

Prospects for 1931-32.

WITH the closing of the financial year on 30th June last, it is opportune to take stock of the present position of main and developmental road conditions and requirements.

As forecasted in the August, 1930, issue of *Main Roads*, the year 1930-31 has been one of great difficulty for those responsible for the upkeep of the roads of the State. Municipal and Shire Councils and the Board have all been confronted with the problem of preventing, with the reduced funds available, the deterioration of the roads which have been placed in good order by past expenditure, and thus avoiding the sacrifice of the money which had been spent in their improvement. As far as the main roads are concerned, the Board has made every endeavour to maintain the roads satisfactorily by devoting the maximum possible amount to this purpose, applying to permanent works only those amounts which were required to complete construction works, as well as negotiations for the acquisition of land for widening which were in hand, or promised, when the year commenced and had to be brought to finality, or to undertake replacement works such as the reconstruction of bridges on the verge of collapse. Work of this last nature, although broadly shown in the expenditure as construction and reconstruction, is, it will be agreed, as far as relative urgency is concerned, equivalent to maintenance work.

All money paid by the Commonwealth Government under the Federal Aid Roads Agreement was required to be expended on construction or reconstruction.*

The expenditure on maintenance therefore was reduced during the year not only because of falling revenue, but to an extent greater than the Board would

have wished because of the necessary application of certain funds to works of construction and reconstruction.

The total reduction in expenditure last year amounted to over £1,500,000 when compared with the year 1929-30 (the year of maximum expenditure on main and developmental roads). The manner in which this reduction took place may be seen in the table on the next page, which also shows the probable expenditure, as far as can be at present estimated, for the financial year 1931-32.

The division of expenditure in the first two funds (the Federal Aid Roads Fund and the Developmental Roads Fund deal only with construction works), and in the combined funds under the various headings is illustrated by the diagrams on page 187, which show the distribution of each £1 expended for the past three years and the anticipated distribution for 1931-32.

It will be noted that in the County of Cumberland, or metropolitan division, a substantial proportion of the expenditure is required for interest and loan repayment, and that the principal reduction is taking place under the heading of construction. The estimated annual sum required for maintenance is from £200,000 to £225,000 (the average for the four years 1926-30 was £224,000, which did not include any provision for the working of the Hawkesbury River ferries now in operation and of which the share of the County of Cumberland Fund may be set down at £7,500). During 1930-31, owing to the excellent condition into which the roads had been brought by the expenditure of previous years, it was possible, without more than minor deterioration of the roads, to reduce the maintenance expenditure

* This will shortly be changed—see article on the Federal Aid Roads Agreement on page 188.

(including the share of the County of Cumberland Fund of the working of the ferries previously mentioned) to £180,000 in order to permit certain important construction and resumption works, which were either in hand or promised, to be completed or undertaken. The maintenance expenditure cannot, however, be continued at so low a figure without loss of condition. Consequently, the amount set down for construction during 1931-32 (£128,000) is sufficient only to provide for the works of access to the Sydney Harbour Bridge (the new road from the bridge head to the junction of Miller and Mount streets, and Spofforth-street on the North Sydney side,

set aside for trunk and ordinary main roads maintenance to 31st December, 1930, suffice to extend the programmes of work to 30th April, 1931. On this latter date, however, it was seen that the Board's revenue was still falling and that it would be impossible to continue to subsidise expenditure by country councils on the basis which had applied from 1st July, 1928, viz., that the Board should bear two-thirds of the cost of work on trunk roads and three-fifths of the cost of work on ordinary main roads. The Board therefore advised councils, on 1st May, 1931, that future assistance for work on main roads would be granted on the minimum basis set out in the Main

Head of Expenditure.	1928-29.	1929-30.	1930-31.	1931-32. (Estimated.)
COUNTY OF CUMBERLAND MAIN ROADS FUND—				
Maintenance	£ 204,788	£ 240,422	£ 179,998	£ 180,000
Construction and reconstruction (including land acquisition) ...	633,769	611,183	361,547	128,000
Interest and loan repayment	206,789	258,243	232,891	274,000
Administration	23,841	24,924	21,405	18,000
Miscellaneous	2,788	4,099	10,160	.....
Totals	£ 1,071,975	£ 1,138,871	806,001	609,000
COUNTRY MAIN ROADS FUND—				
Maintenance	837,918	1,074,861	667,011	606,000
Construction and reconstruction	716,251	812,892	405,378	90,000
Interest and loan repayment	14,199	37,965	65,655	72,000
Administration	62,210	64,239	64,335	58,000
Miscellaneous (including plant running expenses)	76,875	87,176	76,117	65,000
Totals	£ 1,707,453	2,077,133	1,278,496*	891,000
FEDERAL AID ROADS FUND—				
Construction and reconstruction	962,857	1,090,792	641,292	142,000
Loan repayment	19,864	28,651	26,986	28,000
Totals	£ 982,721	1,119,443	668,278	170,000
DEVELOPMENTAL ROADS FUND—				
Construction	247,205	263,382	185,618	44,000
Administration	4,787	8,005	7,443	.....
Totals	£ 251,992	271,387	193,061	44,000
GRAND TOTAL ALL FUNDS—				
Maintenance	1,042,706	1,315,283	847,009	795,000
Construction and reconstruction	2,560,082	2,778,249	1,593,835	404,000
Interest and loan repayment	240,852	324,859	325,532	374,000
Administration	90,838	97,168	93,183	76,000
Miscellaneous	79,663	91,275	86,277	65,000
Totals	£ 4,014,141	4,606,834	2,945,836*	1,714,000

*Figures are subject to adjustment. This total is greater than the total shown on page 192 by £50,000, representing a depreciation allowance on assets.

from Ranger's-road to Military-road) which should, if possible, be completed in time for the opening of the bridge, and for the payment of claims on account of resumptions already effected or in hand. Were the Federal Aid Road moneys available, it would be possible to augment the maintenance allocation to the desirable minimum.

In the Country Main Roads Fund also, substantial reductions have been necessary under both the headings of construction and maintenance. The loss of income to this fund was so acute in the earlier months of last financial year that the Board was compelled, in October, 1930, to reduce the State Highway maintenance works, of which the Board bears the full cost, by one-third, and to make the funds which had been

Roads Act, i.e., the Board and councils shall each bear one-half the cost.

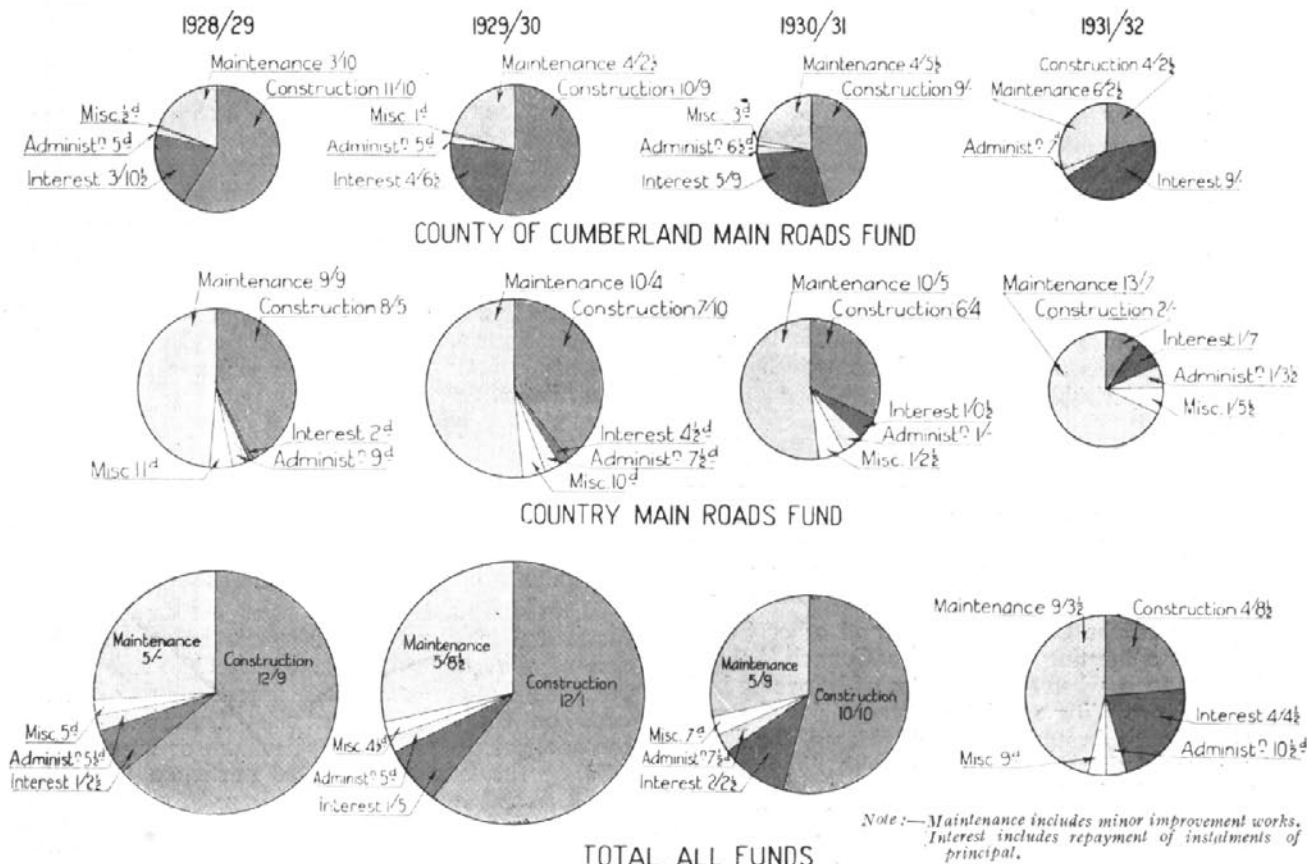
For the current financial year, practically the whole of the available funds, after providing for interest and loan repayments and miscellaneous expenses, has been set aside for maintenance, viz., £606,000 out of a total of £891,000. The comparatively small sum of £90,000 allocated to construction is for the replacement of a number of bridges which are worn out and cannot longer be expected to carry traffic safely. Here again the sum available for maintenance is approximately £250,000 short of that needed to prevent deterioration, and can only be made good by the resumption of the payment of Federal Aid Road moneys, while there is at least £100,000 worth of other bridge replacement

works which would, under more favourable circumstances, warrant authorisation.

In the Federal Aid Roads Fund, the sum of £641,292 for the year 1930-31 represents £524,361 expended from ordinary Federal Aid Funds prior to 1st April, 1930 (on which date the Commonwealth suspended for the time being the payment of further Federal Aid moneys to New South Wales), and £116,931 expended out of the balance of State funds in hand on 1st April, 1931, and an advance of £233,884 made by the Unemployment Relief Council to tide over the suspension mentioned and to complete certain contract works in progress and any similar day labour work to such a

the absence of any supply of such funds the expenditure last year fell substantially. The sum of £44,000 set down for expenditure this year represents the unexpended balances of moneys already allocated to councils.

Apart from the major items of expenditure of construction and maintenance, it will be noted that the proportion of interest and loan repayments to total expenditure has increased in 1930-31 and will still further increase in 1931-32. This is, of course, due to the fact that interest and sinking fund charges are fixed, and when shown in relation to a reduced total expenditure must display a higher percentage. The



Graph showing to scale the expenditures for the past three years, and the estimated expenditure for 1931-32. The areas of the circles represent the total expenditure from each fund for each year, and the radial lines show the amounts expended under each head. The figures indicate how each £ is distributed amongst the several headings. The Federal Aid Roads Fund and the Developmental Roads Fund, which deal only with construction, have not been shown separately.

degree as to make them safe or available for use by traffic. The amount set down for 1931-32 (£142,000) represents the unexpended residue (£112,000) of this advance, together with £30,000 for Western Division roads, of which £10,000 will be provided by State motor taxation and £20,000 by Parliamentary appropriation as laid down by section 31B of the Main Roads Act. Should this latter sum not be voted by Parliament, the estimate should be reduced accordingly. Any further expenditure beyond that set down in the table must await the resumption of payment of Federal Aid Road moneys.

The construction of developmental roads has in the past been carried out mostly from loan funds, and in

rate of 4s. 4½d. in the £, or 22 per cent. for the current year is not considered to be too high, however, when it is remembered that the rate is the outcome of a definite borrowing policy to place the main roads in reasonably good condition and locations with a minimum of delay. The rate will not increase (unless by further restriction in income) and will in fact gradually decrease as loans commence to mature. Moreover, the benefits accruing from this expenditure will last for many years, and in most cases for a period well beyond the term of the loans, e.g., earthworks on the Sydney-Newcastle section of the Pacific Highway and road widenings in the metropolitan area.

(Concluded on page 189.)

Federal Aid Roads Agreement.

IN the April, 1930, issue of *Main Roads*, reference was made to the decision of a Premiers' Conference held at Canberra during February, 1930, to amend the Federal Aid Roads Agreement so as to eliminate all clauses other than those which provided for the distribution of £2,000,000 of Commonwealth revenues among the States on the basis of the original agreement, viz., three-fifths population and two-fifths area. A full account of the negotiations which led up to this decision was subsequently given in the Board's Fifth Annual Report. This decision meant that—

- (1) As from 21st February, 1930, all further contributions by the States *pro rata* with the Commonwealth were eliminated.
- (2) The Commonwealth grant to the States was to be maintained at the same rate as formerly and be distributed among the States in the same proportions as under the original agreement.
- (3) The money could be used for any class of road work, viz., maintenance, repair, construction or reconstruction as the States without reference to the Commonwealth might deem desirable.

A draft agreement embodying these terms was, in due course, drawn up by the Commonwealth Government, signed by the Prime Minister (Hon. J. H. Scullin, M.P., P.C.) on 29th July, 1930, and forwarded to the States for similar action by the Premiers. This amended agreement was subsequently ratified by the Parliaments of Queensland and South Australia, but not by those of the Commonwealth and other States. However, at a meeting of the Loan Council, held on 8th August, 1930, when the questions of balancing budgets and of providing special assistance for the year 1930-31 to South Australia were considered, the Prime Minister stated that the Commonwealth did not propose to proceed with the ratification of the new agreement during the then current session of Parliament. He indicated that, pending further consideration of the question, payments to the States in respect of Federal Aid roads would be dealt with as formerly.

At a later meeting of the Loan Council held on 11th November, 1930, it was decided that, to avoid inconvenience to the States and at the same time to comply with the terms of the original agreement, pending the ratification of the amended agreement, each 35s. paid to the States by the Commonwealth should be regarded as consisting of 20s. grant and 15s. advance (to enable the State to subscribe its quota) subject only to the total payment by the Commonwealth in this manner not exceeding the amount which would have been paid by the Commonwealth if each State could have provided its quota from its own resources. It was also resolved that the whole question of the Federal Aid Roads Agreement should be further considered at the next Premiers' Conference.

At that conference, held on 10th February, 1931, the Prime Minister pointed out that whereas a duty

of 2d. per gallon on petrol and duties on chassis formerly produced a revenue of more than £2,000,000 per year, now the yield from those sources was less than £1,000,000 per annum. It was therefore impossible for the Commonwealth to continue paying to the States at the rate of £2,000,000 per annum for road purposes. He suggested that after 30th June, 1931, this contribution should be reduced to the proceeds of a 2½d. per gallon duty on all petrol cleared through the Customs for home consumption, and, after discussion, the conference resolved that—

The Federal Aid Roads Agreement be amended to provide that as from 1st July, 1931, the Commonwealth shall pay to the States a sum equal to 2½d. per gallon on all petrol cleared through the Customs for home consumption, such sum to be apportioned among the States on the same basis as the £2,000,000 set out in the agreement; all other conditions contained in the roads agreement to be cancelled.

On the basis of 2½d. per gallon on petrol cleared for home consumption, the amounts payable to the States as a whole during the past four years would have been approximately as follow:—

1927-28	.. ..	£1,742,000
1928-29	.. ..	2,085,000
1929-30	.. ..	2,437,000
1930-31	.. ..	1,300,000

It was estimated at the date of the conference that the figure for 1930-31 would be £1,200,000.

A revised amended agreement on these lines was forwarded by the Prime Minister for the consideration of the various States on 23rd April, 1931. It provided that this per-gallon payment should be reckoned on the naphtha, benzine, benzoline, gasoline, pentane, petrol, and other petroleum or oil spirit dealt with by the Customs under a particular item of the Tariff Schedule.

At a special conference of Commonwealth and State Ministers called by the Prime Minister and held at Melbourne from 25th May to 11th June, 1931, this agreement was discussed. Representatives of the States pointed out that by limiting the reference in the agreement to one particular tariff item, any rearrangement of the tariff schedule might substantially affect the volume of petrol upon which the rate of 2½d. could be reckoned, while by excluding any reference to locally distilled petrol, any change in the national habit by the substitution of local refining for the importation of the refined commodity might cause a similar drop. As the consumption of the petrol, wherever distilled, would result in the wear of the roads over which it would propel vehicles, it seemed reasonable that the amount of the petrol tax to be set aside for road purposes should be reckoned on all petrol, whether imported in a distilled condition, or distilled locally.

At this conference, a report was also submitted showing that whereas the Commonwealth Government

had, at the time of the passage of the Federal Aid Roads Act in 1926, imposed a special duty of 2d. per gallon on petrol, estimated to realise £1,500,000 per annum and additional duties on chassis, estimated to realise £500,000 per annum, the receipts to date had been—

		Petrol (2d. per gallon).	Chassis.	Total.
		£	£	£
1926-27	...	1,077,000	.....	1,077,000
1927-28	...	1,394,000	237,000	1,631,000
1928-29	...	1,668,000	405,000	2,073,000
1929-30	...	1,950,000*	258,000	2,208,000
1930-31	...	815,000†	28,000	843,000

* The receipts for 1929-30 were inflated somewhat by heavy clearances of petrol in the last four months. † Approximately ten months.

Since 1st July, 1930, there had been a large drop in petrol consumption and imports of chassis and the special tax of 2d. per gallon on petrol had produced the following sums each month:—

	£	£
July	83,000	
August	28,000	
September	34,000	
October	74,000	
November	73,000	
December	106,000	
Total for six months	£398,000	398,000
January	95,000	
February	99,000	
March	119,000	
April	104,000	
Total for four months	£417,000	417,000
		£815,000

It was estimated from these figures, that the collections for 1930-31, reckoned on a basis of 2½d. per gallon, would realise more than was anticipated in February, viz., £1,300,000.

The present customs tax on petrol is 7d. per gallon, while the excise tax on local refinings is 4d. per gallon. After discussion, it was agreed that it was necessary to amend the draft agreement to provide that the States should not be deprived of some of their expected revenue because of the possibility of increasing quantities of crude oil being imported and refined locally, and the Commonwealth Government undertook to go into the various matters raised by the States and embody in the agreement provision for a further payment to the States of 5/14ths (i.e., the same proportion of the excise tax as is devoted from the customs tax to roads) of excise collections on petrol refined in Australia.

The terms of the revised agreement were explained by the Federal Treasurer during the delivery of his Budget Speech on 10th July, 1931. Instead of fixing the proportion of the excise tax to be devoted to roads at 5/14ths of that tax (which would amount at present rates to 1.43d. per gallon), the Commonwealth has suggested that this should be fixed at the definite rate of 1½d. per gallon.

On the basis of the present level of collections, this means a further payment to the States of about £130,000 per annum. Hence, if the collections on

petrol are maintained at the level of the eleven months ended 31st May, 1931, the total amount that will be available annually for distribution to the States as a whole will be approximately £1,400,000, viz., imports at 2½d. per gallon £1,270,000 and excise at 1½d. per gallon £130,000. For the first three months of the year 1930-31, the imports were abnormally low because of heavy clearances prior to July. If the collections are maintained at the level of the eight months ended 31st May, 1931, the total annual amount payable to the States will be about £1,580,000, viz., imports £1,450,000 and excise £130,000. At a total of £1,400,000, the share of New South Wales will be £386,400 per annum, while at a total of £1,580,000 it will be £436,000 per annum.

Prospects for 1931-32.

(Continued from page 187.)

Similarly, the cost of administration has a tendency to increase, in percentage terms, as income and expenditure fall. This also is due, in some measure, to fixed charges, such as rentals under leases and audit fees. With a view to keeping it in proportion to its work, the Board has been under the necessity of carrying out systematic retrenchment and rationings during the past year, and recently obtained, with the consent of the Professional Officers' Association, a variation of the award governing its professional staff, which permits it to extend the rationing (which from 23rd February, 1931, to 30th June, 1931, had been at a maximum of one week off in six) up to 40 per cent. of the time of any group of officers in which there would otherwise be a surplus. Each group has therefore been examined on the basis of the work available for that group, and the necessary adjustments made, wherever possible by rationing, but when not possible solely in this manner, by rationing combined with the retrenchment of single or less efficient officers. Every care has been taken to adjust the arrangements, so far as the Board could ascertain, in a manner which would inflict the minimum aggregate hardship and at the same time maintain efficiency.]

The present position of main road work is, therefore, that a curtailment of income both from revenue and loan sources has forced a restriction of expenditure to works which are designed to maintain the roads in their existing condition rather than to improve them. There are not at present funds to provide for any additional main roads or even for works of construction or reconstruction on existing main roads. The regular income of the Board is barely sufficient to pay for day to day maintenance, after providing for interest and sinking fund on past loans and for administration. When, however, further Federal moneys become available, they will under the new agreement be able to be used for maintenance, and if so used will ensure that the roads will at least not go back, even if they cannot be improved.

The Kiama-Jamberoo-Robertson Road.

The Kiama Municipal Council is reconditioning and resurfacing a pot-holed length of the Kiama-Jamberoo-Robertson road (No. 264).

News of the Month.

Metropolitan Division.

Traffic statistics to 30th June, 1931, for Peat's Ferry confirm the conclusions drawn from earlier records and presented in the February and March, 1931, numbers of *Main Roads*. The average weekly traffic obtaining before the Christmas holidays was maintained until Easter, the Easter-week traffic being approximately three-quarters of that during Christmas week. There was a distinct falling off for several weeks just before and after Easter as at previous holiday seasons, indicating that much traffic is arranged to coincide with holiday periods. Since Easter, the traffic has fluctuated with the weather conditions. The March average was well maintained during May and the first fortnight of June, but the abnormal weather conditions during the latter half of June, were reflected in a sharp decline in

Municipal Council and operated as a toll bridge until 28th March, 1930, when the tolls were discontinued and the bridge was transferred to the control of the Public Works Department. The major portion of the bridge is of timber, the double-leaf, electrically operated bascule span and an adjacent truss span being of steel.

Outer Metropolitan Division.

The obelisk on the kerb at the intersection of Manning and Terralong streets (post office corner) on the Prince's Highway in the Municipality of Kiama having been removed to a site on the opposite side of the street, the corner is being rounded and improved drainage facilities provided.

The re-surfacing of the first 8 miles north of Mooney Point, on the Pacific Highway, has been commenced.



Left—Flood waters from Tarcutta Creek blocking the Monaro Highway near its junction with the Hume Highway at Lower Tarcutta, on 24th June, 1931.

Right—Waters from Kyeamba Creek crossing the Monaro Highway on the Wagga side of Alfred Town on the same day.

the ferry traffic. The daily average number of vehicles up to 11th January was 588, and the corresponding figure for the period 11th January-28th June was 495 vehicles per day. As forecasted in the March number of *Main Roads*, the continuance of the 6 a.m.-12.30 p.m. service was considered in the light of the night traffic offering, resulting in the substitution of a 6 a.m.-10.30 p.m. service from 5th May onwards.

Nepean Shire and St. Mary's Municipal Councils are improving Orphan School road (part of the Cabramatta-Luddenham secondary road, No. 2020) between the end of the recently reconstructed section, about one mile west of Cowpasture-road, and Luddenham. The gravel and earth formation is being regraded and additional gravel added where necessary, the aim being to gradually raise the standard of the road, which connects Luddenham, Wallacia and Mulgoa with the Hume Highway at Cabramatta.

The control of the Spit Bridge over Middle Harbour, between Mosman and Manly, has been undertaken by the Board, and the bridge is now being maintained and operated by the Board's staff. This bridge was built by the Sydney Harbour Trust on behalf of the Manly

The pavement, which is of local gravel, was tar surfaced in December, 1930. The present re-surfacing with tar is being undertaken with a view to building up a thicker mat more in keeping with the needs of fast traffic experienced on this section.

The Mittagong-Bowral-Moss Vale road (No. 260) in the Municipality of Bowral has been reconstructed between Cliff-street and the northern municipal boundary (Gib Hill) by Contractors Worner and McFarlane. The new road consists of a waterbound macadam base course, 6 inches thick, and a penetration macadam surface course, 3 inches thick and 16 feet wide, with 4 feet shoulders. Prior to commencing the work, alternative proposals involving deviations for improving the grades were considered, but the new work closely follows the old road, which has been regraded where necessary to improve the levels. This work connects at the municipal boundary with the recently completed Gib deviation in the Municipality of Mittagong. The latter, in contrast to the construction in Bowral, included high embankments which have been paved as a first stage with waterbound macadam sealed with tar, pending full consolidation.

Upper Northern Division.

A length of 1 mile on the Great Northern Highway in the Municipality of Tenterfield, has been tar-surfaced, in extension of a length of 3,300 feet surfaced last year.

Contractor R. P. Sylvester has completed the construction of 990 feet of gravel pavement, and 1 mile 3,955 feet of earth formation on the Big Hill deviation on the Grafton-Baryulgil road (No. 150) in the Shire of Copmanhurst, completing the deviation, the first section of which was constructed in 1927.

The construction of 4,344 feet of waterbound macadam pavement and a three-cell 10 feet by 10 feet reinforced concrete box culvert over Horsestation Creek, on the Kyogle-Rathbone's developmental road (No. 1141), in the Shire of Kyogle, has been completed by Contractors J. and A. J. Hill.

Lower Northern Division.

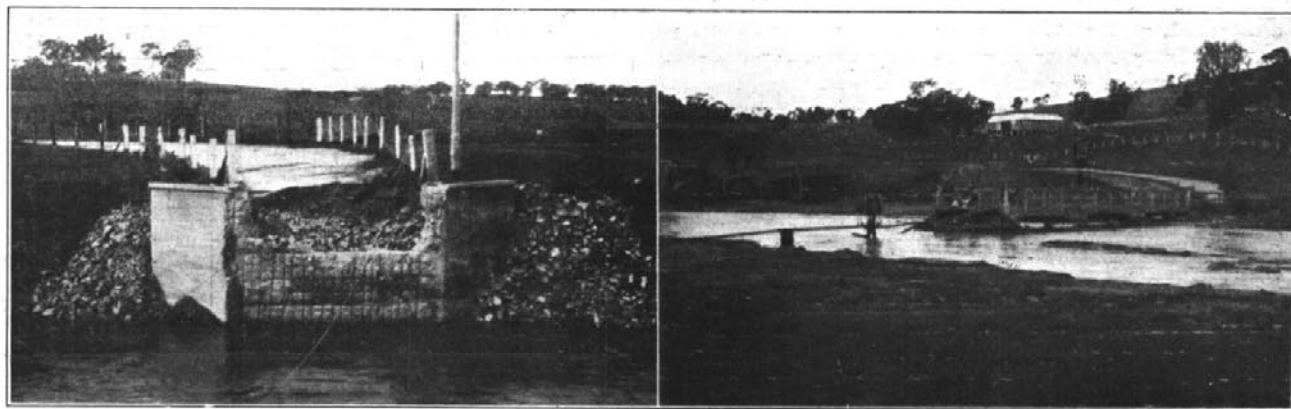
In the July number of *Main Roads*, reference was made to the grading after rain of the shale pavements in the Tamworth district, particular reference being

up rapidly into deep potholes during dry weather. An attempt will be made during future programmes to improve it in this respect by the addition of ridge gravel.

The May and June rains have caused numerous traffic blocks on the main roads in the division. In Namoi Shire, the Narrabri-Moree road (No. 126) has been practically untrafficable north of Narrabri for some weeks; in Barraba Shire, the river crossings at Boomi Creek on the Cobbadah-Narrabri road (No. 133), and at Ironbark Creek on the Barraba-Bundarra road (No. 132) have on several occasions stopped traffic; in Liverpool Plains Shire, the Oxley Highway was blocked at Gunnedah due to the Namoi River waters being over the road; and the Uralla-Walcha road (No. 115) was blocked when Salisbury Creek overflowed. Traffic blocks such as these have been infrequent in recent years.

Riverina Division.

During the first six months of 1931, the rainfall in the Riverina registered 24 inches. In June, the wet



Left—The abutment of the bridge destroyed on 11th June at Hillas Creek, south of Gundagai, on the Hume Highway. The face of the abutment was torn away by the reinforcement when the superstructure was carried away.
Right—The Mt. Adrah bridge over Hillas Creek, on the Monaro Highway. The washaway is shown on the left.

made to the Tamworth-Manilla trunk road (No. 63). Further heavy rains in the latter half of June emphasised the value of this work. Before the May rains, the Great Northern Highway in Peel Shire was rather rough, due to numerous potholes in which water collected and saturated the pavement, rendering it very greasy and difficult to travel. Before the shale had set hard again, the road was reshaped with graders, resulting in the effect of the June rains being not nearly as noticeable. Further grading again restored the road.

In Upper Hunter Shire, advantage was taken of the wet weather to re-shape a badly potholed section of the Great Northern Highway between Wingen and Parkville. Potholes were filled with gravel from the shoulders and the length graded with a baby grader, while moist, until a good cross-section was obtained. What was previously one of the worse sections of the Highway has been converted at very little cost into a fair surface. Unfortunately the creek gravel in the pavement is deficient in binding properties and breaks

weather culminated in a total fall of 8 inches, causing considerable damage to the roads. As a consequence road work throughout the division, other than repairs to washaways, is largely at a standstill.

On the Urana-Albury road (No. 125), the overflow from Billabong Creek broke through the road embankment near Urana during the June floods. At the new concrete bridge over Billabong Creek at Walbundrie, the flood, on 24th June, reached the tops of the piers, a height approximately 2 feet greater than any previously recorded flood. The bridge was isolated, the surrounding country being submerged.

In Kyeamba Shire, both Tarcutta and Kyeamba Creeks rose, on 24th June, to a level approximately 2 feet higher than any previous flood, with the result that the former blocked the Monaro Highway at its junction with the Hume Highway at Lower Tarcutta and the latter blocked the same road on the Wagga side of Alfred Town bridge.

On the Hume Highway, the concrete bridge over Hillas Creek, south of Gundagai, was washed away on

11th June. Traffic was diverted from Tumblong to Mt. Horeb, thence to Adelong, and then along the Monaro Highway to its junction with the Hume Highway near Lower Tarcutta. On 22nd June, Hillas Creek altered its course near Mt. Adrah, on the Monaro Highway between Adelong and Lower Tarcutta, completely washing away the approaches to the Mt. Adrah bridge and depositing large quantities of sand under the latter. The western approach was scoured 4 feet below the natural surface of the ground and 80 feet wide. Traffic was then diverted from Adelong, along the Monaro Highway to Tumut, thence to Wondalga and Tumbarumba, rejoining the Hume Highway at Little Billabong, north of Holbrook. Recently springs have broken out between Tumut and Wondalga, completely blocking the road to traffic, and necessitating a further diversion between Adelong and Wondalga. Tenders have been called for the supply of materials to repair the washaway at Mt. Adrah bridge on the Monaro Highway, and the erection of a temporary structure over Hillas Creek on the Hume Highway has been arranged.

Southern Division.

The State Monier Pipe and Reinforced Concrete Works has completed the steel truss bridge over the Murrumbidgee River at Taemas, on the Yass-Tumut road (No. 278). This bridge was described and illustrated in the February, 1930, and May, 1931, numbers of *Main Roads*. The approaches have been not yet completed, but, when the high level of the Murrumbidgee towards the end of June rendered it impossible to carry on the punt service at Taemas, Contractors Gilroy and Robson allowed traffic to use the unfinished approaches and the bridge was opened to traffic.

Tallaganda Shire Council has completed extensive repairs to the bridge over Reedy Creek, on the Doughboy-Tarago road (No. 269). The bridge consists of two old 75 feet truss spans on a timber sub-structure. Prior to the repairs, the loading on the bridge was restricted owing to its condition. Some of the piles in the sub-structure and some of the truss members were renewed, and a large proportion of the truss cross-beams and decking was replaced with new timber.

Expenditure from 1st July, 1930, to 30th June, 1931.

	Expenditure from 1st July, 1930, to 31st May, 1931.	Expenditure for month of June, 1931.	Total Expenditure to 30th June, 1931.
	£ s. d.	£ s. d.	£ s. d.
COUNTY OF CUMBERLAND MAIN ROADS FUND—			
Construction of Roads and Bridges	218,469 12 0	3,161 15 11	221,631 7 11
Cost of Land Resumptions	105,539 1 6	6,268 2 4	111,807 3 10
Maintenance of Roads and Bridges	155,003 18 9	10,933 9 3	165,997 8 0
Repayment of Loans	164,605 6 11	68,285 13 11	232,891 0 10
Survey, Design, Supervision and Administration	44,007 1 8	5,447 2 2	49,514 3 10
Miscellaneous	28,514 14 3	4,355 1 10*	24,159 12 5
Totals	710,259 15 1	89,741 1 9	806,000 16 10
COUNTRY MAIN ROADS FUND—			
Construction of Roads and Bridges, including Resumptions	348,701 16 7	10,726 2 3	359,427 18 10
Maintenance of Roads and Bridges	612,472 15 0	54,538 13 3	667,011 8 3
Repayment of Loans	36,824 8 9	28,830 18 9	65,655 7 6
Survey, Design, Supervision and Administration	99,847 1 4	10,438 11 9	110,285 13 1
Miscellaneous	24,801 12 1	1,313 19 11	26,115 12 0
Totals	1,122,647 13 9	105,848 5 11	1,228,495 19 8
FEDERAL AID ROADS FUND—			
Construction of Roads and Bridges, including Resumptions	622,545 0 11	26,831 13 2	649,376 14 1
Miscellaneous	18,092 15 2	808 11 1	18,901 6 3
Totals	640,637 16 1	27,640 4 3	668,278 0 4
DEVELOPMENTAL ROADS FUND—			
Construction of Roads and Bridges	169,561 7 11	2,438 0 4	171,999 17 3
Survey, Design, Supervision and Administration	9,096 13 1	660 10 2	10,357 12 3
Miscellaneous	10,724 16 9	21 0 11*	10,703 15 10
Totals	189,982 17 9	3,078 7 7	193,061 5 4
SUMMARY ALL FUNDS—			
Construction of Roads and Bridges, including Resumptions	1,464,816 18 11	49,426 3 0	1,514,243 1 11
Maintenance of Roads and Bridges	767,536 13 0	65,472 2 6	833,008 16 3
Repayment of Loans	201,429 15 8	97,116 12 8	298,546 8 4
Survey, Design, Supervision and Administration	153,610 16 1	16,546 13 1	170,157 0 2
Miscellaneous	82,133 18 3	2,253 11 9*	79,880 6 6
GRAND TOTALS	2,669,528 2 8	226,307 19 6	2,895,836 2 2†

* Credits. † Subject to finalisation and audit of accounts.

Mill Pond Bridge, Botany Road.

IN the early days of Sydney the water supply of the City was obtained from the Botany swamps.

These consisted of fairly extensive areas of low-lying lands bearing fresh water, which emptied into Botany Bay via a stream, now called the "Mill Stream," at a point $\frac{1}{4}$ mile south of the mouth of Cook's River. In order to conserve the supply, eight earthen dams were in due course constructed between Gardener's-road and Botany Bay, forming a series of ponds, of which the second lowest, known as Mill Pond, was bisected by Botany-road. At the point of crossing the stream was formerly spanned by a four-span timber bridge, 60 feet long, providing a total waterway of 460 square feet, but during the reconstruction of Botany-road by the Botany Road Trust in 1924, this was replaced by a reinforced culvert, consisting of three rows of concrete piles, distant 10 feet 6 inches apart longitudinally, and surmounted by a concrete deck, of which

of the Metropolitan Transport Trust and the Board met at the site to determine what steps should be taken to restore access, and the means of concerting action. Owing to the dislocation of the tram service and the losses of revenue involved it was decided that immediate action should be concentrated on providing temporary means of carrying the double line of tram track across the gap in a manner which would also provide a carriage-way for vehicular traffic. A 3 feet footway would be added to replace a temporary footway erected by the Trust on the eastern side of the road. The precise manner of constructing this temporary bridge would depend, however, on the stability of the culvert, which was still wholly under water, and on whether it would be necessary merely to restore the previous situation or to build a new structure. A diver was therefore sent down to examine the culvert, which was found to be generally intact, except that the concrete



The washaway at Mill Pond bridge after the storm on 6th July, 1931.

the top was about 5 feet 6 inches below the level of the roadway. Due to the dam on the western side of Botany-road, the culvert was generally "drowned," and its waterway of 120 square feet was required to deal only with such of the stormwaters as were not regulated or impounded by the dams above it.

During the very heavy storm on 6th July, 1931, one of the upper dams failed, releasing a body of water which caused the successive failure of four lower dams (all above Botany-road), and in turn washed out the earth filling above the Mill Pond culvert and the roadway on either side to a total length of about 80 feet. Traffic was thereby completely interrupted, the double line of tram track which traverses the road being left suspended in mid-air.

As soon as the subsidence of the stormwaters permitted an examination of the position, representatives

of the Metropolitan Transport Trust and the Board met at the site to determine what steps should be taken to restore access, and the means of concerting action. Owing to the dislocation of the tram service and the losses of revenue involved it was decided that immediate action should be concentrated on providing temporary means of carrying the double line of tram track across the gap in a manner which would also provide a carriage-way for vehicular traffic. A 3 feet footway would be added to replace a temporary footway erected by the Trust on the eastern side of the road. The precise manner of constructing this temporary bridge would depend, however, on the stability of the culvert, which was still wholly under water, and on whether it would be necessary merely to restore the previous situation or to build a new structure. A diver was therefore sent down to examine the culvert, which was found to be generally intact, except that the concrete

sheathing which had been used to retain the filling behind the abutment piles was found to be partly broken and displaced. It was evident, then, that if the culvert were to be retained the simplest and the cheapest course would be to replace the sheathing and to restore the filling as quickly as possible. Whether the culvert should be retained or a larger one built would, however, depend upon whether the Metropolitan Water, Sewerage and Drainage Board, which had charge of the swamps, proposed to reconstitute the dams or not. In the former case, the storms would generally be regulated; in the latter, the flow would be free, except that, owing to the dams on the western side of Botany-road, some portion of the waterway under the road would always be

(Concluded on page 197.)

Highway Work in the United States.

BY H. M. SHERRARD, M.C.E., ASSOC. M.INST. C.E.

Assistant Chief Engineer.

(Continued from page 167, June, 1931.)

Penetration Macadam.—While there is still a considerable proportion of penetration macadam in the United States, new construction work of this type has almost ceased in the western States, and very little, comparatively, is being done in other parts of the country. In New York State there is more penetration macadam than any other type, although the greater part is not on the highways. Some of the States have never done much of this class of work; when it has been necessary to change from light traffic to heavy traffic pavement, they have adopted concrete in preference to penetration macadam. In other States, mixed-in-place surfaces, with their smoother riding qualities and machine construction, have displaced penetration. Penetration macadam still predominates in some of the New England States, notably Rhode Island and Massachusetts.

Rhode Island.—Perhaps the most unique feature of the penetration work, and the one which contributes most to the life of the road, is that a drained sub-base of gravel, 1 foot wider than the pavement on each side, and 6 inches to 12 inches thick, is always provided.

The base course is constructed to a consolidated thickness of $5\frac{1}{2}$ inches, using 4 inches to 1 inch stone (crusher-run) or crushed gravel. The filler is either sand or 1 inch-dust stone. The base stone is required to have a French coefficient of 6 and a toughness of 6. It is regarded as essential to thoroughly roll the base-course before any filler is applied. Then the filler is applied in thin spreadings, concurrently with further rolling. First-class earth shoulders are provided. The crusher-run stone is considered to give greater compactness than an artificial mixture of $2\frac{1}{2}$ inch and $1\frac{1}{2}$ inch commercial sizes. Before the surface course stone is applied, the base is swept clear of excess filler, by hand if necessary, to ensure a bond between the two courses.

For surface course, the stone must pass a $2\frac{1}{2}$ -inch ring and be retained on a $1\frac{1}{2}$ -inch ring. It is regarded as important to use a hard rock, otherwise crushing will occur under the roller and the voids will be partly filled by the chippings so formed, resulting in irregular penetration. A French coefficient of 15 and a toughness of 18 is called for. A uniform size of stone is used to obtain a uniform distribution of sufficiently large voids. The thickness of the course ($2\frac{1}{2}$ inches) is not materially greater than the size of the coarse stone, to reduce the possibility of shoving—which also occurs with excess asphalt. All possible precautions are taken to ensure cleanliness of the stone and uniformity in spreading. The course is traversed three or four times by the roller before penetrating.

Asphalt of 85-100 penetration, having a ductility at 25 deg. C. of at least 30, is applied at the rate of

1.40 U.S. gallons per square yard for penetration and 0.60 U.S. gallons per square yard for sealing, both volumes being measured at 60 deg. Fahr. Asphalt costs about 6d. per gallon, applied. Immediately after spraying, which is done in half widths, the surface is covered by hand with 1-inch to $\frac{5}{8}$ -inch screenings, leaving an uncovered edge along the centre to avoid a subsequent excess of material at this point. For the same reason, the centre joint of the seal coat is staggered. The quantity of screenings used is about one-sixth of the weight of the coarse stone. Irregular spraying at the beginning and end of a section is prevented by using a trough under the jets, or spreading building paper. After spreading the screenings, thorough consolidation by rolling is carried out. The roller wheels are treated with water, oil, grease, or kerosene, to prevent "picking up." Excess screenings are then swept off, usually on the following day, the seal coat applied, $\frac{5}{8}$ -inch to $\frac{3}{8}$ -inch chippings spread, and further rolling carried out for a period of up to two weeks after construction. The weight of chippings used is approximately the same as that of the screenings.

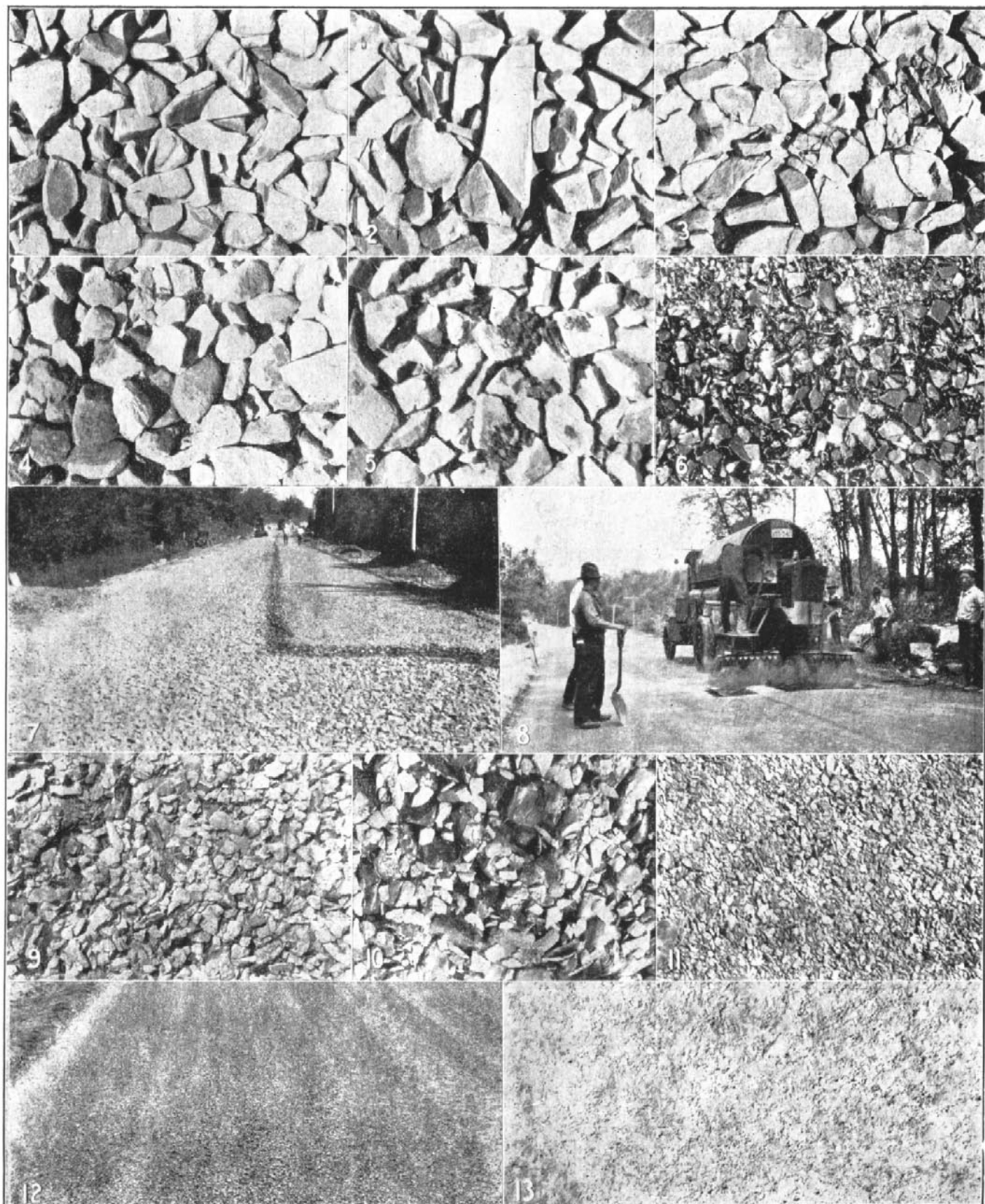
The completed work has a satisfactory rough texture. After five or more years use, the rise of asphalt gradually renders it "polished," after which the surface skin is gradually worn down by traffic. In general it is found unnecessary to re-seal for five to ten years after construction. While extremely smooth penetration roads are obtained in Rhode Island, even at speeds of about 65 miles per hour, they are not as perfect in this respect as mixed-in-place or other machine-built types.

The cost is £5,000 to £6,000 per mile, 18 feet wide, including light grading, or about £4,500 per mile for an 8-inch pavement only, whereas concrete pavements cost £6,000 to £7,000, with somewhat higher maintenance for the latter.

California.—The sections then under construction in Yosemite National Park, described by Mr. T. Hill, Chief Engineer, Commonwealth Department of Works, in his report on the construction and maintenance of roads in U.S.A. and Canada, were inspected, and found to be in excellent condition. The surface has a rough texture. Extremely heavy summer tourist traffic is carried.

Massachusetts.—Penetration macadam roads are said to be carrying traffic of up to 8,000 vehicles per day at maintenance costs less than those of other pavement types.

Virginia.—Near Richmond, one section, six years old, of total thickness 6 inches, was seen carrying moderate traffic and it had not been re-treated. Another section, 6 inches thick, on an old gravel base, on a



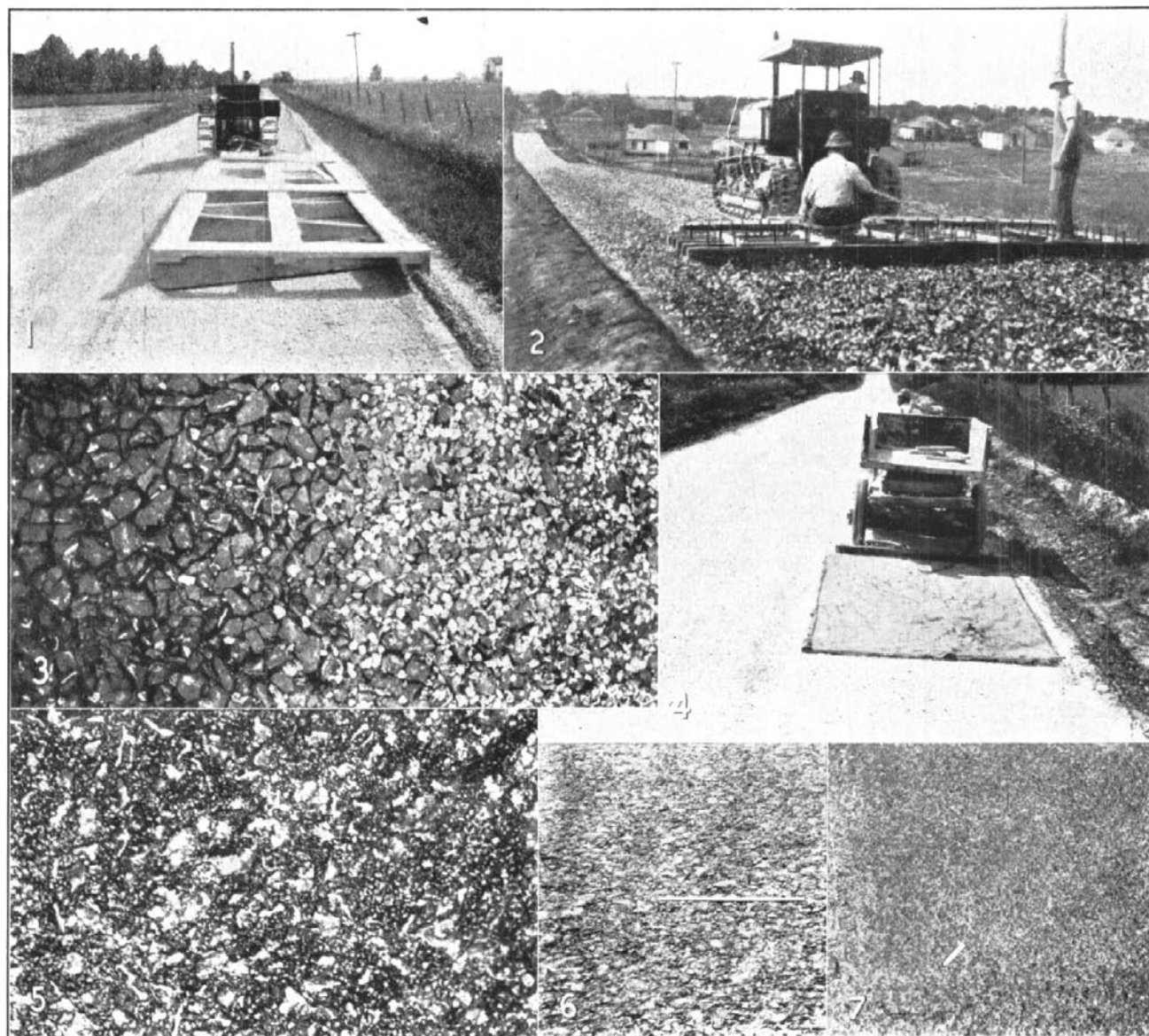
Building penetration macadam in Rhode Island.

- | | | |
|--------------------------------------|---|----------------------------------|
| 1. Well-graded surface course stone. | 2. Badly-graded, flaky stone. | 3. Stone crushed during rolling. |
| 4. Soft stone for base course only. | 5. Cinders left on surface. | 6. After penetrating. |
| 7. Working in half-widths. | 8. Sealing, building paper at beginning of strip. | |
| 9. Key-stone applied. | 10. Insufficient key-stone. | 11. Key-stone after rolling. |
| 12. After sealing and rolling. | 13. Finished surface under traffic. | |

main route in a residential suburb, was fifteen years old, but had not been re-treated. A similar section, ten years old, had been surface-treated once only.

Retread, Indiana.—This, the original "retread," is by no means identical with the mixed-in-place surfacing to which the term is now usually applied.

maintainer. This is not, however, an integral part of the retread top. The Indiana maintenance engineer, Mr. A. H. Hinkle, whose name is well known in connection with the development of retread, states: "The oil-gravel mixture not only adds strength to the base, but forms a more or less impervious layer which sheds



Building retread in Indiana.

- | | |
|--|---|
| 1. Smoothing the gravel base by dragging. | 2. Harrowing after the first application of bitumen. |
| 3. Left—Surface after second application of bitumen. | 4. Dragging with a carpet after spreading cover material. |
| Right—With cover material spread. | 6. Surface texture on completion. |
| 5. Surface after third application of bitumen. | 7. Surface after sealing. |

(Nos. 1-6, inclusive, from Mr. Luker's report.)

To ensure smoothness of the gravel or stone base, it is dragged for some time prior to the building of the top, usually in the spring, using a long-base planer-drag, *e.g.*, two 16-foot drags in tandem, drawn by a 10-ton caterpillar tractor. Often the base is strengthened by removing loose material to the side, spraying the exposed surface with oil, replacing the loose material, and mixing and smoothing with planer or

surface water and also breaks up the capillary attraction from the road base into the top course. It also greatly facilitates levelling the base, and thus helps to obtain a smooth-riding finished surface."

The size of stone used is $2\frac{1}{2}$ inches to $1\frac{1}{2}$ inches or $1\frac{1}{2}$ inches to $\frac{3}{4}$ inch, depending on the thickness of the course. The larger size is the more usual. It is dumped from the trucks through a tail-board opening

or through a spreader, and is levelled by a grader, usually 12-feet blade, drawn by a tractor or a truck, and a drag or maintainer. Usually some hand-trimming at the edges and "spotting" or addition of material at low places is necessary. If the aggregate contains much fine material, it is harrowed so that the fines are dropped to the bottom. The harrow is home-made—merely a pair of wooden frames, each 9 feet wide, of 6 inches x 6 inches timber, with straight vertical teeth of $\frac{3}{4}$ -inch diameter rod, projecting 6 inches, and spaced about 15 inches apart. The surface is then, usually, rolled—just as for ordinary penetration macadam—provided a hard stone has been used. Earth or temporary wooden shoulders are provided.

The surface is then sprayed, at the rate of one-third gallon per square yard (assuming a $\frac{3}{4}$ -inch thick surface, loose measurement), with cut-back asphalt of viscosity 150 to 200 at 50 deg. C., or tar of viscosity 30 to 60 at 40 deg. C. In cool weather, a less viscous asphalt is used (say, viscosity 50-100).

The stone is then harrowed to coat all the particles, and smoothed with a blade. This operation is sometimes omitted. As soon as the binder becomes "tacky," the course is rolled thoroughly. The setting of the binder may take from a few hours for a cut-back asphalt to two or three days for tar.

A second application of binder is then given at the rate of $\frac{1}{4}$ gallon per square yard. When this commences to set, rolling is continued. Should the surface display marked irregularities, it may again be harrowed and levelled at this stage. The surface should have no depression greater than $\frac{3}{8}$ inch in 20 feet—if such exists it can be built up with asphaltic concrete. Cover material is then spread over the surface at the rate of 20 to 35 lb. per square yard and swept by hand to fill loosely all the surface voids. This action is sometimes assisted by drawing an old carpet or tarpaulin over the surface.

The third application of binder is then made at the rate of $\frac{1}{3}$ rd gallon per square yard, after which the surface is smoothed with a long-base planer or a maintainer. The road is then rolled and opened to traffic. If the finished surface is at all open, a light seal coat of, say, $\frac{1}{4}$ gallon or less per square yard, covered lightly with 1-inch to $\frac{5}{8}$ -inch screenings is applied before the winter. From results seen, $\frac{3}{4}$ -inch screenings are more suitable for the seal coat.

Retread surface courses in Indiana are remarkably smooth-running—as smooth as the best roads traversed. The cost is £1,200 to £1,500 per mile. A light re-seal costs £100 per mile. The maintenance cost is about £50 per mile per year. Contractors are given the option of constructing macadam pavement by premixing or by immersion as an alternative to retread, provided similar smoothing operations are carried out.

(To be continued.)

Mill Pond Bridge, Botany Road.

(Continued from page 193.)

drowned. Accordingly, a conference between the Transport Trust, the Main Roads Board, and the Water Board was arranged on 13th July, 1931, at which it was learned that the Water Board did not propose to

restore the dams. As a consequence it became necessary to provide for an entirely unregulated run-off. From data made available by the Water Board, it was ascertained that the catchment area to be drained was 4,300 acres, for which a waterway, after allowing for the portion drowned, of 480 square feet was calculated to be necessary. This was approximately equal to the waterway of the predecessor of the culvert and of the railway bridge upstream, and four times the waterway of the culvert. Consequently a new bridge was required. Plans for this are being prepared by the Board. In the meantime, a temporary timber structure to provide a 21 feet 9 inches width of carriageway (including double line of trams) and one 3 feet footway has been erected by the Metropolitan Transport Trust, under arrangements by which the Main Roads Board and the Trust share the cost. This work, which commenced on 17th July, was completed on 29th July. It has been so arranged that the permanent concrete structure may be constructed without interruption to traffic.

Gravelling of Black Soil Formation, Lower Northern Division.

In a paper read recently before the Melbourne Division of the Institution of Engineers, the Chief Engineer of the Victorian Country Roads Board referred to the manner in which a weak formation could be improved and hardened by the application of a relatively thin layer of gravel or similar material kept in position by frequent dragging or grading. He also expressed the opinion that this method could be extended to provide for the consolidation of the gravel itself more effectively than if the gravel had been consolidated by a roller. An example of this can be seen on the Gunnedah-Boggabri road (No. 126). A bad stretch of black soil exists for several miles on either side of the boundary between Liverpool Plains and Namoi Shires. The Namoi section has been formed, and portion has been surfaced with gravel, about 7 inches thick, consolidated by rolling. Part of the Liverpool Plains section, immediately to the south of the boundary, has been formed and surfaced with a loose sheet, about 2½ inches thick, of fine river gravel. Portion of the gravel was applied after the rains, just after the formation had been re-shaped by the grader, which was kept on the job to shape up the gravel at regular intervals and after each fall of rain. As a result, traffic has been able to traverse the length without cutting into the formation to any great extent, and the formation is hardening up in spite of one of the wettest seasons for some years. On the other hand, the black soil formation in Namoi Shire has cut up very badly and is only trafficable with difficulty, using chains, and traffic has also cut through the gravel-surfaced section in many places, churning up the black soil underneath. It would appear that applying the gravel surfacing in thin layers of not more than 3 inches loose thickness and grading frequently is not only a cheaper method but is advantageous from the point of view of obtaining proper consolidation of the formation itself and of the gravel from the bottom up.

Broadmeadow Junction, Pacific Highway.

ONE of the most difficult problems met with by the road designer is the layout of the junction of a number of roads in such a way as to avoid congestion and accident and make it plain to travellers approaching from any direction the course they are to pursue in passing to another road leading away from the junction. The most common crossing is, of course, the right angled one, which is generally dealt with when the traffic becomes dense by the aid of pointsmen. Where more than four roads converge on one point it is difficult to regulate the traffic by signalling, and if the traffic becomes heavy, the simplest

(No. 107). It carries a double track tramway and is the road next in importance of those so far mentioned. Winship-street leads from the junction easterly through

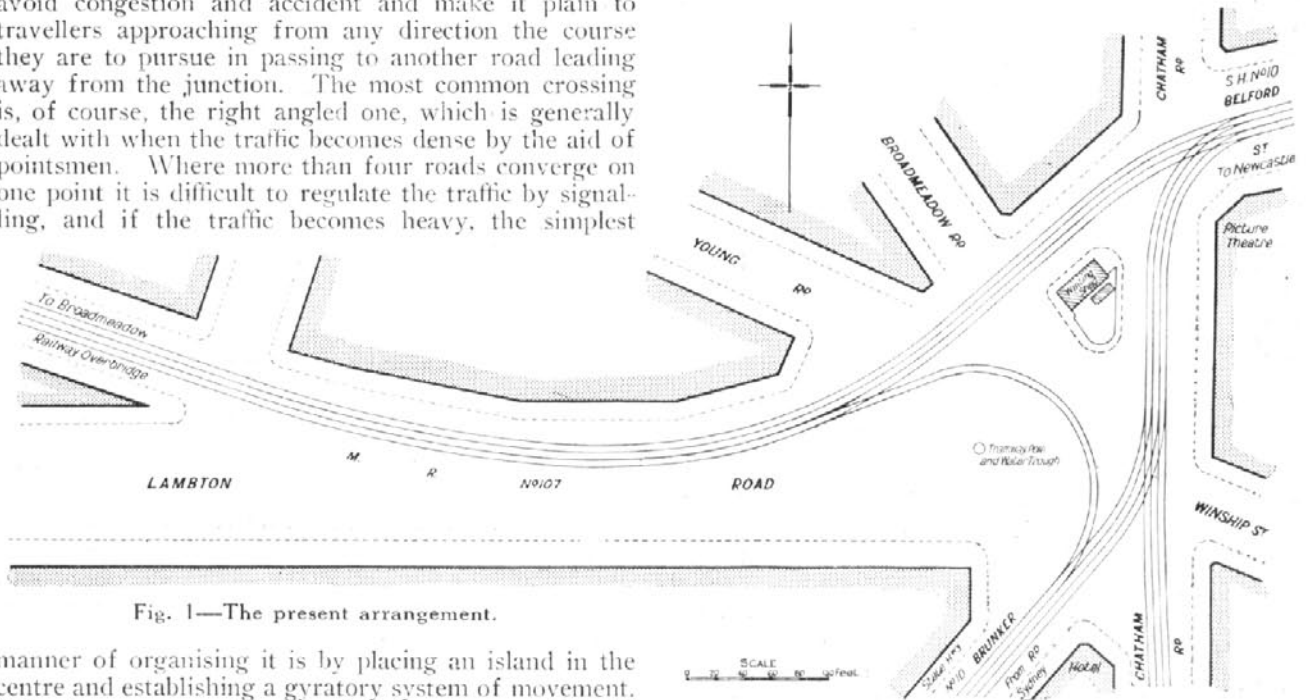


Fig. 1—The present arrangement.

manner of organising it is by placing an island in the centre and establishing a gyratory system of movement. This, however, requires a rather large area, which, if the roads are thickly built upon, may be difficult to obtain.

At Broadmeadow, in the Municipality of Hamilton, eight roads converge upon a common junction. The Pacific Highway (with the local name of Brunker-road) comes from the south, carrying, as well as through traffic, a double track tramway from Adamstown and local road traffic from Adamstown and Charlestown. It emerges at the north-east corner via Belford-street, by way of which and Tudor-street it leads to Newcastle. Belford-street carries a double track tramway, now largely in open ballast formation,

Hamilton to Newcastle, practically parallel to Belford and Tudor streets, and is of particular use to traffic

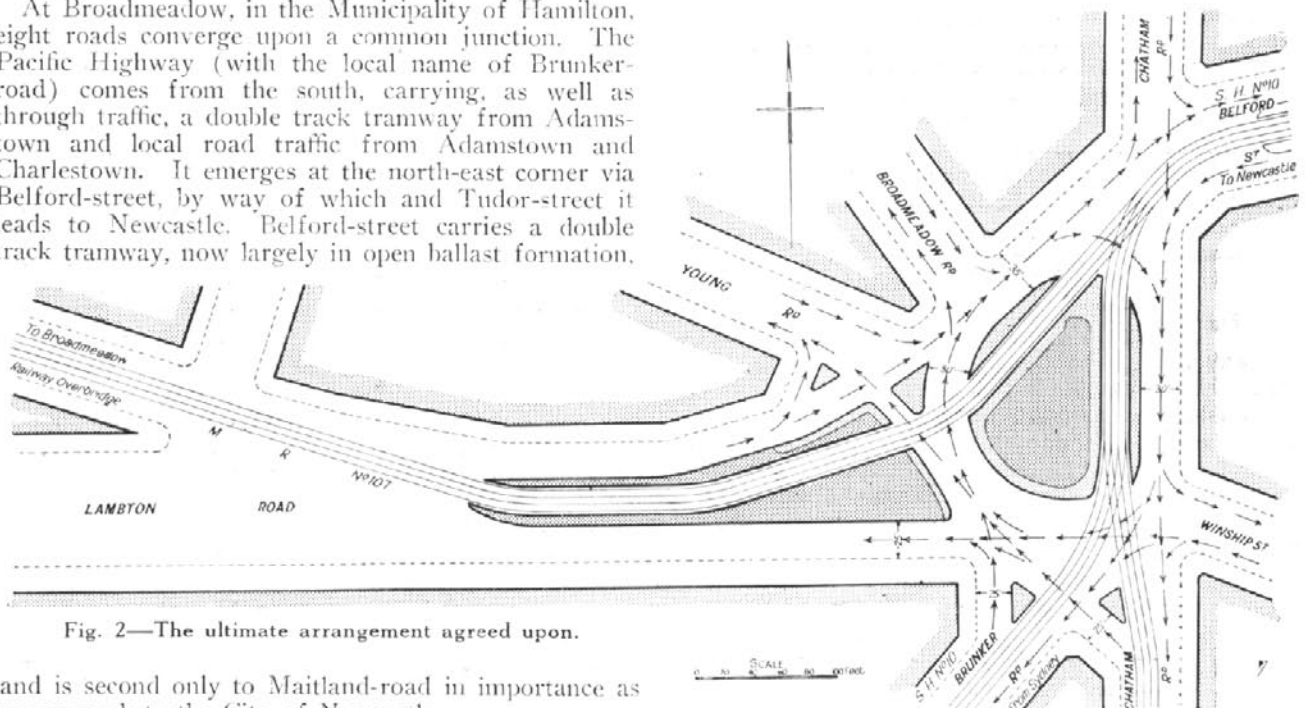


Fig. 2—The ultimate arrangement agreed upon.

and is second only to Maitland-road in importance as an approach to the City of Newcastle.

Lambton-road, approaching the junction from the west, is part of the Newcastle-Wallsend-Minni road

wishing to reach Newcastle without traversing the business areas fringing the highway in Broadmeadow

and Hamilton. Chatham-road runs north and south through the junction, making provision for local needs to the north, and giving access to the Newcastle Race-course on the south, where it carries a double track tramway and is subject to heavy traffic only on race-days. The two remaining roads, viz., Broadmeadow-road and Young-road are mainly of local concern, as giving access to the adjacent Broadmeadow railway station.

The present state of affairs is shown in Fig. 1. From the road traffic point of view, the outstanding defect is the broad expanse of roadway which, as well as involving unnecessary expenditure in surface maintenance, causes confusion and danger to traffic due to the lack of guidance offered to the several vehicular streams which must necessarily intersect or merge, one with another, at the junction. In addition, congestion occurs north and east of the tramway waiting shed, where tramway passengers must share with vehicular traffic the use of the roadway on either side of the

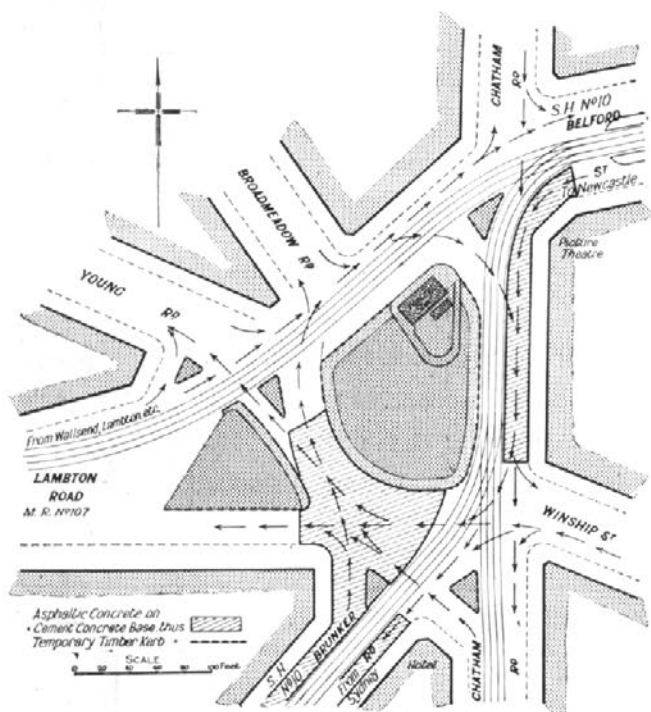


Fig. 3—The plan for immediate improvement.

tramway at the stopping places adjacent to the waiting shed. Hoardings on the southern and eastern sides of the island area upon which the waiting shed stands, as well as the shed itself, seriously obstruct the vision of drivers at the intersection.

Realising the need of tackling the problem of re-organising the junction in a comprehensive manner, the Board conferred with the other public bodies concerned, viz., the Newcastle District Transport Trust, the Hamilton Municipal Council, and the Traffic Department, and, after considerable study and discussion of various possible arrangements, that illustrated in Fig. 2 was agreed upon as disposing of the present disabilities and satisfying all reasonable ultimate requirements. However, at the outset, it was fully appreciated that the adopted scheme would involve considerable expenditure in re-

aligning the tramway tracks unless this should be done when they became due for renewal. Therefore, a preliminary scheme was also drawn up, as shown in Fig. 3, which does not involve any immediate re-location of the tracks, while at the same time conferring immediate benefits, and being so arranged that any permanent work will conform to the ultimate scheme.

The fundamental principles of the ultimate scheme (Fig. 2) are the segregation of tramway and highway traffic, and the smooth and guided rotary circulation of the latter at the junction. The four smaller island areas (shown shaded in the figure) are designed primarily to localise the intersections of the several traffic streams. The two larger islands, as well as assisting towards the abovementioned object, also provide space for waiting tramway passengers, reduce the area of road pavement to be provided and maintained, remove the obstruction of standing tram cars from the roadway, and promote economy in the maintenance of the tramway track by enabling open ballast construction within the island areas. The single track loop tram line from Brunker-road to Lambton-road, being no longer required by the Transport Trust, has already been removed. The arrows show the paths which road traffic will be required to take. It will be noted that this scheme involves the displacement towards the centre of the large eastern island area of both sets of tram tracks, and the placing of Lambton-road tram tracks in the centre of the roadway in lieu of their present location close to the northern kerb, as well as the abandonment of the present tramway waiting shed and the erection of a suitable similar structure within the new island area.

The immediate scheme (Fig. 3) provides for as much of the ultimate scheme as can be undertaken prior to the re-location of the tram tracks. It will be seen that the routing of traffic will be identical in principle, and very closely similar in detail, to that of the ultimate scheme. The present difficulty of the obstruction of traffic by waiting trams adjacent to the waiting shed has been overcome by the institution of rotary traffic at the junction, involving one-way traffic only at the two points where at present congestion is caused by two-way traffic. For the time being, road traffic will share the roadway with the tramways, but ultimately the latter will be removed within the island areas shown in Fig. 2. In the meantime, a small temporary island area is being provided to the north-east of the tramway waiting shed to ensure the desired rotary traffic movement.

The cement concrete base shown to the south-west of the large eastern island area is being built as an extension of a recent contract for the reconstruction of Brunker-road and will be surfaced with asphaltic concrete by the Newcastle City Council in a similar manner to the Brunker-road work. The pavement shown to the east of the same island has already been constructed, while the necessary kerbing for the immediate scheme is being constructed (part being of concrete and under construction as part of the contract extension above-mentioned, and that part which cannot at present be constructed in conformity with its ultimate levels or location, or will not be required in the ultimate scheme, being constructed of timber by

the Hamilton Council) and the Hamilton Council is reconditioning and tar-surfacing such areas of the existing pavement at the junction as require attention. The footways shown adjacent to the two larger island areas are not of direct concern to the Board, and are being attended to by the Transport Trust and the Hamilton Council, which bodies are similarly solely responsible for the construction of paths and the general improvement of the island areas.

The complexities of this intersection render the solution of the problem of particular interest, as exempli-

fying how economy has been reconciled with the need to give immediate relief without sacrificing any of the future benefits of the ultimate scheme. Quite apart from the difficulty of arranging traffic at the junction, however, the extreme flatness of the area, and its low-lying nature imposed severe restrictions upon the design of the drainage facilities, so that the ultimate design, meeting, as it does, the approval of all the interested authorities, represents a very substantial achievement, as well as being a decided improvement to the locality.

Tenders and Quotations Accepted.

The acceptance by the respective Councils of the following Tenders has been approved by the Board during the month of June, 1931:—

Work.			Name of Recommended Tenderer.	Amount of Recommended Tender.
Shire or Municipality.	Road No.	Description.		
Lachlan ...	1,139	Clearing, forming, and constructing causeways, 4,334 lin. ft.	H. Broad ...	£ s. d. 201 10 4
Terania ...	1,085	Forming and gravelling, 2,500 lin. ft. ...	J. Droney and Son ...	659 16 0

The following Tenders and Quotations were accepted by the Board during the month of June, 1931:—

Tenders.

Work.			Name of Successful Tenderer.	Amount of Accepted Tender.
Municipality or Shire.	Road No.	Description.		
Hunter's Hill ...	166	Electric welding 50 new steel buckled plates on Fig Tree Bridge.	A. E. Goodwin...	£ s. d. 160 0 0
Nowra ...	1	Supply and welding of mild steel washers, Shoalhaven River Bridge, Nowra.	E. M. Baldwin ...	14 0 0
Rockdale ...	...	Haulage of 360 tons of coal from Kogarah railway station to Taren Point Ferry, as required, for twelve months.	W. F. Lockley ...	Per ton 0 2 7
North Sydney ...	10	Purchase for demolition and removal of Nos. 105-109 (inclusive), Miller-street.	G. L. Cooper & Son Ltd.	215 0 0
North Sydney ...	10	Purchase and demolition of two brick buildings fronting Hill-street.	S. J. Harrison ...	37 0 0

Quotations.

No. of Quotation.	Description of Article.	Name of Successful Tenderer.	Amount of Accepted Quotation.
34	Tar—24,225 gals., No. 2, sprayed between 0 m. and 8 m. north of Peat's Ferry.	Australian Gas Light Co. ...	£ s. d. 1,059 16 11
48	Broken stone—500 tons, $\frac{5}{16}$ in. ...	Emu and Prospect Gravel and Road Metal Co.	158 6 8
50	Bridge timber, f.o.r., Inverloch—20 in. dia., 126 lin. ft.; 19 in. dia., 26 lin. ft.; 18 in. dia., 23 lin. ft.; 14 in. x 14 in., 21 lin. ft.; 12 in. x 6 in., 18 lin. ft.	Wm. Langley and Sons, Ltd. ...	44 14 7
51	Firewood—50 tons ...	Hourigan Bros. ...	29 7 6
52	Steel buckled plates—65 ...	Walsh Island Dockyard ...	271 0 0
53	Bridge timber, f.o.r., Wagga Wagga—19 in. dia., 642 lin. ft.; 15 in. dia., 268 lin. ft.; 16 in. x 14 in., 396 lin. ft.; 12 in. x 13 in., 70 lin. ft.; 12 in. x 6 in., 3,351 lin. ft.	Allen Taylor & Co. Ltd. ...	744 2 11
57	Bridge timber, f.o.r., Gundagai—19 in. dia., 831 lin. ft.; 16 in. dia., 423 lin. ft.; 13 in. x 12 in., 614 lin. ft.; 12 in. x 6 in., 110 lin. ft.; 6 in. x 6 in., in lengths of 16 ft. or over, 2,520 sup. ft.; 8 in.—10 in. wide x 4 in., in 21 ft. 8 in. lengths, 13,000 sup. ft.	C. T. Abbott ...	648 7 8
58	Broken stone—500 tons, $\frac{3}{4}$ in. ...	Emu and Prospect Gravel and Road Metal Co.	152 1 8
59	Sand—100 tons ...	Glenfield Sand Co. ...	25 8 4