement by the Board to the end of the financial year. Many councils were greatly disturbed on receipt of this advice from the Board, and protested against what appeared to be a very harsh restriction of essential activities. They were advised, however, that the situation was not very much different from that in previous years. Thus, during the financial year 1952–53, when the original allocations were on a drastically restricted basis the total expenditure reimbursed by the Board throughout the whole State represented only 71 per cent. of the total allocations (including commitments). Councils also were reminded that, while grants might conceivably be even fully committed during the year, this did not mean that they would be fully expended during that year, as, from the Board's experience, a considerable portion of these commitments is always carried forward into the succeeding financial year.

It is very gratifying to know that Councils generally have responded very readily to the Board's request, which in general had the desired effect of somewhat retarding the rate of reimbursement of expenditure by the Board. Their co-operation in this matter was greatly appreciated.

On unclassified roads some slight curtailment was necessary in certain projects, but this was achieved by reducing the amounts provided for a limited number of individual projects rather than by an overall reduction.

Country Roads Board Fund.

The gross receipts from motor registration fees and fines, together with half the amount received from drivers' licence fees, amounted to £4,383,407, an increase of £212,291 in relation to the amount received from the same source in the financial year 1952–53. Refunds and the cost of collection absorbed £412,879, leaving a net revenue of £3,970,528.

The following statement indicates the amount received by the Board from this source during the last ten financial years :—

	£
1944–45	1,395,225
1945–46	1,558,480
1946–47	1,762,795
1947–48	1,963,555
1948–49	2,133,717
1949–50	2,687,490
1950–51	3,159,111
1951–52	3,853,962
1952–53	3,861,533
1953–54	3,970,528

While with increasing numbers of vehicles registered there has been a substantial *pro rata* increase in revenue over that period, this has been more than offset by the steeply increasing costs associated with road construction and maintenance. On the 1st July, 1944, the basic wage in this State was £4 17s. per week. On the 1st July, 1953, it was £11 12s. per week. The basis of annual motor registration fees has remained at 3s. per power weight unit excepting for the reductions applicable prior to 1949. Thus revenue has fallen far behind the rapidly increasing requirements.

Commonwealth Aid Road Funds.

The *Commonwealth Aid Roads Act* 1950, which operates for a period of five years from the 1st July, 1950, provided for the distribution amongst the States of the proceeds of 6d. per gallon customs duty on motor spirit imported into Australia and 3½d. per gallon excise duty on motor spirit refined in Australia, on a basis which has been in operation for many years, namely, in the proportion of three-fifths as to population and two-fifths as to area. Collections in respect of spirit used in civil aircraft or for the purposes of civil aviation are excluded. On this basis, Victoria receives only £174,000 of every £1,000,000 distributed.

The Act provided for 65 per cent. of the amount set aside, as above, less an amount of £600,000 per annum over the whole of the Commonwealth, to be expended on the construction, reconstruction, maintenance, and repair of roads, on the purchase of roadmaking plant, or on other works connected with transport, either by road or water, and for the remaining 35 per cent. to be expended on the construction, reconstruction, maintenance and repair of roads in rural areas, i.e., not available for use on declared main roads or State highways.

The sum of £600,000 mentioned in the preceding paragraph had to be expended by the Commonwealth on (*a*) the construction, reconstruction, maintenance and repair of strategic roads and roads of access to Commonwealth property (£500,000) and (*b*) on the promotion of road safety practice through Australia (£100,000).

During the financial year 1953-54, the total sum received by the Board under the provisions of this Act was £2,741,608, making the total sum available to the Board from motor registration fees and fines, drivers' licence fees, municipal repayments, &c., and from Commonwealth sources £7,045,582, as compared with £6,653,974 received from the same sources in the preceding financial year.

In addition, the Board was authorized to expend a total sum of £1,290,500 from loan moneys during the financial year, an increase of £523,000 over and above the authorization for the previous year.

The provision of this loan money has enabled the Board to carry out some very necessary works which could not have been financed otherwise, but the regrettable feature from the Board's point of view of the use of loan moneys is the resultant increase in the Board's interest and sinking fund bill which already stands at £611,154 and absorbs revenue which could be very well applied to the carrying out of road and bridge works.

At the 30th June, 1954, the total amount from all funds standing to the credit of the Board was £54,541. This balance was more than covered by the amount of claims which had been received too late to be passed for payment and included in the accounts for the year. The small balance remaining out of receipts for the year totalling

£8,573,420, again indicates the very close watch which needs to be kept on the Board's funds during the year, both receipts and expenditure, and the necessity for a particularly accurate estimation of the funds likely to be available in the closing weeks of the year.

Commonwealth Aid Roads Act 1950.

The amounts expended on roads and bridges during the year from moneys available under the provisions of the above Act were as under :—

	£
Maintenance of classified roads	1,912,767
Construction of roads of a developmental character and restoration and rebuilding of bridges on unclassified roads	457,156
Assistance on construction of Soldier Settlement Roads	14,595
Construction, reconstruction and maintenance of School Bus Routes	8,836
Repair of flood damage—unclassified roads	9,341
Provision towards maintenance of unclassified roads	338,742
Purchase of roadmaking plant	171
Total	2,741,608

Works Allocations.

The total allocation for new road works from all funds for the financial year 1953–54, i.e., not including revotes and amounts already committed, was £7,605,369, as compared with £6,388,140 in 1952–53. The allocation of £7,605,369 was made up of £3,228,951 from the Country Roads Board Fund, £3,085,918 from the Commonwealth Aid Road Funds, and £1,290,500 from loan moneys.

Including revotes and commitments, the comparable figures for the financial year 1952–53 and 1953–54 respectively were £7,998,667 and £8,783,864.

MAIN ROADS.

Allocation of Funds.

The total amounts applied for both by municipal councils and by the Board's Divisional Engineers (for works under the Board's direct supervision) in respect of the maintenance and improvement of main roads, which totalled 9,791 miles on the 30th June, 1954, was £6,440,378, and the total sum allocated was £3,683,853 or 57 per cent. of the total applications. This last-mentioned sum was made up of £2,745,379 from the Country Roads Board Fund and £938,474 from Commonwealth Aid Road Funds.

The number of municipalities which participated in the allocation was 187, whilst provision was made also for the maintenance and improvement of a number of main roads which are maintained under the direct supervision of the Board. The total amount allotted for the latter group of roads, and included in the allocation figures mentioned in the previous paragraph, was £312,569.

In making this allocation, the Board endeavoured to provide as generously as possible with its limited funds for the essential items such as patrol and general maintenance, maintenance of bridges, and resheeting, and included in its programme of works a greater proportion of initial bituminous treatments than in the previous year in an endeavour to reduce maintenance costs, especially in areas where maintenance materials are not readily obtainable. Provision was made for a number of realignments, rescaling, and bridge construction projects, but on a restricted scale.

The Board was again faced with the many problems associated with a network of roads on which necessary reconstruction has lagged far behind the requirements of present-day traffic. Through lack of funds, pavement replacement and reconstruction has not been proceeding at the required rates, and it is no exaggeration to say that throughout the whole of the State thin pavements are failing to the extent that they are no longer being economically dealt with by patrol maintenance, edges are broken away because the pavements are too narrow, and scores of bridges, already far too inadequate for current requirements, are being kept in service long after they should have been replaced.

The expenditure for the year was £2,455,690, representing 67 per cent. of the amount allocated, as compared with 73 per cent. in the preceding financial year and 72 per cent. in 1951–52, and commitments amounting to £741,787 were outstanding at the 30th June, 1954.

Apportionment of Costs.

The Country Roads Act provides that not more than one-third of the amount expended on the maintenance of main roads from the Country Roads Board Fund during the preceding year shall be apportioned to the municipalities, whose contributions are due and payable on the 1st January in the financial year next following that in which the expenditure was incurred. The Act also provides for the municipal contribution to be reduced below one-third where the cost of maintenance of a road is deemed to be excessive and where such cost is due to motor traffic not of local origin or to timber traffic. At the same time, the Board, in dealing with the apportionment of cost of works, is required to take into account the revenue, valuation, and rating of the municipality concerned.

With the great development in motor traffic, it is natural that contributions have been reduced below one-third in a great many cases, and, in a further endeavour to assist municipalities, the Board has for many years been reducing their contributions by supplementing its allocations from the Country Roads Board Fund with grants from Commonwealth Aid Road Funds, which are free of contribution by the Councils concerned. As a general rule, these supplementary grants are made in relation to particular jobs or in special circumstances, and the amounts to be contributed by the Councils concerned are substantially reduced by the application of these grants of "free" money.

Very little alteration was made by the Board in the rates of contribution by councils which had been adopted in the previous financial year, as the Board's funds would not permit of its accepting responsibility for any greater proportion of the cost of works.

The percentage of contribution by the Councils to total expenditure for 1952–53 was 15·15 per cent., as compared with 13·61 per cent. in the previous year. Details are as follows:—

	£
Expenditure from Country Roads Board Fund	1,575,773
Expenditure from Commonwealth Aid Road Funds	603,274
Total expenditure	2,179,047

	£
Amount apportioned to Councils (based on expenditure from the Country Roads Board Fund only)	330,149
Percentage of apportionment to amounts provided from the Country Roads Board Fund	20·95%
Percentage of apportionment to total expenditure	15·15%

As an indication of the value to municipal councils of reduced contributions and supplementary Commonwealth Aid Road grants, it will be noted that, had the whole of the expenditure been provided from the Country Roads Board Fund and apportioned strictly on a one-third basis, the Councils would have been required to contribute a total sum of £726,349. Thanks to reduced contributions and "free" grants from Commonwealth funds, however, their contributions amounted to £330,149 only, a saving to them of £396,200.

Particulars of some of the major road works carried out during the year are set out hereunder:—

Bairnsdale Division.

Tambo Shire.—Gelantipy Road—widening and improvements to curves on the Murrindal Mountain.

Ballarat Division.

Ararat City.—Ararat–Hall's Gap Road—half a mile of reconstruction and sealing. *Ararat Shire.*—(1) Ararat–Hall's Gap Road—1 mile of reconstruction; (2) Ararat–Warrnambool Road—1 mile of reconstruction and sealing; (3) Maroona–Glenthompson Road—1 mile of reconstruction and sealing. *Avoca Shire.*—Moonambel Road—extension of sealing for 1 mile. *Bungaree Shire.*—Spargo Creek Road—extension of seal for ·72 miles. *Buninyong Shire.*—(1) Buninyong–Mt. Mercer Road—·68 miles of reconstruction and sealing; (2) Navigator Road—extension of sealing for 1·23 miles. *Glenlyon Shire.*—Malmsbury–Daylesford Road—1·73 miles of reconstruction and sealing (thus completing the sealing of the road throughout). *Ripon Shire.*—(1) Eurambeen–Streatham Road—2 miles of reforming and resheeting; (2) Beaufort–Carngham Road—1 mile of reforming and resheeting. *Talbot Shire.*—(1) Maryborough–Ballarat Road—·52 miles of realignment and reconstruction in two sections north of Talbot; (2) Lexton–Talbot Road—2·11 miles of sealing (completion of sealing on this road in Talbot Shire).

Benalla Division.

Beechworth Shire.—(1) Beechworth Road—1·25 miles of resheeting and sealing; (2) Stanley Road—1·35 miles of reconstruction and sealing on two failed sections. *Benalla Shire.*—(1) Benalla–Tocumwal Road—2·7 miles of resheeting and sealing; (2) Benalla–Yarrawonga Road—2·7 miles of resheeting and sealing; (3) Kelfeera Road—3.2 miles of sealing. *Bright Shire.*—Harrietville Road—2·45 miles of resheeting and sealing. *Chiltern Shire.*—(1) Chiltern–Howlong Road—1 mile of sealing; (2) Chiltern–Rutherglen Road—1 mile of sealing. *Cobram Shire.*—Benalla–Tocumwal Road—1.8 miles of reconstruction and sealing. *Euroa Shire.*—Euroa–Mansfield Road—3 miles of resheeting and sealing. *Goulburn Shire.*—Avenel–Nagambie Road—1·17 miles of resheeting and sealing. *Mansfield Shire.*—(1) Mansfield Road—1 mile of reconstruction and sealing; (2) Mansfield–Wood's Point Road—1 mile of reconstruction and sealing; (3) Benalla–Mansfield Road—1 mile of reconstruction and sealing. *Seymour Shire.*—Avenel–Nagambie Road—2 miles of resheeting and sealing. *Shepparton Shire.*—Shepparton–Dookie Road—3·5 miles of sealing. *Towong Shire.*—(1) Murray Valley Road—2 miles of resheeting and sealing (Plate No. 4); (2) Yabba Road—1·02 miles of resheeting and sealing; (3) Corryong Road—1·38 miles of resheeting and sealing. *Tungamah Shire.*—(1) Benalla–Tocumwal Road—2·28 miles of resheeting and sealing; (2) Benalla–Yarrawonga Road—3 miles of sealing. *Wangaratta Shire.*—Wangaratta–Yarrawonga Road—1 mile of reconstruction and sealing. *Yackandandah Shire.*—(1) Dederang Road—1·25 miles of resheeting and sealing; (2) Yackandandah–Wodonga Road—2 miles of resheeting and sealing. *Yarrawonga Shire.*—(1) Benalla–Yarrawonga Road—2 miles of resheeting and sealing; (2) Wangaratta–Yarrawonga Road—2 miles of resheeting and sealing.

Bendigo Division.

Birchip Shire.—(1) Beulah–Birchip–Wycheproof Road—1·5 miles of sealing; (2) Birchip–Warracknabeal Road—1·4 miles of sealing. *Charlton Shire.*—Charlton–Durham Ox Road—2·35 miles of sealing (thus completing the sealing of the whole length of this road in Charlton Shire). *Deakin Shire.*—(1) Kyabram–Tongala Road—1·1 miles of reconstruction; (2) Rochester–Kyabram Road—1·25 miles of reconstruction and ·7 miles of sealing on section previously reconstructed. *East Loddon Shire.*—Bendigo–Pyramid Road—4·08 miles of sealing. *Gordon Shire.*—(1) Bendigo–Pyramid Road—1·81 miles of sealing; (2) Charlton–Durham Ox Road—2 miles of sealing. *Huntly Shire.*—Bendigo–Tennyson Road—1·4 miles of sealing. *Kerang Shire.*—(1) Kerang–Quambatook Road—1 mile of sealing; (2) Koroop Road—1 mile of sealing; (3) Murrabit Road—1·23 miles of reconstruction and ·8 miles of resheeting and sealing. *Korong Shire.*—(1) Serpentine Road—1 mile of sealing (completion of sealing of road in Korong Shire); (2) Wedderburn–Boort Road—1·25 miles of sealing. *Maldon Shire.*—(1) Baringhup Road—construction of new curve and culvert at ·37 miles; (2) Bridgewater–Maldon Road—1·33 miles of sealing. *Marong Shire.*—(1) Bendigo–Eddington Road—2·3 miles of reconstruction and sealing; (2) Bendigo–Pyramid Road—1·61 miles of reconstruction and sealing; (3) Bendigo–St. Arnaud Road—1·7 miles of sealing. *McIvor Shire.*—Heathcote–Bendigo Road—1·6 miles of reconstruction, realignment, and sealing. *Rochester Shire.*—Bendigo–Tennyson Road—2·53 miles of sealing. *Rodney Shire.*—Mooroopna–Undera Road—1.3 miles of sealing. *Swan Hill Shire.*—(1) Robinvale Road—1·1 miles of resheeting and

Plate No. 4.—Passenger bus on Murray Valley Road, Towong Shire, section resheeted and sealed.

Plate No. 5.—Robinvale Road, Swan Hill Shire, section resheeted and sealed.

Plate No. 6.—Taggerty-Thornton Road, Alexandra Shire, section reconstructed and sealed.

3·41 miles of sealing (Plate No. 5.); (2) Tooleybuc Road—resheeting and sealing of the whole length of ·95 miles; (3) Ultima Road—3·04 miles of sealing. *Waranga Shire.*—(1) Corop–Heathcote Road—1·5 miles of reconstruction and sealing; (2) Tatura–Rushworth Road—1·55 miles of light resheeting and sealing.

Dandenong Division.

Alexandra Shire.—Taggerty–Thornton Road—5·6 miles of reconstruction and sealing (completion of sealing on this road, which is part of the most direct route from Melbourne to Eildon). (Plate No. 6.) *Buln Buln Shire.*—Main Neerim Road—1·9 miles of reconstruction and surfacing with fine crushed rock, together with 1·2 miles of sealing, near Neerim Junction and Neerim South. *Cranbourne Shire.*—Koo-wee-rup–Longwarry Road, 1·6 miles of forming and gravelling near Bayles. *Fern Tree Gully Shire.*—Stud Road—1·4 miles of widening and base course surfacing. *Mornington Shire.*—(1) Moorooduc Road—·58 miles of forming, grading and surfacing, including major drainage treatment; (2) Tyabb Road—1·2 miles of reconstruction and sealing. *Mulgrave Shire.*—(1) Springvale; Road—·9 miles of regrading, surfacing with fine crushed rock and sealing at Tally Ho; (2) Wellington Road—·68 miles of resheeting and sealing.

Geelong Division.

Barrabool Shire.—Barrabool Road—·7 miles of reconstruction and widening and 1·8 miles of initial seal (including 1·1 miles reconstructed, realigned, and widened in the previous financial year) between Highton and Ceres. *Bellarine Shire.*—Geelong–Portarlington Road—$1\frac{3}{4}$ miles of widening and reconstruction (base course only) east of Drysdale. *Colac Shire.*—Coragulac–Beeac Road—$1\frac{1}{2}$ miles of reconstruction and sealing. *Kyneton Shire.*—Trentham Road—1 mile of reconstruction and sealing (thus completing sealing between Kyneton and Trentham). *Otway Shire.*—Colac–Beech Forest Road—$1\frac{1}{2}$ miles of reconstruction and realignment between Kawarren and Gellibrand, and extensive resheeting between Gellibrand and Beech Forest. *Winchelsea Shire.*—(1) Birregurra–Forrest Road—1·3 miles of reconstruction and sealing between 2·9 and 4·2 miles, and ·9 miles of reconstruction at Section Hill, 6 miles from Birregurra; (2) Winchelsea–Dean Marsh Road—2 miles of reconstruction between Dean Marsh and Rifle Butt's Road.

Horsham Division.

Arapiles Shire.—(1) Apsley–Natimuk Road—3·6 miles of construction near Mt. Arapiles; (2) Edenhope–Horsham Road—3·9 miles of construction and sealing between Natimuk and Miga Lake. *Dimboola Shire.*—(1) Horsham–Rainbow Road—1 mile of reconstruction and sealing north of Rainbow; (2) Nhill–Jeparit Road—1 mile of reconstruction and sealing west of Jeparit; (3) Rainbow Road—1·8 miles of reconstruction and sealing south of Rainbow. *Donald Shire.*—(1) Donald–Minyip Road—2 miles of reconstruction and sealing towards Minyip; (2) Marnoo–Donald Road—1·5 miles of widening and sealing of narrow pavement at Donald. *Dunmunkle Shire.*—Stawell–Warracknabeal Road—1·2 miles of reconstruction of failed sealed pavement between Rupanyup and Minyip. *Kaniva Shire.*—(1) Broughton Road—1·2 miles of reconstruction and sealing north of Kaniva; (2) Kaniva–Edenhope Road—1·3 miles of reconstruction and sealing south of Kaniva. *Kara Kara Shire.*—(1) Charlton Road—1·6 miles of reconstruction and sealing north of St. Arnaud; (2) Marnoo–St. Arnaud Road—2·9 miles of reconstruction west of St. Arnaud; (3) Navarre Road—1·3 miles of reconstruction and sealing near Beazley's Bridge. *Karkarooc Shire.*—Hopetoun–Rainbow Road—1·2 miles of reconstruction and sealing west of Hopetoun. *Kowree Shire.*—(1) Apsley–Natimuk Road—2·5 miles of reconstruction and sealing near Booroopki and 2·2 miles at Apsley; (2) Edenhope–Horsham Road—4·8 miles of reconstruction and sealing between Maryvale and Miga Lake; (3) Kaniva–Edenhope Road—2·6 miles of reconstruction and sealing north of Edenhope. *Stawell Shire.*—(1) Landsborough Road—1·1 miles of reconstruction extending towards Landsborough; (2) Marnoo Road—1·4 miles of reconstruction and sealing near Callawadda and 2 miles north of Marnoo; (3) Marnoo–St. Arnaud Road—1 mile of reconstruction and sealing east of Marnoo. *St. Arnaud Town.*—Bendigo–St. Arnaud Road—construction of deviation 1 mile in length near St. Arnaud. *Warracknabeal Shire.*—(1) Birchip–Warracknabeal Road—1·8 miles of reconstruction and sealing (completion of road in this Shire); (2) Warracknabeal–Rainbow Road—1·4 miles of reconstruction and sealing extending towards Rainbow; (3) Minyip Road—1·1 miles of sealing of failed pavement reconstructed in previous year.

Wimmera Shire.—(1) Grampians Road—2 miles of sealing on section constructed in previous year; (2) Warracknabeal Road—2·2 miles of reconstruction and sealing of failed sealed pavement.

Metropolitan Division.

Box Hill City.—Burwood Road—widening pavement between McComas Grove and Middleborough Road. *Brunswick and Essendon Cities.*—Albion Street—construction of approaches to new bridge over Moonee Ponds Creek. *Camberwell City.*—(1) Doncaster Road—widening of pavement from Tannock Street to Koonung Creek; (2) Warrigal Road—widening of pavement from Rowen Street to Highbury Road. *Coburg and Preston Cities.*—Bell Street—construction of approaches to new bridge over Merri Creek. *Heidelberg and Preston Cities.*—Bell Street—construction of approaches to new bridge over Darebin Creek, including channelization of intersection with Liberty Parade. (Plates Nos. 7 and 8.) *Malvern and Oakleigh Cities and Mulgrave Shire.*—Warrigal Road—construction of new roadway on east side of road reserve between Holmesglen and Allen Street, Oakleigh, including extension of crossing over Scotchman's Creek by construction of concrete barrel drain. (Plates Nos. 9, 10, and 11.) *Oakleigh and Moorabbin Cities.*—Warrigal Road—widening pavement between North Road and Bossington Street.

Traralgon Division.

Maffra Shire.—Licola Road—6·1 miles of resheeting and sealing north of Glenmaggie. *Morwell Shire.*—Morwell–Mirboo Road—1 mile of construction and sealing between Midland Highway and Boolarra, including approaches to new bridge over Morwell River.

Warrnambool Division.

Dundas Shire.—(1) Victoria Valley Road—2·85 miles of resheeting and initial seal extension; (2) McIntyre's Crossing Road—1·67 miles of resheeting and initial seal extension. *Glenelg Shire.*—(1) Casterton–Apsley Road—·57 miles of reconstruction and 2 miles of initial seal at Nangeela; (2) Merino–Coleraine Road—·76 miles of reconstruction at Tahara Bridge. *Heytesbury Shire.*—(1) Cobden–Port Campbell Road—1·9 miles of resheeting and initial seal extension at Cowley's Creek; (2) Cobden–Warrnambool Road—1·5 miles of resheeting and initial seal extension at Glenfyne; (3) Ayresford Road—1 mile of resheeting and initial seal extension south of Mt. Emu Creek. *Wannon Shire.*—(1) Natimuk–Hamilton Road—5·01 miles of initial seal extension near Balmoral; (2) Coleraine–Harrow–Apsley Road—2·25 miles of initial seal extension near Harrow. *Warrnambool Shire.*—Allansford–Nirranda Road—2 miles of reconstruction and initial seal near Allansford.

STATE HIGHWAYS.

Problems which confronted the Board in allocating funds for main road works applied with equal force to State highways, where it was again possible to make only a restricted allocation. Important major projects such as the provision of additional traffic lanes on the Princes Highway West, between Melbourne and Geelong, and the Princes Highway East, between Oakleigh and Dandenong, as well as the raising of the standard of many obsolete sections such as along the Murray Valley Highway, the Omeo Highway, and on the Princes Highway East beyond Orbost could not be adequately financed, and it has only been possible to make very meagre grants for this class of essential reconstruction of old assets.

Practically the whole of the work on State highways is carried out under the Board's direct supervision, and the Board's organization is capable of greater effort than available funds have so far permitted. In the meantime, Victoria is losing its old reputation as the State of good roads, and the Board is being criticized for the condition into which so many of the roads are falling, a state of affairs which it is powerless to overcome.

The total amount applied for by the Board's Divisional Engineers for expenditure on State highways, of which there is a total length of 3,849 miles, was £5,050,906, and the sum allocated was £2,828,602. The total amount expended was £2,511,018, including £474,268 from the Country Roads Board Fund and £951,812 from loan moneys.

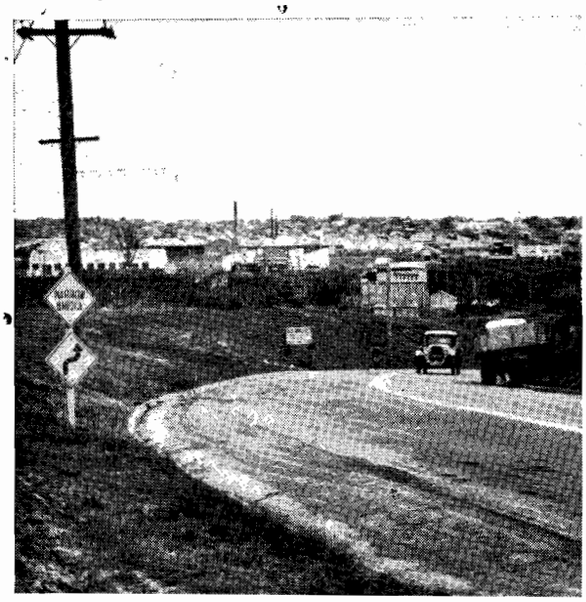

Plate No. 7.—Warning signs at old approach to bridge over Darebin Creek in Bell Street.

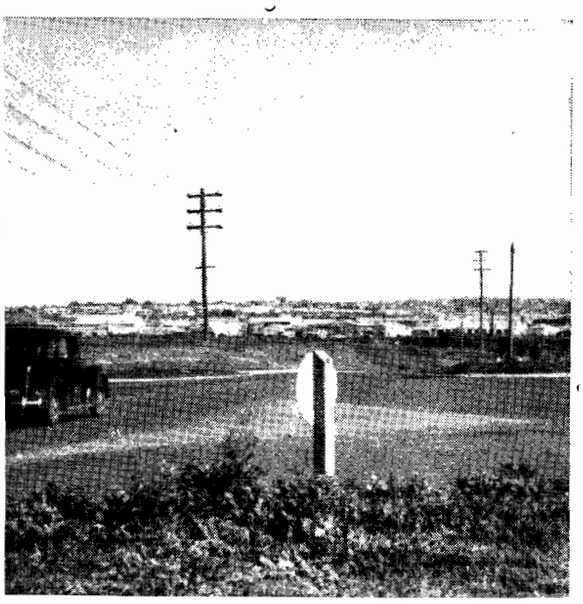

Plate No. 8.—New approach to bridge over Darebin Creek in Bell Street.

Plate No. 9.—Warrigal Road, Holmsglen, before widening.

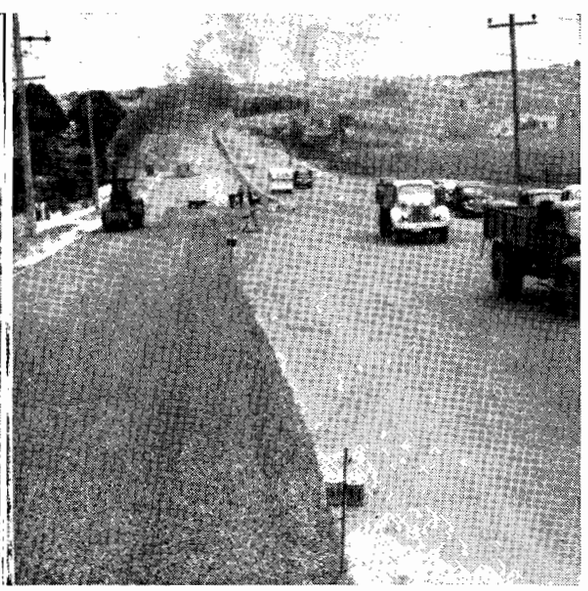

Plate No. 10.—Reconstruction and widening in progress to form divided road, Warrigal Road, Holmsglen.

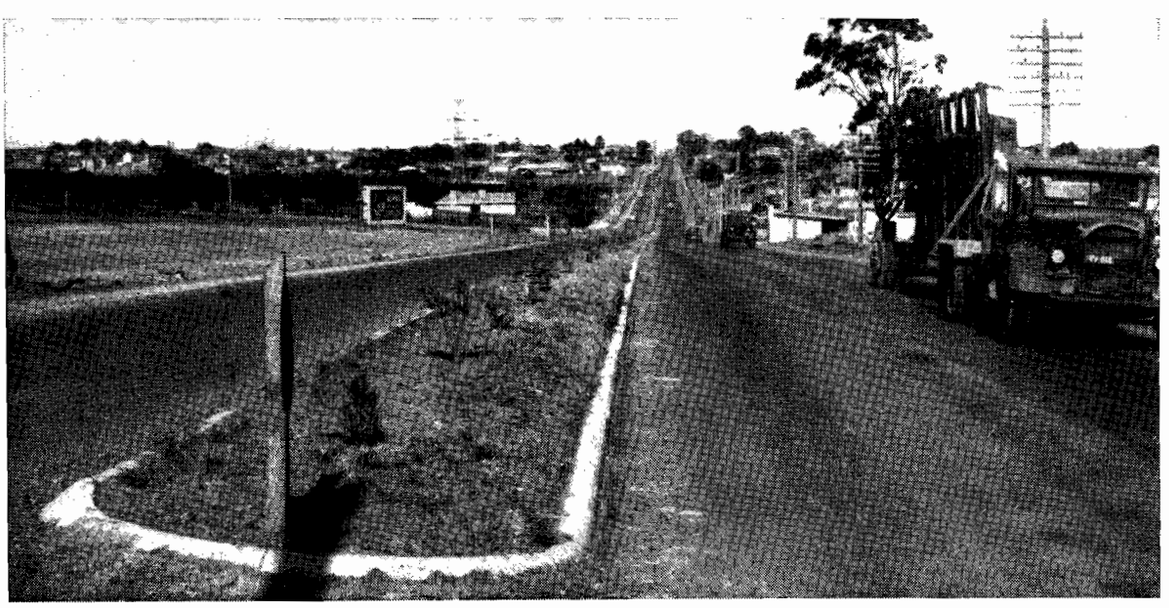

Plate No. 11.—Warrigal Road showing trees planted in centre nature strip.

The more important works carried out during the year included the following:—

Bairnsdale Division.

Princes Highway.—·33 miles of reconstruction and sealing of failed pavement between Stratford and Bairnsdale. ·75 miles of reconstruction and sealing of weak pavement near Nowa Nowa. 7 miles of gravelling and sealing between Newton's Creek and Sydenham Inlet turn-off. Completion of 6·5 miles of sealing on the Mt. Raymond section. (Plate No. 12.) 10 miles of resheeting of gravel pavement near Tonghi and 3 miles near the New South Wales border. *Omeo Highway.*—6 miles of resheeting of gravel pavement near Mountain Ash and 7 miles near Ensay South. 4 miles of reconstruction and sealing near Swift's Creek. (Plate No. 13.) 2 miles of gravelling and sealing near Tambo Crossing. 3 miles of resheeting with mine tailings above the snow line near Glen Wills. Improvement of curves between Omeo and Glen Wills. *South Gippsland Highway.*—·9 miles of gravelling and sealing on deviation at Monkey Creek. 3·8 miles of reconstruction and sealing between Monkey Creek and Giffard. *Bonang Highway.*—7 miles of resheeting of gravel pavement in the vicinity of Sardine Creek.

Ballarat Division.

Western Highway.—Reconstruction including widening and regrading of sections at (1) Ryan's Cutting between Gordon and Wallace; (Plate No. 14) (2) Woodman's Hill, east of Ballarat; and (3) west of Greenhill's Creek near Ararat. ·16 miles of strengthening failed pavement east of Greenhill's Creek. *Glenelg Highway.*—Realignment and regrading at Millar's Crossing west of Sebastopol. 1·13 miles of widening and strengthening between Westmere and Lake Bolac. *Pyrenees Highway.*—2 miles of reconstruction and sealing west of Dunneworthy.

Benalla Division.

Hume Highway.—2·18 miles of reconstruction and sealing near Monea. (Plate No. 15.) Completion of 6·4 miles of reconstruction and sealing near Springhurst. *Omeo Highway.*—1·5 miles of reconstruction and sealing near Noorongong. *Murray Valley Highway.*—1·1 miles of reconstruction and sealing near Huon. 1·43 miles of reconstruction and sealing near Bolga. (Plate No. 16.) 4·55 miles of reconstruction and sealing near Towong. *Ovens Highway.*—2 miles of reconstruction near Ovens. 2 miles of reconstruction and sealing near Eurobin. *Maroondah Highway.*—3·58 miles of reconstruction and 3·09 miles of sealing near Merton. (Plate No. 17.)

Bendigo Division.

Calder Highway.—·9 miles of reconstruction of old failed section north of Wedderburn. Completion of Hattah deviation 14·6 miles in length between Ouyen and Nowingi, including sealing, using sand aggregate from the Murray River. (Plate No. 18.) ·9 miles of widening, resheeting, and sealing in 17th Street, Mildura. *Northern Highway.*—1·95 miles of reconditioning and sealing at Myola. *Murray Valley Highway.*—·95 miles of reconstruction on section at the old Wyuna Cheese Factory, previously damaged by flood waters. 4·1 miles of widening and strengthening from Turrumberry westward. 2·58 miles of widening, strengthening, and sealing easterly from the Leitchville turn-off. 2·07 miles of widening, strengthening, and sealing at Kerang East. Construction and sealing of new pavement 40 feet wide through the township of Cohuna, together with reconstruction, on behalf of the Council, of adjoining parking areas and service roads. ·51 miles of construction and sealing of approaches to the new bridge over Wandella Creek at Fairley, north-west of Kerang. 1·73 miles of reconstruction and widening between Kerang and Swan Hill. 1·15 miles of sealing at Lake Boga. Construction and sealing of 5·9 miles northerly from the Tooleybuc Bridge turn-off. 3·21 miles of forming and light surfacing on low-lying sections, particularly between Bannerton and Wemen. *Midland Highway.*—2·25 miles of widening, resheeting, and sealing, and 1·25 miles of widening and resealing westerly from Mooroopna. ·64 miles of widening and sealing in the township of Mooroopna. *Sturt Highway.*—1 mile of widening on the east side of Deakin Avenue in the City of Mildura. 6·5 miles of reconditioning and sealing between Lake Cullulleraine and the South Australian border, thus completing a bituminous surface from Mildura to link up with a bitumen road to Renmark and Adelaide. *Loddon Valley Highway.*—2·65 miles of sealing at Hawkinston and ·35 miles at South Kerang.

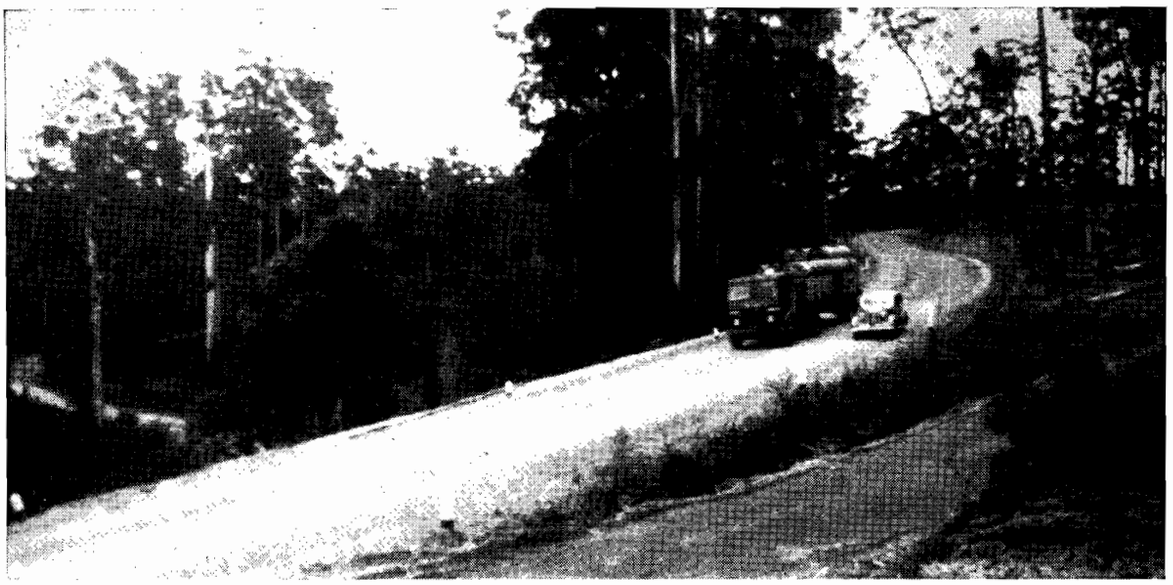

Plate No. 12.—Princes Highway East showing Mt. Raymond deviation at 245 miles.

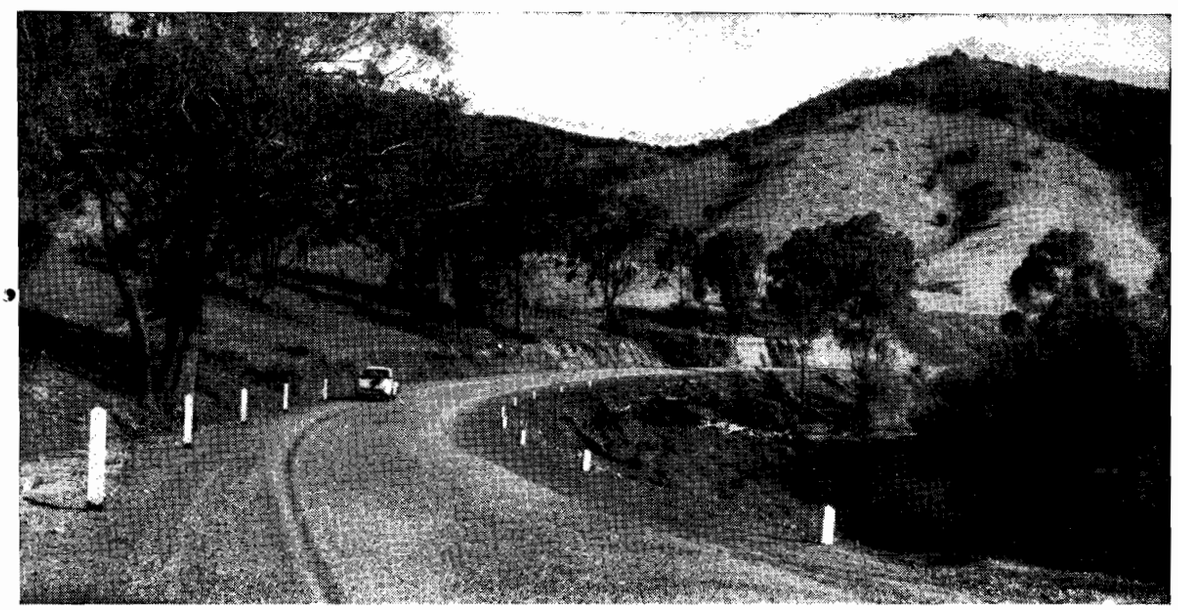

Plate No. 13.—A reconstructed and sealed section of Omeo Highway at 22 miles near Swift's Creek.
(Note low guide posts on inside of curve.)

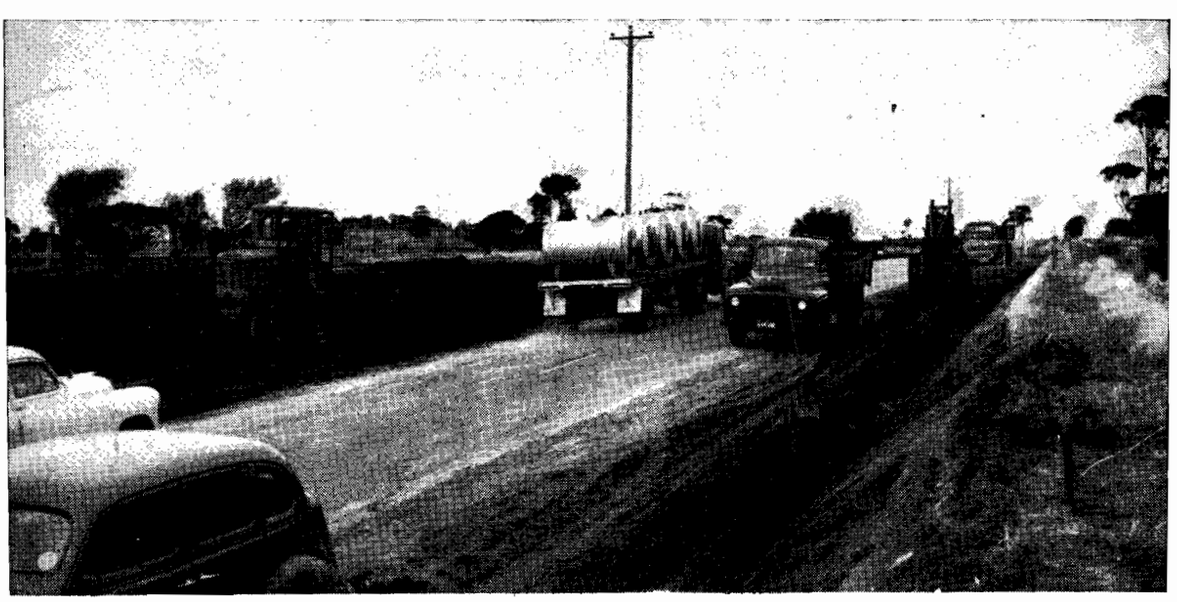

Plate No. 14.—Heavy traffic on Western Highway, 58 miles, at Ryans cutting where work on widening is in progress.

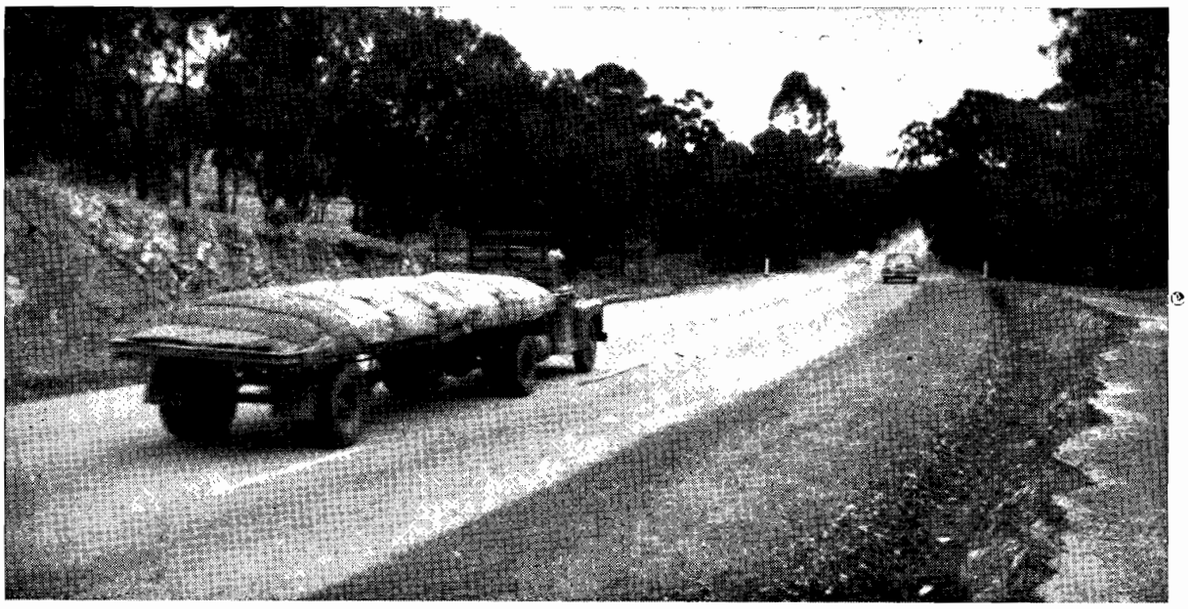

Plate No. 15.—A reconstructed section of the Hume Highway near Monea.

Plate No. 16.—A reconstructed and sealed section of the Murray Valley Highway at Bolga.

Plate No. 17.—Aerial view of reconstruction on Maroondah Highway at Merton.

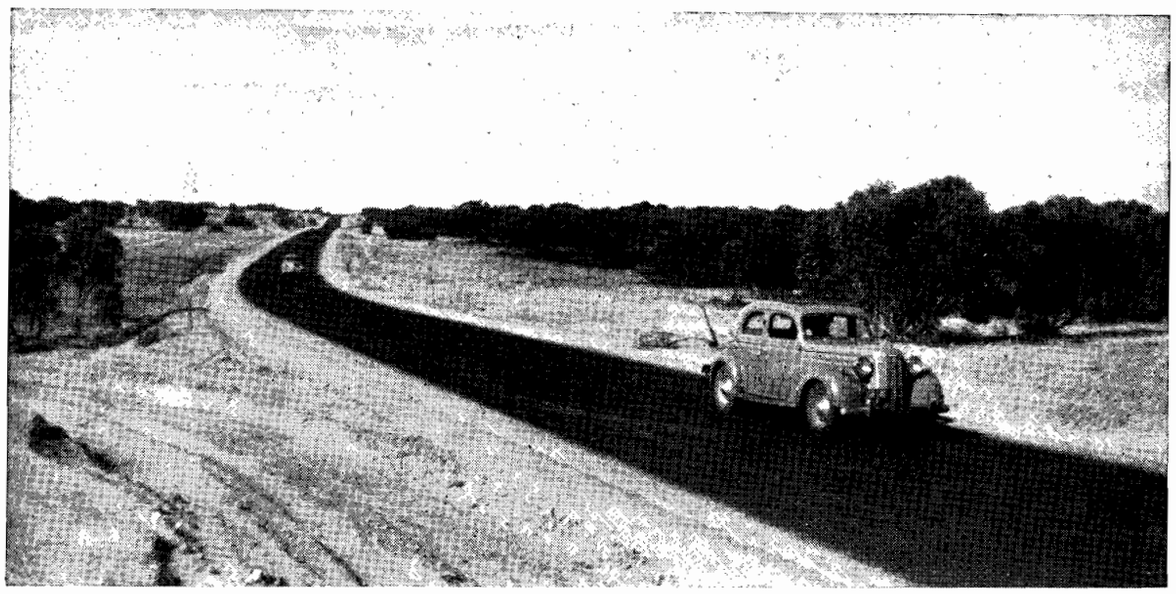

Plate No. 18.—Hattah deviation of the Calder Highway primed ready for sealing.

Plate No 19.—Widening Hume Highway by 4 feet at 12 miles.

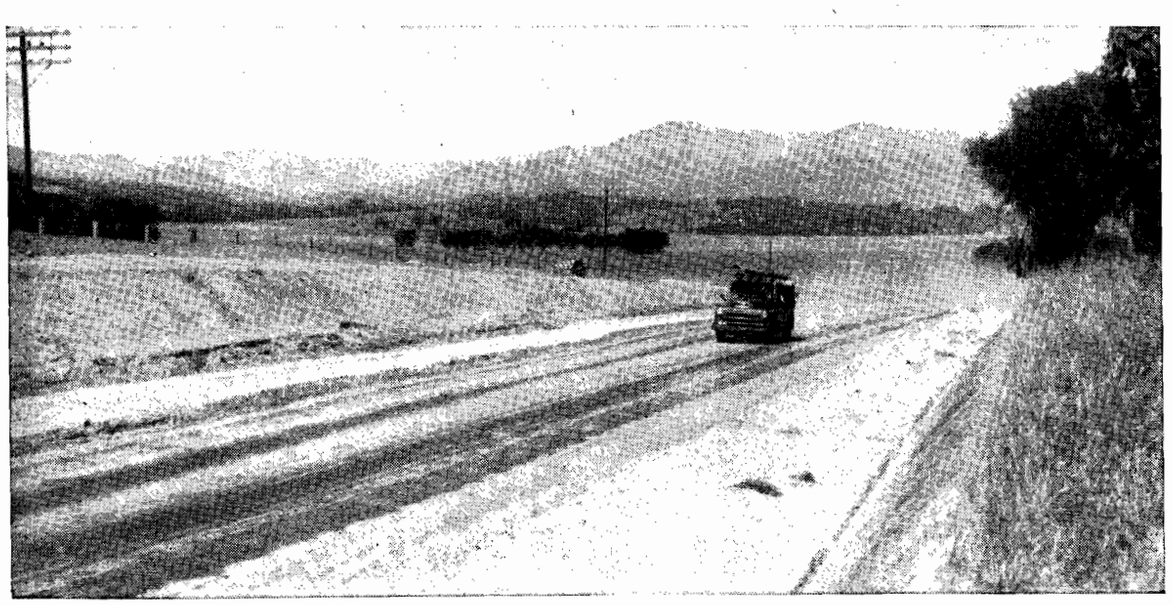

Plate No. 20.—A widened section of Maroondah Highway, north-east of Coldstream.

Dandenong Division.

Princes Highway East.—Reconstruction and sealing of failing lengths totalling 1·6 miles near Officer, Pakenham and Mt. Ararat. *Northern Highway.*—1·6 miles of construction of deviation to replace a weak and rough old gravel section with poor profile north of Pyalong. *Hume Highway.*—3½ miles of widening pavement from 20 feet to 24 feet north from Campbellfield. (Plate No. 19.) *South Gippsland Highway.*—3½ miles of sheeting with burnt stone and crushed rock between Nyora turn-off and Bass River, and easterly from Loch. *Bass Highway.*—3·9 miles of reconstruction and sheeting with burnt stone near Kilcunda. *Maroondah Highway.*—1·3 miles of reconstruction, including realignment, at Green Point, east of Coldstream. (Plate No. 20.)

Geelong Division.

Princes Highway West.—Construction and sealing of portion of service lane on the west side at Norlane, following the moving back of six houses to the future realignment. Strengthening and widening of various sections between Laverton and Winchelsea. Construction of approaches to widened bridge at Birregurra Creek. *Bellarine Highway.*—1·42 miles of widening between Leopold and Wallington. *Western Highway.*—3·5 miles of widening in five sections between Rockbank and Melton.

Horsham Division.

Western Highway.—Elimination of four floodways between Stawell and Dadswell's Bridge by the installation of culverts and embanked formation. Reconstruction of bad curve near Stawell. 6 miles of reconstruction and primer sealing of failed narrow pavement on each approach to the township of Nhill. *Henty Highway.*—6·15 miles of sealing near Mockinya. ·9 miles of reconstruction and realignment of failed section near the City of Horsham. 5·9 miles of sealing between Dooen and Kellalac (completion of sealing between Horsham and Warracknabeal). *North-Western Highway.*—6·75 miles of construction and sealing between Redbank and Stuart Mill (completion of sealing between Ballarat and Litchfield).

Traralgon Division.

Princes Highway East.—1·4 miles of widening between Herne's Oak and Morwell River. 1·7 miles of reconstruction and sealing east of Morwell. *South Gippsland Highway.*—Construction of approaches to new bridge over railway line at Leongatha. 3·8 miles of reconstruction and sealing of old gravel pavement subject to flooding near Monkey Creek at Giffard West. *Midland Highway.*—Construction of approaches to new reinforced concrete bridge at Middle Creek flats north of Yinnar.

Warrnambool Division.

Princes Highway West.—Reconstruction, widening, and sealing of old, weak sections totalling 5 miles west of Yambuk. Two miles of strengthening, widening and sealing between Lyons and Winnap.

TOURISTS' ROADS.

A total sum of £256,825 was allotted for general maintenance and a limited number of "improvements" on tourists' roads, of which the total length proclaimed is 415 miles, but in this case also the shortage of funds precluded a greater allocation being made. The total expenditure was £212,976, of which £208,525 was expended under the Board's direct supervision.

The more important projects carried out included the following:—

Bairnsdale Division.

Alpine Road.—Resheeting of weak sections totalling 3 miles, enabling the road to be kept open in the winter by snow-ploughing to within 2·75 miles of Mt. Hotham. (Plates 21 to 23.)

Benalla Division.

Mt. Buffalo Road.—1·35 miles of realignment, widening, and resheeting on "The Horn" section between the "Tucker Box" and Lake Catani. 1·6 miles of resheeting and sealing near Eurobin Falls.

A TOURIST ROAD

Plate No. 21.—A re-sheeted section of Alpine Road near Cobungra Homestead.

Plate No. 22.—Aveling Austin grader snow plough working on Alpine Road at Dinner Plain.

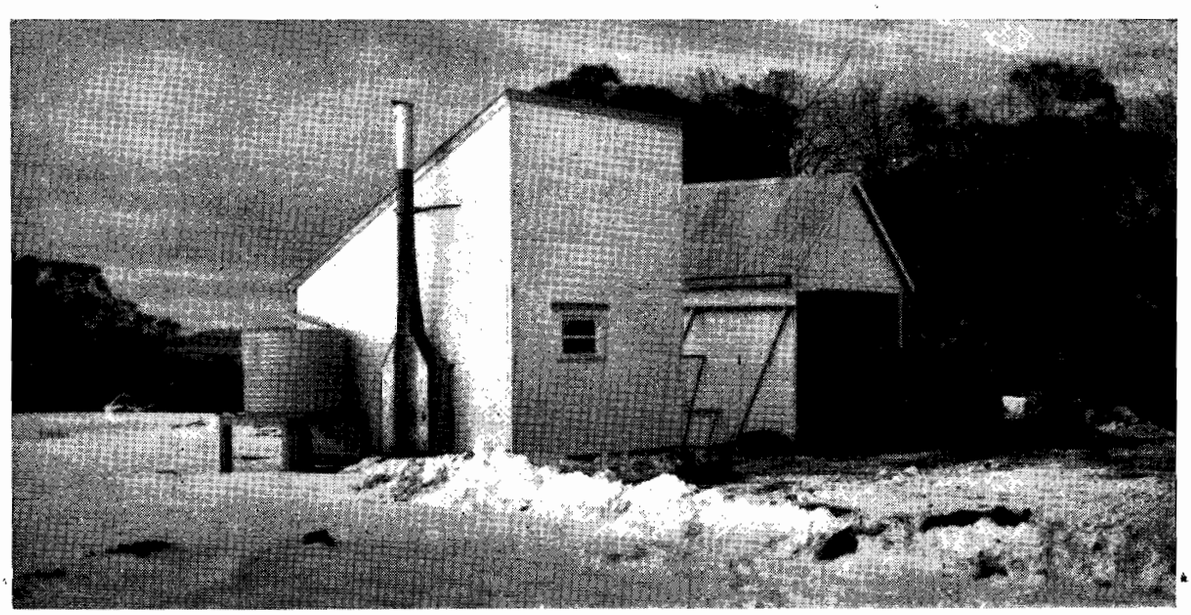

Plate No. 23.—Snow plough driver's hut on the Alpine Road at Dinner Plain.

Dandenong Division.

Phillip Island Road.—1·5 miles of reconstruction and realignment between Anderson and San Remo. *Arthur's Seat Road.*—Construction and sealing of section at the summit.

Geelong and Warrnambool Divisions.

Ocean Road.—Extension of widening and realignment between the Jamieson River and Separation Creek (Geelong). Strengthening 7·24 miles of weak pavement near Port Campbell with soft limestone, and 3·9 miles near Peterborough with gravel (Warrnambool).

Horsham Division.

Mt. Victory Road.—Widening of 1 mile of narrow side-cutting near Hall's Gap.

FOREST ROADS.

An allocation of £112,081, including £2,500 from loan monies, was made for 375 miles of proclaimed forest roads throughout the State, and a total sum of £99,975 was expended. No substantial improvement works could be provided for, the funds available being mainly for patrol maintenance and maintenance resheeting.

The more important works included the following :—

Bairnsdale Division.

Bairnsdale-Dargo Road.—Construction of single-span bridge and approaches over Stoney Creek. *Dargo Road.*—Widening and improvements to curves. *Bruthen–Buchan Road.*—1·5 miles of reforming and gravelling. Replacing timber bridge over Boggy Creek by triple 6-ft. diameter reinforced concrete pipes.

Ballarat Division.

Drummond–Vaughan Road.—7·5 miles of resheeting between Drummond and Vaughan Springs. Concreting floodway on Boundary Creek Crossing.

Traralgon Division.

Walhalla Road.—·5 miles of reconstruction and sealing in township of Erica. (Plates Nos. 24 and 25.)

UNCLASSIFIED ROADS.

Provision was again made by the Board for unclassified roads under two general headings, namely, the construction and reconstruction of roads serving settlement, including short roads to serve the properties of isolated settlers, and the maintenance of unclassified roads generally.

Applications received by the Board for construction totalled £4,120,126, and for maintenance £798,706, and the amounts allotted were £1,082,209 and £382,640 respectively. The grants for construction were made on a contributory basis, the Councils' contributions varying according to the circumstances of each particular case, but, in general, the basis of allocation was not so generous as in earlier years, owing to the Board's acute financial position. The grants for the maintenance of unclassified roads were, however, generally on a basis of £2 Board to £1 Council, following previous practice.

Many requests were received by the Board during the year from municipal councils for certain unclassified roads to be declared main roads, but the Board was unable to accede to these requests. The Board has, however, endeavoured to assist the Councils with the maintenance of these roads, as far as its finances permit.

Details of some of the major works carried out during the year on unclassified roads are set out hereunder :—

Bairnsdale Division.

Tambo Shire.—Suggan Buggan Road—construction of quadruple "Armco" pipe culvert over Toonginbooka River to provide access to new settlement at Suggan Buggan. (Plate No. 26.)

Ballarat Division.

Ballarat Shire.—Mt. Rowan Road—1·52 miles of scarifying, reshaping, and resurfacing. *Creswick Shire.*—Lone Hand and Beaconsfield Roads—3·05 miles of reforming and gravelling north from the Creswick–Smeaton Road at Allendale. *Newstead Shire.*—Yapeen–Muckleford Road—1 mile of realignment and resheeting. *Ripon Shire.*—Mt. Emu–Streatham Road—2·13 miles of resheeting.

WALHALLA ROAD

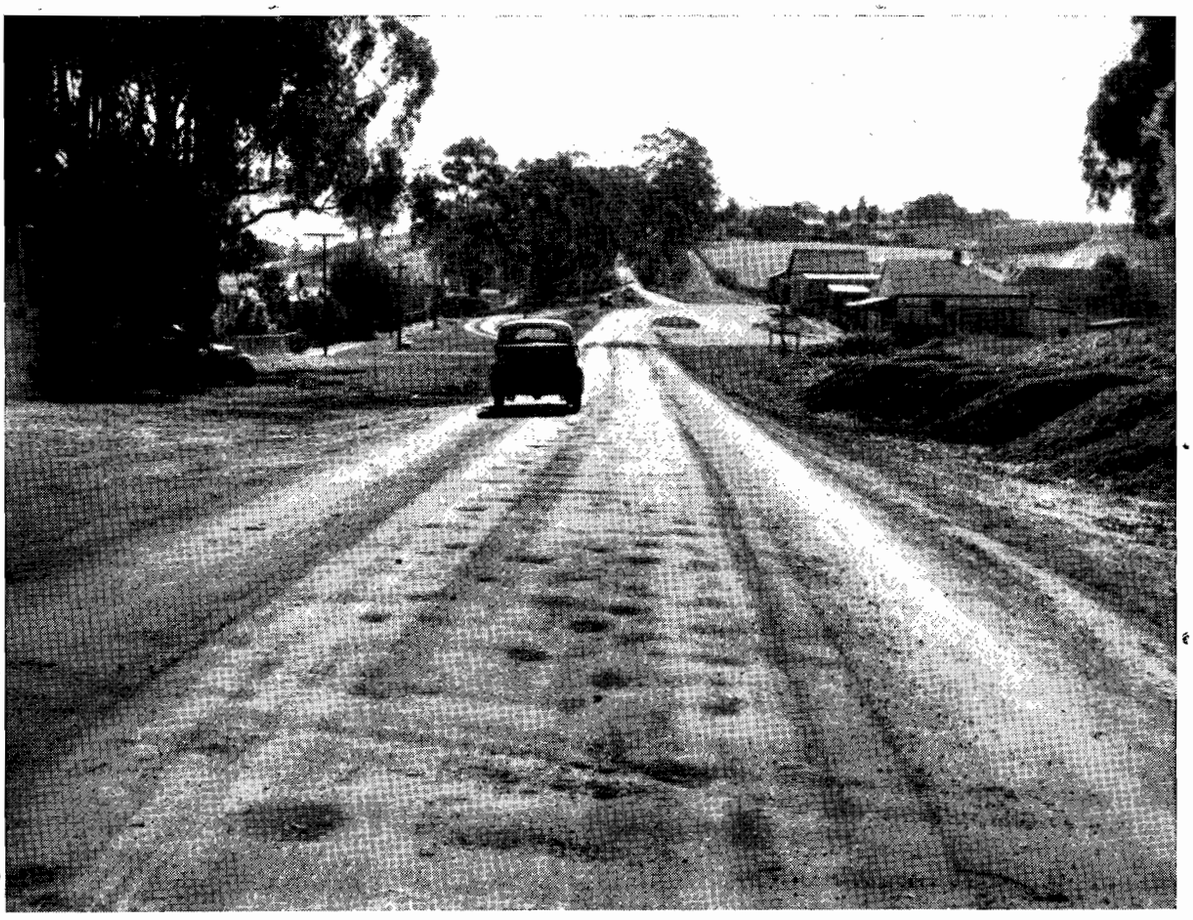

Plate No. 24.—Walhalla Road through Erica Township, before reconstruction.

Plate No. 25.—View of completed reconstruction and sealing of Walhalla Road, Erica Township.

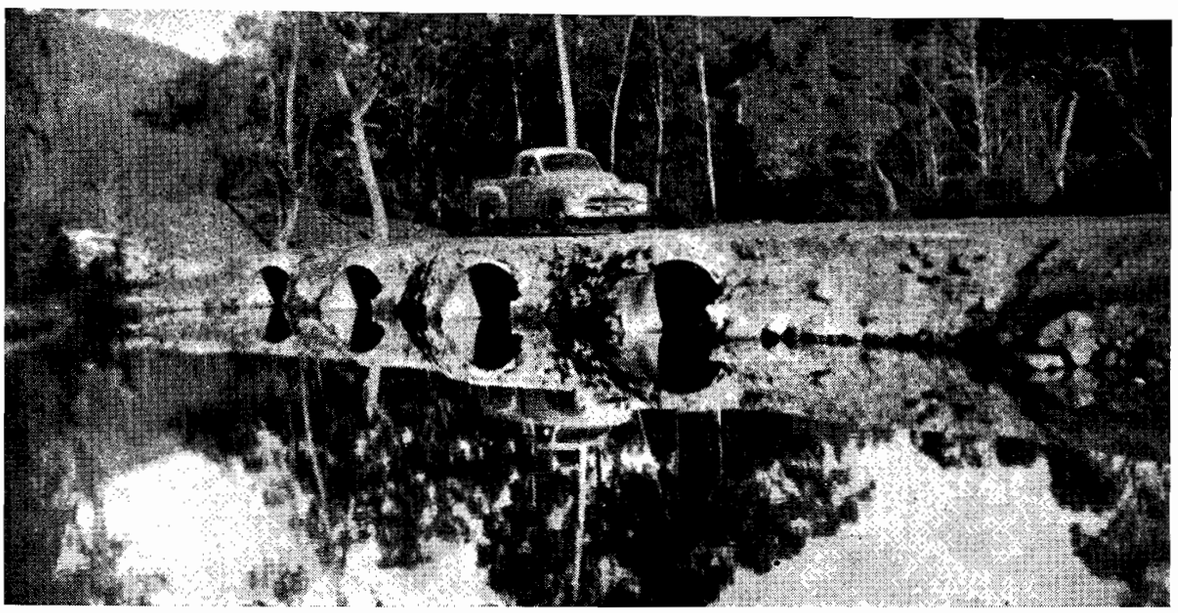

Plate No. 26.—Armco pipe culvert on Suggan Buggan Road over Toonginbooka River.

Plate No. 27.—Old track.

Plate No. 28.—New construction on road north from Tankerton, French Island.

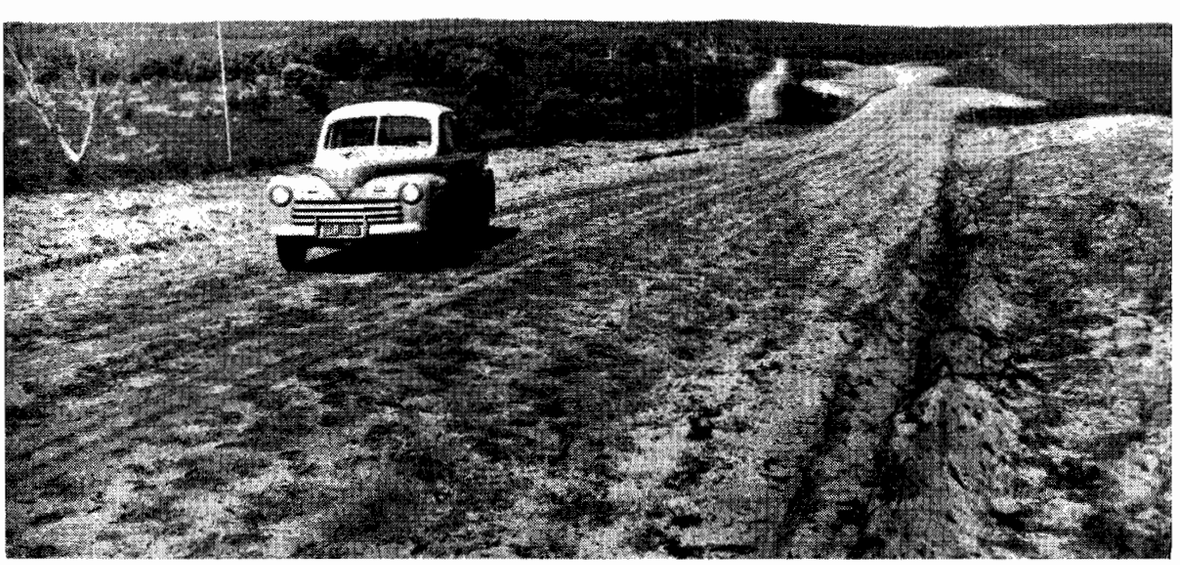

Plate No. 29.—Portland–Nelson Road, new formation approximately 7 miles west of Mt. Kincaid.

Benalla Division.

Benalla Borough.—Goomalibee Road—·62 miles of reconstruction and sealing in Benalla. *Benalla Shire.*—Baddaginnie–Warrenbayne Road—·53 miles of reconstruction and sealing. *Cobram Shire.*—Sandmount–Yarroweyah Road—1 mile of reconstruction and sealing near Yarroweyah. *Euroa Shire.*—Creighton's Creek Road—1·18 miles of reconstruction and sealing. Longwood–Ruffy Road—3·5 miles of reconstruction and sealing. *Rutherglen Shire.*—Three Chain Road—1·54 miles of reconstruction and sealing. *Towong Shire.*—Mitta North Road—·78 miles of resheeting and sealing near Eskdale. *Wangaratta Borough.*—Vincent Street—·68 miles of reconstruction and sealing.

Bendigo Division.

Bendigo City.—Specimen Hill Road—·6 miles of sealing to provide, in conjunction with McKenzie Street West, a by-pass of the city for heavy traffic using the Calder Highway. *Charlton Shire.*—2·76 miles of sealing on the Borung–Charlton, Charlton–Jeffcott and Yeungroon Roads. *Rodney Shire.*—(1) Tatura–Toolamba Road—2 miles of sealing; (2) Ardmona Settlement Road—1·3 miles of sealing.

Dandenong Division.

French Island Roads.—Clearing and forming 7 miles to replace an old track serving settlers on the north-west portion of the island. All resident settlers on this portion of the island now have access to Tankerton via the road. (Plates Nos. 27 and 28.)

Geelong Division.

Barrabool Shire.—(1) Boundary Road (joint work with Shire of Winchelsea)—1·6 miles of forming and gravelling; (2) Gundry's Road—$3\frac{3}{4}$ miles of forming and gravelling. *Bellarine Shire.*—Ocean Grove–Drysdale Road—1 mile of reconstruction and sealing. *Colac Shire.*—Carlisle Road—1 mile of clearing, forming and surfacing, and construction of reinforced concrete culvert. *Corio Shire.*—Forest Road—1 mile of reconstruction and sealing adjoining the bridge over Hovell's Creek. *Kyneton Shire.*—(1) Carlsruhe–Lancefield Road—1·1 miles of reforming and surfacing with granitic sand; (2) Piper's Creek Road—$1\frac{1}{2}$ miles of reforming and gravelling; (3) Trentham East Road—1·1 miles of reforming and gravel sheeting; (4) Central Road—1 mile of reforming and sheeting with granitic sand; (5) Barker's Lane—1 mile of forming and sheeting with granitic sand. *Leigh Shire.*—Wingeel Road—1 mile of forming and gravelling south of Barunah Plains Estate. *Otway Shire.*—(1) Gellibrand East Road—3·8 miles of gravel resheeting east and south of Gellibrand; (2) Phillips Track—1·6 miles of gravel resheeting south from the Beech Forest–Laver's Hill Road; (3) Johanna River Road—5·14 miles of gravel resheeting (full length of road). *Romsey Shire.*—Riddell–Sunbury Road—$1\frac{1}{2}$ miles of reforming, regrading, gravel sheeting and provision of culverts. *Werribee Shire.*—Doherty's Road—1·6 miles of reconstruction and sealing. *Winchelsea Shire.*—(1) Cressy Road—$1\frac{1}{4}$ miles of reconstruction; (2) Cape Otway Road—5 miles of resheeting with gravel and reforming.

Horsham Division.

Dimboola Shire.—(1) Katyil–Wail Road—1·6 miles of reforming and surfacing; (2) Rainbow–Albacutya–Pigick School bus route—1·9 miles of reforming and surfacing. *Donald Shire.*—(1) Carnes–Laen school bus route—2·75 miles of forming and surfacing; (2) Devon Park Road—1·1 miles of forming and surfacing; (3) Jeffcott South school bus route—1·2 miles of forming and surfacing. *Kaniva Shire.*—(1) Sandsmere–Bleak House Road—1 mile of forming and gravelling; (2) Webb's Road—1·1 miles of forming and gravelling; (3) Serviceton North Road—2 miles of reforming and gravelling. (This section was subsequently sealed at the cost of the Council.) *Kara Kara Shire.*—Avon Plains Road (joint with Donald Shire)—1·75 miles of reforming and gravelling. *Warracknabeal Shire.*—Watchem–Warracknabeal Road—1·8 miles of reforming and surfacing. *Wimmera Shire.*—(1) O'Bree's Road—1·5 miles of reforming and surfacing; (2) Dimboola–Minyip 5-chain road—1·5 miles of reforming and surfacing; (3) Dogwood Road—1·9 miles of reforming and surfacing.

Warrnambool Division.

Dundas Shire.—(1) Loates Road—2·25 miles of forming and gravelling; (2) Gatum–Mooralla Road—3 miles of reforming and resheeting; (3) Strathkellar Road—3 miles of initial seal extension. *Glenelg Shire.*—West Strathdownie Road—1·2 miles of reforming and surfacing. *Portland Shire.*—(1) Portland–Nelson Road—7·1 miles of forming and

light surfacing with soft limestone west of Kentbruck. (Plate No. 29.) 3·28 miles of resheeting with soft limestone west of Nine Mile Gap; (2) Winnap–Drik Drik Road—3 miles of resheeting and initial sealing at Winnap.

BRIDGES.

The problems associated with bridge construction and maintenance have not eased during the year, and the Board is faced with an increasing demand upon its resources for new structures or extensive maintenance of old ones. It is gratifying to note keener competition for bridge works, and, if funds permitted, much more work could be carried out at reasonable costs.

Reports continue to reach the Board at frequent intervals as to the condition of various structures throughout the State, and it is still necessary in numerous cases to fix gross load limits on these bridges, some of them so low as to severely restrict the class of traffic by which they can be used. Damage by floods has further aggravated the position, and has hastened the end of structures which might have been kept in service a few years longer.

The construction of new bridges within the metropolitan area which has been entrusted to the Board, together with the many new bridges necessitated by the raising of the water levels on the Hume and Big Eildon projects, has resulted in the Board's bridge design staff being very fully occupied with an ever-increasing volume and variety of work.

The space available at the Board's Head Office having proved inadequate to house the personnel of the bridge division, arrangements were made during the year to rent a portion of the offices of the State Electricity Commission in Church Street, Richmond, and working conditions have been considerably improved thereby.

During the year a commencement was made with the construction of 164 bridges, of a total value of £646,804, bringing the total number of bridges either erected or in course of erection with funds provided by the Board to 4,100.

Of the new bridges, 134 of a total value of £351,409 were under municipal control, and the remaining 30, of a total value of £295,395, under the direct supervision of the Board. In the financial year 1952–53, 140 bridges of a total value of £300,591 had been commenced under the supervision of the councils, and 29, of a total value of £129,285 under the Board's direct supervision.

Some of the major structures in progress during the year are referred to hereunder :—

Metropolitan Bridges.

Bell Street, Cities of Coburg and Preston (Merri Creek).

The work of replacing this narrow and weak bridge was commenced in May, 1952, and was carried through to practical completion by June, 1954, leaving only some painting to be done. The new bridge provides a roadway of 43 feet, together with a 6-ft. footway on each side. Provision has been made in the deck for tram rails to be placed on the bridge if ever necessary. The work was carried out with little or no inconvenience to the general public. Plates Nos. 30 and 31 show site before construction started and the completed bridge. The work was carried out by direct labour under the Board's supervision, the Coburg City Council carrying out the work on the approaches and the laying of the surface on the bridge deck.

Albion Street, Cities of Essendon and Brunswick (Moonee Ponds Creek).

During the year, the work of replacing this narrow and very weak timber and steel bridge by a much wider concrete bridge on an improved alignment was completed except for some minor details. The work was let by contract in September, 1952, and the construction of the approaches and surfacing of the deck was carried out by the Brunswick and Essendon City Councils. During construction, traffic was not inconvenienced except for a short period when it was detoured to enable the contractor to place some of the superstructure. A bigger waterway has been provided so that the Melbourne and Metropolitan Board of Works plan for the ultimate canalization of this creek may be undertaken. The new bridge provides a road width of 28 feet with a 6-ft. wide footway on each side.

METROPOLITAN BRIDGES

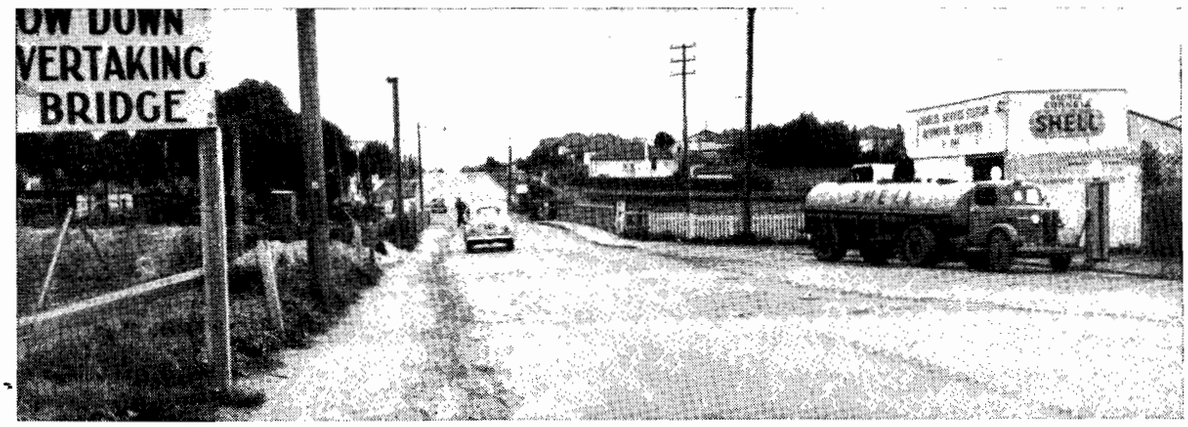

Plate No. 30.—Approaches to old bridge over Merri Creek in Bell Street.

Plate No. 31.—New bridge and approaches over Merri Creek in Bell Street.

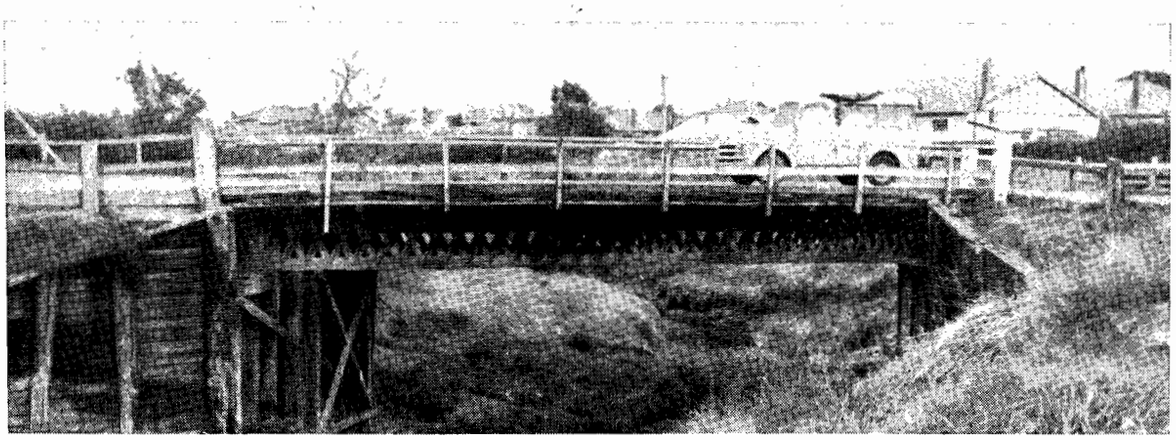

Plate No. 32.—Old bridge over Moonee Ponds Creek in Albion Street.

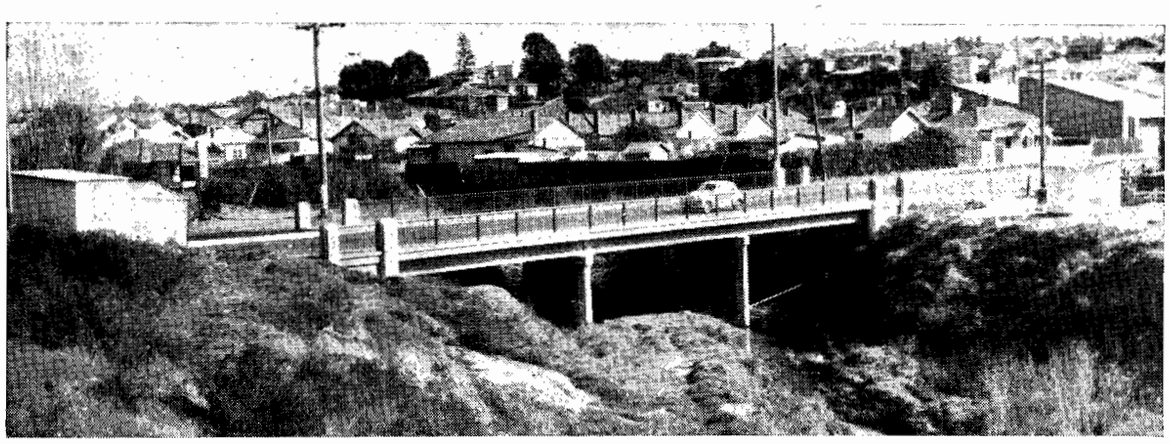

Plate No. 33.—New bridge over Moonee Ponds Creek in Albion Street.

Plates Nos. 32 and 33 show, respectively, site with the old bridge in position and with the new bridge completed.

Moreland Road, Cities of Coburg, Essendon, and Brunswick (*Moonee Ponds Creek*).

During the year, traffic was diverted to the temporary timber and steel bridge constructed, and a contract was let for the construction of the new bridge which will be 120 feet long, providing a roadway 28 feet wide with two 9-ft. wide footways. While progress has not been as good as was expected, the bulk of the foundation work has been done up to the end of June, 1954, and all the superstructure beams cast ready for erection. Increased waterway has been provided to permit of the straightening and canalization of the creek, while provision is being made for trams to be carried over the bridge if ever necessary.

Arthurton Road, Cities of Brunswick and Northcote (*Merri Creek*).

A contract was let for the construction of a new reinforced concrete bridge to replace the weak and narrow timber bridge on this site. The old bridge was widened and strengthened by direct labour to cater for traffic, whilst the first half of the new bridge is under construction. During the year, work was carried out on foundations and the casting of the necessary beam stems.

Johnston Street, Cities of Collingwood and Kew (*Yarra River*).

Good progress was made during the year with the construction of this bridge, the water level in the river remaining very low except on one occasion, in December, 1953, when a rise of approximately 20 feet in water level took place. Nearly all the foundation work was completed, the exception being half the abutment at the Collingwood side, which cannot be completed until the old bridge is demolished.

Country Bridges.

Bairnsdale Division.

Unclassified Roads.

Orbost Shire.—Sydenham Inlet–Cann River Road—construction of steel and timber bridge over the Bemm River.

Ballarat Division.

State Highways.

Pyrenees Highway.—Widening bridge and replacing concrete deck at Pinkerton's Bridge at Dunneworthy.

Bendigo Division.

Main Roads.

Waranga Shire.—Colbinabbin–Moora Road—construction of new bridge and approaches at Wanalta Creek. *Wycheproof Shire.*—Boort–Wycheproof Road—new reinforced concrete bridge over the Avoca River.

State Highways.

Calder Highway.—Construction of two-cell reinforced concrete bridge at Myer's Creek near Bendigo, and a steel and concrete structure near Derby.

Unclassified Roads.

Metcalfe and Strathfieldsaye Shires.—Construction of reinforced concrete and rolled steel joist bridge, 232 feet long, over the Coliban River near Lyal, replacing an old timber bridge.

Dandenong Division.

Main Roads.

Eltham and Doncaster and Templestowe Shires.—Warrandyte Bridge.—Work commenced in the financial year 1952–53 on the replacement of the old narrow and weak bridge over the Yarra River at Warrandyte. Piers were completed under contract, while separate contracts were let for the fabrication of the steel work and its erection and the placing of the concrete deck. Steady progress has been made with the work.

The new bridge, consisting of concrete piers, steel girders and concrete deck will be 390 feet long of five spans (two 40-feet, two 75-feet, and one 100-feet), and will provide a road width of 24 feet with a 6-ft. footway on each side.

Ferntree Gully Shire.—Belgrave Bridge. During the year a contract was let for the construction of a concrete bridge 127 feet long, providing a road width of 30 feet with two 9-ft. wide footways, to replace a very narrow old timber bridge built many years ago over the railway line at Belgrave.

The bridge will consist of a central arch span of 75 feet made up of pre-cast arch ribs forming the members of an open spandril three-hinged arch.

Bass Shire.—Almurta–Grantville Road—construction of reinforced concrete bridge of 150-ft. span over the Bass River. *Mornington Shire.*—Mornington–Dromana Road—reconstruction of timber bridge over Balcombe Creek at Mt. Martha and widening to 24 feet between kerbs.

Unclassified Roads.

Yea Shire.—Ghin Ghin Road—construction of 240-ft. span timber and steel bridge over the Goulburn River approximately 4½ miles north-east of Yea.

Geelong Division.

Main Roads.

Colac Shire.—Colac–Forrest Road—construction of concrete bridge over Boundary Creek and of temporary approaches.

State Highways.

Calder Highway.—Jackson's Creek Bridge. During the year a contract was let for the construction of a steel and concrete bridge over Jackson's Creek in the township of Gisborne. Some time ago the piers of the old bridge subsided badly, and as the superstructure was of timber in rather poor condition, replacement was proposed. Reference was made in the Fortieth Annual Report to the erection of Bailey bridging to cater for traffic.

The new bridge will be 120 feet long with a central 60-ft. span and two end spans each of 30 feet. A road width of 24 feet with one 6-ft. footway will be provided.

Tourists' Roads.

Ocean Road.—Construction of new reinforced concrete bridge at Wye River. Provision of foundations and piers for new bridge at Spouts Creek.

Unclassified Roads.

Barrabool Shire.—Completion of reconstruction of Ceres Bridge. *Colac Shire.*—J. B. Bailey's Road—construction of single-span bridge and approaches. *Corio Shire.*—Forest Road—construction of 3-span concrete superstructure to replace a collapsed timber structure over Hovell's Creek (using pre-cast units manufactured at the Board's Divisional Depot). *Kyneton Shire.*—(1) Lauriston–Malmsbury Road—construction of reinforced concrete structure to replace old timber bridge; (2) Carlsruhe–Newham Road—construction of reinforced concrete structure to replace old timber bridge; (3) Kyneton–Baynton Road—construction of reinforced concrete bridge to replace old timber structure. *Newham and Woodend Shire.*—Woodend–Wallan Road—construction of new reinforced concrete bridge, using pre-cast units manufactured at the Divisional Depot. *Romsey Shire.*—(1) Sutherland's Bridge, replacement of old bridge by new composite concrete, steel, and timber structure, using pre-cast piles manufactured at the Divisional Depot; (2) Pyalong Road—replacement of old timber bridge at Kangaroo Waterhole Creek by double 5-ft. diameter reinforced concrete pipes. *Winchelsea Shire.*—(1) Dean Marsh–Deepdene Road—provision of a new bridge and approaches, together with erosion prevention measures; (2) McConachy's Bridge—reconstruction of bridge.

Horsham Division.

Main Roads.

Kara Kara Shire.—Bendigo–St. Arnaud Road—construction of reinforced concrete flat slab bridge 90 feet long over Campbell's Creek at Kooreh (Dobson's Bridge) on an improved alignment, replacing a very old timber bridge.

State Highways.

North-Western Highway.—Construction of reinforced concrete flat slab bridge 60 feet in length at Cope Cope to replace a very old timber structure.

Unclassified Roads.

Kara Kara and Bet Bet Shires.—Dunolly–Stuart Mill Road—construction of reinforced concrete, steel and timber bridge over the Avoca River to replace an old timber structure.

Warrnambool Division.

Main Roads.

Heytesbury Shire.—Timboon–Scott's Creek Road—construction of new timber bridge on improved alignment at Cowley's Creek. *Mount Rouse Shire.*—Penshurst–Dunkeld Road—construction of pre-cast reinforced concrete bridge, 61 feet long over Back Creek, to replace old timber bridge. *Wannon Shire.*—Natimuk–Hamilton Road—construction of a concrete, rolled steel joist and timber deck bridge over Frenchman's Creek to replace old timber bridge. *Warrnambool Shire.*—Warrnambool–Caramut Road—(1) construction of reinforced concrete bridge 140 feet long over Spring Creek at Woolsthorpe, together with approaches; (2) construction of reinforced concrete bridge 83 feet long over Muston's Creek at Caramut. (Both these new structures replace bridges washed away in the 1946 floods.)

State Highways.

Henty Highway.—Construction of triple cell 9 feet x 6 feet culvert north of Condah. *Glenelg Highway.*—Construction of new reinforced concrete bridge over Denhill's Creek, west of Coleraine.

Unclassified Roads.

Wannon Shire.—Coleraine–Nareen Road—construction of timber and rolled steel joist bridge over Wando River. *Warrnambool Shire.*—O'Keefe's Road—replacement of old timber bridge over Mt. Emu Creek.

RAISING BRIDGES.

The construction by the State Rivers and Water Supply Commission of the Cairn Curran Reservoir, near Baringhup, has been responsible for a feat of engineering by the Board which is believed to be the first work of its kind ever carried out in Australia, viz.: the raising by about 10 feet of the 190-ft. seven-span bridge over Joyce's Creek on the Pyrenees Highway. It is known that some bridges in America have been raised, but different methods were adopted.

The raising of Joyce's Creek Bridge had become necessary owing to the fact that a short section of the Pyrenees Highway was to be inundated when the water in the reservoir reached full supply level. Investigation showed that the route over the present bridge required the shortest length of road construction, but that the level of the water would be above the present level of the bridge deck, and it was therefore decided to raise the bridge rather than abandon it in favour of a new structure at another site. The deck of the bridge was also to be widened from 16 feet to 24 feet between kerbs. The operation actually commenced in 1950, but, owing to lack of funds, work ceased early in 1951 and was not resumed until January, 1954.

In the initial stages, the concrete piles for the wider bridge were driven, the new columns constructed to the level of the existing deck, piles were driven for the jacking towers, and reinforcing steel was exposed by cutting the concrete in preparation for the lifting of the deck.

On the resumption of work in January, 1954, the towers were erected, the final cutting of the deck from the existing piers and abutments was carried out, the existing downstream columns were increased in size, and all preparations were made for lifting the deck.

The first two spans were lifted on the 23rd and 25th March, 1954, when twelve jacks, two under each side of the abutments and the piers, raised a weight of 65 tons. This weight was later increased to 100 tons when a 3-span section was raised, using a total of 16 jacks. (Plates Nos. 34 to 36.) It is anticipated that the operation will be entirely completed and the bridge open for traffic by September, 1954.

During the progress of the work provision has been made for traffic on a side track, and a temporary low level bridge was constructed over Joyce's Creek which has been sufficient for requirements.

RAISING JOYCE'S CREEK BRIDGE

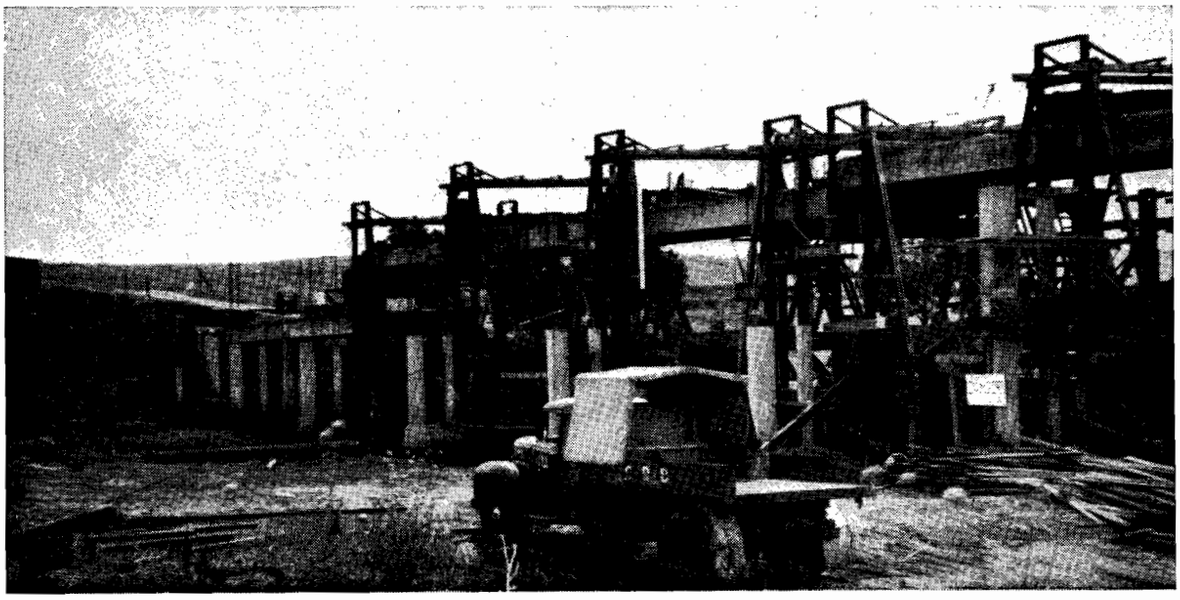

Plate No. 34.—Raising of three continuous 30-ft. spans.

Plate No. 35.—Raising of three centre spans viewed from Maryborough end. End spans still in original position.

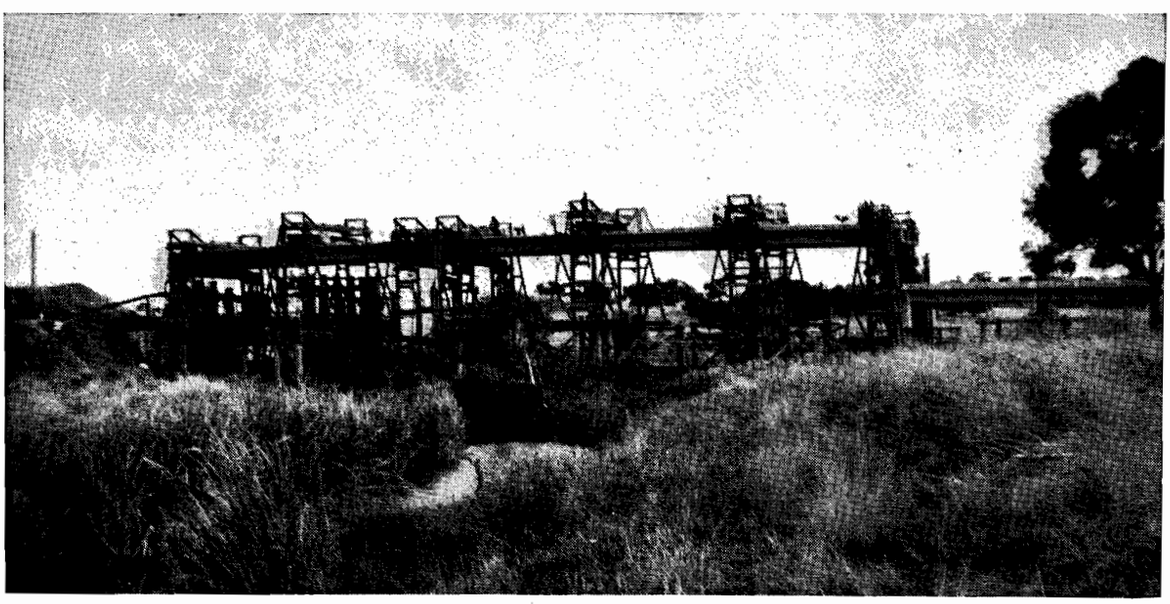

Plate No. 36.—Two continuous 25-ft. spans and three continuous 30-ft. spans at completion of jacking.

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A somewhat similar operation has been undertaken on the Western Highway mid-way between Ballan and Gordon, where the concrete bridge over Paddock Creek is being raised. In this instance the necessity for raising the structure arose from the fact that, when the construction of the Bostock Dam on the Western Moorabool River by the Geelong Waterworks Trust has been completed, the backed-up water, when the reservoir is full, would cover the decking of the old bridge. To meet this situation the level of the decking of the bridge is being raised 6 feet. In this case it is necessary to raise the concrete decking 9 ft. 6 in. to enable the concrete columns to be raised in height and concrete abutments placed in position. The decking is then being lowered to its final level, 6 feet higher than previously.

This bridge was constructed in 1935, and consists of a single span of 35 feet between piers, with a cantilever span of 12 feet at each end, making a total length of 59 feet. The decking and supporting rolled steel joists weigh approximately 170 tons. To lift this structure it has been necessary to construct four jacking towers on each side of the piers. Two 30-ton jacks are being used in each tower, each jack being required to carry more than 20 tons. Advantage was taken of the absence of water in the creek to strengthen the foundations of the bridge so that, when circumstances permit, the deck could be widened even though the reservoir may be full. The present width of 22 feet between kerbs is sufficient for existing traffic requirements.

FLOOD DAMAGE.

Whilst in general not as disastrous as in the previous financial year, floods during the early stages of 1953-54 caused considerable damage to roads and bridges in various parts of the State, resulting in numerous applications being received by the Board from municipal councils for assistance in the carrying out of repairs. The expenditure during the year from special funds provided under Act No. 5657, Item 13, was £245,741.

A freak storm with torrential rains in the area traversed by the Ocean Road, between Anglesea and Lorne, in February, 1954, did a great deal of damage at two particular spots on that road, viz., at Fairhaven, near Airey's Inlet, and at Hut Gully, between Anglesea and Airey's Inlet. Official readings of rain gauges at Lorne and Eastern View showed that 710 and 684 points respectively fell at these places, mainly between 8 p.m. on the 15th February and 3 a.m. on the 16th. Readings from private gauges at Airey's Inlet showed that 883 points of rain fell between 8 p.m. and 4 a.m. and 1,050 points between 6 p.m. and 7 a.m. The official gauge at Anglesea registered 886 points for the 24 hours ended 9 a.m. on 16th February.

With these intense falls, it was not surprising that severe washaways occurred on the Ocean Road, which was cut in four places. Two of these cuts were of a relatively minor nature, but major gaps occurred at Hut Gully (mileage 72·1) and at Fairhaven (mileage 76·6). In addition to these four gaps, there were a number of extensive slips on the top side of the road and numerous washaways on the low side due in the main to the blocking of drains and culverts.

At Hut Gully, a 4-ft. diameter culvert and filling were washed away, the resultant gap being 110 feet wide, with a distance from bed to road level of approximately 50 feet. At Fairhaven, the embankment over a 30-in. diameter reinforced concrete pipe collapsed, and the road was cut.

In order to restore communications and allow stores and mail to be got into Airey's Inlet, Fairhaven, and Eastern View, it was necessary for immediate action to be taken to clear at least a path for one-way traffic through or round the various slips and washaways, and this was done. It was originally intended to construct side tracks at Hut Gully and Fairhaven, but, in view of the extensive damage at these points, other action was necessary.

It was found that materials for a Bailey bridge of 170-ft. span to bridge the Hut Gully could be supplied at short notice, and the necessary materials were unloaded on the site on the 19th and 20th February.

On the latter date, all available men were mustered and, under the guidance of senior engineers of the Board's Bridge Division who had had experience with Bailey bridges, a double track 170-ft. span bridge was completed by 7.15 p.m. except for the ramps at each end. Work was resumed on the following morning and traffic was able to pass over the bridge by 9.30 a.m.

Erection of a Bailey bridge at Fairhaven commenced on the morning of the 22nd February, and traffic was able to use it by 6 p.m. on that day. A total of 60 men, including a number recruited locally, was engaged on these two projects, which were carried out in a manner which reflected great credit on all concerned. (Plates Nos. 37 to 39.)

Major flood damage repair works carried out during the year included the following :—

Bairnsdale Division.

Avon Shire.—Construction of steel type truss bridge with timber and steel approach spans, together with approaches, at Wonnangatta River. (Plate No. 40.) *Bairnsdale Shire.*—Bairnsdale–Paynesville Road—river protection work along the Mitchell River, consisting of driven pre-cast concrete sheet piling over a length of 510 feet. (Plate No. 41.) *Orbost Shire.*—(1) Marlo Road—completion of protection work at Gilbert's Gulch. (Plate No. 42.) (2) Cann Valley Road—replacement of "Double Bridges", these two last-mentioned projects being carried out under the supervision of the Shire Engineer.

Dandenong Division.

Upper Yarra Shire.—Warburton–Wood's Point Road—construction of grouted stone walling and timber and stone groynes where the Yarra River seriously eroded the formation during the 1952 floods.

Warrnambool Division.

Heytesbury Shire.—Hawks Nest Road—restoration of ·65 miles of causeways flooded by the rising waters of Lake Corangamite. (Plate No. 43.)

WORK FOR OTHER AUTHORITIES.

The Board's organization and equipment has been fully availed of for many years by other authorities, both Commonwealth and State, for the carrying out of certain special projects for which the authorities themselves were not suitably equipped and, whilst the total expenditure incurred on these works (£1,028,379) did not reach the figure for the previous financial year, it none the less represents a very considerable effort on the part of the Board. Approximately half the amount (£502,826 16s. 4d.) was expended on projects undertaken at the request of the Commonwealth Department of Works.

Brief particulars of the number of works undertaken, both State and Commonwealth, are given hereunder :—

Department of Public Works.

A total expenditure of £47,354 1s. 8d. was incurred on behalf of the Public Works Department on the Chandler Highway in the City of Kew, on the Big Desert Road in the Shire of Kaniva which serves a large area being developed by the Australian Mutual Provident Society, on road works at Heyfield to carry heavy timber traffic, and on the improvement of grounds and sports areas at various State schools throughout Victoria.

The Big Desert Road project, to which reference was made at some length in the 40th Annual Report, involved the construction of 14½ miles from a point north of Lillimur to an area in the northern part of the Shire of Kaniva known as the Big Desert, the total cost of this project being over £40,000.

A contract was let for the supply and delivery of 24,300 cubic yards of limestone, which has been spread on the sand clay base as a pavement material, and the work has been completed except for minor maintenance work.

The Australian Mutual Provident Society established the nucleus of its headquarters approximately 1½ miles from the end of the road and put down a bore. Preliminary clearing operations were commenced by the Society towards the end of the financial year.

Forests Commission of Victoria.

A total sum of £3,317 10s. was expended on behalf of the Commission on the Licola Bridge in the Shire of Maffra and the Bemm River Suspension Bridge in the Shire of Orbost, both these projects being designed to facilitate the extraction of forest produce.

Geelong Waterworks and Sewerage Trust.

The amount of £5,090 15s. 1d. was expended on behalf of the Trust on works associated with the Bostock Dam adjacent to the Western Highway. The raising of the bridge over Paddock Creek on the Western Highway, which was necessitated by the construction of this dam, is described in some detail under the heading of "Raising Bridges" elsewhere in this Report.

EMERGENCY BRIDGE, HUT GULLY

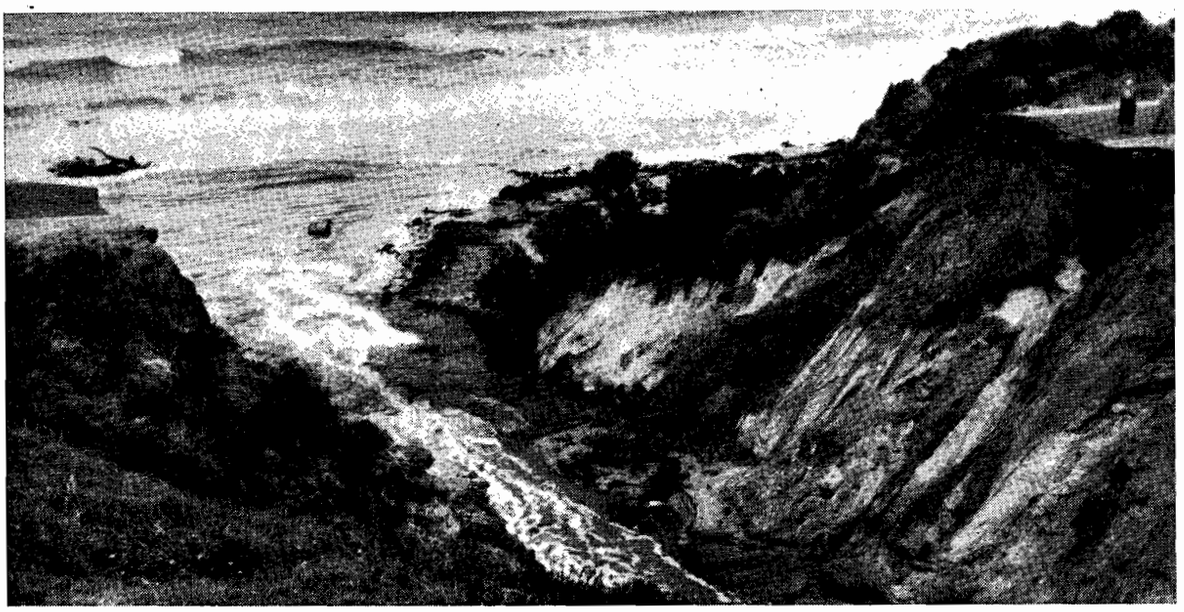


Plate No. 37.—Roadway and culvert washed away by floodwaters.]

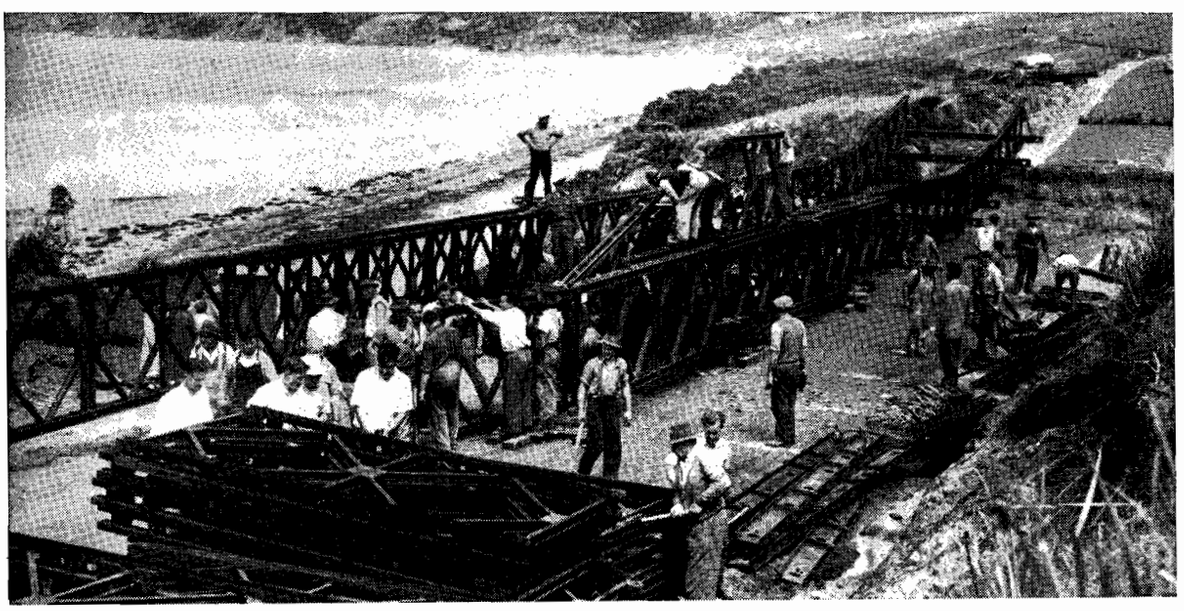


Plate No. 38.—Bailey bridge in course of erection.

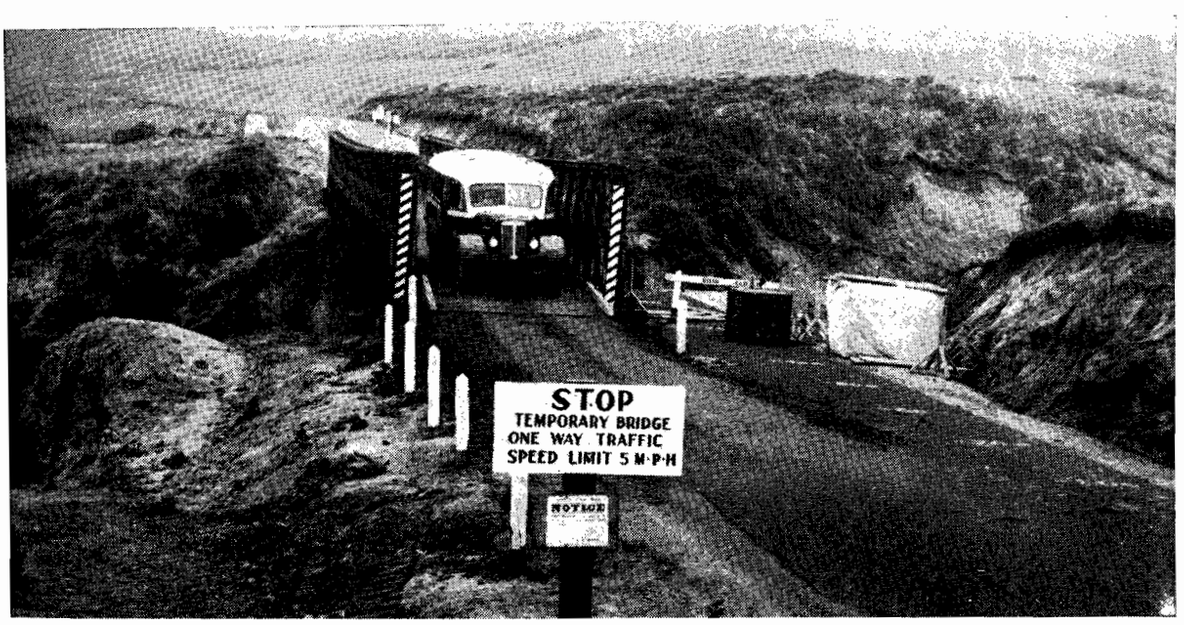


Plate No. 39.—Traffic using 170-ft. span Bailey bridge.

FLOOD DAMAGE REPAIRS

Plate No. 40.—Steel truss bridge, Crooked River Road, over Wonnangatta River.

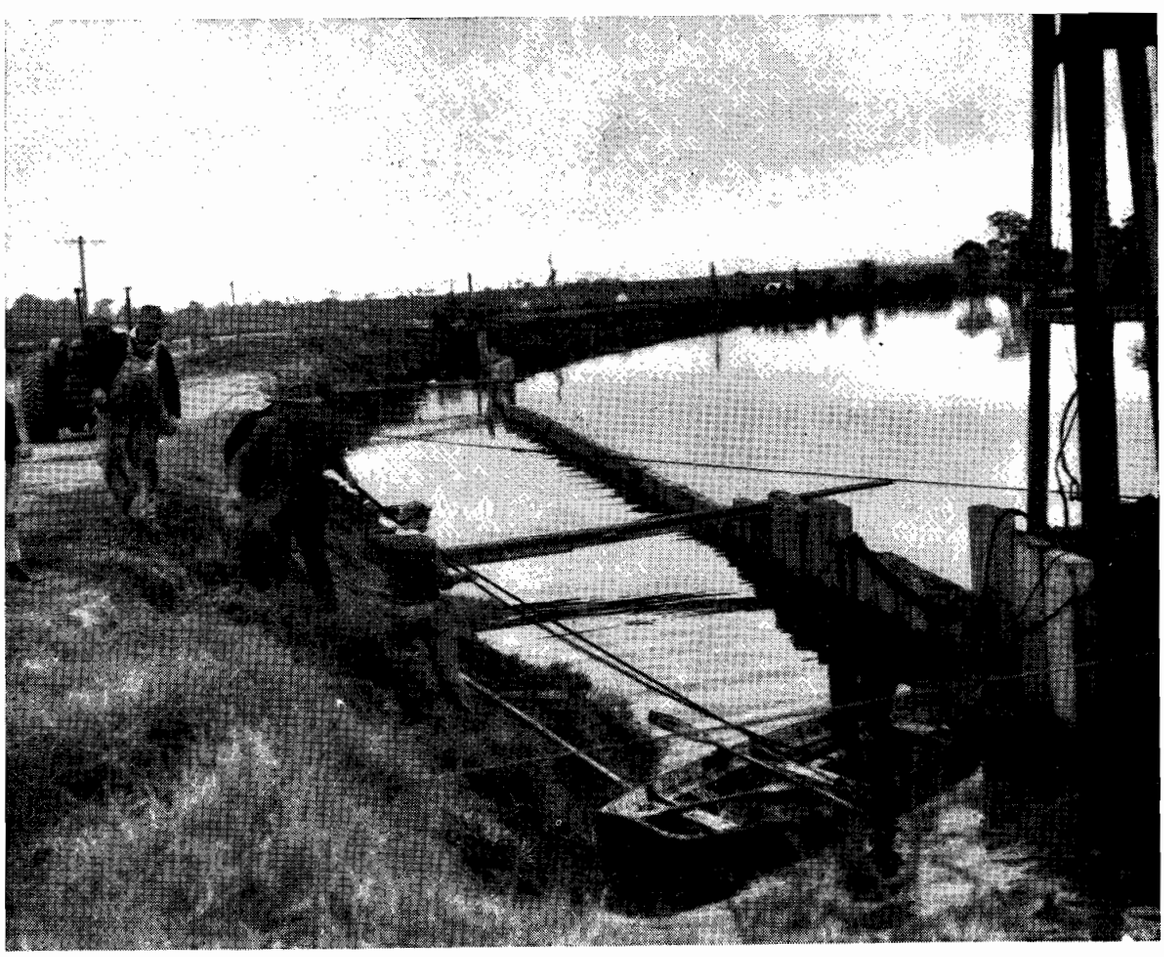


Plate No. 41.—Flood protection work along Paynesville Road on banks of Mitchell River.

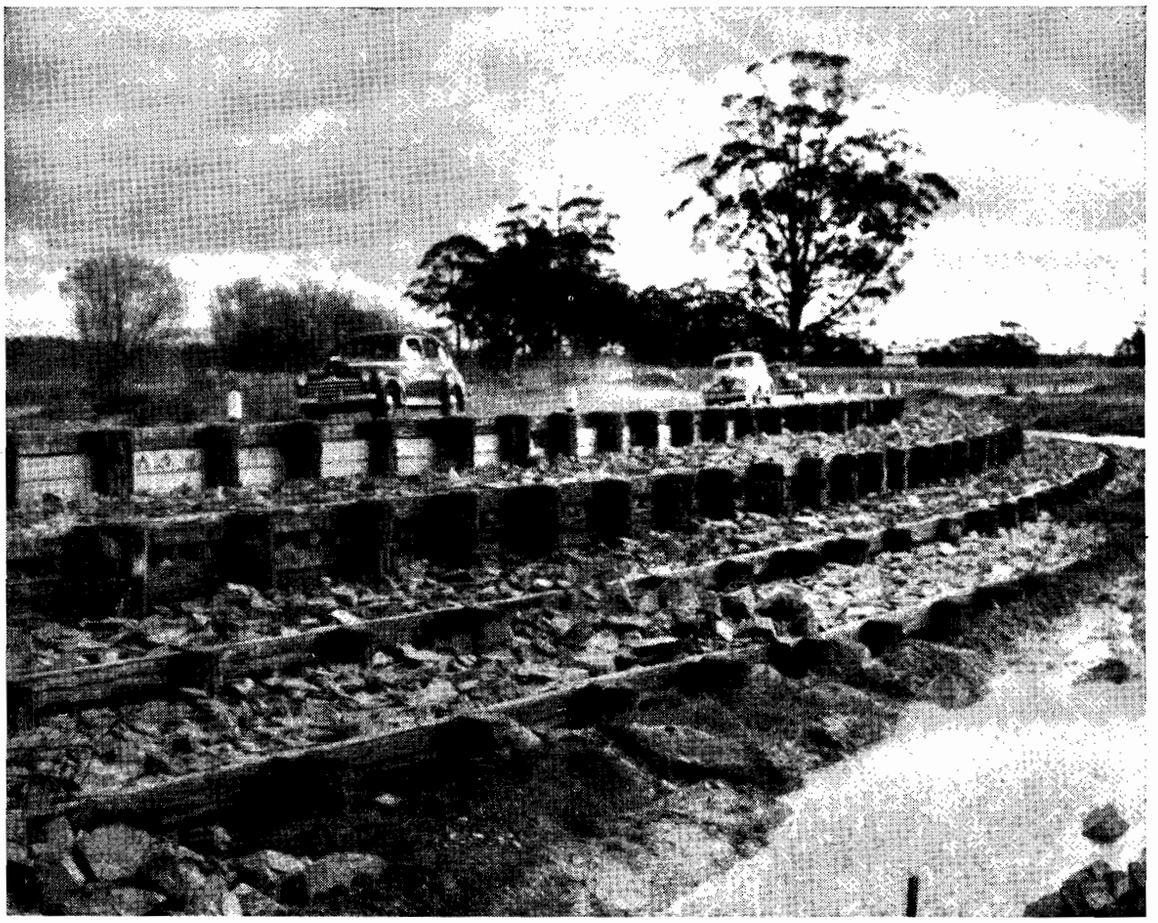


Plate No. 42.—Completed work at Gilbert's Gulch, Marlo Road, Orbost Shire.

Plate No. 43.—Reconstructed causeway on Hawks Nest Road above the rising waters of Lake Corangamite.

Housing Commission, Victoria.

There was considerable activity during the year on works associated with various housing schemes, particularly at Norlane Estate, the Ballarat Common Estate, the Ballarat West Estate, Hourigan's Estate, Morwell, and the Morwell Shire Housing Estate.

A total sum of £89,580 18s. 11d. was expended by the Board in 1953–54 on these projects.

Melbourne and Metropolitan Board of Works.

Work was continued on behalf of the Melbourne and Metropolitan Board of Works in the area affected by the Upper Yarra Dam, and a total expenditure of £10,249 11s. 5d. was incurred. The main items of expenditure were on the new Wood's Point Road east from Warburton, the old Marysville–Wood's Point Road, "Yarra Track" and the relocated road between East Warburton and Muddy Creek.

State Electricity Commission.

A total expenditure of £11,281 6s. 6d. was incurred on works carried out on behalf of the State Electricity Commission and more than half this sum was expended on works on the Kiewa Valley Road, which serves the Commission's interests at Mt. Beauty, the balance being expended mainly on the strengthening of bridges and culverts on the Princes Highway East between Dandenong and Morwell to carry the Commission's particularly heavy traffic to its area of operation at Yallourn.

State Rivers and Water Supply Commission.

Apart from Commonwealth Works, the heaviest expenditure incurred by the Board on behalf of another authority was the sum of £260,447 2s. 7d. expended on works financed by the State Rivers and Water Supply Commission. The bulk of this expenditure was associated with the Commission's project at Eildon and the raising of the Hume Weir by the River Murray Commission, whilst over £26,000 was expended on road and bridge works necessitated by the Commission's operations at the Cairn Curran Reservoir.

Big Eildon Project.

Good progress has been made with the construction of bridges in the area affected by the Big Eildon project.

Towards the end of the year traffic was turned on to the new bridge over the Goulburn River on the Upper Goulburn Road near Thornton, built to replace a weak old narrow timber bridge at the same site. (Plate No. 44.)

The job has been completed except for minor details. The new bridge is 451 feet long, and consists of twelve 37 ft. 6 in. spans, with a roadway width of 24 feet.

A contract was let for the construction of the 1,260 feet long bridge over the Brankeet Creek, on the Maroondah Highway, the steel girders being let under a separate contract. The steel work has not come forward as fast as was anticipated, but no "hold ups" have occurred and good progress has been made with the piers. Plate No. 45 shows the progress at the site at the end of the year, several of the twenty-one 60-ft. spans being shown.

Contracts have been let for the construction of the new steel and concrete bridge over the Howqua River on the Mansfield–Wood's Point Road, the road being constructed on new alignment approximately half a mile upstream of the present one.

On the Dry Creek Road in Mansfield Shire, where a deviation of the road necessitated by the Commission's operations requires new bridges over Glen Creek and Dry Creek, a contract was let for the former, which will be 181 feet long, of three 60-ft. spans, and 12 feet between kerbs. It is anticipated that a contract for the Dry Creek bridge will be let early in 1954–55.

Road works carried out in the Benalla Division in connection with the Big Eildon project included the completion of Royaltown Road, construction of 8,000 feet of Hutchinson's Road, the construction of approximately 15,000 feet of the Maintongoon Road deviation, and the commencement of the Maroondah Highway deviation, including the new bridge over Brankeet Creek near Bonnie Doon already referred to.

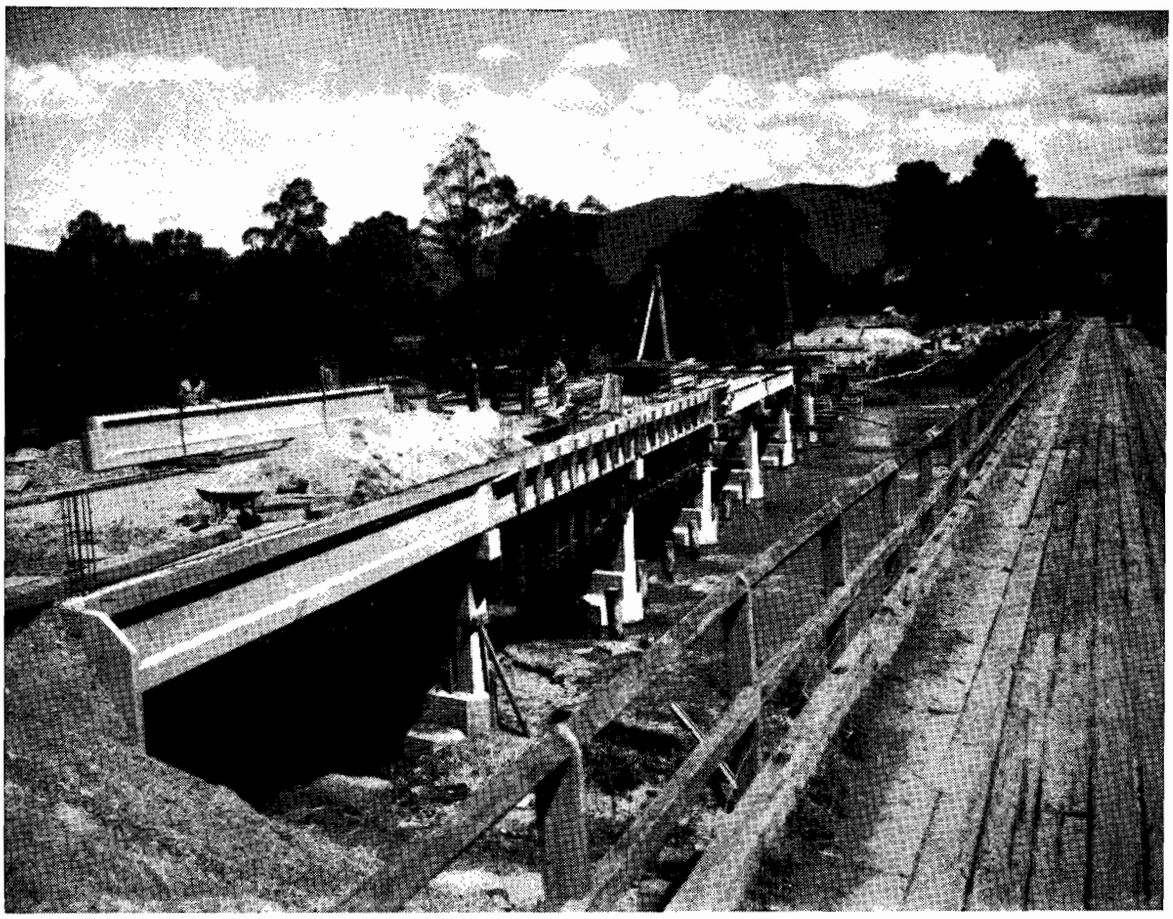


Plate No. 44.—New bridge under construction, and old bridge on Upper Goulburn Road over Goulburn River, near Thornton.

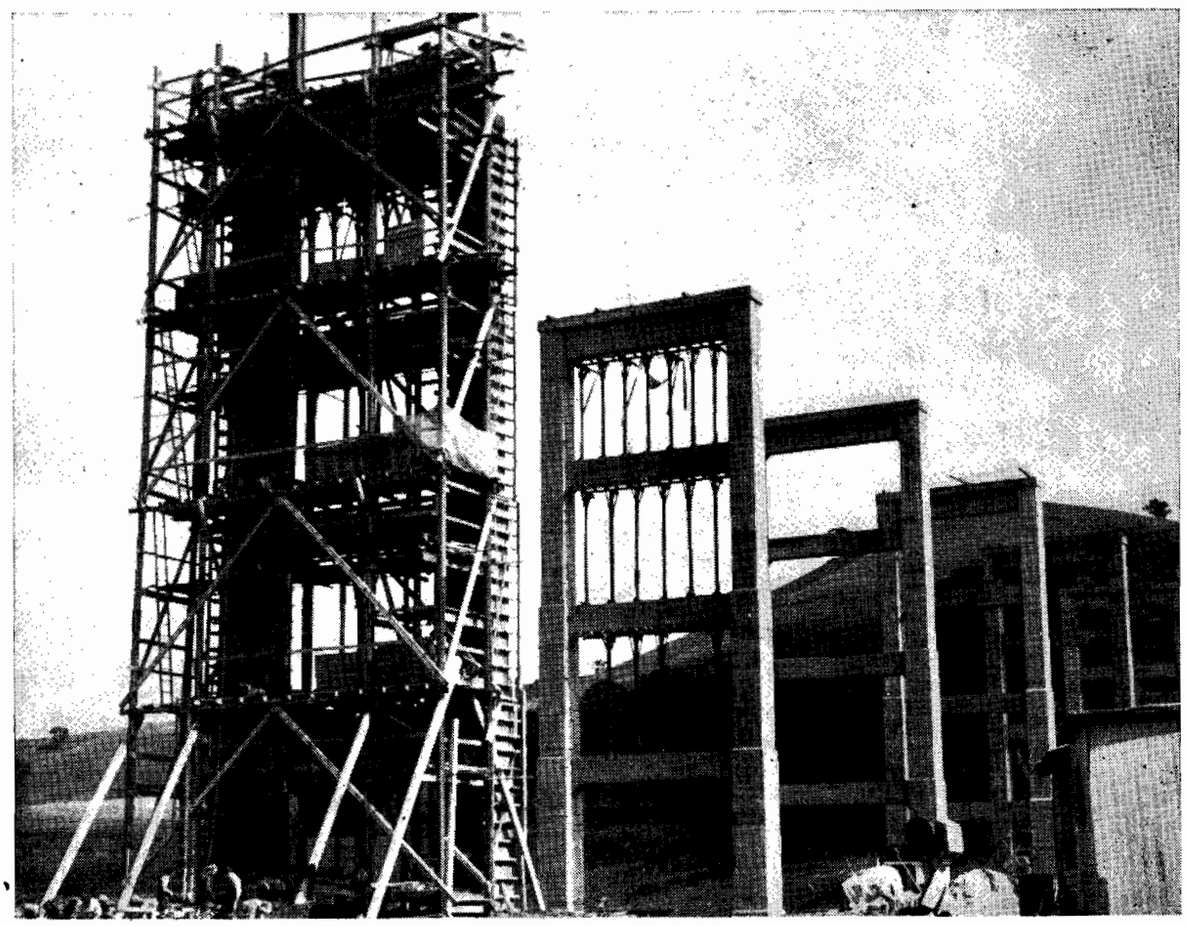


Plate No. 45.—Bridge under construction over Brankeet Creek on Maroondah Highway at Bonnie Doon.

In the Dandenong Division, a further ·95 miles of reconstructed roadway was primed and sealed on the Upper Goulburn Road near Thornton. This completed the reconstruction and sealing of the section from Alexandra to Eildon to standards desired by the State Rivers and Water Supply Commission for access to the Big Eildon project, with the exception of the immediate approaches to Gilmore's bridge over the Goulburn River. The cost of this work is shared between the Commission and the Board in the ratio of 45 : 55.

Approximately 1·8 miles of resheeting and reshaping was carried out, in preparation for sealing, on a deviation of the Upper Goulburn Road immediately south of New Eildon, which was originally constructed to by-pass the Commission's proposed pondage area below the new dam. This work was carried out at the Commission's cost.

A camp was established at the old Torbrecht Station site as a base for constructing the westerly portion of the new Eildon–Jamieson Road, which will leave the Dry Creek Road near Mt. Torbrecht at a point approximately 12 miles east of the Upper Goulburn Road and proceed to Jamieson through hilly country somewhat southerly from the present Eildon–Jamieson Road.

A total length of 2·65 miles from the camp site easterly was cleared, formed and partly gravelled. The whole of this work was done with Commission's funds.

Hume Weir Project.

The enlargement of the Hume Weir from its present capacity of 1,125,000 acre feet to a capacity of 2,000,000 acre feet, and subsequently to 2,500,000 acre feet, which is being undertaken by the River Murray Commission, involves extensive road and bridge works to replace existing facilities which will be submerged by the waters of the Weir.

The full supply level of the Weir will in the first major increase be raised from R.L. 606 to R.L. 626, and ultimately, to R.L. 636. In the immediate future only those deviations will be undertaken where the existing roads will be inundated or the freeboard reduced below a desirable minimum by a reservoir capacity of 2 million acre feet. In all such deviations (except those of a very minor nature), the new works are being designed and constructed so that they will be satisfactory for the ultimate maximum capacity of $2\frac{1}{2}$ million acre feet.

The principal road works necessitated by the Hume project are as set out hereunder :—

(*a*) Deviations at Ebden, Two Bays Creek, and Tatonga, all west of Tallangatta, rendered necessary by reason of railway relocation.

(*b*) A major crossing of the Mitta Valley at Tallangatta by means of an embankment and bridge, 3,400 feet and 750 feet long respectively. This embankment is to carry both road and rail, but the bridges are to be separate structures, although adjacent to each other. The total length of the deviation required is approximately 2 miles.

(*c*) A major deviation, including a new bridge, at Koetong Creek on the Murray arm of the reservoir.

(*d*) A short deviation on the west side of the Mitta River near Tallangatta.

(*e*) The raising of minor low spots on the Murray Valley (main) road.

(*f*) A deviation of approximately 4 miles of the Bethanga Road to raise it above the new river level. This will commence west of the present railway viaduct, and will extend easterly through "Toorak", thence turning southerly over the relocated railway to join the deviated Murray Valley Highway east of Tallangatta.

(*g*) A short deviation of the Yabba Road on the east side of the Mitta River just south of Tallangatta.

Portland Harbour Trust.

An amount of £36,384 4s. 9d. was expended on work carried out for the Portland Harbour Trusts Commissioners on the Cape Grant project. In this case, the labour and plant were made available to the Trust by the Board, but the engineering supervision was provided by the Trust.

The work comprised mainly the construction of access roads to a new quarry at Cape Grant, the shifting of 60 feet of overburden from the quarry site, and levelling in the vicinity of the new breakwater.

COMMONWEALTH PROJECTS.

Whilst the total expenditure on Commonwealth projects carried out by the Board during the year (£502,826 16s. 4d.) was considerably less than the amount for the previous financial year, the works undertaken represented a substantial diversion of the Board's manpower and plant from its own works.

The works included two runways, extensive hardstandings, mounds, and roads in explosives areas, and resealing of a runway and sealing of a taxiway at Essendon airport.

SOLDIER SETTLEMENT ESTATE ROADS.

Considerable additional work was carried out during the year in connection with the construction of roads to serve estates purchased by the Soldier Settlement Commission, the basis of finance of this work having been fixed by the Government. Since the inception of the scheme the Board has been entrusted with the responsibility of recommending to the Commission the contributions from the Commission, the Board, and Councils respectively considered to be fair and reasonable according to the circumstances of each particular case, and the Board has endeavoured to treat councils as liberally as possible having regard to the financial position of the Commission and itself. During the last few years, however, it has not been possible to make grants as liberal as previously, and this has caused concern to many councils, especially those in whose municipal districts extensive soldier settlement has taken place.

Following a conference early in the financial year between the Hon. S. Merrifield, M.L.A., Minister of Public Works, and the Hon. R. W. Holt, M.L.A., Minister for Soldier Settlement, and, following a subsequent deputation from a number of interested councils to the Hon. John Cain, Premier, in March last, it was decided by the Government that the basis of contribution in future should be uniformly £4 Commission, £3 Board, and £1 Council, and this is now in operation in respect of projects embarked upon since the beginning of the 1953–54 financial year.

A total sum of £266,291 was allotted during the year for new works on Soldier Settlement Estate roads, of which £138,114 was provided by the Commission, £94,372 by the Board, and £33,805 by Councils, the corresponding figures for the previous year being £141,093, £103,809, £12,615, and £24,669 respectively. The amount expended from the Board's funds during 1953–54 was £96,076 16s. 5d.

Thanks to the vigorous manner in which many of the councils tackled their soldier settlement road works problem, the roading of a number of estates was completed during the year, and the Board again desires to place on record its appreciation of their co-operation and assistance.

The overall expenditure on roads since the inception of the scheme in the 1946–47 financial year is £698,484, comprising £478,178 expended by the Commission, £138,796 by the Board, and £81,510 by the councils.

Major works carried out during the year on soldier settlement roads included the following :—

Bannockburn Shire.—14,924 feet of forming and gravelling in Moranghurk Estate No. 1 and 14,711 feet in Estate No. 2. *Glenelg Shire.*—16,518 feet of reforming and gravelling in sections in Talisker and Hindson's Estate. *Gordon Shire.*—15,786 feet of forming and gravelling in Loddon Park Estate. *Hampden Shire.*—48,600 feet of forming, grading, &c., in Terrinallum Estate. *Minhamite Shire.*—34,783 feet of forming and gravelling in Tarrone Estate No. 2, Eerilya Estate, and Moyne Falls Estate. *Mortlake Shire.*—30,208 feet of forming and gravelling in Nerrin Nerrin Estate. *Ripon Shire.*—15,900 feet of forming and gravelling and 33,000 feet of forming in the Mt. Emu and Carngham Estates. *Rosedale Shire.*—53,435 feet of forming and gravelling in the Nambrok–Denison Estate.

DECENTRALIZATION.

The progress made during the year in connection with the development of the Board's Divisional organizations in country centres is summarized hereunder :—

Bairnsdale Division.

The pre-casting yard was developed during the year, and manufactured the concrete piles for the extensive river protection scheme on the Paynesville Road. The erection of the trussed roof type plant shelter was completed.

Dandenong Division.

A 36 ft. x 52 ft. steel-framed building sheeted with galvanized iron has been erected on the Pakenham patrol depot site. It will be used to house patrol stores and equipment and certain Divisional branch stocks.

Geelong Division.

A new modern workshop in the Divisional depot at Geelong was completed during the year, and is now in operation. The pre-casting of units for concrete bridges and culverts has been developed further, and a gang of nine men has been kept going full-time casting piles, beams, slabs, kerbs, and handrails for both municipal works and works under the Board's direct supervision.

Horsham Division.

A bulk camp equipment store and sheds for steel and timber fabrication in the pre-casting yard were completed.

Traralgon Division.

The Divisional depot was further developed by the erection of a plant shelter 160 feet long.

Warrnambool Division.

In addition to the purchase of a new Divisional Office (referred to elsewhere) the construction of a steel-framed 60 ft. x 100 ft. workshop at the Divisional depot at Warrnambool was completed. "On site" work was completed on two prefabricated houses obtained to accommodate the workshops foreman and fitter. Extensive repairs and additions were carried out to the depot foreman's residence, which had been moved from the previous depot site to the new depot.

NEW DIVISIONAL OFFICE AT WARRNAMBOOL.

When the Board established its Divisional Office at Warrnambool in 1928, it took advantage of the offer of the Warrnambool Shire Council to provide accommodation on the upper floor of the Shire Office, a two-storied building at the corner of Koroit and Fairy Streets.

Although the Board was very appreciative of the Council's gesture in making this accommodation available, it was never regarded as a permanent solution, and in recent years both the Council and the Board have, through normal development, been considerably hampered by the restricted space available to them.

In May, 1954, the Council asked the Board to consider seeking suitable accommodation elsewhere, as it now requires the office space for its own purposes.

It then came to the notice of the Board that the Bank premises at the corner of Koroit and Kepler Streets, recently vacated by the Union Bank as a result of bank amalgamation in Warrnambool, were under offer for purchase by the Government, and following an inspection by members of the Board and negotiations with the agents for the Bank, the building was purchased by the Board for the sum of £14,500.

The building, which is on pleasing aesthetic lines, is a substantial two-storied sandstone structure, in sound condition, and a good state of repair. It is conveniently situated and very suitable for adaptation to the Board's requirements for divisional office administration. The land on which it is built, which has a frontage of 74 ft. 3 in. to Kepler Street and 132 feet to Koroit Street, is only one block west from the main shopping street, and is in the professional and office area of the City.

The acquisition of this building and its favourable location will greatly assist the Board's administration in Warrnambool.

ROADMAKING MATERIALS.

Bendigo Division.

In order to ascertain the suitability of sandstone from Mt. Scobie, in the Shire of Deakin, as screenings for bituminous surface treatment work, arrangements were made for a field test of the material.

The Board's Asphalt Engineer arranged to carry out all the normal tests for stone to be used as covering aggregate on a sample of the harder stone from Mt. Scobie, and for purposes of comparison, on quartzite from McKenzie Creek, near Horsham, and sandstone from Lorne, materials which have been in use for many years. The tests

carried out comprised the Los Angeles loss on dry stone, Stewart aggregate impact value on dry stone, aggregate crushing test, wet stone, and bitumen adhesion (plate) test. The last-mentioned test was carried out on Lorne sandstone and Mt. Scobie selected sandstone only.

The test results were as tabulated below :—

Stone.	Los Angeles Percentage Loss Dry.	Stewart A.I.V. Percentage Loss Dry.	A.C. Test Percentage Loss Dry.	A.C. Test Percentage Loss Wet.	Bitumen Adhesion.
McKenzie Creek Quartzite ..	38·1	32·5	31·8	28·9	..
Lorne sandstone	31·9	21·6	33·8	36·6	11·4
Mt. Scobie (selected sandstone) ..	42·1	31·1	34·4	35·4	6·6

The sample of McKenzie Creek quartzite used for the test was thought to be slightly better than the normal run of the material from that quarry, as the Los Angeles test is usually in the region of 40–44 per cent. instead of 38·1 per cent. as shown above. Examination of the test results would appear to indicate that the selected sandstone from Mt. Scobie would be on a par with the Lorne sandstone and similar to the normal run of McKenzie Creek material. The Lorne sandstone has been used with a fair measure of success under light traffic up to 150 vehicles per 12-hour count in localities where the cost of basalt aggregate is very high owing to the long lead from the Colac quarries.

The McKenzie Creek quartzite has been used successfully for many years in the Horsham Division with similar traffic densities. In the past five years aggregate for the Deakin Shire has been obtained from four principal sources, namely, Axedale quarry near Bendigo (soft basalt), rock from old mine workings at Bendigo (quartzite and quartz), crushed and screened gravel from the Goulburn River at Seymour, and screenings from the Dookie area. The price of these aggregates delivered in the Deakin Shire at the present time would be from £3 to £3 10s. per cubic yard, whereas it is probable that aggregate could be produced at the Mt. Scobie quarry and delivered for less than £2 per cubic yard.

This quarry, which is operated by the Deakin Shire Council, is principally engaged in the production of fine crushed rock for pavement construction. Rejects from the 2-in. screen are either sent back to the secondary crusher or stockpiled for later crushing. When the harder seams of stone are being worked in the quarry, the rejects obtained in this way would be suitable material for crushing into covering aggregate, and it was a sample of such material that was subjected to the tests outlined above.

Arrangements have been made with the Shire Engineer to produce approximately 100 cubic yards of $\frac{5}{8}$-in. one-size aggregate during the next few months, and to use this material for initial surface treatment on some work which will be carried out by the Council in the next spraying season. This will enable the material to be tested under service conditions, and the production of aggregate in quantity from the Mt. Scobie quarry will be considered in the light of the field experience from this experimental section.

Horsham Division.

(*a*) Supply of aggregate for bituminous surface treatment work in the Rainbow area has always been difficult and costly. After certain experimental work had been carried out in order to determine the suitability of the stone, action was taken to collect limestone spalls or " field stone " which had been gathered into heaps of various sizes in farmers' paddocks over a period of many years' working.

Approximately 7,000 cubic yards of these limestone spalls were collected into a stock pile at Yaapeet, where a commencement was made in the operation of crushing these spalls into three sizes of aggregate which will be suitable for bituminous surface treatment work. It is estimated that the finished product will be available in the area at an average cost of from 40s. to 45s. per cubic yard, whereas in the past it has been necessary to import aggregate long distances by rail at costs up to 80s. per cubic yard.

(*b*) A contract was let for 6,000 cubic yards of bituminous surfacing aggregate to be obtained at Stawell, where an old very good quartz porphyry quarry was reopened. This material is being used for sealing work in the Stawell area, to which it has been necessary in previous years to import material at extra cost, generally by rail from Ararat and Beaufort.

Warrnambool Division.

(*a*) A deposit of volcanic tuff has been opened up at Lilley's Lane, South Ecklin, in the western portion of the Shire of Heytesbury. This material, which is obtained by heavy dozer and ripping, or by blasting, is proving very suitable for unsealed roads and for resheeting in winter. Its suitability for sealing has not yet been determined. Use of this material, which costs approximately 6s. per cubic yard in the pit, effects a saving of 20 miles cartage over the gravel which has been used in the past. The pit contains a very great quantity of material.

(*b*) A disused pit of soft limestone at Dartmoor was reopened and 14,000 cubic yards of good roadmaking limestone were obtained. Previously material was obtained by blasting, but the use of heavy plant has now made blasting almost unnecessary.

Further soft limestone pits were opened up in the Nelson area, from which 13,000 cubic yards of material were obtained.

PHOTOGRAPHY.

There is still a steady demand for screenings of the Board's 16 m.m. documentary sound films, 53 screenings having been given to schools, clubs, and other organizations during the year, with audiences totalling approximately 4,500 people.

Borrowers whose standard of projection was satisfactory made use of 21 of the Board's films in the same period, the films most in demand being " Road Reconnaissance " (12 occasions) and " Seaside Holiday " (7 occasions). It is estimated that approximately 3,000 persons viewed these screenings.

In addition, the Board's mobile film unit gave 108 screenings to Board's employees in camps remote from townships, covering 44 locations and entertaining a total audience of approximately 2,940 persons. For these screenings, films hired from commercial distributors were used, together with films prepared by the Board.

During the year under review, two new colour films with sound tracks were completed. The first was a short film prepared for exhibition at the Royal Agricultural Show held in Melbourne in September, 1953, to demonstrate the reduction in running costs of motor vehicles resulting from road improvements, and to emphasize the economy of good roads.

The second film, which was produced in conjunction with the Mildura Shire Council, deals with the visit of Her Majesty Queen Elizabeth II. and His Royal Highness the Duke of Edinburgh to Mildura on the 25th March, 1954.

To assist the State Film Centre to obtain adequate photographic coverage of the Royal Visit, arrangements were made for the Board's Film Officer, Mr. J. B. Stirling and Photographer, Mr. E. T. Scott, to be available when required for duty with that organization. Film exposed by them has been used in the official film produced covering the Royal Visit to Victoria.

When not required for the above duty, the Board's photographers obtained photographic records of the Royal Party using traffic facilities which had been built by the Board, among these being several aerodromes as well as roads and bridges. (See Frontispiece and Plates 46 to 48.)

TRAFFIC DEVELOPMENT.

The amazing growth of motor traffic in the post-war years has clearly demonstrated the urgent need for developing such major arteries as the Melbourne–Dandenong section of the Princes Highway East, the Nepean Highway, and the Springvale Road, and an extensive survey of the traffic using these roads was made by the Board's Traffic and Location Division between December, 1953, and February, 1954, a period of the year when volumes of traffic generally are considerably higher than the annual March count.

Hamilton.

Arrival Sale Aerodrome.

Midland Highway near Benalla.

Plates Nos. 46, 47, and 48.—Scenes during the visit of Her Majesty Queen Elizabeth II. and His Royal Highness, Duke of Edinburgh, to Victoria.

The survey was initiated to cover generally the traffic moving during this holiday period to and from the Mornington Peninsula, and to determine the extent to which the practical capacities of the roads are being exceeded.

Points of special interest emerging from the survey were :—

(*a*) The extraordinarily high traffic volumes observed on the Nepean Highway and Princes Highway East, when hourly volumes well in excess of acceptable practical capacity standards suggested by the United States Highway Capacity Manual are exceeded a large number of times during the summer months.

(*b*) The high volumes recorded on the Springvale and Dandenong–Frankston Roads, where maximum daily volumes are between 4,000 and 5,000 vehicles per day.

An automatic counter has been in operation at a point on the Princes Highway East, 200 yards east of Fern Tree Gully Road, Oakleigh, since February, 1953. When first installed, volumes slightly more than 60,000 vehicles per week were being recorded. This figure dropped to a minimum of 56,000 per week in mid-August 1953, and rose to a maximum of 77,222 during the week ended 27th December, 1953. The highest daily recording up to the end of January, 1954, occurred on Monday, 25th January, when 12,700 vehicles were counted. Since the "Streeter-Amet" recording meter was installed at this post in December, 1953, the highest daily count was over 17,000 vehicles on Easter Tuesday (20th April, 1954) with a maximum hourly volume of 1,169 vehicles on the 28th December, 1953.

On the Nepean Highway, where traffic varies day by day and week by week under the influence of recreational vehicles far more than on the Princes Highway East, the highest daily count recorded was 25,045 vehicles on Sunday, 24th January, 1954, and the lowest 8,760 vehicles on Tuesday, 19th January.

These figures decreased at recording stations further along the highway, maximum daily volumes of 18,000 and 8,000 vehicles being recorded at Oliver's Hill, Frankston, and at a point a quarter of a mile south of Springvale Road, Edithvale, respectively.

On Springvale Road it was found that the average week-day traffic at a point a quarter of a mile south of the Princes Highway East was 3,200 vehicles, with an increase to 4,000 vehicles on Sundays.

The total of 25,045 vehicles in 24 hours on the Nepean Highway at Mordialloc is of particular interest, being the highest figure ever recorded outside the metropolitan area.

To meet the obvious need for widening and/or adding carriage-ways to these very important roads, the Board has already taken preliminary action, in the case of the Princes Highway East by entering into contracts for the supply of materials for a commencement on the duplication of the highway pavement during 1954–55, and in the case of the Nepean Highway and Springvale Roads by the acquisition of land and the fixing of alignments to provide for widening the road reserves and for development of additional routes as mentioned in the 39th Annual Report. Limited funds make it necessary to deal with these projects on a long-range basis at this stage, but it is hoped that if additional moneys become available, substantial progress can be made with the actual provision of additional traffic lanes and improved facilities. Plates Nos. 49 and 50 illustrate the need for "channelizing" traffic at critical points and the use of models to assist in designing an intersection to handle the traffic safely and conveniently.

ECONOMIC ANALYSIS OF PROJECTS.

On many occasions during the year, traffic engineering factors such as vehicle operating costs under varying conditions of distance, grade, rise and fall, and alignments were freely used in the economic analysis of road and bridge locations and the economic comparison of alternative proposals.

Very often these types of analysis were augmented by origin and destination studies to determine the extent to which the amount and nature of traffic would benefit from the construction of a particular road or other traffic facility. Detailed origin and destination studies were also undertaken at complex metropolitan intersections for the purpose of designing suitable rotary, channelized, or grade separation facilities.

Plate No. 49.—Mixed traffic at intersection of Princes Highway East and Box Hill Road, Oakleigh.

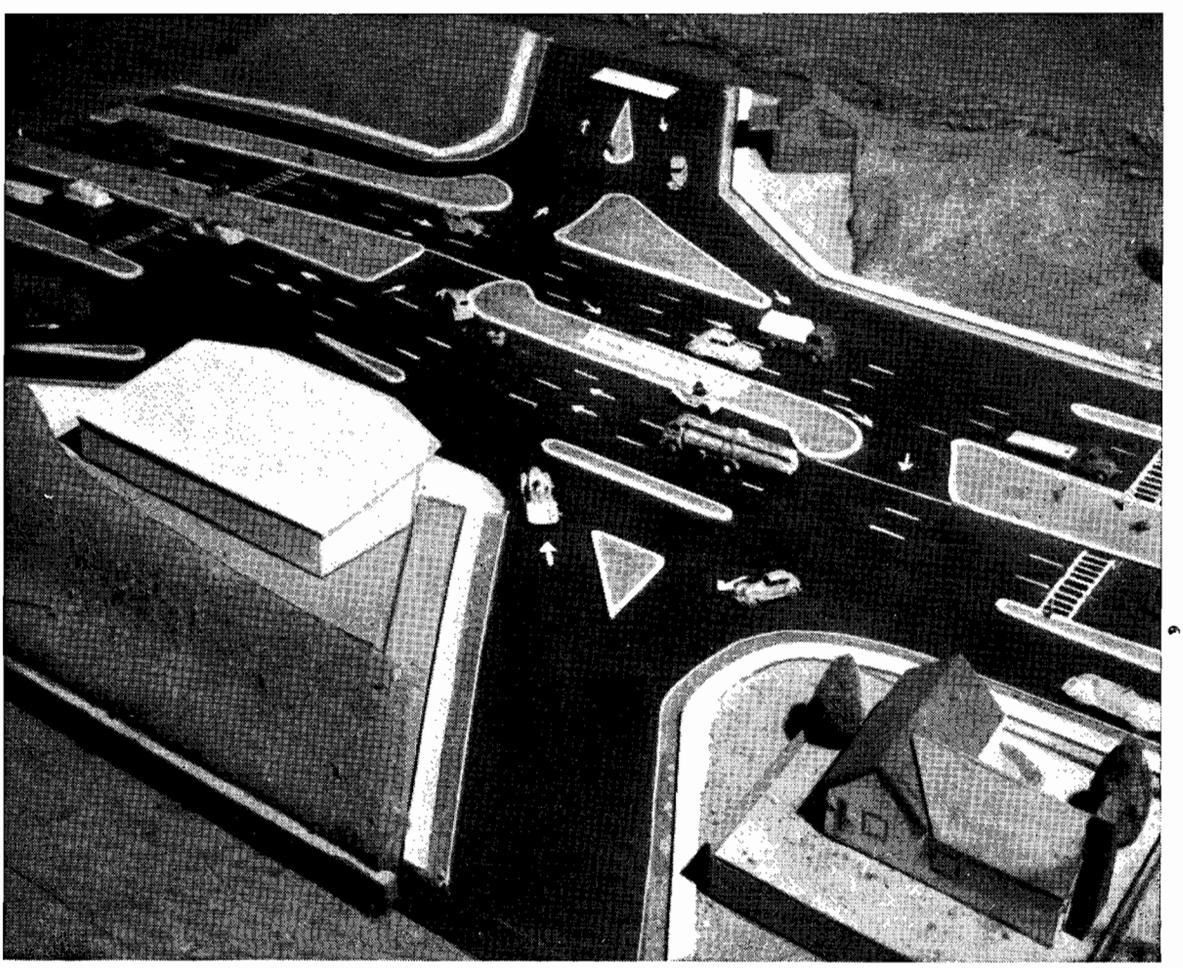


Plate No. 50.—Model of proposed intersection of Princes Highway East and Box Hill Road, Oakleigh.

Special traffic studies were undertaken at a number of metropolitan and rural level crossings. The economic loss due to the halting of private, commercial, and public transport vehicles and the time lost to cyclists and pedestrians was estimated and compared with the estimated cost of eliminating the level (gated) crossing in each case by means of grade separations.

LOAD LIMITS.

It is evident that the load limits laid down in the *Motor Car Act* 1951 (No. 5616) as applicable to road transport have caused considerable misunderstanding in the minds of numerous operators, their contention being that these limits are far too restrictive. They were, however, decided upon only after very careful consideration of the factors involved, and represent the weights which may be safely and economically carried by various types of vehicles according to the type of construction.

The essential factors which must be considered are that road transportation costs are made up of—

(*a*) the cost of operating the average vehicle, and

(*b*) the cost of providing and maintaining the track (i.e., the road and road structures) upon which the vehicle runs.

In order to determine the proper economic balance between these conflicting factors, investigations were made by the Board, firstly into the relationship between wheel loads and the required strength of the pavement, and, secondly, into the cartage costs for different types of vehicles with varying wheel loads.

The balancing of these two elements of total transportation costs, i.e., the pavement and vehicle operation, led the Board to the conclusion that for Victorian roads a minimum cost of transportation to the community as a whole is afforded by the loading of wheels up to a maximum of 8,500 lb., or 17,000 lb. per axle, and that an increase beyond this limit is not warranted under the volumes of truck traffic that can be expected on the majority of roads for some years to come.

When investigating, from an engineering point of view, the limitation of loads which can be carried over any section of road, consideration must be given not only to the effect of loads on pavements, but also their effect on existing bridges. If the pavement were the only relevant factor, a vehicle could be constructed with any number of axles along its length, irrespective of spacing, each axle carrying up to 17,000 lb. With bridges, however, this is not possible, and a bridge criterion has therefore been established which must be satisfied independently of the single axle load criterion.

The limit imposed by the strength of bridge structures depends primarily on the gross load and the spacing of the axles carrying it. The schedule in the Act setting out the permissible gross loads in relation to the axle spacing is based on a procedure evolved in the United States of America, but takes into account the average condition of bridges in Victoria and their ability to carry repeated imposed loads. The Board is responsible for some thousands of bridges, many of which were constructed by other authorities to varying standards, and until all these can be brought into conformity with the new standards now adopted, no increase is possible in the schedule governing gross loads which is at present in force.

The arbitrary framing of load limits for each type of vehicle which operated prior to the adoption of the Schedule was much more restrictive. The present system allows vehicle and body builders more latitude in developing new types of vehicles and bodies and in pre-determining the maximum loads which may be permitted consistent with all the legal limits. The schedule has been very carefully drafted, and there would appear to be no difficulty in designers making their vehicle designs fit in with its requirements.

SOILS LABORATORY.

The activities of the Soils Laboratory of the Materials Research Division have shown a marked increase in 1953 over previous years. The numbers of samples tested in the years 1952 and 1953 respectively were 1,762 and 2,300, the increase being a gratifying indication of the greater reliance now being placed on the results of such tests.

In addition to the routine testing of these samples, a certain amount of research work was carried out, including :-

(1) Preliminary work on both static and impact penetrometers,

(2) The compaction of fine crushed rock with various types of equipment,

(3) The increase of plasticity by continuous milling, and

(4) The determination of loose and rodded densities for a wide variety of stone.

The use of laboratory staff for control work in the field also increased in 1953, jobs undertaken where special control was required, including the Lara Airstrip and widening of the pavement of the Western Highway at Rockbank and the Princes Highway East at Pakenham.

Works in the Soils Laboratory were hampered by staff changes but the present staff is doing excellent work. The present laboratory is not, however, ideal for the Board's requirements, and further increase in the number of samples to be dealt with may prove beyond the capacity of the section, due to its unsuitable quarters. This aspect, however, is receiving the Board's consideration.

ROAD MARKERS.

Investigations have been made by the Board's Engineers into the properties of various types of reflective traffic line markers, including the following :—

(*a*) Reflecting studs—

(i) Self-wiping studs consisting of four glass studs in a rubber pad which is inserted in a cast iron base.

(ii) Rigid studs consisting of four glass studs set in a metal holder.

(*b*) Beaded surfaces—

(i) Beads dropped on to freshly sprayed traffic paint.

(ii) Traffic paint in which fine beads are uniformly dispersed prior to spraying.

(iii) Thermo plastic incorporating beads.

These investigations indicate that beaded lines reflected a comparatively small amount of light back to the driver of a vehicle, and that there is very little difference between the appearance of a good beaded line and a freshly painted line applied to a new seal.

Reflecting studs appear as brilliant points of light for a long distance from the headlamps of a vehicle and may even be discerned beyond weak opposing headlights. Reflecting studs alone are generally considered to be rather inadequate for lane delineation by day, and are usually supplemented by painted lines. There is no accepted practice of using studs to represent double lines.

The Board has had no experience in the use of rigid reflecting studs, the efficiency of which would possibly be lessened by mud and dust.

Reflecting surfaces consisting of beads dropped onto paint have a higher initial brilliance than beads applied in the paint mixture, but in a few weeks the beads in paint mixtures wear to a bright surface which they hold for a long time.

Self-wiping reflecting studs have been tried out by the Board on three sections of the Western Highway, on the Shepparton–Mooroopna section of the Midland Highway, and on the Heidelberg–Eltham Road in Banksia Street, Heidelberg, the earliest installation being on the Midland Highway in November, 1949. 105 studs were installed, of which, up to October, 1953, 45 had been replaced.

All replacements of each of those installed have been to make good damage caused by vandals, but some of the older pads are now showing signs of wear. Based on an average road life for inserts of 4 years with 5 per centum per annum lost due to vandalism, and on a life of 20 years for the bases, the average cost is 2s. 9d. per stud per year.

"NON-SKID" SURFACES ON STATE HIGHWAYS.

The modern technique of covering freshly sealed surfaces with screenings to produce a "non-skid" surface has brought criticism and protest from several lay members of the community about the resultant rough riding qualities of the newly treated roads.

Apart from occasional patching by patrolmen, the surface of sealed roads requires periodic treatment on long lengths to prevent the surface being worn off, as, if this were allowed to happen, the road pavement would in most cases disintegrate quite rapidly. Whilst it is agreed that, when thus retreating the road, it is desirable to adopt a procedure which would correct minor irregularities in the pavement surface and provide a fine textured non-skid surface, such retreatments are very expensive, costing about £2,500 per mile, and for that reason are applied only in a limited number of cases where the traffic is very heavy. Under present conditions, all that the Board can afford to do is to rebind the road with sufficient bitumen and cover it with screenings, at a cost of approximately £1,000 per mile. This type of retreatment has very little effect on correcting inevitable surface irregularities, but does provide a strong wearing surface. For public safety also, it is very necessary that the surface after resealing should have a non-skid surface and one which will not reflect glare from opposing headlamps.

The Board's engineers have devoted a great deal of research to the development of special equipment and the application of bitumen and screenings so as to eliminate, as far as is practicable, the presence of loose stones on the work. The few loose screenings which are sometimes present on the surface for the first day or so while the bitumen is setting are an unavoidable temporary disadvantage, but, if drivers comply with the request displayed on notices to "drive slowly on new work", lifting of such screenings will not occur.

This type of treatment is used in all countries where traffic conditions are similar to those on Victorian rural roads. In spite of noisiness during the first few weeks after resealing, this is not, in fact, a sign of rapid tyre wear, nor is there any appreciable extra fuel use in driving at a reasonable speed over these surfaces. Drivers should, of course, adjust their speed to any such varying conditions met with on a journey.

BOARD'S EXHIBITS.

For the first time in its history the Board exhibited, at the Royal Agricultural Show in September, 1953, a display relating to its State-wide activities and its financial obligations. The display, which consisted of illuminated transparencies, film screenings and a speed indicator, was well received by the general public and attracted a good deal of attention. The special sound film entitled "Victorian Roads", which lasted 4 minutes, was exhibited (Plate No. 51.)

The success of the venture was such that the Board has decided to again exhibit at the Royal Show in September, 1954.

In April, 1954, the Board availed itself of a further opportunity of bringing its work before the public when it was again invited to exhibit at the International Motor Show held at the Exhibition Building. As on the previous occasion, the invitation came from the National Safety Council of Australia, with which the Board co-operated in a display of a cut-out map of Victoria featuring seven illuminated colour transparencies of the Royal Tour where roads, bridges or airstrips constructed by the Board were used. In addition, a moving belt upon which were mounted model motor cars and trucks was a centre of interest (Plate No. 52.) During the Motor Show, many copies of the Board's pamphlet "Good Roads Cost Less Than Bad Roads", which is intended as an educational medium, were distributed to the public.

COMMUNITY EFFORTS.

Reference was made in the 40th Annual Report to the substantial offer of assistance made by land owners whose properties are served by the Longwood–Ruffy Road in the Shires of Euroa and Goulburn. These land owners offered to contribute £2,500 towards the cost of the sealing of the road subject to the work being carried out within five years.

When dealing with the allocation of its funds for 1953–54, the Board provided the sum of £3,180 for this work, subject to contributions of £1,940 by the Council and £1,250 by the landowners. This sum was fully expended on the sealing of a length of $3\frac{1}{2}$ miles of the road. The work was completed in January last.

Plate No. 51.—Country Roads Board Exhibit at 1953 Royal Agricultural Show.

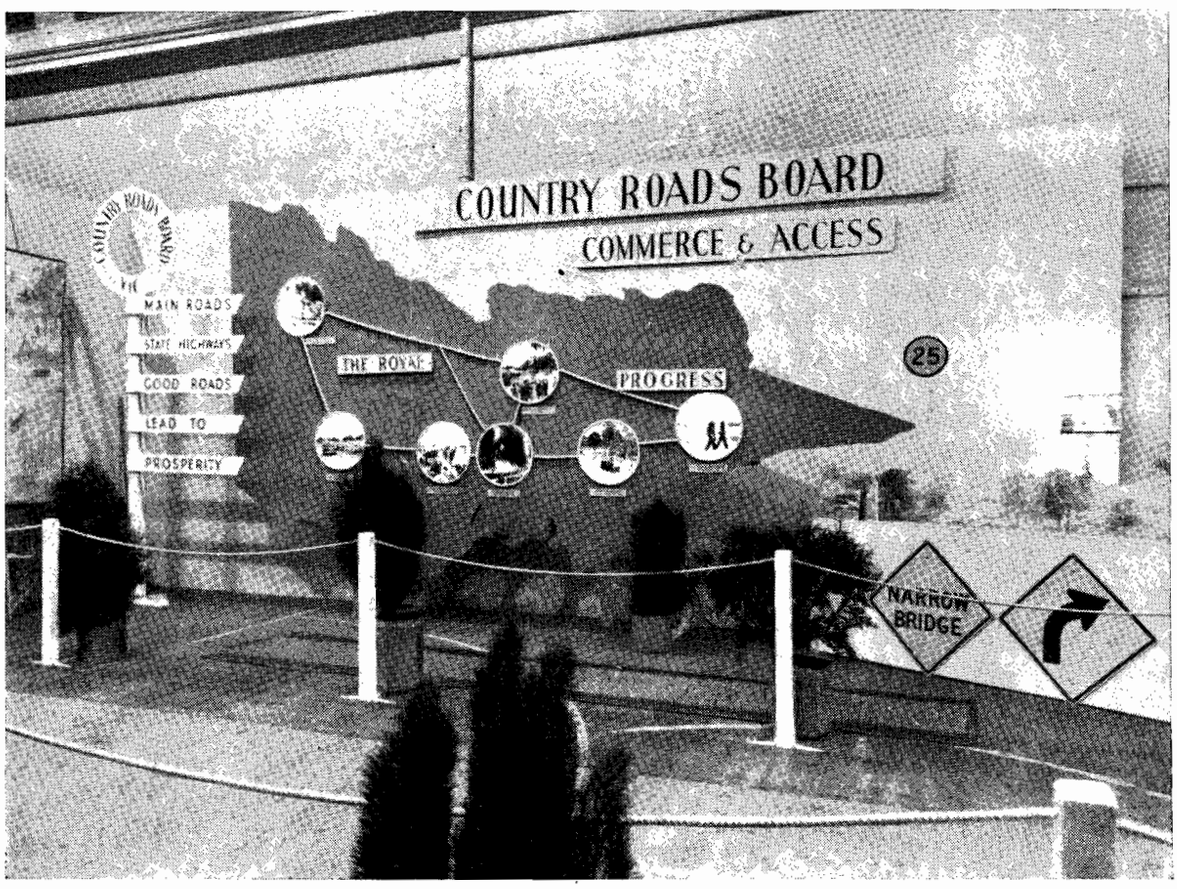


Plate No. 52.—Country Roads Board Stand at 1954 Motor Show.

In May, 1954, a large working bee organized by the Longwood–Ruffy Road Development League carried out earthworks in preparation for an extension of the sealing of the road in the financial year 1954–55. About 25 men were employed, together with fourteen Ferguson tractors fitted with various attachments, three other rubber-tyred tractors, and two angle dozers. In addition the Goulburn Shire Council supplied a power grader and the Euroa Shire Council a loader and trucks. The work was carried out over eight working days, and it is estimated that the value of the work done was £2,000. In the course of the work many curves were improved in alignment, much widening was done, and all curves were fully superelevated, this latter item being a major job in itself, as the old road was very flat in cross section on all curves. In addition many drains and culverts were constructed.

The Board's Divisional Engineer, who inspected the work being undertaken, reports that it was of a high standard and is a major contribution in the reconstruction and sealing the road.

The extent of the road works carried out by the landholders together with their financial contribution is unique in the history of roadmaking in this State, and is a praiseworthy example of well organized and efficient community self-assistance.

Plates Nos. 53 to 55 illustrate the work in progress.

Another example of community effort occurred in the Kowree Shire where, in what is normally a grazing area, the development of the dairying industry caused the local settlers to consider improvements whereby a section of the Bringalbert South–Mortat Road could be improved to meet their requirements. This road feeds to the Hamilton–Edenhope–Apsley (Main) Road, thence to Apsley.

The Council's riding funds were inadequate to assist in the matter and although the road had been the subject of applications to the Board for grants from C.A.R. funds, its priority in the past has been relatively low. Seven of the settlers, therefore, arranged private finance to the extent of £3,500, in order to construct and seal a length of $2\frac{1}{4}$ miles of the road.

The construction was carried out by the Council and the road will be sealed during 1954–55.

HISTORICAL STONE.

The Board's employees recently located the stone where the old toll gate on the Calder Highway on the Bendigo side of Big Hill was erected last century. This stone had been covered up during the treatment of the road pavement many years ago.

While it is desirable that it be retained as an historical record, its location—about 100 yards north of the crest of Big Hill on a fairly steep grade—was such that any person who stopped his car to examine the stone might be in some danger. Arrangements were accordingly made for the stone to be built up on a stone base opposite the site of the old toll gate and a suitable notice board erected.

CONTROL OF HEAVY TRAFFIC.

The number of special permits issued during 1953–54 for the carriage of loads in excess of legal limits was 4,832, an increase of 518, or 12 per cent. over the number issued during the preceding financial year. This figure of 4,832 represents the highest annual issue of permits for all time, despite the fact that the number of "annual" permits has decreased to 10 per cent., and is an indication of the extent to which heavy traffic over the States network of roads is increasing year by year.

The number of permits for "single trips" increased by 651 to 3,625, an increase of 22 per cent. These permits involved 7,570 excess dimensions, (height, width, length, &c.). The movement of prefabricated houses showed a slight increase over the previous year. Single trip permits in which excess weight was involved rose from 1,314 to 1,457, the most significant increase being in the 30–40 tons class, which showed a rise from 386 to 567. Permits in the "over 40 tons" class rose by only one, viz., from 30 to 31. Of these last-mentioned permits, five covered loads between 40 and 50 tons, eight between 50 and 60 tons, eight between 60 and 70 tons, three between 70 and 80 tons, and four between 80 and 100 tons, the remaining three being for a gross weight between 131 and 141 tons and covering transformers carried on the 40-tyred float belonging to the State Electricity Commission. Of the 31 loads over 40 tons weight, only four were for other than Government or semi-Government Departments.

COMMUNITY EFFORT

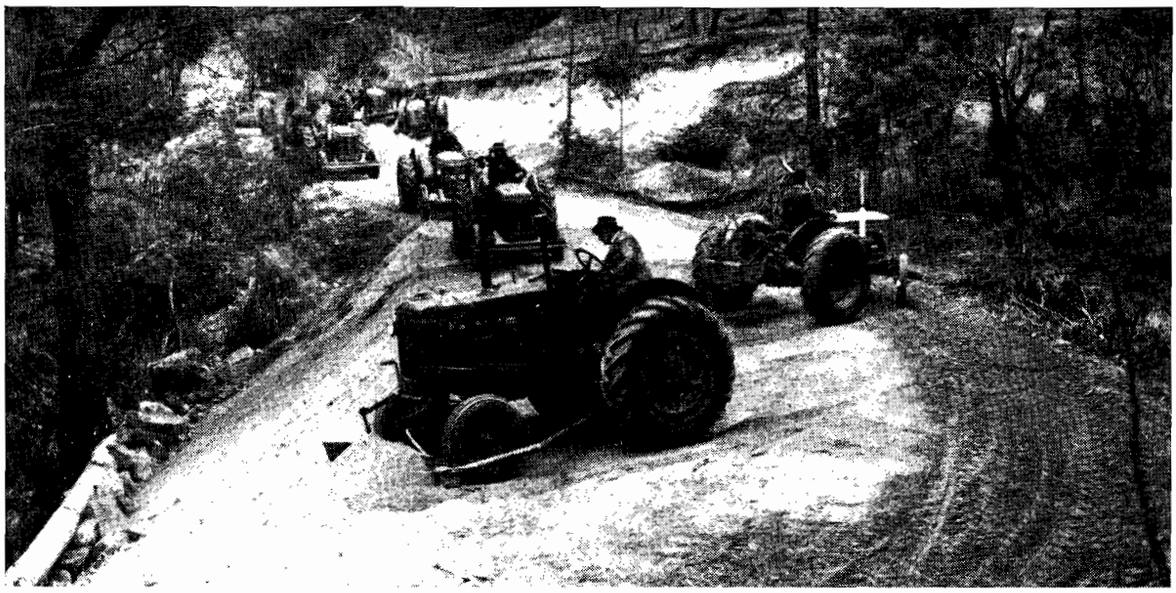


Plate No. 53.—Longwood–Ruffy Road being reconstructed by voluntary labour.

Plate No. 54.—A culvert constructed by voluntary labour on the Longwood–Ruffy Road.

Plate No. 55.—A sheep transport on a completed section of the Longwood–Ruffy Road.

RESTRICTION OF LOADING ON ROADS.

On both main roads and State highways, there are many sections which, through lack of funds for strengthening, are still too weak to meet the needs of the traffic using them, and, for this reason, it is necessary to limit the gross loads to be carried on these sections to 6 tons, under the appropriate provision of the Motor Car Act. The primary purpose of these load limits is not to entirely prohibit heavy traffic on the roads concerned, but rather to enable the Board to exercise control over the traffic by the issue of permits in which consideration is given to the type and tyre equipment of the vehicles proposed to be used.

In imposing load limits of this nature, the Board takes action by which certain roads are closed to traffic during the months of June to October in each year, or by which permanent 6-ton limits, applicable all the year round, are imposed. During the year, it was considered desirable to add the following roads to the list of those to be closed during the winter months :-

Callignee Estate and Callignee South Roads in the Shire of Rosedale.

Warracknabeal and Dimboola Road in the Shires of Warracknabeal, Wimmera, and Dimboola.

Nhill–Jeparit Road in the Shires of Lowan and Dimboola.

Toora–Gunyah Road in the Shire of South Gippsland.

Dingo Creek Road (from Midland Highway to the Grand Ridge Road) in the Shire of Alberton.

Marysville–Wood's Point Road (Yarra Track section) which had previously had a 6-ton gross load limit, was omitted during the year, whilst a similar restriction was also lifted in respect of the Kyabram–Tongala Road in the Shire of Deakin, the Sturt Highway between Mildura and South Australian Border, and the Calder Highway between Ouyen and Redcliffs. On these sections, special attention has been given to reconstruction of the weak sections so as to remove the necessity for the restrictions.

The reduction in the mileage of roads affected by 6-ton limit closures has been reflected in the reduction in the number of annual permits issued, as in the past it had been necessary for operators continually using these roads to take out annual permits covering their vehicles. The total length of roads on which a 6-ton limit is still in force is 1,356 miles.

TRAFFIC OFFENCES.

The total number of offences reported, namely, 2,422, constitutes an increase of 500 for the year 1952–53, and is 18 per cent. above the previous years' figure reached in 1951–52. Of the total reported, 2,214 cases resulted in successful prosecutions, an increase of 25 per cent. A great proportion of the "unsuccessful" cases was due to the resignation of one of the traffic officers during the year, with his consequent inability to conduct cases detected during the latter portion of his service as an officer of the Board. Of the 31 cases withdrawn, 16 were in instances where a double charge had been preferred, and the alternative charge resulted in a fine.

The fines resulting from prosecutions totalled £20,316 5s., an increase of 24 per cent. on the total for the previous year, and 17·5 per cent. over the highest recorded total in 1951–52. Costs allowed totalled £349 13s. 11d., an increase of 32 per cent. over the 1952–53 figures.

The fines resulting from prosecution under the Motor Car Act (included in the above figures) amounted to £18,929, an increase of £3,873 over the 1952–53 total. This increase was due almost entirely to a greater number of loads in excess of the weight provisions of the Act, as speeding and other offences show a considerable decrease. It is worthy to note, however, that, due to the removal of 6-ton gross load limits on the Western and Calder Highways, fines from breaches of this restriction dropped by nearly £1,000. The number of summonses the service of which proved impracticable (mostly interstate) dropped from 32 to 23, whilst, of the 1,744 cases actually presented to court, only two were dismissed. One disturbing feature of the year's traffic policing is, however, that the average fine per case dropped from £11 13s. 3d. to £10 17s. 4d., emphasizing the fact that fines generally are not sufficient to be an adequate deterrent to the operators who are prepared to take the risk of carrying excess loads. It is quite apparent that, with the present scale of fines laid down in the Act, unscrupulous

operators can continue to carry excess loads with the knowledge that, notwithstanding the imposition of a fine, they will still make a residual profit on the trip, and will tend to continue to abuse the roads to the detriment of the community.

As a result of their having been detected and convicted for a second time for a speed offence, the licences of six drivers were cancelled for periods ranging from two to six months.

The offences against the provisions of the Motor Car Act during the financial years 1952–53 and 1953–54 are summarized hereunder :—

—	1952–53.	1953–54.
Speeding (freight vehicles)	320	257
Speeding (passenger vehicles)	2	1
Exceeding 17,000 lb. on one axle	571	1,084
Exceeding weight on axle group	109	203
Exceeding 6-ton limit	142	87
Exceeding conditions of special permit	66	45
Exceeding load capacity	29	42
Exceeding 5,000 lb. on one tyre	3	..
Exceeding 8 ft. in width	59	56
Exceeding 12 ft. in height	7	23
Exceeding length limits	63	103
Refusing to allow vehicle to be weighed	1	3
Failing to carry permit	3	..
Using trailer with articulated vehicle	..	2
	1,375	1,906

IMPOUNDING OF STOCK.

Of the 515 reports presented during the year by the Board's inspectors dealing with offences against various provisions of the Country Roads Act, 489 were in respect of unattended stock on State highways, of which 453 resulted in successful prosecutions. This last figure is 18 less than for the previous year, and there was a corresponding drop in fines from £1,282 to £1,260 5s. The average fine per case was £2 15s. 8d., a rise of 2s. per case, due chiefly to the proving of prior convictions against constant offenders, on whom the maximum fine of £10 was imposed.

Although the number of persons detected was only 18 less than in the previous year, the number of stock found on State highways was 3,758, a drop of 48 per cent. Of these, 659 were impounded, a drop of 26 per cent., the remainder being released to owners who were either fined or warned. It is again emphasized that the fines imposed are far too small to be a serious deterrent to persistent offenders.

COLLECTION OF FINES.

With the assistance of a member of the Mobile Traffic Police, the collection of outstanding unpaid fines has continued, and in this connection, the amendment contained in Act No. 5608, which provided for the issue of a commitment warrant on declaration on the distress warrant that the person is resident outside Victoria, has proved to be of great assistance. The amount of actual cash collected by the Board during the financial year was £1,543 10s., an increase of £171 over the sum collected during the previous year.

These collections included fines imposed as far back as 1948–49, and are a tribute to the efforts of the officers concerned. Their efforts are still being continued and are, in fact, being intensified. The Board is grateful for the co-operation of the Chief Commissioner of Police in making one of his officers available to assist in this important work.

WEIGHBRIDGES.

In view of the extremely heavy commercial traffic which operates over the Hume Highway, it was considered advisable by the Board to install its own weighbridges along the highway at Seymour, Wallan, and Benalla, to facilitate the weighing of loads considered to be in excess of legal limits.

The first of these was installed at Seymour and opened for use in February, 1954, in time to deal with seasonal traffic between the Shepparton area and Melbourne arising from the cartage of soft fruits. Since then, 166 overload offences have been detected

at the weighbridge, of which 119 have been dealt with and fines to the amount of £1,595 imposed. Many of these offences would not have been detected had loadometers been used, owing to the necessity for allowing a certain tolerance in the loads registered on these devices, whilst the handling of the traffic, which totalled up to 150 vehicles in one night, was much more expeditious. The weighbridges at Wallan and Benalla are now installed, and will commence operation shortly.

A major decision which should have a lasting effect in bringing about a substantial reduction in the incidence and severity of overloading was made by the Board late in the financial year when it decided to invoke the provision in the Motor Car Act whereby drivers of seriously overloaded vehicles may be instructed to unload so much of the load as will bring the gross weight within legal limits.

TRAFFIC LINE MARKING.

During the financial year 1953–54, the total mileage of roads maintained in a "striped" condition was increased by 629 miles, from 1,384 miles in 1952–53 to 2,013 miles. As some sections of road had to be marked more than once during the year, and some roads had to be marked for three or four lanes, the maintaining of these 2,013 miles of road in a "striped" condition involved the painting of 3,023 miles of line on roads under the jurisdiction of the Board, in addition to 197 miles of centre line stripes on other roads marked on behalf and at the cost of municipal councils.

The total expenditure on the above work was £23,776, which represents an average cost of £7 8s. per mile of line, whilst 10,462 gallons of lacquer were used at an average rate of application of 3·26 gallons per mile.

The corresponding figures for the previous financial year were £7 17s. per mile of line and 3·32 gallons of lacquer per mile.

ACTS AFFECTING THE BOARD.

The following legislation affecting the Board was enacted during the financial year 1953–54 :—

Motor Car (Fees) Act 1953 (No. 5751).

Section 8 of the *Motor Car Act* 1951, No. 5616, provided that, in addition to any other fee payable in respect of the registration of any motor car under that Act, there should be paid an additional fee at the rate of 2s. 6d. per unit of horse power in the case of cars and £1 per vehicle in the case of motor cycles. The Act further provided that until the 30th June, 1953, all money received by way of additional registration fees under this Section would be paid into consolidated revenue.

Act 5751 provided for these additional fees to be paid into consolidated revenue up to the 30th June, 1954.

Public Works Loan Application Act 1953 (No. 5763).

This Act provides for the application from loan monies of various amounts for the special purposes set out in the Schedule to the Act. The following items concern the Board :—

Government contribution towards the cost of strengthening certain unclassified roads at Heyfield to carry straddle trucks—£4,000.

For the purpose of carrying out repairs to and replacements of roads and bridges damaged by fire or flood, including assistance to municipalities in connection therewith—£100,000.

CONFERENCE OF STATE ROAD AUTHORITIES OF AUSTRALIA.

The Sixteenth Conference was held at the offices of the Department of Main Roads, Sydney, from the 14th to the 18th September, 1953, and was attended by the representatives of the other State Road Authorities throughout the Commonwealth, with a representative of the Commonwealth Department of Works. An officer of the Department of Shipping and Transport was also present at one stage of the conference.

Among the subjects discussed were costs of roadmaking machinery, liaison with the Australian Transport Advisory Council, various standard specifications under consideration by the Standards Association of Australia, a symposium on soil stabilization, investigation into moisture conditions in subgrades, invitation of tenders for bitumen supplies, and route numbering.

The conference also dealt with recommendations from the various Technical Officers' Committees relating to the use of glass beads or reflectors for road signs, standard methods of sampling of roadmaking materials, trends in the design of pavements for rural roads resulting from the recent increase in heavy truck traffic, road design standards, highway bridge design specifications, and economy in the use of steel.

Arrangements were made for meetings of the Principal Technical Committee (Adelaide, May, 1954), Materials Research Committee (Adelaide, March, 1954), Bridge Design Committee (Hobart, February, 1954), and Plant and Equipment Committee (Sydney, March, 1954).

CONFERENCE OF MUNICIPAL ENGINEERS.

The 10th Conference of Municipal Engineers, convened by the Board, was held in the Auditorium, Police Headquarters Building, Melbourne, on the 26th and 27th May, 1954, there being an excellent attendance of municipal engineers from all parts of the State.

As in previous years, municipal engineers were invited some time prior to the conference to submit items for inclusion in the Agenda, but on this occasion the comments of the Board's officers on the various points raised were prepared and sent to all municipal engineers before the conference, to enable them to be assimilated and to save time at the conference itself. This altered procedure proved to be very acceptable to all concerned.

The conference was opened by the Hon. S. Merrifield, M.L.A., Minister of Public Works, who in his remarks again indicated his full appreciation of the problems and difficulties associated with road and bridge construction and maintenance in this State. The items on the Agenda included a paper by Mr. R. R. Anderson, C.E., A.M.I.E. (Aust.), Engineer to the Shire of Benalla, on the maintenance organization within that Shire, and a talk by Mr. F. West, the Board's Divisional Engineer at Bendigo, on his recent mission abroad. The remaining items covered a wide field. On the afternoon of the 27th May an inspection was made of the nursery of the National Resources Conservation League of Victoria at Springvale, where particular attention is being given to the propagation of species of trees suitable for roadside planting in various parts of the State, and to the dissemination of information on their planting and preservation. (Plates Nos. 56 and 57.)

VISITS FROM OVERSEAS ENGINEERS.

Under the Commonwealth Technical Co-Operation Scheme in South and South-East Asia (known as the Colombo Plan), in which the Commonwealth Government is a participant, six overseas engineers were attached to the Board to enable them to learn the methods and technique employed by the Board and to study the Board's organization.

Mr. J. L. Steevensz, of Indonesia, who had commenced his course with the Board early in 1953, concentrated on mechanical matters and on road planning and construction, and completed his work with the Board in August, 1953.

Mr. S. Mahalingham, of Ceylon, after being attached for a period to the Department of Main Roads, New South Wales, spent a few days with the Board in August, 1953.

Messrs. K. T. Hossain and M. N. Shafi, of Pakistan, were with the Board from September, 1953, to January, 1954, whilst Mr. F. Beg, Chief Engineer of the Public Works Department for Phopal State, India, spent a few days here in November, 1953. Mr. R. Promoedgi, of Indonesia, was attached to the Board during portion of February and March, 1954. (Plates Nos. 58 and 59.)

CONFERENCES

Plate No. 56.—Tenth Conference of Municipal Engineers.

Plate No. 57.—Tenth Conference of Municipal Engineers on visit to nursery of Natural Resources Conservation League at Springvale.

OVERSEAS VISITORS

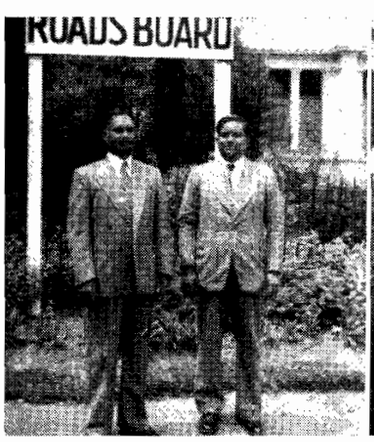


Plate No. 58.—Messrs. M. M. Shafi and K. T. Husgain, Visiting Engineers from Pakistan.

Plate No. 59.—Mr. F. Beg, Chief Engineer of Bhopal State, India.

Plate No. 60.—(From L. to R.) Messrs. D. V. Rao (India), S. Deany, H. Rutherford, and H. D. Gupta (India) discussing bituminous surfacing.

In addition to the above, Messrs. C. B. Rao and H. D. Gupta, of India, spent two weeks with the Board in January, 1954, under United Nations Fellowships. (Plate No. 60.)

MISSIONS ABROAD OF OFFICERS.

As mentioned in the Board's Fortieth Annual Report, the Board's Divisional Engineer at Bendigo, Mr. F. West, B.C.E., M.I.E. (Aust.), left Melbourne by air on the 20th May, 1953, for the United States to observe, through the Bureau of Public Roads at Washington, developments in the theory and practice of highway improvement and utilization, including soil stabilization, low cost bituminous surfacing, and general aspects of tunnel design and operation.

Mr. West returned to Melbourne via Canada and the United Kingdom on the 30th January, 1954. He completed his inspection in the United States early in October, 1953, and subsequently, studied recent trends in research and practice in road and traffic engineering in the United Kingdom for a period of approximately ten weeks.

The very valuable information obtained by him in both countries has been embodied in a report which is being printed for distribution.

DOMINION CIVIL SERVICE FELLOWSHIPS.

In the 38th and 40th Annual Reports reference was made to the award to Mr. K. G. E. Moody, B.C.E. (Hons.), M.Eng.Sc. (Hons.), of the Board's Engineering staff of one of the five fellowships offered in 1951 by the Commonwealth Fund Foundation of New York to persons with appointments in the service of the Governments of Australia, New Zealand, and South Africa, these fellowships being tenable in the United States of America.

Mr. Moody chose as his field of research the behaviour of reinforced concrete and steel structures when subjected to loads approaching the maximum loading capacity of the structures, and subsequently obtained the degree of Doctor of Philosophy. Professor Hognestad, of the University of Illinois, under whom he studied, in a letter to the Director of the Commonwealth Fund, described Mr. Moody as possessing ability and sound judgment to an exceptional extent, and commended him for his successful completion of an extremely ambitious programme of study, a tribute which was noted by the Board with great satisfaction. Dr. Moody returned to Melbourne at the end of September, 1953, after having taken the opportunity of pursuing his investigations in England en route. He is engaged on special research work associated with the Board's Bridge Division, with particular reference to composite action between steel and concrete and the testing of bridges in relation to heavy loadings.

EMPLOYMENT.

The total number of men employed by the Board for varying periods during the financial year 1953–54, i.e., field personnel as distinct from staff, was 4,574, as compared with 4,502 in the previous financial year. The peak was reached in December, 1953, when the total number employed was 2,522. Of this total, 355 were employed on works being carried out for other authorities, including 225 engaged on Commonwealth works.

The peak of employment in respect of works carried out for other authorities was reached in April, 1954, when the number of men employed was 414, including 195 on Commonwealth works.

Whilst these figures indicate an increase in the Board's own direct labour effort, they also show that the Board is doing work of considerable magnitude for other authorities and for the Commonwealth Government.

Taking into consideration the men employed by contractors and those engaged on works carried out by municipal councils with funds provided by the Board, it would appear that the total labour force engaged at one time on road and bridge works, wholly or partly financed by the Board, would be between 4,500 and 5,000 men.

ACCIDENTS TO EMPLOYEES.

The number of accidents in which employees of the Board were involved during 1953–54 was 583, i.e., 24 less than in the previous financial year.

The general nature of the accidents, which, fortunately, were not all serious, is set out in the following statement. The fact that four of the Board's employees lost their lives through accident during the year is, however, deeply regretted :—

Fatal	4	Poison	4
Strains and sprains ..	66	Heart strain	2
Fractures	29	Head injuries	21
Eye injuries	78	Infections	21
Bruises and lacerations ..	98	Miscellaneous	111
Burns	28		
Injuries to limbs ..	121	Total	583

CANTEEN.

A modern canteen erected by the Public Works Department at the Central Workshops, South Melbourne, with interior furnishings and fittings designed by the Board's officers, was opened in April, 1953, and an agreement was entered into with a contractor specializing in such work for the running of the canteen. For various reasons, however, patronage declined until the Board undertook direct control. The present system of operation has revealed a gratifying return of patronage, and the indications are that the canteen will, henceforth, justify its existence as an attractive adjunct to the Central Workshops establishment.

HOSTEL.

As the Board's hostel, " Trinafour " in Holmes Road, Moonee Ponds, which had been purchased for the purpose of accommodating qualified tradesmen from Great Britain under a group nomination, was not being utilized to its full capacity owing to a curtailment in the supply of these tradesmen, the Board decided to discontinue its operation.

The property was leased on the 1st April, 1954, for a period of three years, and is now being used for the accommodation of Asian students attending various centres of learning in this City.

MOTOR REGISTRATION.

Registrations effected during the year, under the Motor Car Acts, totalled 567,204. This is an increase of $3\frac{1}{3}$ per cent. on the registrations effected during the previous year and indicates a renewal of a tendency towards increasing numbers of motor vehicles, the increase reported last year being only $1\frac{1}{4}$ per cent. as compared with 20 per cent. in the previous year.

Details of registrations are set out here under :—

Vehicles.	Financial Year 1952–53.		Financial Year 1953–54.		Increase.	Decrease.
Private—						
New	28,556		36,258			
Secondhand—						
Re-registered	15,966		14,356			
Renewals	326,348		342,039			
		370,870		392,653	21,783	..
Commercial—						
New	7,072		7,697			
Secondhand—						
Re-registered	4,392		3,914			
Renewals	71,149		69,872			
		82,613		81,483	..	1,130
Primary Producers—						
New	4,343		3,801			
Secondhand—						
Re-registered	2,598		2,358			
Renewals	37,020		39,339			
		43,961		45,498	1,537	..
Hire		4,825		4,561	..	264
Licences under Motor Omnibus Act ..		759		812	53	..
Trailers		12,442		11,342	..	1,100
Traction Engines, &c.		36		15	..	21
Motor Cycles		33,437		30,840	..	2,597
Total		548,943		567,204	23,373	5,112

BOARD'S PERSONNEL—SECOND WORLD WAR.

Although a number of years has elapsed since the termination of the Second World War, it is thought desirable to place on record the names of those officers and employees of the Board who served in the Forces. A similar record of those who served in the first World War appeared in the Board's Fifth Annual Report.

The following list contains the names of 60 members of the staff and 536 employees, although there are probably others of whom particulars are not recorded. Nine officers and at least eight employees lost their lives.

Enlistments from Staff.

Alford, J. R.
Archibald A. S.
Atkinson, R. S.
Attridge, F. J.

Banks Smith, S.
Beale, R.
Bruford, P.
Brumley, D. L.

Cameron, D. A.
Chapple, D. R.
Cooper, R. G.
Crebbin, J. N.

Davies, D. H. V.
Dohrman, J. F.
Doig, S. M.
Dolamore, W. H.
Deverall, A.

Eastick, R. F.
Edwards, J. F.
Evans, J.

Fletcher, P. N.
Fowler, W. A.
French, G.

Graham, J. O.
Green, D. G.
Guthrie, A. E.

Hewson, D. T.
Hocking, H. M.
Holmes, A. F.
Hosking, F.
Hutchins, B. G.

Jackson, F. W.

King, E. J.

Martin, E. H.
Mau, F.
Metzner, C. B.
Montgomery, A. M.

Neville, W. F.

O'Donnell, I. J.

Roberts, C. G.
Rough, R. L.

Sargeant, H. T.
Smart, W. H.
Snell, R. R.
Storey, T. (Miss)
Swift, R. S.

Thompson, A. G.
Thorpe, J. D.
Tucker, R. N.
Turnbull, J. E.
Turner, F. W.
Turner, J. J.

Upton, L.

Wade, T. A.
Walsh, K.
Whitehead, R. V.
Wilkinson, W. M.
Willis, W. D.
Wood, A. V.

Yardy, K. D.

Enlistment from Employees.

Abbey, C.
Abbey, W. L.
Acton, N.
Adams, L. S.
Agnew, W.
Airey, A. C.
Akers, J. T.
Albert, S.
Aldridge, A.
Alford, J. R.
Allen, L.
Anderson, J.
Andrews, J.
Angus, R.
Ansell, A.
Arkley, R. R.
Armstrong, F. R.
Armstrong, O. J.
Atkins, J.
Auger, F.
Avery, A. B.

Bailey, J.
Baillie, F. H.
Baldwin, A. F.
Balke, K.
Bandel, L. R.
Barnes, E. R.
Barry, P.
Bartlett, E.
Bassett, R.
Batchelor, R. J.
Beasley, A. J. (Jr.)
Beard, R. C.
Benson, W.
Bernds, N.
Berry, B.
Berry, B. E.
Beths, F. B.
Blackmore, M. E.

Blake, P.
Blake, T. J.
Bortoli, L.
Bound, A. D.
Bourke, D.
Bourke, N. S.
Bowden, A. H.
Boyes, C.
Brady, V. P.
Bragg, J.
Brauer, L. G.
Bray, W.
Brennan, F. J.
Briggs, H.
Briggs, S. W.
Bristow, J.
Brown, A.
Brown, G.
Brown, L.
Brown, P.
Brown, R.
Brown, R. E. F.
Bruce, J. W.
Brydon, K. C.
Buchanan, D.
Bunn, C. C.
Burgess, R.
Burkingshaw, A. H.
Burns, F.
Burton, J. W.
Buse, G.
Butcher, L. C.

Cain, F.
Cairns, W. T.
Callow, I.
Callow, P.
Callow, S.
Cameron, G. W.
Cameron, H. H.

Carland, J. C.
Carlyle, W. J.
Carter, G.
Cartledge, L. H.
Cassidy, A. J.
Caughey, O.
Caulfield, P.
Challis, L. J.
Charters, W. W.
Clarkson, J.
Clinton, E.
Cock, H. G.
Cole, W. E.
Coleman, T.
Collins, A. M.
Collins, F. E. W.
Collins, K.
Collins, R. J.
Collins, T.
Combridge, H. H.
Connell, R. F.
Connelly, C.
Connor, B. G.
Connors, W. J.
Conroi, I.
Considine, G. A. P.
Cousley, J. W.
Cousins, L.
Coverdale, G.
Cowell, A.
Cox, A.
Cox, F.
Cox, T.
Crichton, G.
Cross, W. J.
Curtis, I. H.
Cusworth, H. S.

Davey, C. H.
Davey, J. A.

Davidson, N. A.
Davis, A. G.
Davis, D. E.
Davis, F. K.
Davis, J. E.
Delaney, A.
Delaney, K.
Deering, F.
Dellar, J. R.
Dennis, R. A.
Devers, H. J.
Dickson, R.
Diprose, F. C.
Dodd, D.
Douglas, M. J.
Drake, S.
Druce, C.
Drummond, R.
Drury, C.
Duff, H. G.
Duggan, J.
Dunn, H. G.
Dunn, J.
Dunne, E. P.
Dureau, J. L.

Ebling, A.
Eddy, L. J. E.
Elliott, E.
Emonson, J. G.
Enzi, E.
Evans, A. H.
Evans, H.
Every, D.
Eyre, A. J.

Fallis, W.
Farmer, A.
Farmer, F. N.
Faulkner, S. J.

ENLISTMENTS FROM EMPLOYEES—*continued.*

Fedley, R. C. A.
Ferguson, D.
Fernie, J.
Ferris, A.
Fisher, H. G.
Fisher, H. P.
Fitzgibbon, J.
Fitzpatrick, F. C.
Fogarty, J. S.
Foley, H.
Fox, J. E.
Fraser, D. T.
Freeman, B. E.

Gale, T. J.
Galvin, P.
Garrard, A.
Garthwaite, S.
Gartlan, B.
Gartlan, B. P.
Gascoigne, J. A.
Gaynor, F. L.
Gaynor, J. W.
Gebbie, B. V.
Gibbs, G. E.
Gillies, D. C.
Gillespie, R.
Gilmour, D.
Gooding, G.
Goodwin, F.
Gorton, J. F.
Graham, A.
Grant, R. R.
Grayson, D.
Green, L.
Grenfield, J.
Grinfell, W.
Grundy, W.

Haberfield, R.
Haebich, E. A.
Haig, R. R.
Hamilton, F. W.
Hamilton, H.
Hammet, J.
Hammon, L. R.
Hannon, J. T. M.
Hannon, P. J.
Harding, A. L.
Harding, E.
Harding, L.
Hardy, G. E.
Harris, C.
Harris, H.
Harris, T. C.
Harrison, C.
Harrison, H. H.
Havers, J. D.
Haylock, C.
Heard, T. H.
Heazlewood, F. W.
Heenan, J.
Hewat, W. J.
Hicks, L.
Hider, W.
Hill, J.
Hinton, K.
Hobbs, A.
Hogan, J.
Hollingsworth, A.
Hotchin, A. L.
Hunter, F. R.
Hunter, W.

Iken, K. W.
Ireland, A.

Jervis, F. J.
Johnson, A. R.
Johnson, H. G.
Johnston, E.
Joiner, W. H.
Jones, A. G.
Jones, K. A.
Jones, R.
Jones, R. C.
Jones, W. A.
Jonson, J. C.
Jordon, R. G.
Joy, N. M.
Jutson, W.

Karnatze, E.
Keaney, P.
Kelly, B. J.
Kelly, J.
Kelly, J. W.
Kennedy, F. W.
Kesper, K.
Key, G. H.
Kilpatrick, H. R.
King, G.
Kirby, R.
Kirkman, E. W.
Klunitz, J.
Knights, J. H.

Lacey, J. W.
Lakeman, L. C.
Lane, C. R.
Lane, J.
Lane, M. J.
Larsen, J.
Latta, J. A.
Laurie, A. J.
Laurie, L. R.
Laze, C. H.
Leahey, A. L.
Lee, E. C. W.
Leitch, N.
Lindsay, J.
Lingenberg, —.
Lloyd, H.
Lougoon, R.
Love, G.
Lowery, C.
Lukins, T. A.
Lunn, C.
Lunsden, F.
Lynch, F.
Lynch, L.
Lynch, T.
Lyons, J.

Mackley, K. H.
Maddison, —.
Martin, G. R.
Meekle, D. R.
Meikle, C.
Mercer, B. J.
Mercer, W. A.
Miles, A.
Miles, W.
Miller, J.
Milliken, D. R.
Mills, J. G.
Mills, P. O.
Mills, R.
Mitchell, A.
Mitchell, F.
Mitchem, H. M.
Moody, J. W.
Moran, E. T.
Moran, O. J.
Morehouse, C. L.
Morley, A. S.
Morrison, C. D.
Muller, E.
Muller, R.
Munro, A.
Murphy, F. T.
Murphy, T.
Murphy, V. C.
Murrell, W. J.
Musgrove, R. W.
Mustey, C. J.

MacAlister, E. M.
McArthur, T.
McAuliffe, J. M.
McCarthy, C.
McCarthy, L. G.
McCartney, R. J.
McCormack, E.
McCormack, H.
McCormack, L. T.
McCormack, W. P.
McCrickard, K.
McCrohan, V.
McDonald, C.
MacDonald, T.
McGeary, D. E.
McGregor, H.
McInnes, J. A.
McIntosh, M. R.
McIntyre, D. M.
McKay, C.
McKay, P. J.
McKay, T. T.
McKee, R. A.
McKenzie, G.
McKenzie, R. J.
McLaren, J. C.
McLaughlin, H.
McLaurin, A.
McLeod, A. R.
McLeod, H.
McLeod, J. L. J.
McLeod, L.
McLeod, S. A.
McMinn, —.
McNab, C. L.
McNalty, E. R.
McNalty, J.
McNaughton, H.
McPherson, W.
McQueen, W. A.

Nalder, R. J.
Neave, D. R.
Nepean, A.
Nepean, A.
Newman, A. D.
Newman, F.
Newton, A. W.
Nicholls, A.
Nolte, F.
Norman, E. J.
Northway, G.
Norton, S. A.
Noy, W.
Nuske, E.
Nuske, O. A.

O'Brien, C. R.
O'Brien, E.
O'Brien, F.
O'Brien, J.
O'Donnell, F.
O'Leary, P. K.
Oldfield, R. S.
Oliver, A. E.
O'Keefe, E. V.
O'Rourke, W.
Osterfield, F. J.
O'Sullivan, C. L.
O'Sullivan, J. R.
Owen, J.
Oxford, G. T.

Patterson, J.
Peake, A.
Perkins, H.
Pettigrew, W. T.
Pevitt, I. C.
Pickering, A.
Pietersen, A. M.
Pike, W. R.
Pittock, L.
Platt, F. J.
Platt, R.
Plier, J.
Plumridge, F. G.
Pollock, H.
Potter, A. H.
Powell, T.
Predl, L. F.
Preece, A. J.
Presser, H. H.
Primrose, J.

Quarrell, I. J.
Quigley, —.
Quintan, F.

Ralph, E. R.
Rankin, A. J.
Reddie, A.
Reed, W.
Reid, J.
Reid, N.
Reynolds, J.
Rickard, L. G.
Ridgway, E.
Roberts, C. E.
Roche, L. H.
Rommel, K.
Rooke, L. G.
Rothwell, A. J.
Rowe, O. M.
Rowe, D. C.
Russell, A. J.
Russell, W. J.
Ryan, D. G.
Ryan, J. C.

Saward, B. C. A.
Sargent, F. J.
Sayers, P.
Scarff, J.
Schliebs, L. R.
Scott, D. W.
Scott, K.
Scott, L. J.

ENLISTMENTS FROM EMPLOYEES—*continued.*

Selwood, G. A.
Selwood, L. H.
Selwood, H. L.
Selwood, J. A.
Sewell, H.
Sexton, P.
Sheedy, P.
Shepheard, E.
Short, E. R.
Sinclair, H.
Smith, A. G.
Smith, C.
Smith, H. C.
Smith, R.
Smith, R.
Smith, W. A.
Smith, W. J.
Somers, P. H.
Spencer, E. F.
Spicer, Y.
Squires, W.
Stafford, W. F.
Steers, C.
Stephenson, A. J.
Stephenson, N. J.
Stevens, A.
Stevens, R.
Stevenson, J. S.
Storton, H.
Stowe, E.
Sullivan, J. P.
Swetman, G. C.
Swift, R. S.
Sydall, H.

Taig, H. S.
Talbot, F.
Talton, W. J.
Taylor, C. R.
Taylor, H. E.
Terry, D.
Thomas, J.
Thompson, A. J.
Thompson, D. K. G.
Thompson, H.
Thomson, C. R.
Thomson, W. R.
Thwaites, T.
Toomey, T.
Topp, E. C.
Treloar, A.
Trimble, J. E.
Tucker, D.
Tuddin, J. A.

Upham, S. J.

Vanderfeen, W.
Vines, W. G.
Vincent, L.

Waite, J.
Walker, A.
Wallace, F. A.
Walters, G.
Walsh, P.
Ward, J. P.
Ward, K. E.
Warner, T.
Warwick, G.
Watson, R.
Watts, H. F.
Watts, J.
Webster, C.
Webster, F. J.
West, W. S.
Westgarth, A.
Wharton, A. J.
White, H. L.
White, J. W.
White, R.
White, R.
Whitehead, H.
Whiteley, C. J.
Whitfield, T.
Whittaker, J.
Whitty, H.
Wilkinson, D. H.
Williams, F. J.
Williams, J. R.
Williams, R. H.
Wilson, A. H.
Wilson, A. M.
Wilson, D.
Wilson, F.
Wilson, F. H.
Wilson, H.
Wilson, T. J.
Winnell, A. C.
Wise, H.

Yeomans, C.
Young, G.

Zapelli, R. P.

STAFF.

Since the 1st July, 1953, the total number of officers on the Board's staff has decreased from 291 males and 46 females on the permanent staff and 81 males and 60 females on the temporary staff, a total of 478, to 466 made up as follows :—

Permanent Staff—	
Males	311
Females	57
Temporary Staff—	
Males	54
Females	44
Total—	
Males	365
Females	101
	466

Thirty-five male officers and 30 females resigned or retired during the year, 1 officer (Mr. H. E. O'Hare of the Central Stores Staff) died, and new appointments amounted to 58, of which 33 were males and 25 females.

It will be noted that several of those officers who left the Board's service during the year were not replaced, and difficulty is still being experienced in obtaining competent female typists, stenographers, and machine operators, and qualified male engineering officers.

Four officers retired during the year, namely, Mr. R. F. Foster, at the time of his retirement Officer-in-Charge of the Trade Claims Section of the Accounts Branch (34 year's service), Mr. F. T. Stone, second-in-charge of the Municipal Claims Section of the Accounts Branch (17 years), Mr. W. Jeffrey, Accounts Branch (8 years), and Mr. A. Lehmann, of the Central Workshops Clerical Staff (11 years). Each of these officers had given the Board loyal and efficient service, of which the Board is deeply appreciative.

STAFF CHARITIES FUND.

The members of the Board's staff continue to support this fund by way of contributions on a voluntary basis, which are deducted from their salaries at regular fortnightly intervals.

On the 1st July, 1953, the balance in hand was £117 6s. 1d., and contributions and sundry donations during the year increased this sum to £437 7s. 2d. A total sum of £326 11s. was disbursed during the financial year to 25 different charities throughout the State, such institutions as metropolitan and country hospitals, the Legacy Club, the Returned Servicemen's League, and the Institute for the Blind, being among those participating. Donations on " bulk " basis were also made to several special button-day appeals, a sufficient number of buttons being purchased in this way to serve each of the contributors to the fund. As in the past, a balance is retained in the bank to enable prompt assistance to be given to any urgent appeal which may arise throughout the year.

ACCOUNTS.

Statement of accounts for the year ended 30th June, 1954, appear in the appendix.

The following statement shows the expenditure on road construction, maintenance, &c., from moneys at the disposal of the Board in the Treasury.

—	Under Board's Supervision.	Under Council's Supervision.	Total.
	£ s. d.	£ s. d.	£ s. d.
1. State Highways—			
Construction	943,421 8 4	8,391 0 6	951,812 8 10
Maintenance and reconditioning	1,492,012 17 4	67,192 9 2	1,559,205 6 6
2. Main Roads—			
Construction	256,731 18 7	58,455 12 7	315,187 11 2
Maintenance and reconditioning	269,582 7 1	2,186,107 8 6	2,455,689 15 7
3. Unclassified Roads—			
Construction, reconstruction, &c.	26,150 8 5	463,778 6 3	489,928 14 8
Maintenance	50,838 6 3	287,903 6 7	338,741 12 10
4. Tourists' Roads—			
Maintenance and reconditioning	208,524 12 7	4,451 1 3	212,975 13 10
5. Forest Roads—			
Maintenance and reconditioning	66,545 7 1	33,429 15 1	99,975 2 2
6. Murray River Bridges and Punts—			
Maintenance and reconditioning	16,315 4 8	717 3 11	17,032 8 7
	3,330,122 10 4	3,110,426 3 10	6,440,548 14 2

In addition to the amounts shown in the above statement, the following expenditure was incurred during the year in respect of (*a*) Works carried out on behalf of the Commonwealth Government, State Instrumentalities, &c., and (*b*) Flood and Bush Fire Damage, for which special provision was made by the Government.

	£ s. d.
Commonwealth Government	502,826 16 4
State Instrumentalities, &c.	502,630 18 2
A.M.P. Project—Kaniva Shire..	19,294 17 3
Road Works at Heyfield	3,626 8 3
Flood and Bush Fire Damage..	245,740 12 4
	£1,274,119 12 4

OFFICERS AND EMPLOYEES.

The Board desires to express its appreciation of the loyal and efficient manner in which officers and employees responded to the demands made upon them during the year, when shortages of personnel to deal with a scattered programme of works made conditions difficult. The turnover of staff in certain sections has placed an additional burden upon the other officers but the fact that the organization functioned smoothly and effectively is a tribute to them.

ACKNOWLEDGMENTS.

The sincere thanks of the Board are tendered to the Hon. S. Merrifield, M.L.A., who held office during the year as Minister of Public Works, for his help and interest in its work.

The Board also desires to place on record its thanks and appreciation of the co-operation and assistance of officers in Government Departments and other State Instrumentalities, as well as the Road Authorities in other States. The happy relationships with the Victorian Municipal Councils and their officers are also very much appreciated.

We have the honour to be,

Sir,

Your obedient servants,

D. V. DARWIN, Chairman.

F. M. CORRIGAN, Deputy Chairman.

R. F. JANSEN, Member.

W. H. NEVILLE, Secretary.

CHIEF ENGINEER'S REPORT

Country Roads Board Office,
Melbourne.
22nd October, 1954.

THE CHAIRMAN,

SIR,

I have the honour to submit the following report on matters of engineering interest included in work done in the financial year 1953–54.

MECHANICAL PLANT.

During the year the Board's mechanical plant has been maintained at Central Workshops and Divisional Workshops with assistance to the extent of 5 per cent. by private firms where the Board's shops were unable to do the work on account of labour shortage. The overall efficiencies are shown in Table I., which indicates that there has been slight improvement over the last two years.

The total number of fitters employed has remained substantially the same as last year, but there has been a slight falling off in the number at Central Workshops, instead of the increase required to do the work necessary. This is due to the loss of good men attracted by higher wages paid by private industry, the Board being required to pay at award rates. It is noteworthy that this disability applies at South Melbourne rather than at country centres and apparently indicates that living conditions, including travelling time to work, influences a man's choice of employment considerably. This lines up with reports received from private industry, where it has been found that when a business is shifted from a crowded metropolitan area to a rural or semi-rural district, so that employees are able to have pleasant homes within easy reach of their place of employment, the labour position in that business has materially improved.

During the year a considerable amount of work has been done on the planning and design of the new shops to be erected at Syndal, and a Master Plan showing the areas allotted to the various divisions and sections has been approved. Details and plans of the parts to be constructed first are being prepared.

While the main reason, of course, for transfer of the Central Workshops to Syndal is to provide adequate and more efficient maintenance facilities for plant owned by the Board, it is hoped that improvement in recruiting and retaining skilled men will also result from the move.

Windrow Spreading Attachments for Maintenance Graders.

When a maintenance grader is engaged in building up the shoulder adjacent to the pavement, the normal procedure is to take one run through, cutting the shoulder material and depositing a small windrow just inside the edge of the pavement, then to take another run, spreading the windrow material over the shoulder again. This practice is objectionable for two reasons, firstly, the windrow material on the edge of the pavement is a hazard to traffic until it is respread and secondly, the grader usually has to make two additional trips over the length being maintained in order to spread the windrowed material; one trip to get back into position to avoid working against traffic and the other a working run to actually spread the windrowed material. The Board has developed a windrow spreading blade designed for attachment to drawn maintenance graders; this attachment enables the windrow of cut material to be levelled in the same run as it is cut. The attachment, which is illustrated in Figure 1, consists of an auxiliary spreading blade mounted behind the cutting blade of the grader and is completely under the control of the grader operator so far as depth of spread is concerned. When not in use or when travelling, the auxiliary blade is folded up out

TABLE I.—PLANT EFFICIENCY.

Type of Plant.	Number of Units in Group.	Average Age of Units in Group Years.	Overall Efficiency.			Overall Mechanical Efficiency.			Mechanical Efficiency of Units in the Field.		
			1951–52.	1952–53.	1953–54.	1951–52.	1952–53.	1953–54.	1951–52.	1952–53.	1953–54.
			%	%	%	%	%	%	%	%	%
Crawler Tractors—											
Class I.	54	2·8	32	34	34	41	50	59	79	79	78
Class II.	47	4·8	26	22	31	31	27	49	88	77	77
Class III.	19	5·8	19	20	22	27	27	35	87	72	70
Class IV.	32	4·8	23	29	21	29	38	35	90	82	81
Power Graders—											
Heavy—Tandem diesel ..	116	4·9	64	57	60	67	64	69	94	91	85
Medium—Dual wheel diesel	22	5·8	63	52	36	67	56	57	95	85	93
Lights—Single drive, power control	20	5·7	43	22	42	48	24	66	95	86	94
Patrol power graders ..	27	3·3	53	56	56	64	60	67	94	94	89
"Speed" patrols	8	5·5	51	35	35	54	38	53	92	93	89
Front End Loaders—											
Pneumatic-tyred	66	4·3	..	..	47	..	..	63	..	..	82
Crawler	12	5·75	..	..	26	..	..	41	..	..	71

Definitions :—

(*a*) Overall Efficiency $= \frac{\text{Days worked}}{\text{Working days}} \times 100$ per cent.

(*b*) Overall Mechanical Efficiency $= \frac{\text{Days worked}}{\text{Working days less days lost for reasons other than plant breakdown or overhaul or awaiting overhaul}} \times 100$ per cent.

(*c*) Mechanical Efficiency of Unit in the Field $= \frac{\text{Days worked}}{\text{Days worked + days broken down on the job}} \times 100$ per cent.

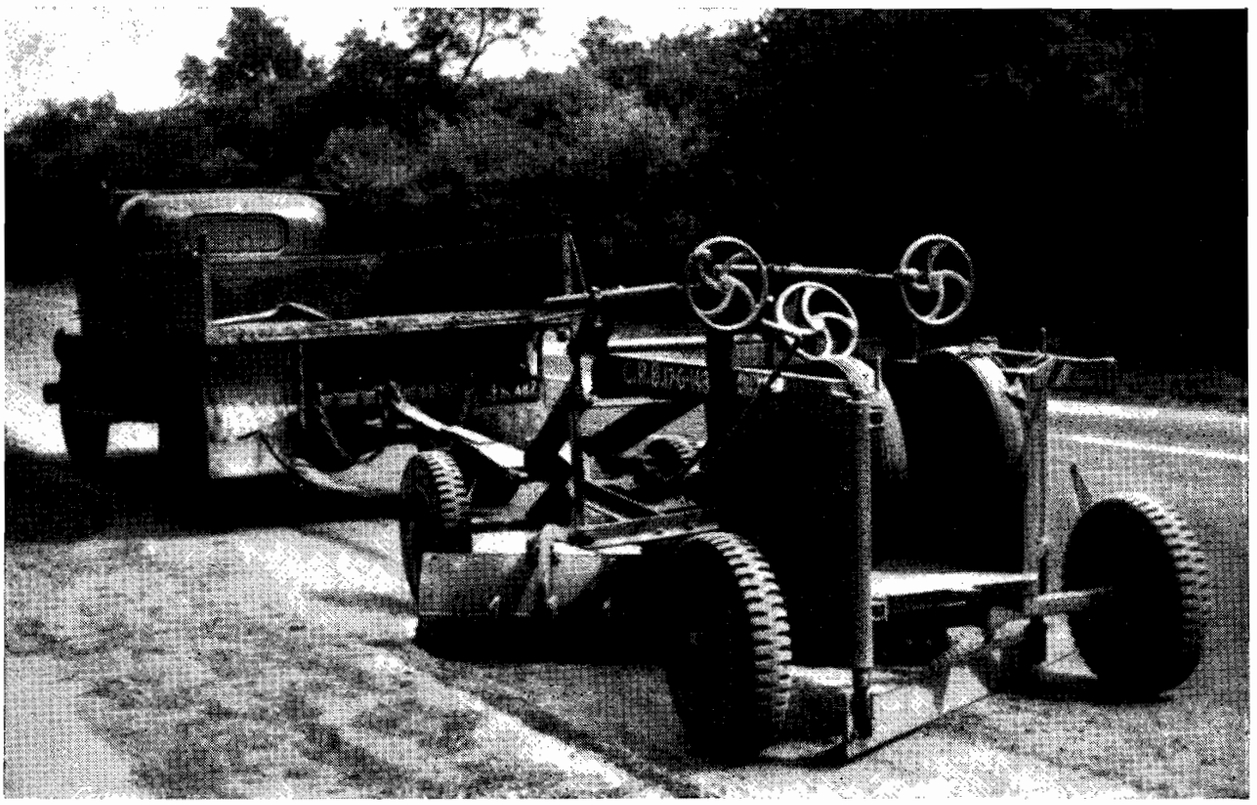


Fig. 1.

of the way as shown in Figure 2. It is proposed to fit this attachment to all drawn maintenance graders operating on sealed section of roads.

A similar attachment for automobile patrol graders is being developed.

Screen for Removing Excess Flats from Aggregate.

A rotary bar-type screen was used to remove excess flats from a quantity of $\frac{3}{4}$-in. one-sized aggregate delivered for resealing the Hume Highway near Kilmore. The screen was 6 ft. long, the bars being placed longitudinally and spaced as shown in Figs. 3 and 4.

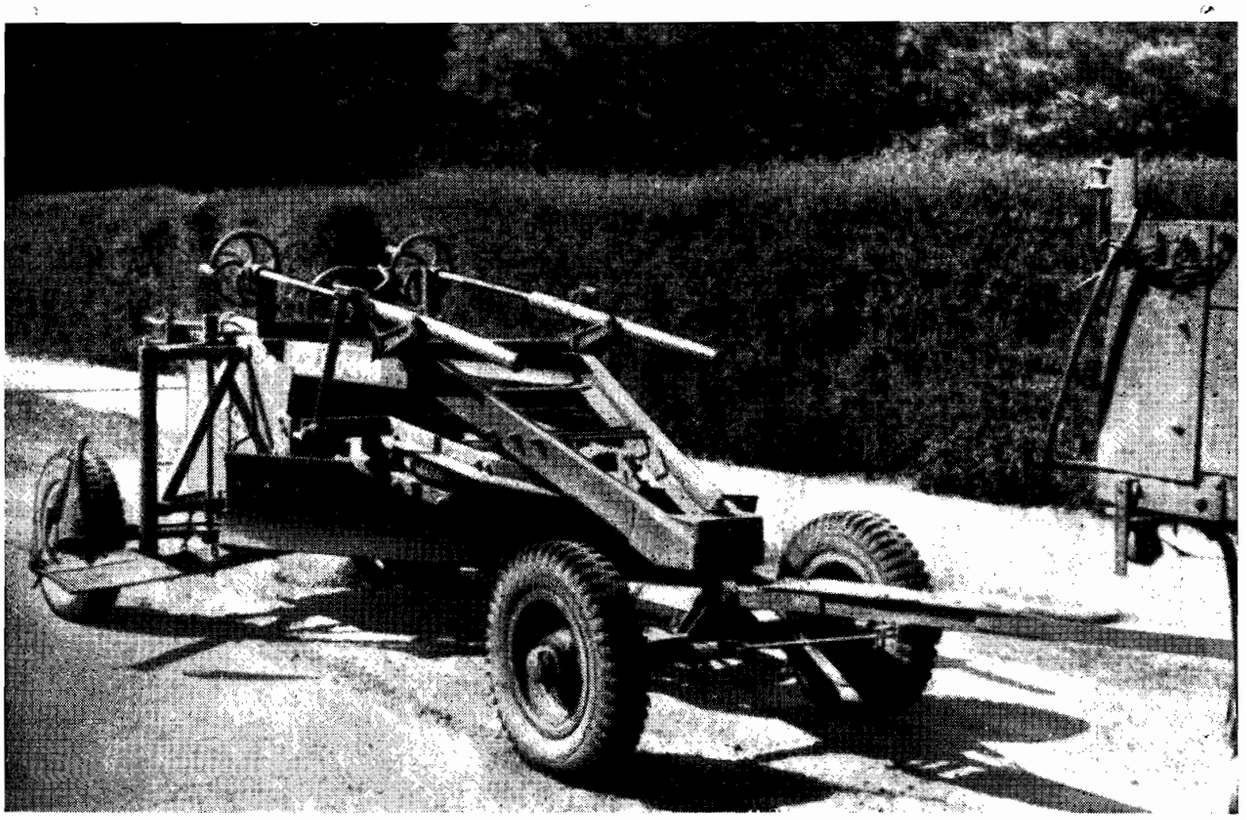


Fig. 2.

Fig. 3.

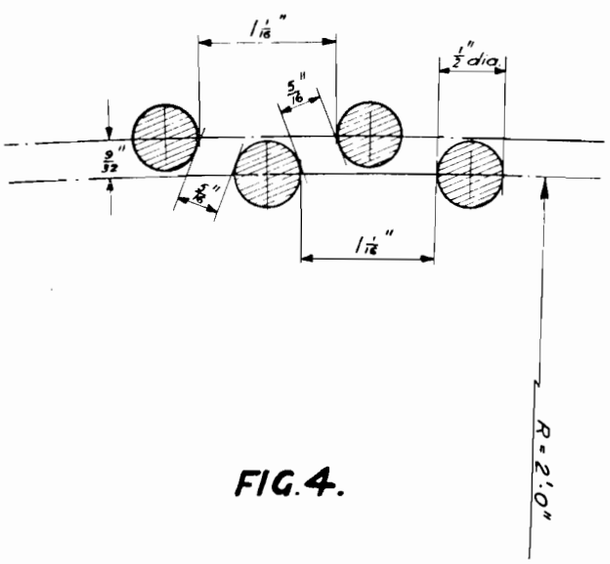


FIG. 4.

Pertinent details of the set-up and results achieved were :—

(1) Tilt of screen = 5° from horizontal.

(2) Speed of operating = 18 revolutions per minute.

(3) Output achieved = 45 cubic yards per day.

(4) Costs :—

	s.	d.	
Loading	4	6	per cub. yd.
Screening	2	0	,,
Restacking	3	0	,,
Supervision	0	9	,,
	10	3	,,

(5) Reduction in flats and improvement in grading, as shown in Table II.

TABLE II.—EFFECT ON GRADING AND PERCENTAGE OF FLATS PASSING THROUGH BAR SCREEN.

B.S. Square Mesh Sieve Opening.	Percentage Passing.		
	Specified.	Before Screening.	After Screening.
1 in.	100	100	100
¾ in.	85–100	91	82·5
½ in.	0–35	26	10·5
⅜ in.	0–7	4·5	1·0
No. 7	0–2	1·0	0·2
Percentage flats ..	35 max.	40·7	30·2

It is considered that the costs could be at least halved if a 12-ft. screen of slightly larger diameter were used, increasing the output to approximately 100 cubic yards per day. The operation proved the value of the bar screen of the type shown as a method of removing undesirable flats from aggregate. It is not intended that the use of portable plant for such work should be encouraged as the proper place for obtaining the specification requirements is at the supply plant.

TRAFFIC ENGINEERING.

Investigations Undertaken.

Considerable work has been done during the past year on investigation and research into several phases of traffic engineering, and the application of the results to the solution of problems relating to design and economic analysis of various projects.

Road Capacity Study.

Hitherto, the Board has perforce adopted road capacity standards as determined and recommended for design purposes by the Highway Research Committee on Highway Capacity (U.S.A.). A study to determine the capacity of roads to discharge traffic under Victorian conditions of driver behaviour and traffic characteristics was therefore initiated. While the work already done has enabled tentative capacity standards to be determined for certain conditions, considerably more field work with statistical analysis of its results will be necessary before practical capacity standards (for specified degrees of congestion) based on local factual data, can be definitely established and used for geometric design.

Location of Capacity Study.

The investigation was undertaken on a straight 2-lane section of the Princes Highway East, east of Oakleigh, where the pavement is 26 ft. wide, visibility is good, and the effect of cross traffic is negligible. Peak traffic volumes varied over a year from 650 to 1,150 vehicles per hour on week days when 30 per cent. of the traffic was commercial vehicles. During weekends and holidays, when the traffic was predominantly passenger cars, peak volumes varied from 950 to a maximum of 1,400 vehicles per hour.

Procedure.

The particular traffic characteristics influencing the capacity of the roadway were determined by means of—

(*a*) speed studies, including the percentages of vehicles travelling at various speeds and mean speed differences of successive vehicles in relation to varying traffic volumes;

(*b*) a study of vehicle spacings in terms of time and distance related to vehicle speeds and traffic volumes;

(*c*) a study of overtaking manoeuvres and trailing times for varying traffic volumes;

(*d*) a study and determination of operating speeds, that is the overall speeds which vehicles are able to maintain when desiring to travel at the design speed of a section of road.

Consideration and analysis of these inter-related studies enabled the possible and practical capacities to be determined.

Practical Capacity.

It was tentatively concluded that for a level straight section of a two-lane roadway under ideal conditions, the practical capacity is 1,200 passenger cars per hour, or 850 vehicles per hour where the traffic is composed of 30 per cent. trucks. The practical capacity is defined as "the maximum number of vehicles that can pass a given point on a roadway or in a designated traffic lane without the density (i.e., the vehicle concentration) being so great as to cause unreasonable delay hazards or restriction to the drivers' freedom to manoeuvre under the prevailing roadway and traffic conditions".

The practical capacity is, therefore, by this definition, a subjective standard, the establishment or adoption of which finally depends on the level of congestion which is to be tolerated for the particular facility under consideration. American findings suggest that the practical capacity for a two-lane road under ideal conditions is 900 passenger cars per hour.

Possible Capacity.

Of particular interest is the extent to which a road or road facility can discharge traffic above the design or practical capacity, although under congested conditions. The possible capacity of a roadway which is reached when all vehicles tend to travel at the same speed, is defined as "the maximum number of vehicles that can pass a given point on a lane or roadway during one hour under the prevailing roadway and traffic conditions".

The study indicated that the possible capacity is 2,000 passenger cars or 1,350 vehicles per hour when the traffic is composed of 30 per cent. trucks. These capacity volumes suggest that one truck has an effect equivalent to about $2\frac{1}{2}$ passenger cars when the roadway is operating at or near its possible capacity.

Vehicle Time Losses.

The studies carried out enabled vehicle time losses, due to the presence of other vehicles on the road, to be estimated for varying traffic volumes. With volumes less than 200 vehicles per hour on two-lane roads, free moving conditions are considered to exist. Under these conditions there is little time loss to vehicles even when attempting to travel at the design speed of the road, and the overall speed of the fastest vehicles is close to the design speed.

When the volume is 850 vehicles per hour (the practical capacity of a straight level section), the time loss is 4 vehicle-hours per hour for each mile of road. If, however, the road is carrying traffic at, say, 1,350 vehicles per hour (the possible capacity for traffic composed of 30 per cent. trucks), the total time losses amount to more than 34 vehicle-hours per hour for each mile of road.

Estimation of Required Hourly Capacity from Random Daily Counts.

Generally, the knowledge of traffic on roads in Victoria is limited to a more or less random 12-hour count (or sometimes a 24-hour count) taken at twelve monthly intervals. Such a random count is not sufficient to give a direct indication of the traffic lanes needed to satisfy future traffic demands nor of other features of the road deemed to be necessary to properly serve road users. It is, therefore, necessary to have some means of estimating peak hourly volumes and their frequency of occurrence from available daily counts in order that practical capacity standards can be applied to the problem of defining the proper amount of carriageway after making due allowance for estimated traffic growth.

The American Association of State Highway Officials has adopted as a design policy (for the National System of Interstate Highways) "the Thirtieth Highest Hourly Volume" considered over a full year, as a reliable criterion of the needed capacity for which it is most practical to design.

A traffic study conducted over a full year has determined the volumes during the 10th, 20th, 30th, and 50th highest hours for one station on a Victorian highway. Daily and weekly traffic patterns, and seasonal fluctuations were also established. From this data it was possible to establish a factor relating a random 12-hour count to an average annual day from which the 30th (or 50th) highest hourly volume can be estimated for planning purposes. For the particular highway station studies, it was found that the 30th highest hourly volume was about 16 per cent. of the average 12-hour week day count. Until a representative coverage of the state highway system has been made, the above percentage might be considered to be a reasonable estimate of the 30th highest hourly volume if such a peak volume is to be adopted for geometric design purposes.

Investigation is necessary to determine, whether in fact, the 30th highest hourly volume is the proper criterion for design in Victoria.

Daily Variations.

Daily traffic variations resulting from the full year's count on the P.H.E. near Oakleigh and a transportation survey carried out over 7 days on various State Highways in 1944–45, are set out in Table III.

TABLE III.—VARIATION OF TRAFFIC DURING A WEEK.

Day of Week.	P.H.E. 1953–54.	Seven State Highways 1944–45.
Monday	0·94	0·92
Tuesday	0·99	1·03
Wednesday	0·94	0·86
Thursday	0·93	0·83
Friday	1·05	0·95
Saturday	0·96	1·08
Sunday	1·19	1·33

PLANS AND SURVEYS.

Staff.

This vital work has again been hampered by loss of trained staff to more remunerative appointments, at a time when the complexity of much of its work in urban areas is increasing.

Photogrammetry.

Every endeavour has been made to render the work of the staff more effective by the greatest possible use of photogrammetry, in which regard it is desired to pay tribute to the co-operation of the Lands Department. Topographical plans at scales as large as 1 in. to 100 ft., with contours at 5 ft. intervals, have proved extremely useful. Checks carried out have confirmed the accuracy of the contours to be within 1 ft. vertically.

State Standard Precise Level Datum.

This work, commenced in 1951, has been steadily extended, although the rate of progress is necessarily not rapid. Co-operation between the Board's staff and the survey staff of the Lands Department is, however, laying the foundation of a sound system of Standard levels throughout the State which will be invaluable in the years to come. Permanent marks are being extended on a planned system of closed circuits, as conditions permit.

Interstate Policy for the Design of Rural Roads.

Under the direction of the Conference of State Road Authorities the production of an acceptable interstate policy for the design of rural roads is now nearing completion and should prove very valuable in co-ordinating design standards throughout Australia.

CONSTRUCTION—COMPACTION OF FINE CRUSHED ROCK.

During the year a detailed examination was made of the processes by which fine crushed rock is consolidated. The compaction of crushed rock on two projects was investigated; the first investigation concerned the use of Footscray basalt on the Western Highway near Rockbank, and the second the use of Berwick older basalt on the Princes Highway East near Pakenham. Certain important fundamental information was obtained.

Degree of Compaction.

The normal method of expressing density as a percentage of either Standard A.A.S.H.O. compaction or Modified A.A.S.H.O. compaction was found to be unsatisfactory when dealing with crushed rock because the Modified A.A.S.H.O. density of the material used was found to vary from 132 to 152 lb. per cubic foot on samples taken from the one heap of material. Investigation showed that the reason for these variations was variation in grading—Fig. 5 shows how the Modified A.A.S.H.O. density varies with grading.

It was found, however, if density was expressed as per cent. "solidity", that is, as the percentage of stone present by volume, then a density satisfactory for the application of a seal coat was about 83 per cent. "solidity", within the narrow range of about $\pm$ 2 per cent. It was also found that crushed rock compacted to a density of 79 per cent. solidity would not kick out under traffic if kept moist. The field determination of "solidity" is a comparatively simple matter and does not require prior tests on the unconsolidated material as are necessary if one of the A.A.S.H.O. compactions is used as a yardstick.

Grading of Crushed Rock.

Irrespective of the method of compaction used it was found impossible to obtain an 83 per cent. "solidity" (equivalent to about 108 per cent. of Modified A.A.S.H.O. compaction, suitable for sealing) unless the grading of the fine crushed rock was very close to a maximum density curve. Crushed rock as spread on the road bed using normal material handling techniques has an extremely wide variation in grading (see Fig. 6), also the average grading is generally a long way from the maximum density grading, usually being on the coarse side, around the No. 7 sieve. Once crushed rock is brought to a maximum density grading, consolidation is easy and rapid. The present technique in using fine crushed rock requires that this final adjustment to a maximum density grading be achieved in the road bed by the action of traffic and rollers. The remarkable evenness of grading which traffic does effect is illustrated by the curves in Fig. 7.

Compaction of Crushed Rock by Rolling.

In the past, various types of rollers have been used for compacting fine crushed rock. Quantitative tests carried out on the works at Rockbank and Pakenham showed the output of rollers per 8-hour day when consolidating crushed rock to 79 per cent. "solidity" to be :—

	c. yds.
9-ton pneumatic tyred roller (50 lb. per sq. in. tyre pressure)	4
25 cwt. vibrating roller	30
10-ton self-propelled steel-wheeled roller (1 m.p.h.)	50
9-ton drawn steel roller (3 m.p.h.) ..	142
9-ton drawn steel roller (6 m.p.h.) ..	190

A pneumatic-tyred roller will probably consolidate a properly graded crushed rock reasonably well, but when used on an average F.C.R. the tyres do not exert enough pressure to crack many stones, and the roller does not move fast enough to cause stones to crack by impact, so adjustment to a maximum density grading by a pneumatic-tyred roller is a very slow process. Until the grading has been adjusted it is not possible to achieve a 79 per cent. solidity by any normal means. It can be shown that on a project which is three-quarters of a mile long and carries 1,000 v.p.d. (12-hour count) the "compacting" effect of traffic in 24 hours will be over 20 times as great as that of a 7-ton pneumatic-tyred roller which only works an 8-hour day. In addition,

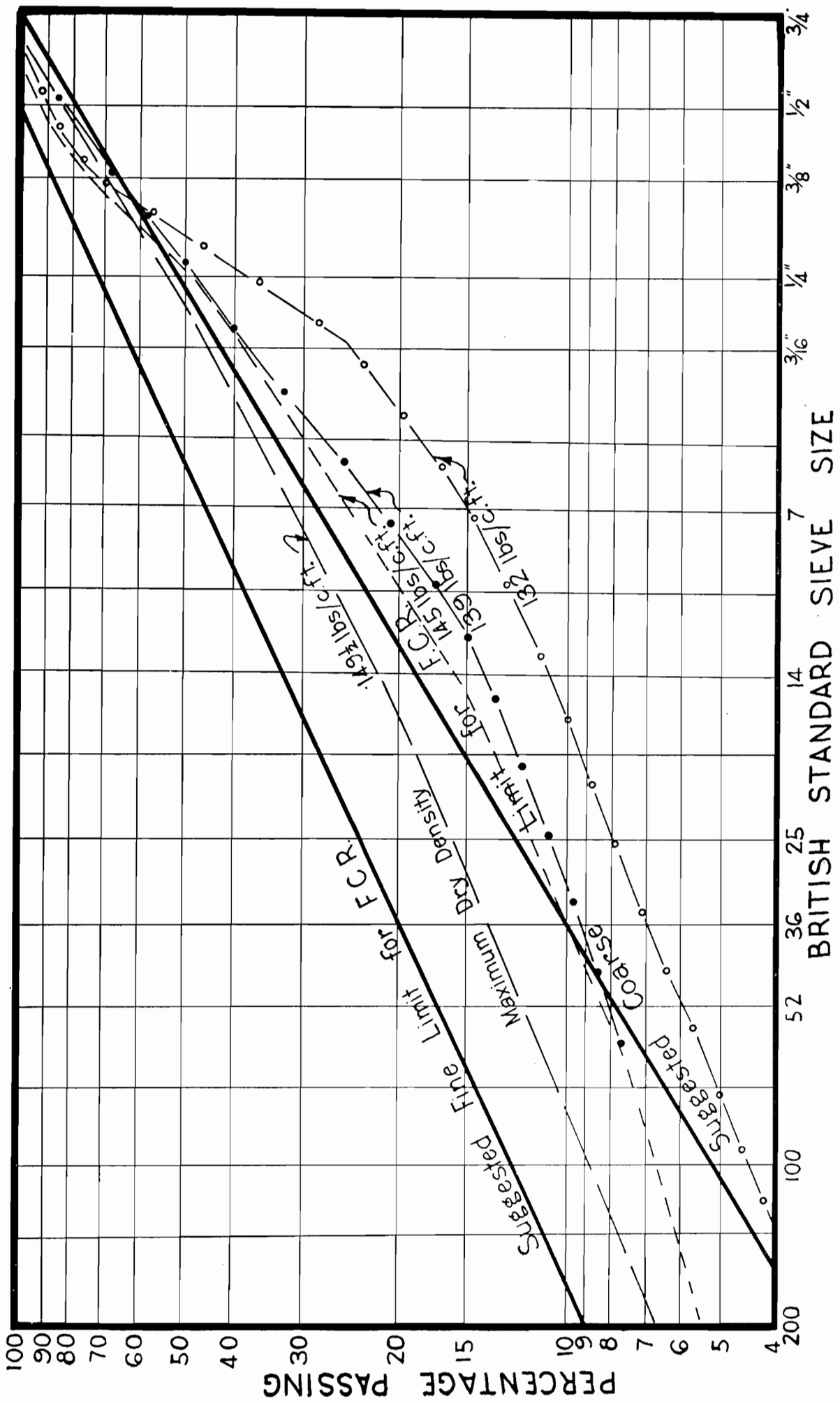

PERCENTAGE PASSING
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
200
100
52
36
25
14
7
3/16"
1/4"
3/8"
1/2"
3/4
BRITISH STANDARD SIEVE SIZE
Suggested passages
Coarse
Maximum Limit for Dry Density for F.C.R.
Fine Limit for F.C.R.
F.C.R. 145 lbs/c.ft.
147 lbs/c.ft.
132 lbs/c.ft.

Fig. 5.

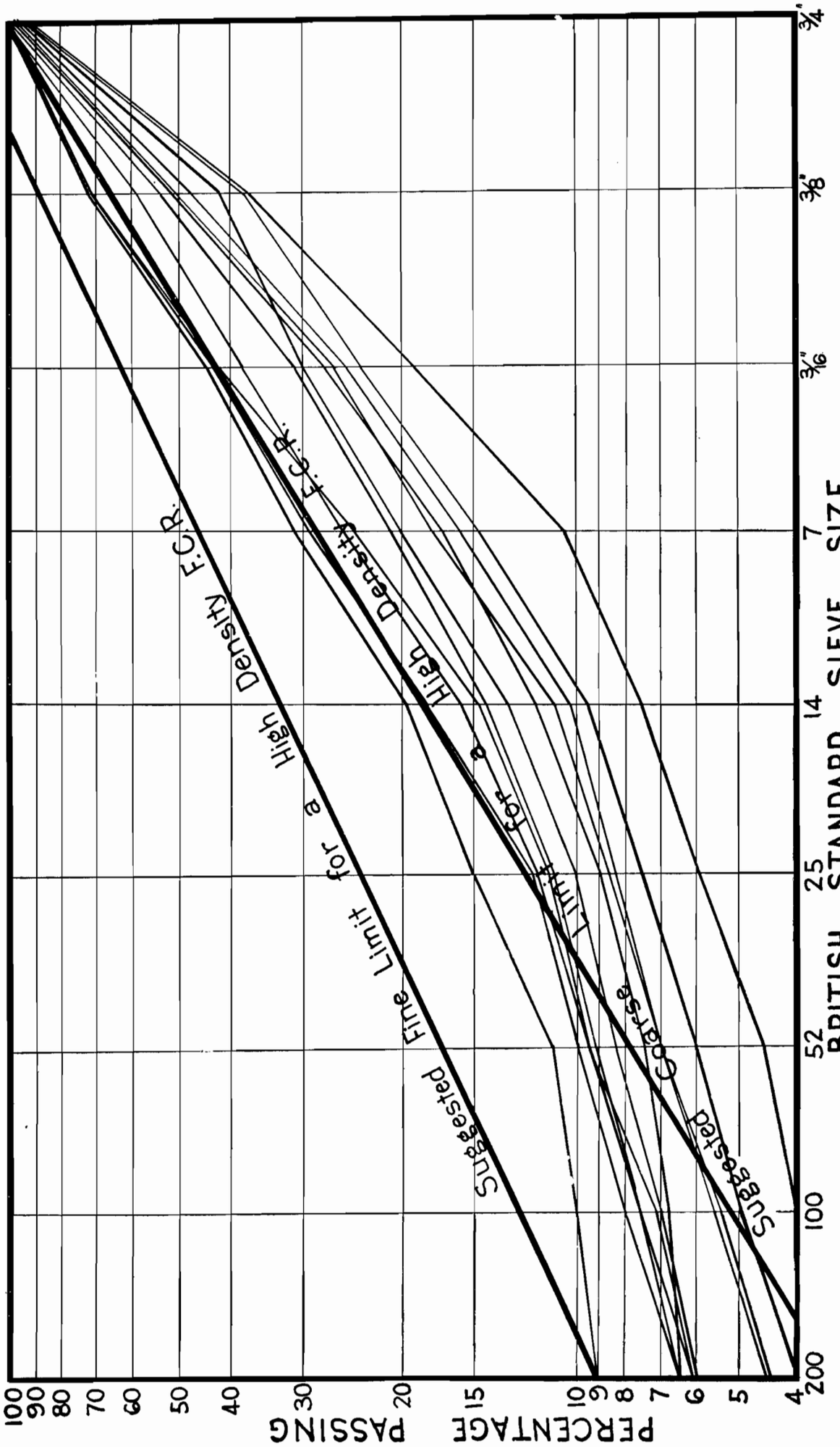

PERCENTAGE PASSING
BRITISH STANDARD SIEVE SIZE
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
200
100
52
25
14
7
3/16"
3/8"
3/4"
Suggested Fine Limit for a High Density F.C.R.
High Density F.C.R.
Fine Limit for a
Coarse
Suggested

Fig. 6.

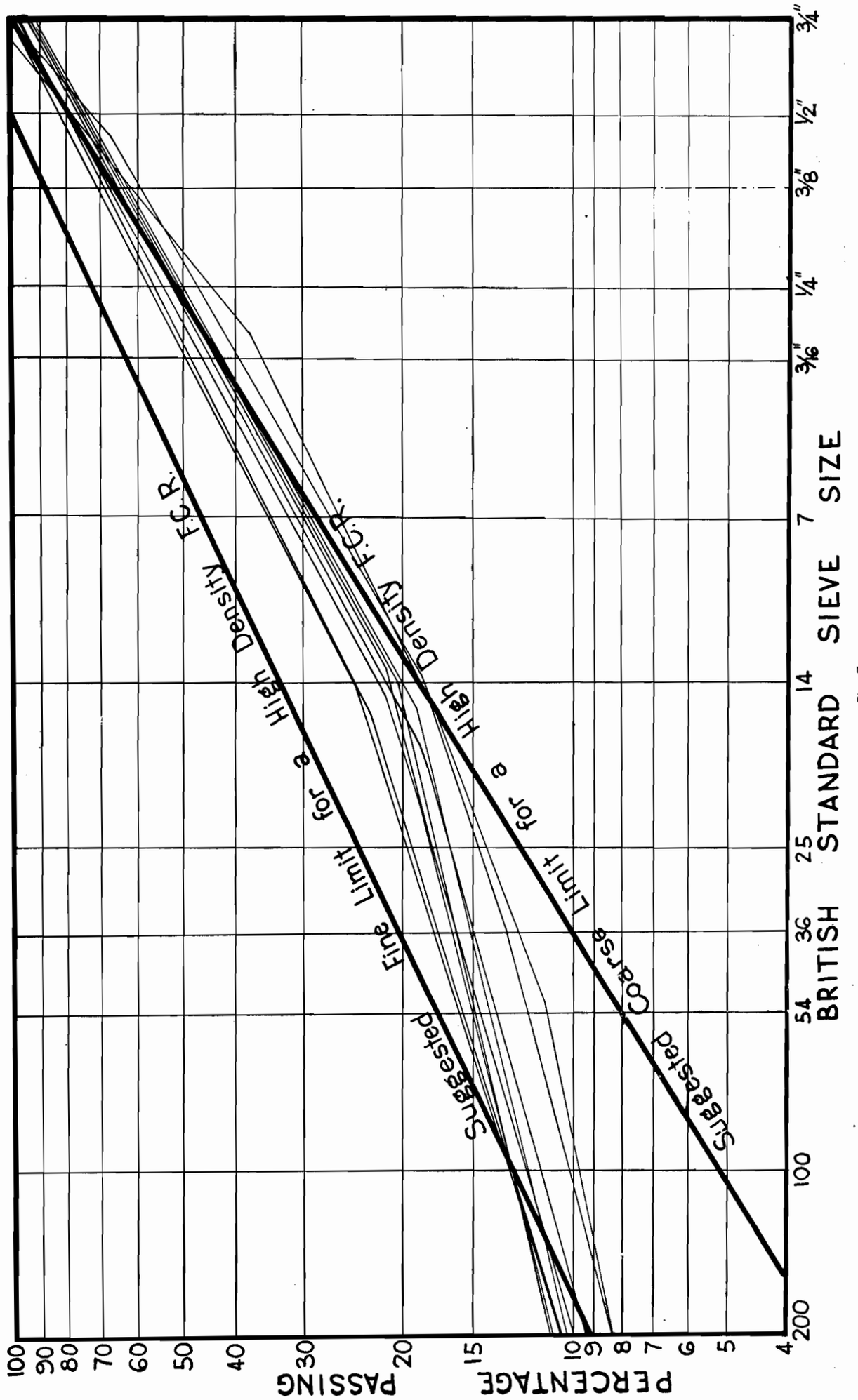

PERCENTAGE PASSING
BRITISH STANDARD SIEVE SIZE
Suggested for a High Density F.C.R.
Fine Limit
Suggested for a High Density F.C.R.
Coarse Limit
3/4"
1/2"
3/8"
1/4"
3/16"
7
14
25
36
54
100
200

Fig. 7.

the crushing and grinding effect which fast moving traffic has on loose crushed rock is apparently much greater per ton mile than that of a slow moving pneumatic-tyred roller. This means that adjustment of grading occurs more rapidly under traffic and the overall consolidating effectiveness of traffic is probably several times as great as consideration of its weight alone would indicate.

Effect on Over-consolidation.

On the Rockbank project it was found that bad failures could develop if material was over-consolidated. Such failures occurred in areas where the amount of material passing a 200-mesh sieve exceeded 11 per cent. and the crushed rock held more than about 6 per cent. by weight of water. When a typical fine crushed rock in this state is compacted to 82 per cent. " solidity " its composition by volume is—

	%
Stone	82
Water	16·2
Air	1·8
	100

A small increase in compaction or moisture content will compress the air, induce hydrostatic pressure and thus cause the fine particles of material to be forced apart by pore pressure.

With only the specified amount of fines, crushed rock will not normally hold enough water for this critical state to be reached, but where the fines exceed 11 per cent. passing a 200-mesh sieve, sufficient moisture can be held to cause disruption of the fine crushed rock to occur before a satisfactory " solidity " is obtained. Once this happens it is very difficult to re-consolidate the disrupted material.

Breaking Down Action of Rollers and Traffic.

The five curves shown in Fig. 8 indicate the breakdown of fine crushed rock which occurs under various rollers.

It is seen that per pass, a smooth-tyred steel roller has more effect on altering the grading than any other type of roller tried, and the faster the roller goes the greater the breaking down action per pass.

It is not possible to compare the consolidating effect in various rollers unless the material being consolidated of each case has the same grading.

Conclusions.

The results of the investigation emphasize the following :—

(*a*) The importance of ensuring that the grading of crushed rock as delivered is as close as possible to the maximum density curve for the material.
(*b*) An excess of fines can prevent proper consolidation.
(*c*) That every effort should be made to ensure uniformity of grading in material when spread.
(*d*) The high output of smooth steel-tyred rollers with fine crushed rock as commonly delivered at present.

BITUMINOUS SURFACING.

Extent of the Work.

The amount of bituminous surfacing carried out during 1953–54 is the largest that has been done by the Board to date in a single season. Table IV. sets out the total mileage of work carried out.

The percentage increase over that carried out during 1952–53 is :—

	%
Work on C.R.B. declared roads	12
Work on undeclared roads	196
Work for other authorities	8
All work	16

TABLE IV.—LENGTH OF WORK CARRIED OUT IN 1952–53 AND 1953–54.

Type of Road and Plant Used.	Miles. 1952–1953.	Miles. 1953–1954.
(*a*) Work on C.R.B. Declared Roads—		
(i) Board's plant	1,032	1,146
(ii) Municipal and contractor's plant	34	52
	1,066	1,198
(*b*) Work on Undeclared Roads to which the Board contributes—		
(i) Board's plant	25	74
(ii) Municipal plant ..	3	9
	28	83
(*c*) Work for other authorities done by Board's plant—		
(i) Municipalities	83	91
(ii) State Instrumentalities ..	10	3
(iii) Commonwealth of Australia	44	54
	137	148
	1,231	1,429

Extension of the Treated System.

The surfaced treated length of the declared system was increased by 300 miles which, with the 17·5 miles of primerseal carried out last year brings the total to 7,679 miles or 53·2 per cent. of the declared system, which was 14,430 miles at 30th June, 1954. (See Table V.).

Reconstruction and Retreatment of the Bituminous Surfaced System.

Initial treatments on reconstructed lengths of previously sealed pavements totalled 116·4 miles or 1·6 per cent. of the treated system at 30th June, 1954, indicating the slow progress in improving existing roads to a standard desirable for today's traffic.

Retreatment of the declared system amounted to 781·5 miles or 10·6 per cent. of the treated system as at 30th June, 1953. All of this, with the exception of 6 miles, was of the sprayed type, providing in no way for correction of any irregularities in the surface, which is the more needed in view of the slow rate of reconstruction.

Reconstruction and retreatment together amounted to 12·2 per cent. of the treated system as at 30th June, 1953.

Details of this work are set out in Table V.

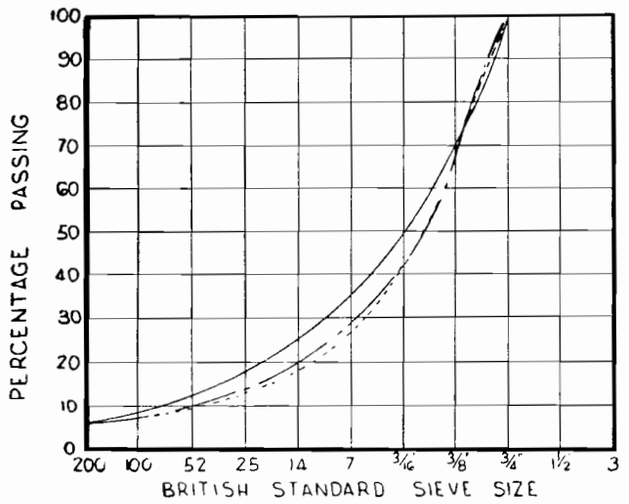
Bituminous Surfacing on Undeclared Roads and for other Authorities.

Table VI. sets out details of the 83 miles of work on undeclared roads.

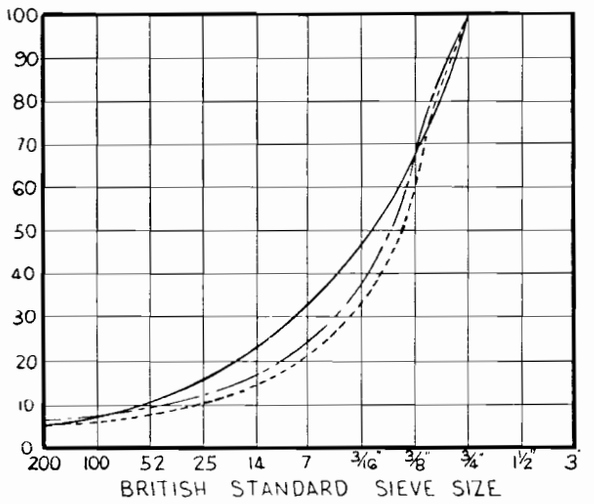
The equivalent of 148 miles of work was carried out by Board's bituminous surfacing plant for other authorities, as set out in Table IV.

TABLE VI.—MILEAGE OF WORK CARRIED OUT ON UNDECLARED ROADS DURING SEASON 1953–1954.

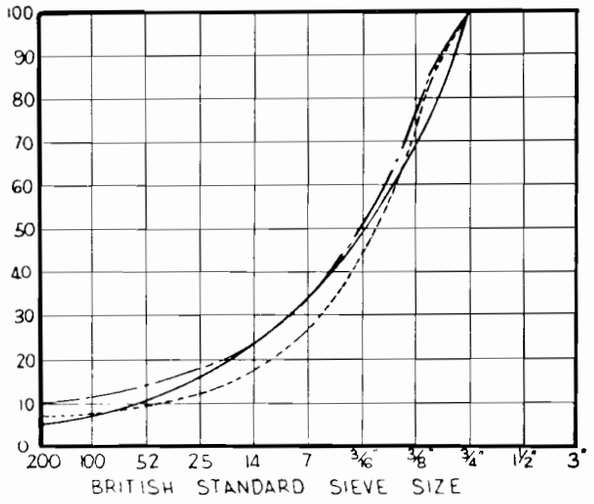
Work.	Miles.
Initial treatments—	
Extensions	44
Reconstructed lengths of previously sealed pavements	3
	47
Retreatments	36
Total	83



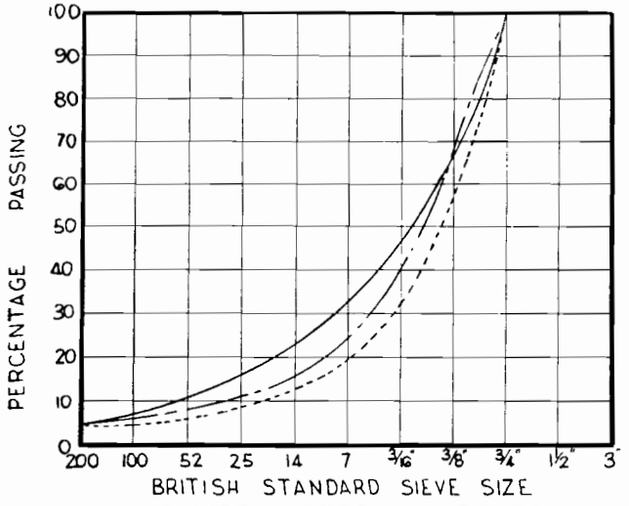
MULTI-WHEEL ROLLER
48 PASSES 4½ M.P.H.



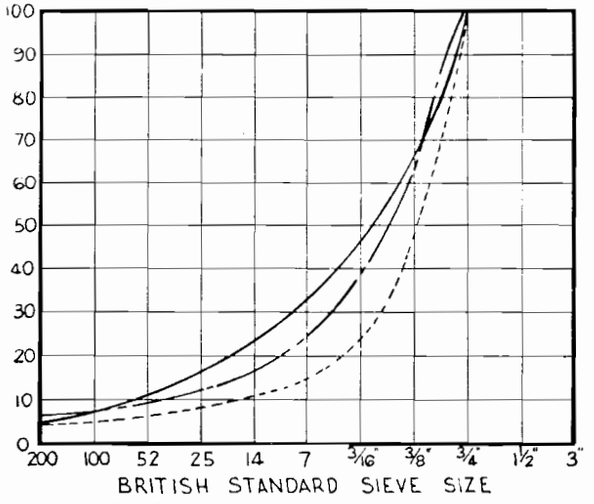
VIBRATING ROLLER
48 PASSES 1 M.P.H.



10 TON SMOOTH STEEL WHEELED
POWER ROLLER
30 PASSES 1 M.P.H



SMOOTH STEEL WHEELED
DRAWN ROLLER
48 PASSES 2¾ M.P.H



SMOOTH STEEL WHEELED
DRAWN ROLLER
48 PASSES 6 M.P.H.

Fig. 8.

LEGEND

- - - - - - FCR as delivered to Road Bed
- — - — - FCR after rolling
——— Maximum density curve

NOTES

1. All gradings shown are the average of five samples.
2. Weight per lineal inch of smooth steel wheeled rollers -
   Drawn roller 275 lb
   Power roller 450 lb (Rear wheels)

TABLE V.—MILEAGE OF EACH TYPE OF WORK CARRIED OUT ON C.R.B. DECLARED ROADS DURING 1953–54.

Type of Road and Control of Work.		Length in Miles.																			
		Nature of the Work.																		Summary of Work.	
		Initial Treatments.										Retreatments.									
		Primerseal.		Seal Only—One Application. On existing primer.		Seal Only—Two Applications. On existing primer.		I.T. Prime and Two Application Seal.		I.T. Prime and Seal.		Reseals.					Two Application Reseal.	R.M.S.	P.M.S.	State Highways.	Other Declared Roads.
												Nominal Size of the Aggregate.									
Road.	Control.	E.	R.	E.	R.	E.	R.	E.	R.	E.	R.	¾-in.	⅝-in.	½-in.	⅜-in.	¼-in.					
State Highways	Direct ..	..	6·29	22·61	20·09	..	0·14	6·56	..	37·18	41·54	127·31	10·23	86·68	62·44	19·04	4·61	..	4·82	529·54	..
	Municipal ..	..	..	..	0·38	..	..	..	..	8·30	1·19	1·09	1·61	8·70	2·40	13·38	..	..	1·00	38·05	..
Main, Tourist, and Forest Roads	Direct ..	..	..	1·43	3·17	..	..	..	..	15·13	6·28	1·75	6·80	8·40	4·02	..	..	..	..	..	46·98
	Municipal ..	..	0·93	8·50	8·53	..	..	8·34	..	192.21	27·88	45·79	54·68	185·86	45·88	4·91	..	..	0·14	..	583·65
		..	7·22	32·54	32·17	..	0·14	14·90	..	252·82	76·89	175·94	153·32	289·64	114·74	37·33	4·61	Nil	5·96	567·59	630·63
		7·22		64·71		0·14		14·90		329·71		775·58						5·96			
		416·68										781·54								1,198·22	
		1,198·22																			

Abbreviations.—E, Extension to the Bituminous Surfaced System; R, Initial Treatment on a Reconstructed length of previously sealed pavement; R.M.S., Retreatment with Readmix; P.M.S., Retreatment with Plantmix.

TABLE VII.—AVERAGE COST OF WORK CARRIED OUT BY C.R.B. PLANT ON C.R.B. DECLARED ROADS DURING 1953–54.

(Cost in pence per square yard.)

Item.	Nature of the Work.																						
	Initial Treatments.										Retreatments.												
											Reseals.												
											Nominal Size or Gauge of Aggregate Used.												
	Primerseal—Two Applications (Light).		Seal only—Binder, 0·25 gallon per sq. yd.		Seal only—Two Application Work.		I.T. Prime and Two Application Seal.		Prime and Seal—Primer 0·20 Seal 0·25 gallon per sq. yd.		¾-in.		⅝-in.		½-in.		⅜-in.		¼-in. and Sand.		Two Application Reseal.		Plantmix Seal.
Square yards costed ..	73,776		782,948		3,453		120,332		2,941,549		1,965,980		1,645,446		2,486,711		1,008,588		289,596		43,270		50,143
	*d.**	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%	*d.*	%	*d.*
Materials	12·2	79·7	14·5	63·9	17·9	70·2	24·0	76·6	24·5	66·2	16·3	67·1	17·1	71·3	13·6	68·0	11·8	70·1	8·1	63·3	15·1	75·9	..
Labour	1·5	9·8	4·7	20·7	3·5	13·7	3·6	11·4	7·2	19·5	4·7	19·3	3·9	16·3	3·7	18·5	2·8	16·7	2·6	20·3	2·3	11·6	Work done by contract.
Stores	0·3	2·0	0·7	3·1	0·8	3·1	0·7	2·3	1·0	2·7	0·6	2·5	0·6	2·4	0·4	2·0	0·4	2·4	0·4	3·1	0·5	2·5	..
Plant hire	1·3	8·5	2·8	12·3	3·3	13·0	3·0	9·7	4·3	11·6	2·7	11·1	2·4	10·0	2·3	11·5	1·8	10·8	1·7	13·3	2·0	10·0	..
Total ..	15·3	100	22·7	100	25·5	100	31·3	100	37·0	100	24·3	100	24·0	100	20·0	100	16·8	100	12·8	100	19·9	100	52·7

* Cost in pence per square yard.

Supply of Bitumen.

The total usage of bitumen amounted to 12,380 tons, including 5,040 tons, or 40·8 per cent., supplied in bulk. Of this latter, 4,694 tons or 37·8 per cent. of the total bitumen was delivered in bulk by road direct from a refinery in Melbourne, and 350 tons or 2·9 per cent. by road from rail tank cars delivered on rails to N.S.W. border stations from a refinery in Sydney.

Cost of the Work.

Table VII. sets out details of the cost of all work carried out by C.R.B. plant during the season, the costs being slightly higher than those for work carried out in 1952–53.

Aggregate.

The average price of each type of aggregate at per cubic yard in stacks by the roadside for each season since 1949–50 is set out in Table VIII., indicating stabilization in the price of these materials.

A survey of the 170,331 cubic yards of aggregate spread by the Board's plant during the season was made to ascertain its grading and shape. Compliance or otherwise with the specification for the grading of one-sized aggregate is set out in Table IX., and for shape in Table X. The tables show that over most of the State a reasonable standard has been reached with regard to grading, but that much remains to be done to obtain aggregate of good shape.

TABLE VIII.—AVERAGE PRICE OF AGGREGATE FOR BITUMINOUS SURFACING, AT PER CUBIC YARD IN STACKS BY THE ROADSIDE.

Material.	Price per Cubic Yard.				
	1949–50.	1950–51.	1951–52.	1952–53.	1953–54.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Screenings	30 6	35 9	39 11	40 3	41 11
Gravel	33 11	32 0	39 2	42 4	40 10
Sand	10 4	22 5	21 5	21 0	17 7
Scoria	10 5	7 8	18 2	17 3	15 7
Weighted average	29 4	34 3	39 0	39 10	40 11

Premixed Bituminous Macadam Surfacing.

For single course pavement work in the area close to Melbourne, where the traffic was heavy and the consolidated thickness of a coat not less than 2 in. nor more than 3¼ in., premized bituminous macadam was used. The type adopted is the British Standard graded bituminous macadam of 1½ in. nominal size, range of sizes 1½ in. to ¼ in., with a binder content (according to circumstances) from 3·5 to 4·25 per cent. by weight of total mix.

TABLE IX.—AGGREGATE—GRADING—COMPLIANCE OR OTHERWISE WITH THE SPECIFICATION FOR GRADING.

Division.	Proposed. One Size.	Used.		Oversize.			Correct Size.	Undersize.	
		One Size.	Graded.	+ 3%.	+ 2%.	+ 1%.		− 1%.	− 2%.
	%	%	%	%	%	%	%	%	%
Bairnsdale	100	69	31	..	..	24	66	10	..
Ballarat	100	93	7	..	4	38	55	3	..
Benalla	100	88	12	..	4	48	44	4	..
Bendigo	100	67	33	..	9	29	51	11	..
Dandenong	100	98	2	..	2	27	59	8	4
Geelong	100	96	4	..	2	48	47	3	..
Horsham	100	92	8	..	..	18	79	3	..
Traralgon	100	90	10	..	1	41	54	4	..
Warrnambool	100	93	7	..	1	36	58	5	..
All (average)	100	87	13	..	3	34	57	6	..
					37%			6%	
All (range)	100	67 to 98	2 to 33	..	0 to 9	18 to 48	44 to 79	3 to 11	0 to 4

TABLE X.—AGGREGATE—SHAPE.

Wholly Crushed.						Rounded and Partly Crushed.					
Size and Designation.	Trade Size or Name.	Range F.I.	Average F.I.	≯ 35.	Number of Samples.	Size and Designation.	Trade Size or Name.	Range F.I.	Average F.I.	≯ 35.	Number of Samples.
		%	%	%				%	%		
1″ O.S. ..	D	19–24	22	100	3	1″ O.S. ..	D	.	..	..	Nil
¾″ O.S. ..	E	5–54	26	93	309	¾″ O.S. ..	E	4–28	17	100	70
⅝″ O.S. ..	F	8–44	27	82	226	⅝″ O.S. ..	F	4–35	19	100	81
½″ O.S. ..	G	7–45	29	83	137	½″ O.S. ..	G	9–24	15	100	27
⅜″ O.S. ..	H	12–39	31	71	34	⅜″ O.S. ..	H	8–46	20	86	14
¼″ O.S. ..	I	33–36	35	50	4	¼″ O.S. ..	I	..	..	..	Nil
¾″ G. ..	No. 6	16–19	17	100	3	¾″ G. ..	No. 6	..	..	..	Nil
¾″ G. ..	No. 67	9–37	25	73	11	¾″ G. ..	No. 67	11–24	17	100	11
¾″ G. ..	No. 68	21–38	31	80	5	¾″ G. ..	No. 68	9–25	17	100	2
½″ G. ..	No. 7	21–54	42	20	10	½″ G. ..	No. 7	14–22	18	100	6
½″ G. ..	No. 78	8–25	14	100	4	½″ G. ..	No. 78	18–27	24	100	3
⅜″ G. ..	No. 8	14–48	33	43	14	⅜″ G. ..	No. 8	19–24	22	100	3
⅜″ G. ..	No. 89	40–53	47	..	3	⅜″ G. ..	No. 89	33	33	100	5

O.S. = One-sized aggregate. G = Graded aggregate. F.I. = Flakiness index.

For wearing course work in the same area a graded bituminous macadam was used when the traffic was relatively light, and a gap-graded material when the traffic was heavy. The grading of the bituminous macadam used complied with the British Standard specification and is shown in Table XI.

TABLE XI.—GRADED BITUMINOUS MACADAM SURFACING.

Consolidated Thickness of the Work.	Nominal Size of Material.	Range of Sizes.	Binder Content by Weight of Total Mix. Range according to Conditions.
¾ in. to 1½ in.	¾ in.	¾ in. to ⅛ in.	3·5 to 4·5 per cent.
½ in. to 1 in.	½ in.	½ in. to ⅛ in.	3·75 to 4·75 per cent.

The gap-graded bituminous macadam used under the heavier traffic is that recommended by the British Road Research Laboratory. It is a material of ½-in. nominal size and is laid in consolidated thicknesses of not less than ¾ in. nor more than 1½ in. The mineral aggregate combination is given in Table XII., the binder content, by weight of total mix, having a range of from 4 to 5 per cent. according to circumstances.

TABLE XII.—GAP-GRADED BITUMINOUS MACADAM SURFACING.

Aggregate.	Range of Sizes.	Percentage by Weight.
Coarse	½ in. to ⅛ in.	80 to 90
Fine	⅛ in. to No. 200	5 to 15
Filler	Passing No. 200	4 to 6

Total mineral matter—100.

MAINTENANCE PROCEDURE.

Patching of Sealed Fine Crushed Rock Pavements.

When failures develop in the surface of a waterbound pavement protected by a comparatively thin seal coat on a heavily trafficked road it is necessary that the surface be reinstated quickly. Over the years, several methods have been used to accomplish this result, but none has been completely satisfactory under all conditions owing to the difficulty of obtaining final consolidation without the patch being damaged by rain before sealing. During the year, a very promising method was developed in the Dandenong Division.

Defective areas are dug out, and after any necessary attention to the subgrade, are back filled with good quality fine crushed rock and well consolidated with a punner or, if the area is sufficiently large, rolling with a loaded motor truck. If necessary, the fine crushed rock is watered before or during the process of consolidation. After maximum consolidation with the available equipment is obtained, the relatively loose surface of the patched area is immediately given a primerseal of bituminous emulsion at the rate of approximately one-third of a gallon to the square yard, and covered with fine granular material at the rate of approximately 1 cub. yd. to 120 square yards. Patches are sealed with cut back bitumen covered with screenings in from one to three weeks after application of emulsion.

The emulsion primerseal has proved sufficient in almost every instance to withstand road traffic for several weeks. Continuous or heavy rain within 24 hours of completing the patch appears to be the greatest factor against complete success. The method has been promulgated in Engineering Note No. 45.

BRIDGES.

General.

Major bridges under construction during the year were those at Bonnie Doon on the Maroondah Highway, Jacksons Creek at Gisborne, Yarra River at Warrandyte, all by contract, and the Johnston Street bridge over the Yarra by direct labour. Good progress was made on the construction of the three-pin precast arch bridge at Belgrave, mentioned in the last annual report.

In the metropolitan area, the bridges over Merri Creek on Bell Street and over Moonee Ponds Creek on Albion Street were completed. Progress on the contracts let for the bridges at Moreland Road and Arthurton Road was not as good as anticipated. Work on the bridge over the Yarra River at Johnston Street was started and progress to date has been good. All foundation work with the exception of some at the Collingwood end of the bridge has been completed.

Supply of Materials.

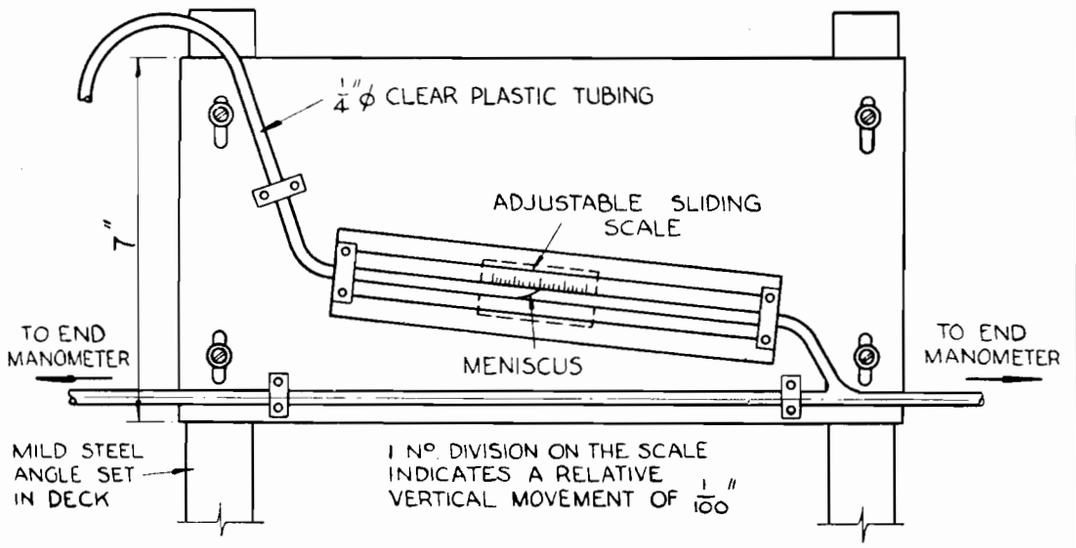
During the year the supply of materials for bridge construction was much the same as in the previous year. Steel joist supply is somewhat worse, and forward ordering of all types of steel is still essential. Contractors are tendering for the supply of fabricated girders, but the availability of steel makes the production difficult and often delayed. Much substitution of sizes has to be done.

Timber Decks.

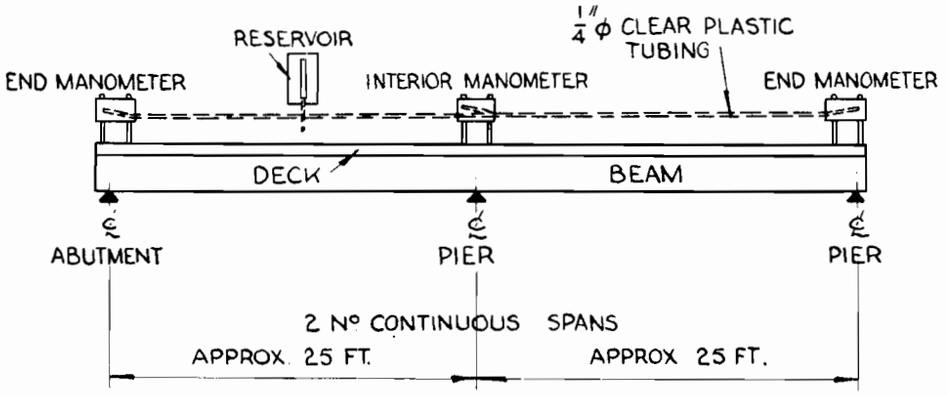
During the year an experimental type of deck was used on a low level bridge in an attempt to keep the construction depth to a minimum.

Figure 9 illustrates the bridge, which is of three 17-ft. spans. The deck consists of 6-in. deep planks placed side by side and bolted together by long lateral bolts at four points in each span, these bolts being tightened as shrinkage occurs. The abutting faces of the timber were given a liberal coating of creosote and petroleum jelly and the whole deck given a bitumen seal. It proved very economical in cost and its life will be watched with interest.

Fig. 9.



INTERIOR MANOMETER



DIAGRAMMATIC LAYOUT OF MANOMETERS

NOTE : 1. RELATIVE LEVELS AT JACKING POINTS A, B AND C ARE INDICATED ON MANOMETER SLIDING SCALES.
2. INDICATOR LIQUID CONSISTED OF A SOLUTION OF FLUORESCEINE IN WATER WITH A LISSAPOL WETTING AGENT.

COUNTRY ROADS BOARD DETAILS & GENERAL ARRANGEMENT OF MANOMETERS		
DRAWN	CHECKED	REF.
TRACED	DATE	NO

Fig. 10

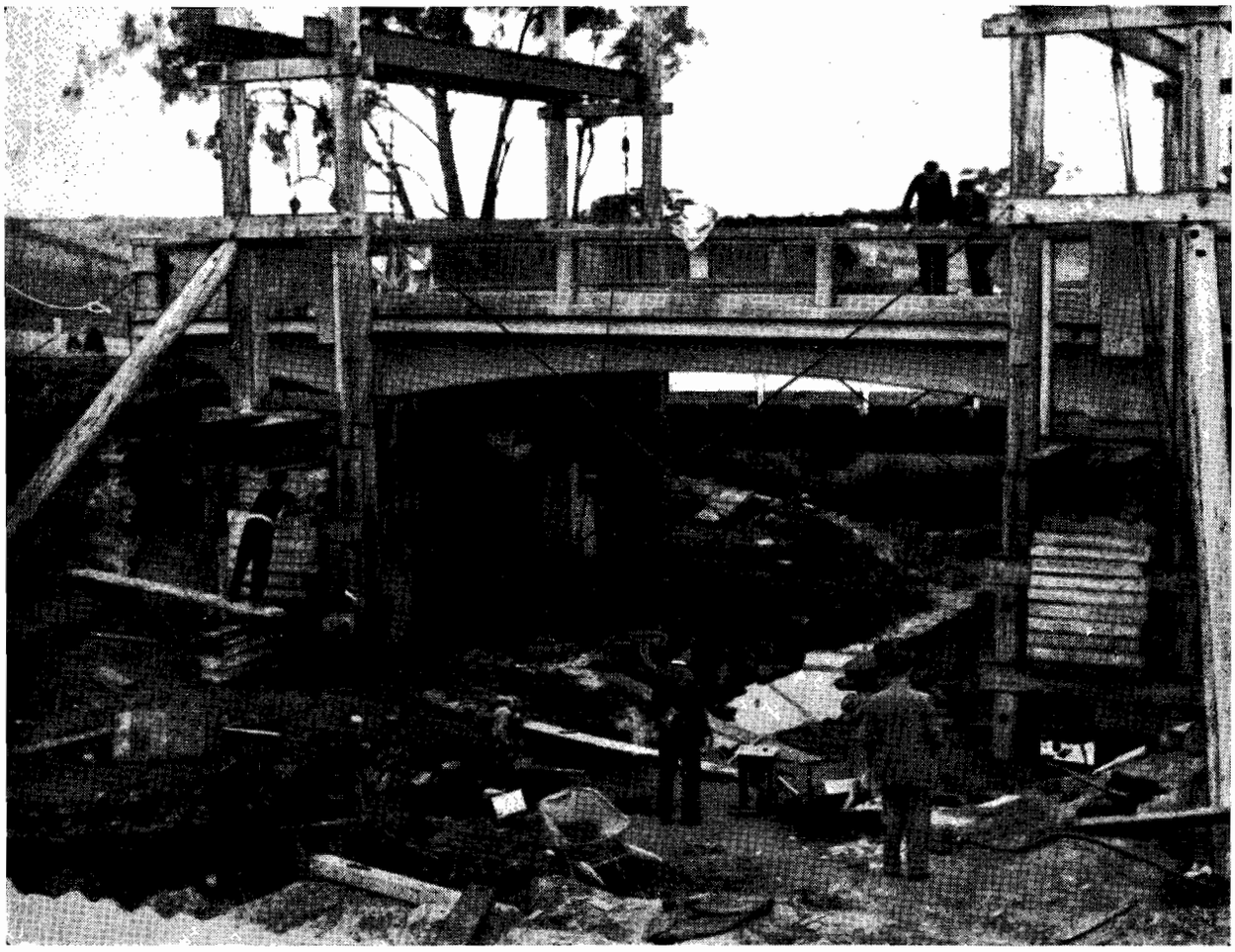


Fig. 11.

Raising Concrete Bridges.

Reference is made on page 32 of the Board's report to the task of raising the decks of two concrete bridges. One bridge 59 ft. long by 22 ft. between kerbs, over Paddock Creek on the Western Highway, the superstructure of which weighed about 170 tons, was raised by 6 feet. The superstructure was cut from the piers, jacked up and held in position while the piers were concreted and then lowered on to the new piers. Lifting beams passed under the bridge to lifting or jacking towers in which manually operated 30-ton hydraulic jacks were installed. The relative levels of the bridge were checked as the jacking proceeded by a series of manometers, details of which are given in Fig. 10. Calculations indicated that a relative movement between jacking points of 0·15 inches would not cause any undue strains, and by using these manometers it was readily possible to keep within this limit. No cracking occurred. Fig. 11 shows the operation in progress.

The other bridge, over Joyces Creek on the Pyrenees Highway, is of seven spans and 190 ft. long. The centre three spans and each pair of 25-ft. spans at the ends are continuous. Each continuous section was raised in turn and held similarly to the one section at Paddock Creek. During the operations, electric strain gauges were placed on some steel in the bridge which had been "bared", indicating that the maximum stresses developed were of the order of only 4,500 lb./sq. inch. The operation was concluded without damage to the structure.

Composite Steel and Concrete Bridges.

Last year's annual report referred to a development of shear connectors between the deck slab and the steel joists on this type of bridge. During the year a series of tests was carried out on a composite type 40-ft. span bridge with a skew of 40 degrees. The deck consisted of a flat slab directly on the girders, and the structure was not "propped" during the casting of the deck. The shear connectors were of a similar pattern to those mentioned last year. The load was applied by means of a loaded truck bogie and in magnitude and distribution complied reasonably well with the 32,000 lb. A.A.S.H.O. (H20–S16) axle loading.

The conclusions reached from these tests were:—

(*a*) The bridge acted in a fully composite manner with no significant slip between the joists and concrete deck, and there appeared to be excellent bond between the deck and the top surface of the joists.

(*b*) The load-distributing effect of the deck slab was somewhat greater than allowed for in design.

(*c*) The deck slab itself appeared to resist a substantial part of the live load, due probably to the big skew of the bridge.

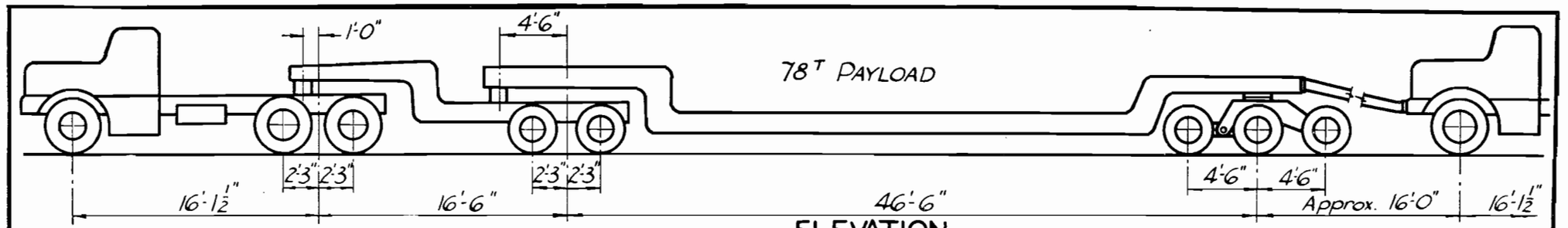
(*d*) No information regarding skrinkage and creep could be obtained.

(*e*) The maximum live load stress in the bottom flange of a girder was 3,300 lb. per sq. in., considerably lower than that calculated. The complex distribution of loads and stresses in a skew bridge could account for this.

Further tests on a "square" composite bridge will be carried out this year.

Heavy Loadings.

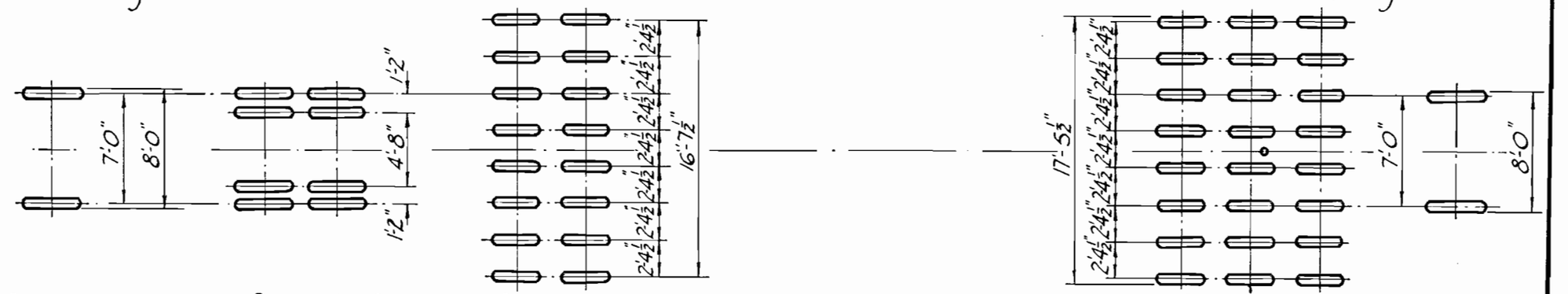
In previous annual reports, mention has been made of heavy pay loads and special vehicles designed to carry them, bearing in mind the condition of bridges and allowable pavement loadings. During the year, on two occasions a pay load of 78 tons was carried by road to



ELEVATION

Leading Prime Mover

Trailing Prime Mover



BOGIE N° 1 BOGIE N° 2 BOGIE N° 3 BOGIE N° 4 BOGIE N° 5

WHEEL SPACING

		BOGIE N° 1	BOGIE N° 2	BOGIE N° 3	BOGIE N° 4	BOGIE N° 5	BOGIE N° 6
78 T PAYLOAD OF 9·10 JAN.	TARE	4·8 T	10·5 T	19·8 T	30·6 T	4·8 T	10·5 T
	PAYLOAD	0·7 T	11·1 T	34·0 T	32·0 T		
	GROSS	5·5 T	21·6 T	53·8 T	62·6 T	4·8 T	10·5 T
78 T PAYLOAD OF 22-23 MAY	TARE	4·8 T	10·5 T	19·8 T	30·6 T	4·8 T	10·5 T
	PAYLOAD	0·6 T	9·9 T	30·7 T	36·6 T		
	GROSS	5·4 T	20·4 T	50·5 T	67·2 T	4·8 T	10·5 T

COUNTRY ROADS BOARD

S.E.C. TRANSPORTER

DRAWN	CHECKED	REF.
TRACED O.P.	DATE 19·10·54	NO.

Fig. 12.

Yallourn in the eastern part of the State. A special vehicle was constructed for the purpose, and a considerable amount of strengthening was carried out on bridges on the route.

Fig. 12 gives details of the vehicle and the various loads developed at the different axles. The vehicle was moved by a pushing unit to assist its own pulling power. Fig. 13 shows the assembly en route.

During both trips the opportunity was taken to carry out measurements on bridges which had been strengthened, and on some which had not been touched. From the tests done, the following observations are made :—

(1) When steel joist stringers were used to strengthen existing timber beam spans, the timber stringers took considerably more of the load than calculated. This is probably due to the difficulty of assessing the stiffness of a timber stringer of unknown quality, varying diameter along its length, and to the unknown support offered by the corbels.

(2) Where concrete bridges were strengthened by wedging from independently supported stiff steel joists or reinforced concrete " U " type slabs, the strengthening was very effective provided the wedging and the independent supports were adequate and satisfactory.

(3) In the case of an unstrengthened cell type culvert the measured stresses were very low while no evidence of cracking was detected. A conventional analysis of this culvert indicated that the stresses calculated by conventional methods of design were considerably greater than those measured.

(4) A 35-ft. span reinforced concrete rigid frame which was not strengthened was also tested. These tests revealed no unduly high stresses at the haunches but minor cracking of the concrete occurred at the crown of the frame. The distribution of live load moments throughout the bridge differed considerably from those indicated by a conventional analysis as a rigid frame. This could be caused by various factors :—

(*a*) The amount of reduction in the value of " n " in the case of good quality " old " concrete.

(*b*) The redistribution of relative stiffness caused by the minor cracking at the crown.

(*c*) The effect of the passive earth pressure behind the abutments.

MATERIALS RESEARCH.

Cutback Bitumens.

During the year an investigation has been carried out to establish the characteristics of cutback bitumen made from locally refined bitumen and fluxes, in order to provide information on which an Australian Standard Specification can be based.

Pavement Thickness.

Static Cone.—The work with the static cone penetrometer and with the impact cone, which was described in the last annual report, has been pursued as opportunity offered. For clay soils an excellent correlation has been obtained between the static cone penetration resistance and the California Bearing ratio, up to a C.B.R. of 20. The relations, which need to be confirmed by further tests, including field tests, are as follows :—

(1) California Bearing Ratio at 0·1 in. penetration = cone penetration resistance in lb. per square inch divided by 25.

(2) Average California Bearing Ratio (at 0·1, 0·2, 0·3, 0·4, 0·5 in.) penetration = cone penetration resistance in lb./sq. in. divided by 33.

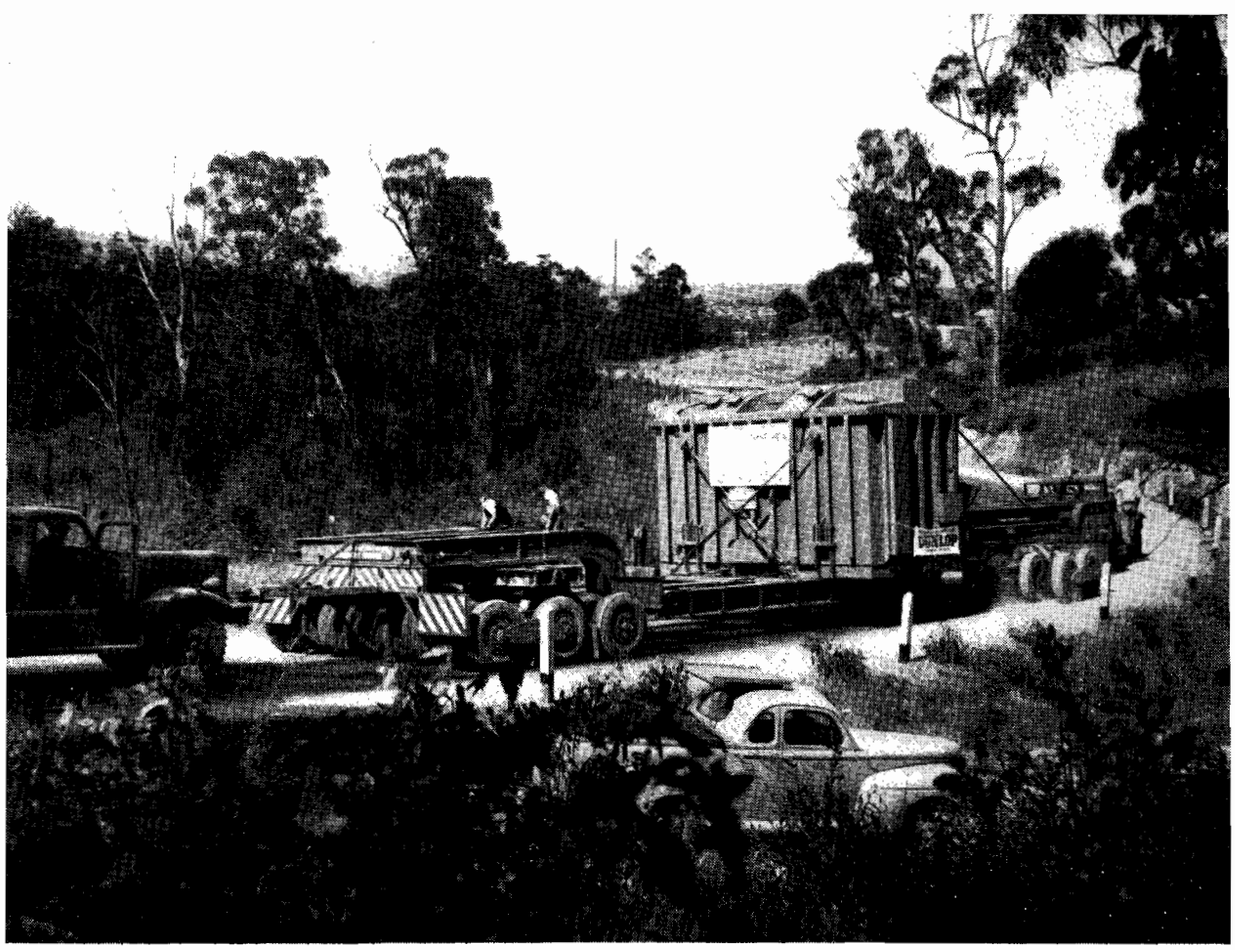


Fig. 13.

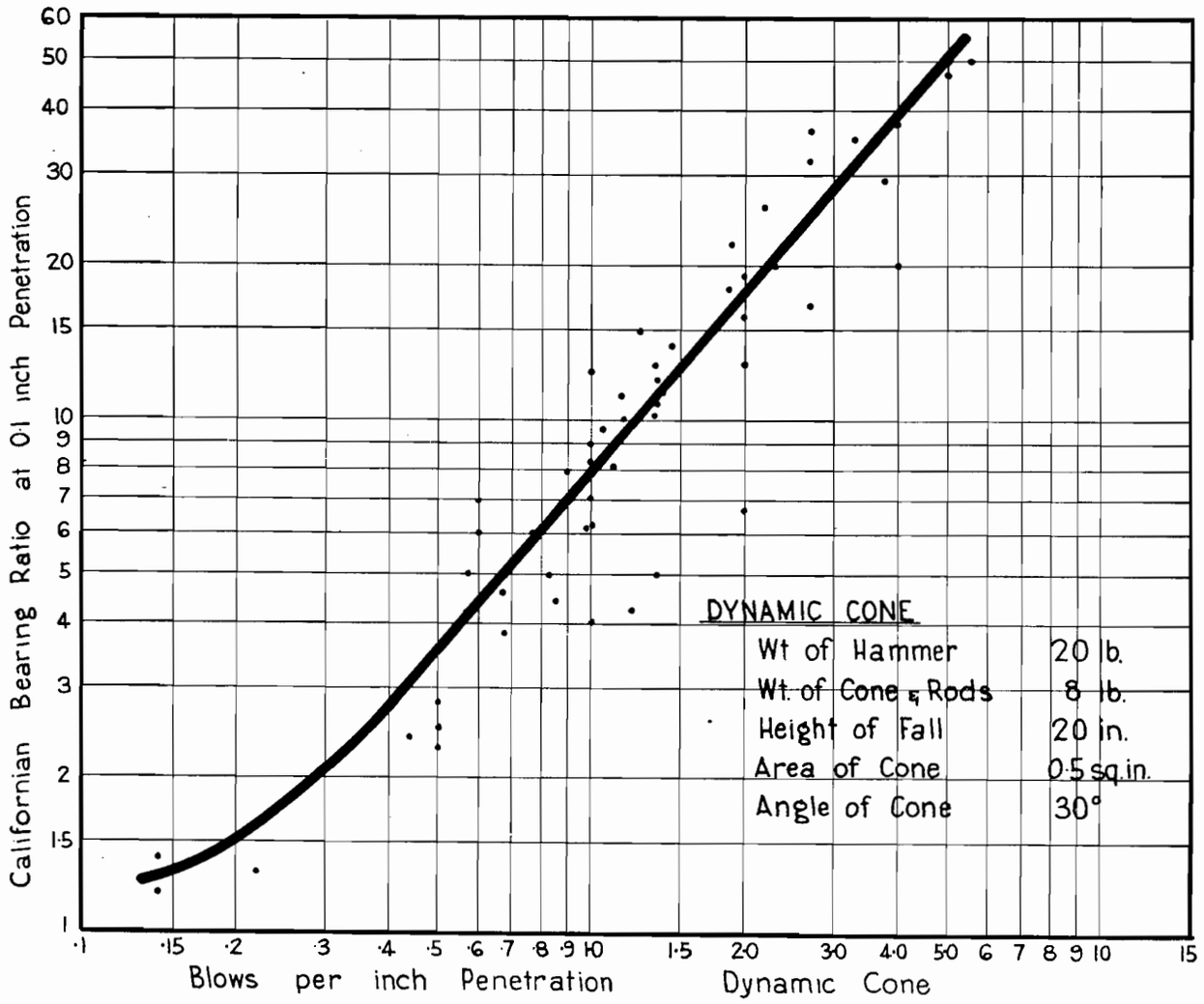

Californian Bearing Ratio at 0·1 inch Penetration
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1·5
1
·1
·15
·2
·3
·4
·5
·6
·7
·8
·9
10
1·5
2·0
3·0
4·0
5·0
6
7
8
9
10
15
Blows per inch Penetration
Dynamic Cone
DYNAMIC CONE
Wt of Hammer 20 lb.
Wt. of Cone & Rods 8 lb.
Height of Fall 20 in.
Area of Cone 0·5 sq.in.
Angle of Cone 30°

Fig. 14.

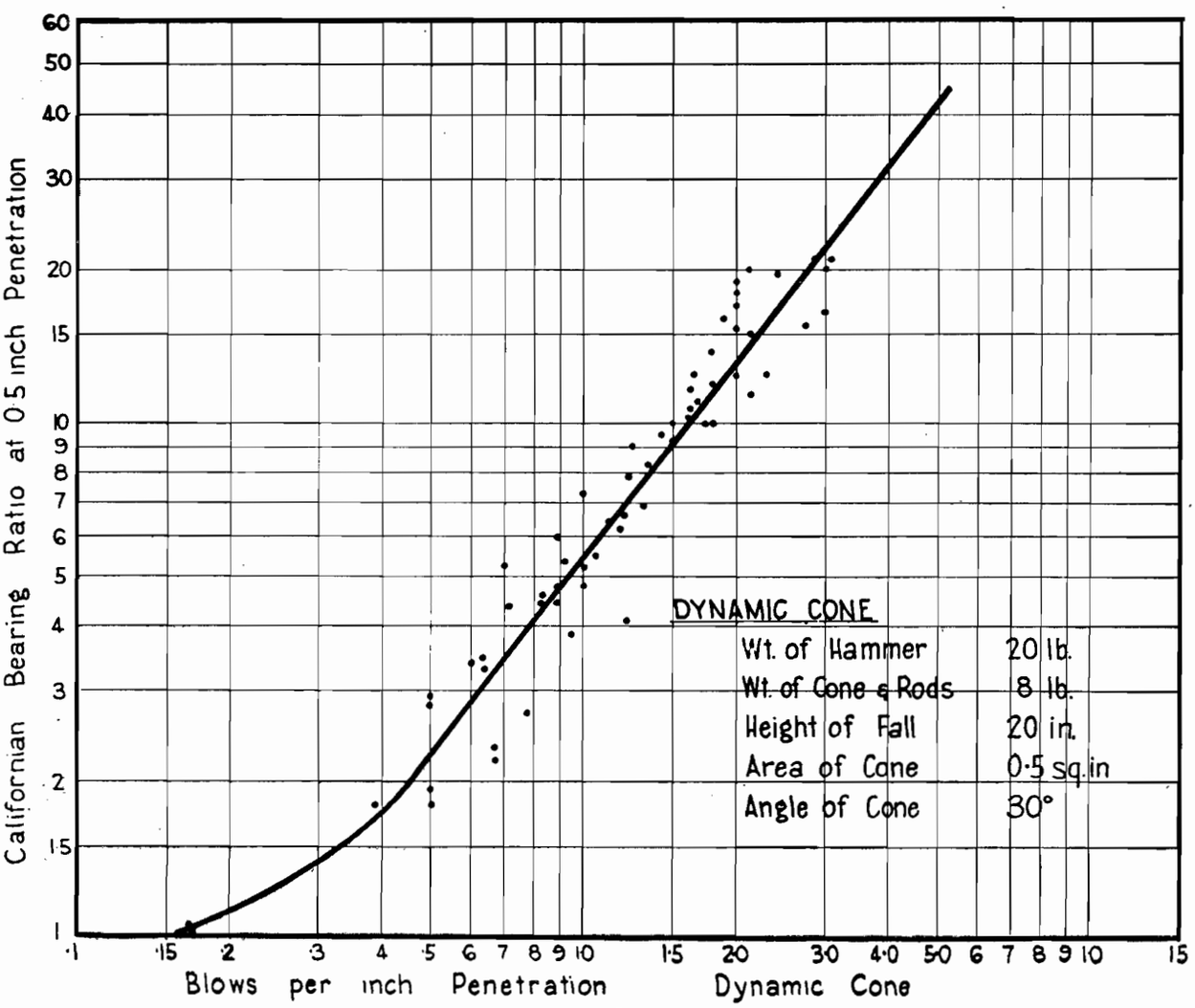

Californian Bearing Ratio at 0·5 inch Penetration
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1·5
1
·1
·15
·2
·3
4
·5
6
7
8
9
10
1·5
20
30
4·0
5·0
6
7
8
9
10
15
Blows per inch Penetration
Dynamic Cone
DYNAMIC CONE
Wt. of Hammer 20 lb.
Wt. of Cone & Rods 8 lb.
Height of Fall 20 in.
Area of Cone 0·5 sq.in
Angle of Cone 30°

Fig. 15.

(3) Minimum California Bearing Ratio (usually at 0·5 in.) penetration = cone penetration resistance in lb./sq. in. divided by 43.

The correlation seems slightly better for formula (2) and (3) than for (1), but all are good.

The cone penetration apparatus has been modified for easier transport and is being adapted to enable the same apparatus to be used for field C.B.R. tests, thus allowing a field comparison to be made more easily.

Impact Cone.

The impact cone, described in the last annual report, has also been found to give a good indication of the C.B.R. of clay soils in the range of C.B.R. from 2 to 60. In the field it has proved capable of differentiating between the subgrades under the failed and sound sections of a pavement on the basis of resistance of the cone to driving, and its greater portability and speed in use, with apparently equal accuracy, may make it more useful than the static cone. A tentative correlation with the C.B.R. at 0·1 and 0·5 inch penetration for clay soils, is shown in Figs. 14 and 15.

It is proposed to measure the change in bearing strength with season throughout the coming year under sealed pavements.

DIRECTION BOARDS AND WARNING SIGNS.

Materials.

In the past, advance direction boards and warning signs have been constructed from either plywood, tongue and grooved timber or steel. None of these materials has been satisfactory, as plywood tends to peel, tongue and grooved timber opens up and rust spots appear on the surface of steel signs where the paint becomes damaged through handling or vandalism, and signs often have to be replaced before their surface coating is at the end of its useful life. In order to increase the service life of signs, the Board is now using warning signs made from either aluminium alloy or 10-gauge steel galvanized after punching and cutting. To avoid rust streaks from bolts disfiguring the surface of signs and posts, only galvanized bolts, nuts, and washers are now used where a bolt passes through a painted surface on a sign.

In order that bolts should fit as flush as possible with the sign surface, holes in these signs are punched square, slightly larger in size than the square section at the head of the coach bolt which is used to attach the sign to the post.

ENGINEERING CIRCULARS.

The following Engineering Notes were distributed during the year :—

Number.	Title.
43	Grading of Fine Crushed Rock
44	Formation and Grading—Use of Top Soil
45	Maintenance Patching
46	Preparation of Sealed Pavements before Reseal
47	Use of Explosives in Road Works
48	12 Foot Seals
49	Treatment of Railway Level Crossings

Staff.

It is desired to express appreciation of the work of all members of the engineering staff in the service of the community.

C. G. ROBERTS,
Chief Engineer.

COUNTRY ROADS BOARD.

STATEMENT OF RECEIPTS AND PAYMENTS FOR YEAR ENDED 30TH JUNE, 1954.

(Adjusted to nearest pound.)

		Country Roads Board Fund.	*Commonwealth Aid Roads Act* 1950.		Loan Funds.		Total.
			Sec. 6 (1).	Sec. 7 (1).	Permanent Works.	Restoration of Flood and Bush Fire Damage.	
RECEIPTS.	£	£	£	£	£	£	£
Balances at 1st July, 1953		15,097	..	..	..	..	15,097
Motor Car Registration Fees	4,081,578						
Drivers' Licence Fees ..	178,885						
Fines	95,398						
	4,355,861						
Less Cost of Collection ..	385,333						
		3,970,528	..	..	..	..	3,970,528
Municipalities Repayments—							
Permanent Works—Main Roads ..	1,456						
Maintenance—Main Roads ..	330,149						
		331,605	..	..	..	..	331,605
Moneys provided by *Commonwealth Aid Roads Act* 1950		..	1,693,005	1,048,603	..	..	2,741,608
Receipts from State Loan Funds—							
Act 3662		..	..	..	300,090	..	300,090
Act 5363		..	..	..	951,812	..	951,812
Act 5657—Flood and Bush Fire Damage ..		..	..	..	..	245,741	245,741
Treasurer's Advance—Pending Legislation—Main Roads		..	..	..	15,098	..	15,098
Other Receipts—Fees and Fines		1,841	..	..	..	..	1,841
		4,319,071	1,693,005	1,048,603	1,267,000	245,741	8,573,420
PAYMENTS.							
Construction and Maintenance of Roads and Bridges—							
Main Roads		1,859,264	605,426	..	315,188	72,373	2,843,251
State Highways		474,268	1,084,938	..	951,812	*Cr.* 7,106	2,503,912
Tourists' Roads		..	..	212,976	..	4,828	217,804
Forest Roads		90,548	..	9,427	..	8,529	108,504
Unclassified Roads—							
Construction and Maintenance		..	2,470	484,897	..	167,117	654,484
Isolated Settlers' Roads		..	..	2,561	..	..	2,561
Federal Maintenance		..	..	338,742	..	..	338,742
Murray River Bridges and Punts		17,032	..	..	..	..	17,032
Traffic Line Marking		23,854	..	..	..	..	23,854
Plant Purchases		670,218	171	..	..	..	670,389
Traffic Lights		8,399	..	..	..	..	8,399
Interest and Sinking Fund Payments.. ..		610,154	..	..	..	..	610,154
Interest and Sinking Fund Payments—Great Ocean Road		1,000	..	..	..	..	1,000
Payment to Tourists' Resorts Fund		58,000	..	..	..	..	58,000
General and Administration Expenditure ..		460,793	..	..	..	..	460,793
		4,264,530	1,693,005	1,048,603	1,267,000	245,741	8,518,879
Balances at 30th June, 1954 ..		54,541	..	..	..	..	54,541

NOTES.—The amount shown under *Commonwealth Aid Roads Act* 1950, Sec. 6 (1) does not include the proportion reserved for other works connected with transport in terms of that Act, as that proportion is not disbursed by the Board.

Relief to Municipalities, granted under Acts 4140 and 4415, amounted in 1953-54 to £164,163.

AUDITOR-GENERAL'S CERTIFICATE.

The accounts of the Country Roads Board for the year ended 30th June, 1954, have been audited. In my opinion the above statement of Receipts and Payments fairly presents in summary form the transactions during that period.

E. A. PEVERILL,
Auditor-General,
12th January, 1955.

C. G. GRIFFITHS,
Accountant,
12th October, 1954.

COUNTRY ROADS BOARD.

Loan Liability at 30th June, 1954.

—	£ s. d.	Main Roads. £ s. d.	Developmental Roads. £ s. d.	Total. £ s. d.
Permanent Works—				
Main Roads	5,785,042 2 10			
State Highways	3,839,978 18 0			
Tourists' Roads	55,292 10 3			
Forest Roads	1,083 18 11			
		9,681,397 10 0	..	..
Developmental Roads		..	6,425,757 10 11	16,107,155 0 11
Discount and Expenses		182,172 5 0	238,496 1 9	420,668 6 9
Total amount borrowed		9,863,569 15 0	6,664,253 12 8	16,527,823 7 8
Less Redemption of Loans—				
Redemption Funds		85,219 1 1	646,386 7 4	731,605 8 5
Main Roads Sinking Fund		285,688 7 7	..	285,688 7 7
Developmental Roads Sinking Fund		..	55,083 0 2	55,083 0 2
State Loans Repayment Fund		931,691 10 9	..	931,691 10 9
National Debt Sinking Fund		880,002 19 9	1,283,929 7 0	2,163,932 6 9
		2,182,601 19 2	1,985,398 14 6	4,168,000 13 8
Loan Liability at 30th June, 1954		7,680,967 15 10	4,678,854 18 2	12,359,822 14 0

COUNTRY ROADS BOARD.

Works Executed on Behalf of Commonwealth and State Authorities for Year ended 30th June, 1954.

Department or Authority.	Description of Works.	Expenditure Chargeable to Authority. £ s. d.
Department of Public Works	Roadworks: Chandler Highway, Ocean Road, Australian Mutual Provident Society Project (Kaniva Shire, Big Desert Road), Heyfield; Various: School projects throughout Victoria ..	47,354 1 8
Forests Commission	Bridgeworks: Orbost Shire; Roadworks: Maffra Shire ..	3,317 10 0
Gas and Fuel Corporation of Victoria ..	Roadworks: Morwell Shire	209 11 5
Geelong Waterworks and Sewerage Trust ..	Bridgeworks: Bostock Dam Project	5,090 15 1
Housing Commission	Roadworks: Ballarat, Morwell, Norlane Housing Estates ..	89,580 18 11
Melbourne and Metropolitan Board of Works	Bridgeworks, Roadworks: Healesville, Upper Yarra Shires ..	10,249 11 5
Soldier Settlement Commission	Roadworks in Soldier Settlement Estates throughout Victoria ..	96,076 16 5
State Coal Mine	Maintenance of roads: Wonthaggi	28 3 11
State Electricity Commission	Bridgeworks, Roadworks: Kiewa Valley, Morwell, Princes Highway East	11,281 6 6
State Rivers and Water Supply Commission	Bridgeworks, Roadworks: Eildon Project (Alexandra, Mansfield, Bonnie Doon), Hume Weir Project, Cairn Curran Reservoir ..	260,447 2 7
Victorian Inland Meat Authority ..	Roadworks: Ballarat	1,916 5 9
		525,552 3 8
Commonwealth Department of Works ..	Construction and Sealing Works: Avalon, East Sale, Essendon, Mallacoota, Mangalore Aerodromes, Albion Project, Bandiana Army Ordnance Depot, Longlea Explosives Depot, Monegeeta Army Establishment, Puckapunyal Army Camp, Wilson's Promontory; Bridge strengthening: Seymour area	502,826 16 4
		1,028,379 0 0

By Authority: W. M. Houston, Government Printer, Melbourne.