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TRANSPORT- COMMUNICATIONS

MONTHLY REVIEW

APRIL 1955—No. 96

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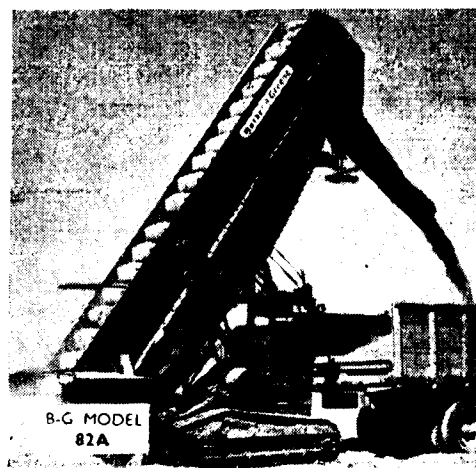
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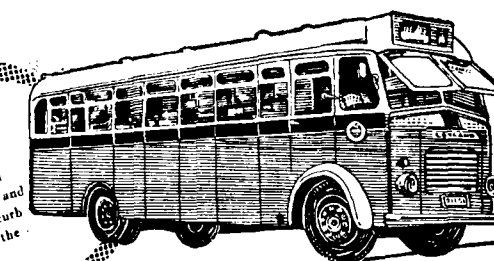
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CORRIGENDUM

Transport-Communications Monthly Review for March, 55.

Page 2 For "Concrete Surfacing in Agra-Bombay Road—Madhya Pradesh"
READ "Concrete Surfacing in Agra-Bombay Road—Madhya Bharat"

Page 16 The heading of the article Read "General Design Considerations of Foundations—Safe Bearing Capacity—Settlements."

The Table referred to in the above article at page 16 is reproduced below:—

Table 1. Maximum Safe Bearing capacities for Horizontal Foundations at 2-ft. Depth below Ground Surface under Vertical Static Loading.

		Types of rocks and soils	Maximum safe bearing capacity, tons per sq. ft.		Remarks
I Rocks	1	Igneous and gneissic rocks in sound condition	100		To be assessed after inspection
	2	Massively-bedded limestones and hard sandstones	40		
	3	Schists and slates	30		
	4	Hard shales, mudstones, and soft sandstones	20		
	5	Clay shales	10		
	6	Hard solid chalk	6		
	7	Thinly-bedded limestones and sandstones	...		
	8	Heavily-shattered rocks	...		
II Non-cohesive soils			Dry	Sub-merged	Width of foundation not less than 3 ft. "Dry" means that the ground-water level is at a depth not less than B below the base of the foundation.
	9	Compact well-graded sands and gravel-sand mixtures	4-6	2-3	
	10	Loose well-graded sands and Gravel-sand mixtures	2-4	1-2	
	11	Compact uniform sands	2-4	1-2	
	12	Loose uniform sands	1-2	$\frac{1}{2}$ -1	
III Cohesive soils	13	Very stiff boulder clays and hard clays with a shaly structure	4-6		This group is susceptible to long-term consolidation settlement. To be determined after investigation.
	14	Stiff clays and sandy clays	2-4		
	15	Firm clays and sandy clays	1-2		
	16	Soft clays and silts	$\frac{1}{2}$ -1		
	17	Very soft clays and silts	$\frac{1}{2}$ -nil		
IV	18	Peat			To be determined after investigation.
V	19	Made ground			To be determined after investigation.

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ALSO : Definitions of Highway Engineering Terms — Worth Remembering — Organizational Methods.

Transport - Communications Monthly Review is published on the 25th of each month by the Indian Roads Congress, New Delhi.

This Review is sponsored by the Roads Wing of the Ministry of Transport, but the Government of India accept no responsibility for any views or opinions expressed.

Subscriptions. Annual subscription including postage is Rs Fourteen. Single copy including postage is Rs one and annas four.

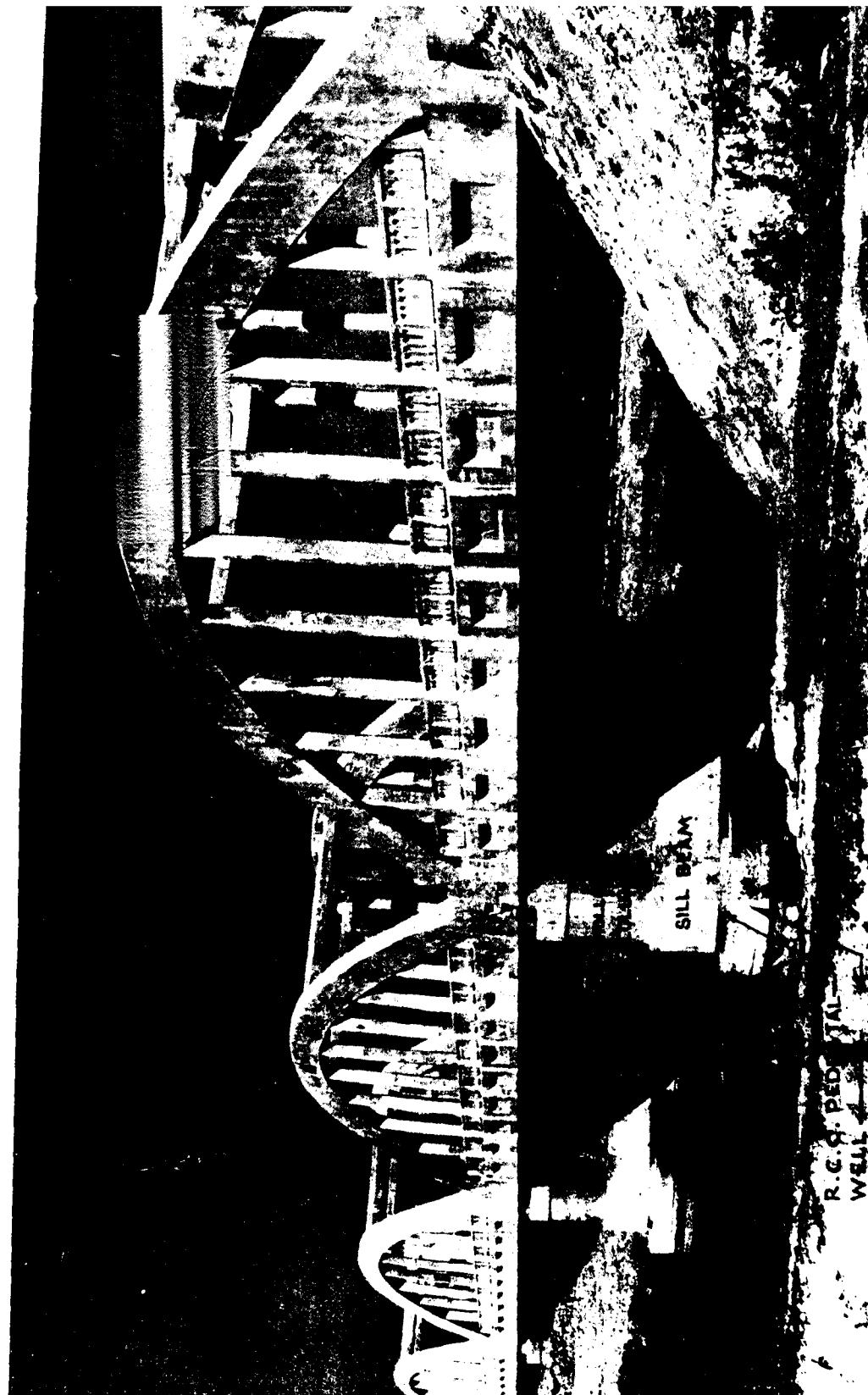
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BYGOOL BRIDGE

TRANSPORT-COMMUNICATIONS MONTHLY REVIEW

A REVIEW OF
ROAD ENGINEERING, DEVELOPMENT & TRANSPORT

APRIL 1955

BRIDGING INDIA'S RIVERS

THE BHAKRA AND THE BYGOOL BRIDGES

TWO new major bridges in Uttar Pradesh across the Bhakra and the Bygool rivers were thrown open to traffic recently, thus fulfilling a long felt need. These rivers cross the Delhi-Meerut-Bareilly-Lucknow road (National Highway No. 24) within two miles of each other in miles 113 and 115 respectively. Prior to the construc-

tion of these bridges, pontoon bridges over the dry weather channels and ferries in the flood season used to operate at the crossings. The maintenance of these cost the Government Rs 22,000 a year. Also, the pontoon bridges and the ferries were not safe for heavy vehicles and they had to unload partly before crossing. This arrangement caused considerable inconvenience to traffic and entailed waste of time. So the bulk of motor traffic preferred to travel by a detour avoiding the two crossings. Hence these two bridges were included in the first 5-Year Plan.

Sites

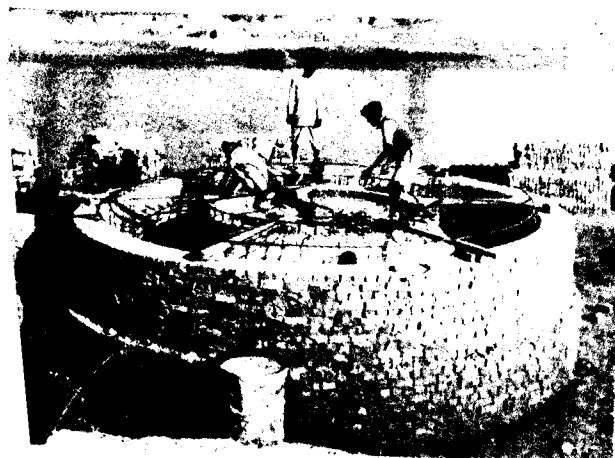
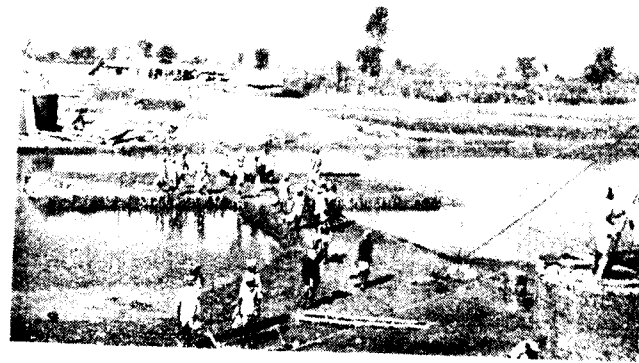
Taking advantage of the protective and river training works already provided for the railway bridges, which exist near the site the Bhakra bridge is located.

950 ft downstream and the Bygool bridge is located 2500 ft downstream of the rail-

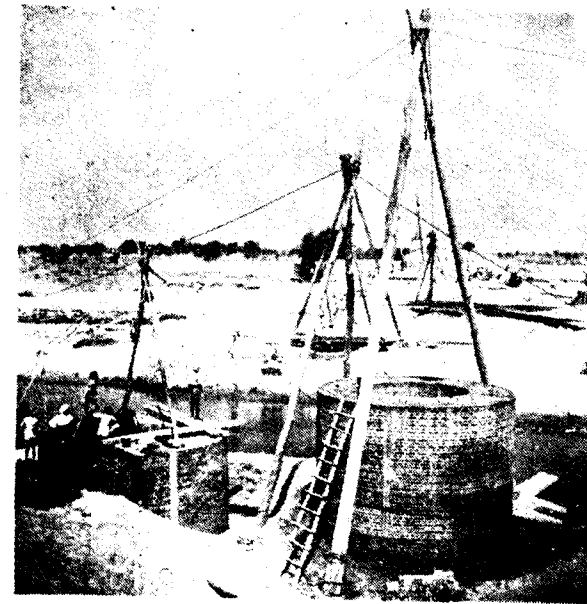


Shri Lal Bahadur Shastri at the Exhibition during the opening ceremony

Island in mid-stream for Placing
well curbs.



Placing of Reinforcement
for well curb.

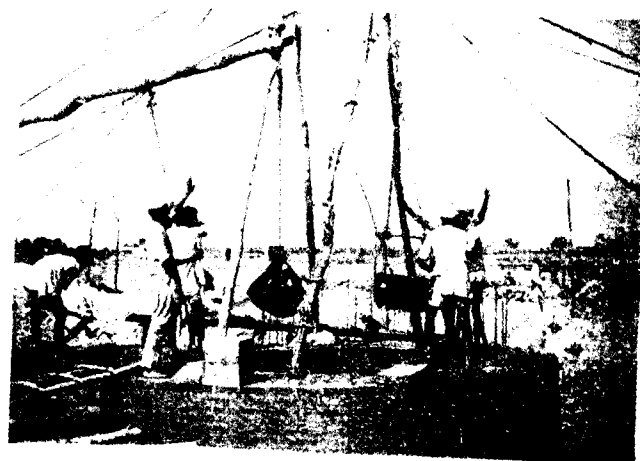


Well sinking in Progress.

Masonry for wells in progress.



Dredging in wells.



Testing the Upstream well
under pier 2--Load 763 Tons.

way bridges. Both the sites have straight reaches and firm well-defined banks. The sites being close to existing crossings little changes in the alignment of the road were necessary.

Hydraulic Data and waterways

The catchment areas of the Bhakra and the Bygool at the sites of the bridges are 815 and 1,007 square miles respectively. The active channel in each case is 200 ft wide during normal floods; at times of peak floods, however, the waters of the two rivers merge and a slightly greater discharge passes through the Bygool than through the Bhakra river. The linear waterway provided by the Railway for their bridges is 700 ft (7 skew spans of 100 ft each) for the Bygool and 600 ft (6 skew spans of 100 ft each) for the Bhakra. Inspection in 1950 showed that four out of the seven spans of the railway bridge across the Bygool were blocked up to a few feet below the high flood level, and 2½ out of the 6 spans of the Bhakra bridge were found completely blocked up. So, it was considered that a linear waterway of about 480 ft on the 'square' for each of these bridges was adequate. However, as a measure of precaution, a breaching section has been provided on the Bygool bridge approach to pass extraordinary flood discharge, if any.

Design

The design provides for two lanes of I. R. C. Class A loading or one lane of I. R. C. Class AA loading, whichever gives the higher stresses in particular component members. The bridges are of R. C. C. bow-string girder type with four spans of about 120 ft clear in each.

Foundations

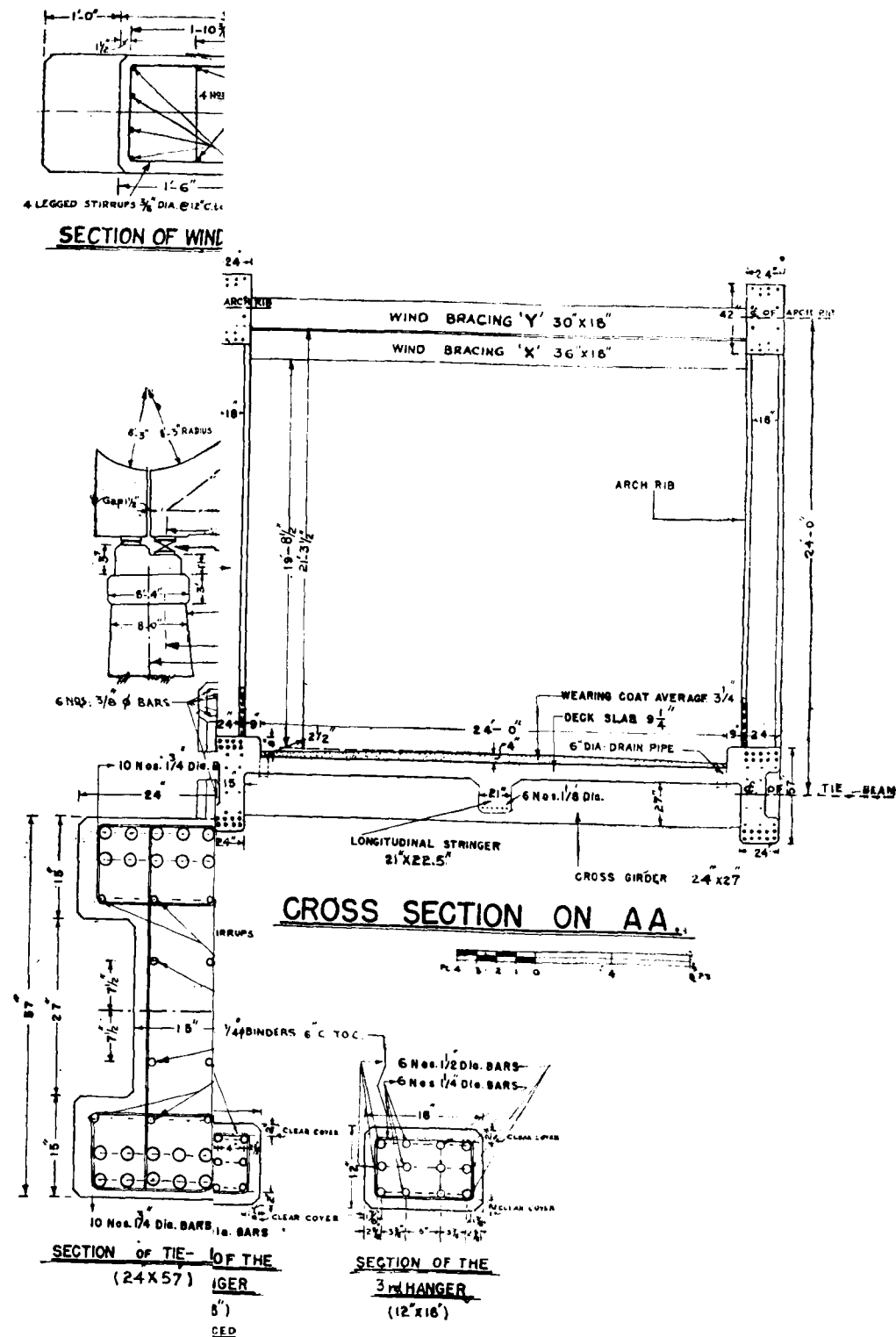
Two circular brick masonry wells of 9 ft internal and 16.5 ft external diameters with R. C. C. curb and steel cutting edge are provided under each pier. The wells had to be sunk about 70 ft below the low water level of the rivers through clayey silt in the top layers and through sand, clay and kankar-chipping strata below. Well sinking at Bhakra bridge was done

exclusively with small 1.5 cu. ft. dredgers operated by a pair of bullocks. On the other hand, at Bygool bridge 7 to 15 cu. ft. capacity dredgers were operated by steam winches. An old roller was also commissioned into service for use as a winch. Actual experience showed that sinking by both these methods was equally effective and quick, and in about six months time the major portion of well sinking was completed in both the bridges. Hard strata was encountered in the later stages of sinking, and while sinking through them the wells shifted from their intended position. All efforts at rectification were of no avail; so the wells were left in the inclined positions as they were after subjecting them to a test load of 763 tons which was the design load. The wells were plugged as usual except that the sand filling in the badly tilted wells was replaced by lean concrete filling.

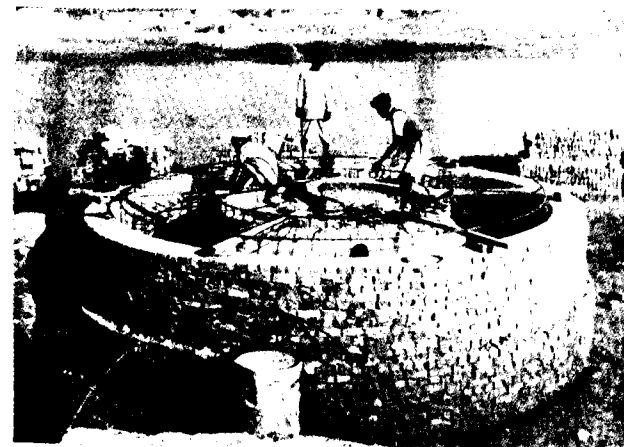
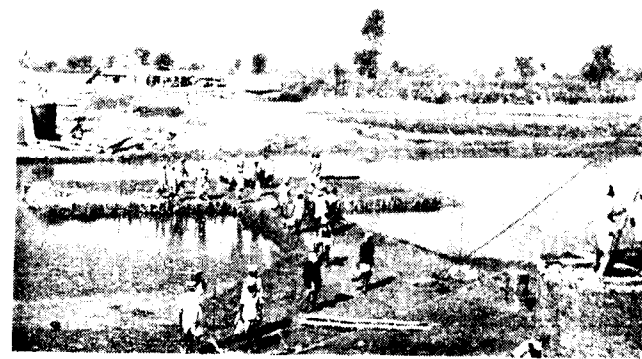
Substructure

As designed, masonry piers and abutments were to rise centrally over a combined capping on the two foundation wells. Due to the cants and shifts in the wells and consequent eccentric incidence of the load, it was found that excessive stresses will be induced. After considering various alternatives it was decided that the design of the substructure be changed to make it lighter and so transmit the load to the foundation wells that the stresses developed remain within limits and no tension is developed under the worst conditions of loading. The ingenious method by which this was achieved is the most interesting feature (vide Frontispiece).

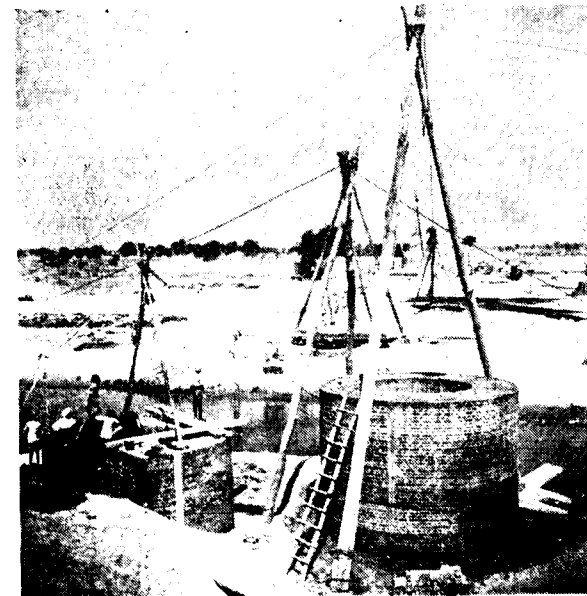
The conventional solid piers were dispensed with. Separate well cap was provided for each well in place of the combined well cap, and an R. C. C. pedestal 8 ft x 8 ft x 9 in. with heavy reinforcing mat was constructed over each well cap at predetermined positions. The introduction of these pedestals permitted some flexibility with regard to the points of application of the super-imposed load and their positions were determined so as to result in favourable development of stresses in the foundation wells. Over these pedestals a full length R. C. C. beam with semi-circular ends



Island in mid-stream for Placing
well curbs.

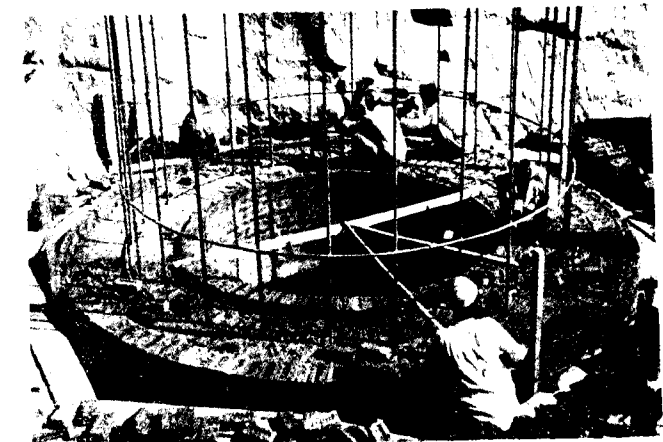


Placing of Reinforcement
for well curb.

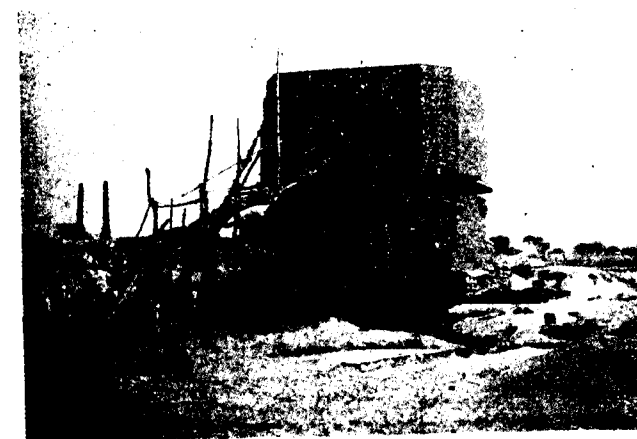
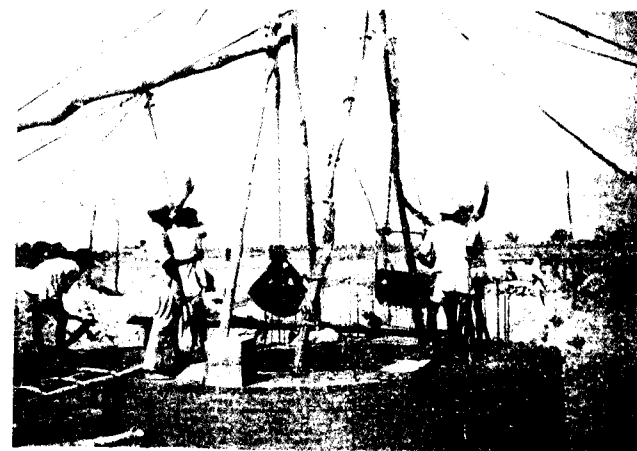


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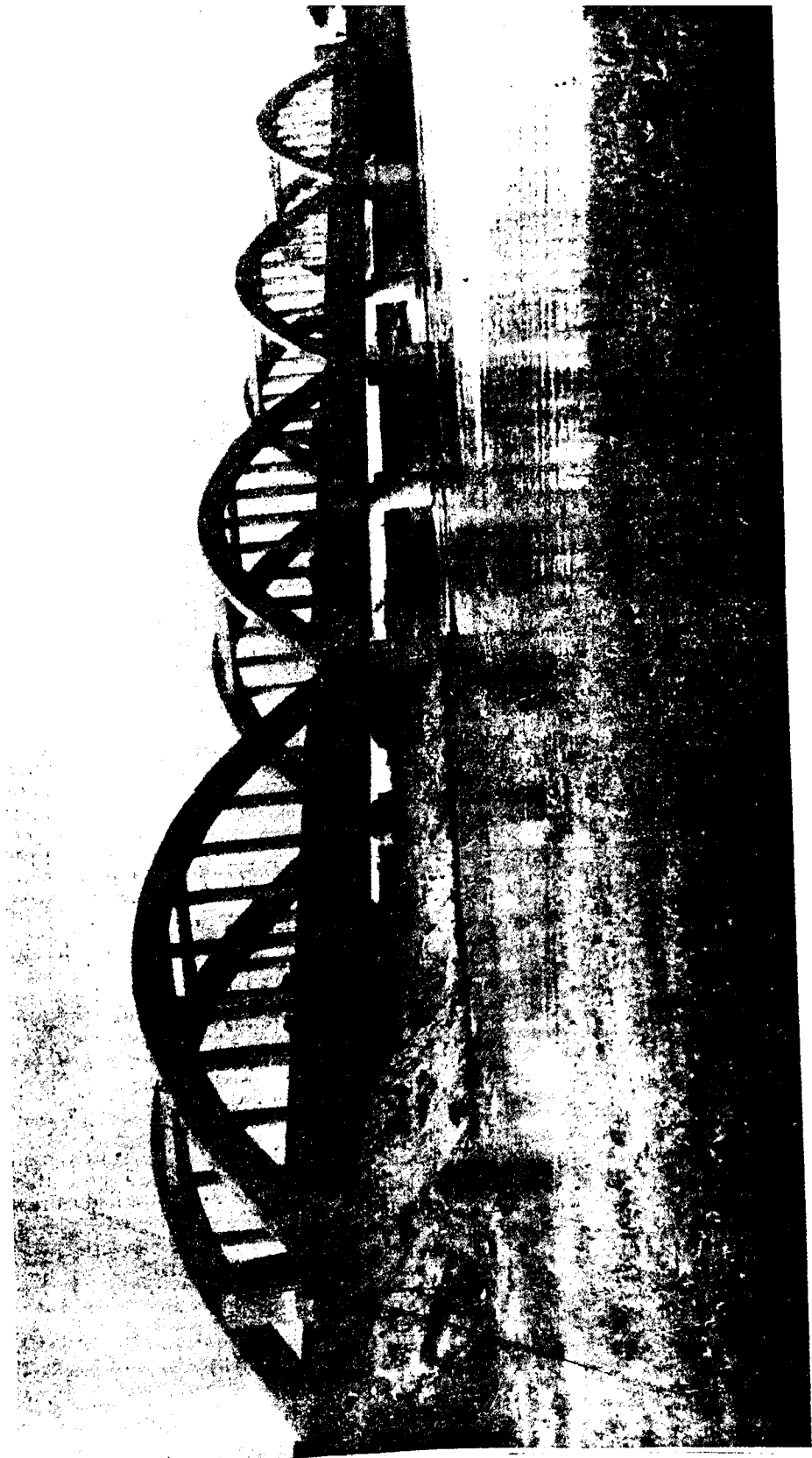
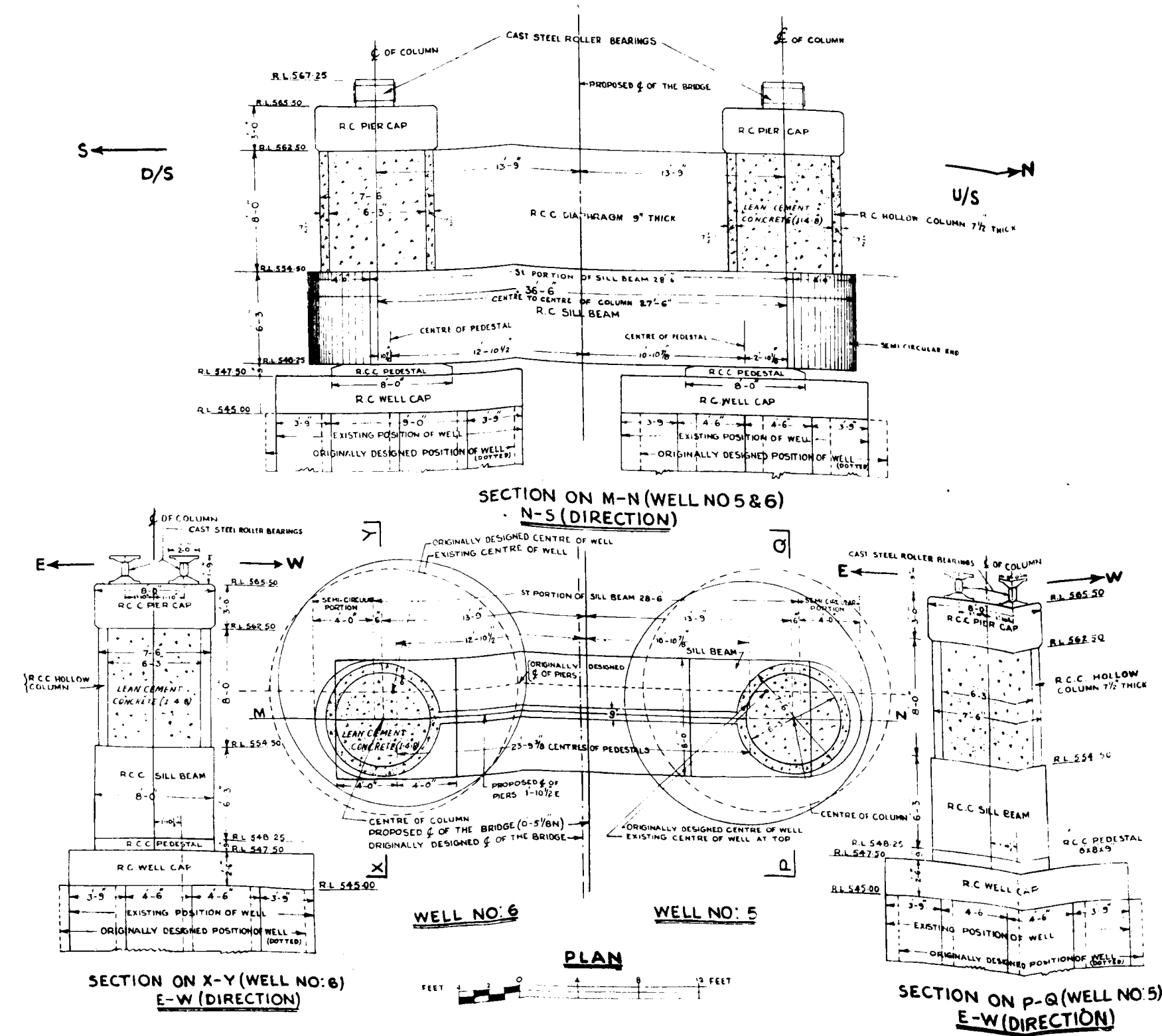


Dredging in wells.



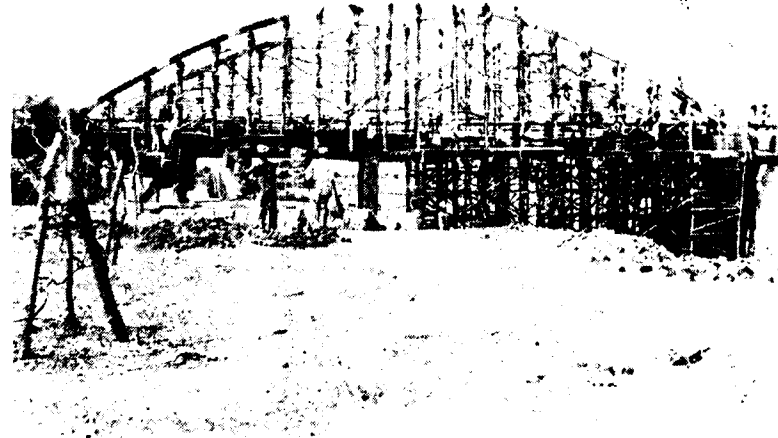
Testing the Upstream well
under pier 2 -Load 763 Tons.





BHAKRA BRIDGE

in plan connecting the two wells was provided. This beam designated as the 'Sill Beam' is 36 ft long by 8 ft wide by 6½ ft thick, and is very heavily reinforced. Over the sill beam two circular hollow R. C. C. columns, 7 ft 6 in. external diameter, with shell thickness 7½ in. and the hollow spaced filled with lean cement concrete, receive the ends of the girders. These columns have been connected by a R. C. C. diaphragm wall 9 in. thick, except in the case of abutment columns. Details of the arrangement are given in page 8.



Erection of centering in the water span. The Right half of the span has been erected on 5" balli piles driven into ground 12 to 15'

3 ft thick R. C. C. pier caps have been provided over these columns to accommodate the cast steel roller and rocker bearings of the girders. The rollers have a diameter of 12 in., while the rocker plates will be 9 in. in depth at the centre. In the case of abutment piers, the caps have been connected by a bracer R. C. C. beam.

stringers 21 in. × 22.5 in. The deck slab is 9.25 in. The wearing coat over the deck slab is of cement concrete average 3½ in. thick. The carriageway is 24 ft between R. C. C. curbs 12 in. × 9 in. Rise of bow-string is 1/5th of the span. The length of approaches constructed is one and 0.8 for the Bygool and Bhakra bridges respectively. Detailed drawing is at page 7.

Concreting

The concreting in these bridges has been done according to Reynold's system which advocates that the deck system along with the junction of arch rib and tie-beam be concreted first with judicious construction joints. The arch ribs are then concreted symmetrically from both ends towards the crown, leaving a shrinkage gap of about 6 ft at the crown which was concreted as late as possible. The wind bracings were next concreted. The hangers were concreted last when the full dead load of the bridge had come on the suspenders. It took about 10 working days with two concrete mixers operating per day to complete the laying of one span.

Dimensions of the Girders and Roadway

Arch rib measures 24 in. × 57 in. at the haunches and 24 in. × 42 in. at the crown and is of 1:1½:3 concrete. The tie-beam is 24 in. × 57 in.; cross beams are 24 in. × 27 in. in section, and longitudinal

A SURVEY OF ROAD DEVELOPMENTS IN RECENT YEARS IN ASIA

ROADS are vital to the integration and to the social and economic progress of a nation. They give access to a country's untapped wealth and opening for utilization of the potentially rich areas of the world. Roads must be built to increase production, to distribute surpluses, to exchange ideas and services and to extend the cultural and economic benefits of the modern age.

The Importance of Good Roads in the Field of Food Production

Many countries report that producers are constrained through lack of farm-to-market roads, or by high freight charges resulting from inadequate roads, to concentrate on certain crops. The raising of perishable crops, in particular, is subject to these difficulties. In countries like India, for example a large acreage of the cultivable land is allowed to lie idle because of the lack of access road. In such circumstances, planned agricultural production cannot be introduced nor can the land be put to the best possible use from the viewpoint of national economy. Another instance of the hampering effect of inadequate road facilities is provided by the Gold Coast where most of the food now imported at great cost to feed the cocoa planters could have been grown in the hinterland if roads had been available to carry the produce.

Roads Help Marketing of Crops

Apart from the marketing of crops, the transport of cattle in areas with poor roads also presents serious problems. Where trucking is not practicable, the alternatives of droving or of carriage by rail lead to very considerable loss of weight and consequently to diminished yields and profits for the producer.

Roads are necessary to introduce improved methods of agriculture

Perhaps the most serious result of poor roads in agricultural areas is that farmers are prevented from introducing more efficient farming methods and new techniques. For instance, suppliers of agricultural machinery, tools and spare parts, maintenance mechanics, etc., may be unable to deliver to or visit the farms, or the use of combine harvesters and other heavy equipment may be precluded because of difficulties of access. Moreover, the increased cost to the farmer arising from heavy freight charges due to inadequate access roads may drain away his reserves to such an extent as to make it financially impossible for him to effect needed improvements. This problem is a very real one in almost all under-developed countries.

Roads help to control pests and promote health

Another problem which faces the producer—the control of disease—is made difficult, if not impossible, when road communications to the farm are inadequate. In addition, measures to eradicate insect pests, where speed is essential, may, for the same reason, be rendered ineffective. Other hindrances to efficient farming, inadequate labour supplies and absentee landlordism, are exacerbated where road communications are poor.

Efficient production is dependent on healthy manpower; in the rural communities where roads do not exist, medical facilities cannot be made available easily. Better rural roads are essential also if the drift to the towns is to be arrested, since roads make possible the enjoyment of increased educational and social amenities by the rural labourer, making him a more efficient worker. If the rural areas are to be developed, roads are needed to ensure

a healthy, adequate and mobile labour force.

Cheap road transport is essential

An adequate road network cannot play its full part, however, unless the utmost endeavour is made to ensure cheap road transport without undue restrictions. Only when both these aspects of transport are taken care of will the drive for increased production reach its maximum and can the agricultural potentialities of each country be utilized to the full.

Many countries have profited by good roads

The difficulties described above are indeed great, but a country which succeeds in building good rural roads is likely to reap enormous benefits.

New Zealand: New Zealand provides a useful object lesson; before modern roads were built, large areas of land were unproductive, but with the coming of roads, the scientific application of fertilizers became possible and the same unproductive areas now rank among the most productive in the country. In New Zealand the reclamation of marginal land in inaccessible hill country has also been made possible only by the modern technique of aerial top dressing, and here again roads are essential as supply lines for bringing manures to the aeroplanes.

Indeed, it has been pointed out that the dairy industry of that country was largely the creation of road transport.

The importance of New Zealand's road development as a factor in increased farm production is illustrated by the following figures:

Year	Total mileage of roads	Milage of surfaced roads	Production index
1930	49,121	2,086	100
1940	53,086	5,355	123
1953	55,463	8,961	152

Nicaragua: In Nicaragua, an increased road network has led to substantial agricultural development. In 1940, when there were only 20 kilometres of roads, there were six farm tractors in use, whereas in 1951, when the road mileage had increased to 900 kilometres, there were 1,200 tractors.

Mexico: The Mexican Roads Association has realized the need for farm roads in the national economy and has estimated that 80,000 miles of farm-to-market roads are required; already the Association is responsible for having had some 3,000 miles of such roads built since 1950. It is significant that, as a result of this policy, in some areas as much as 25 per cent more land is under cultivation, corn production has increased six-fold and the fruit crop has trebled.

Africa: In Africa, where the development of transport is in its beginnings, to quote from the Food and Agriculture Organization (FAO) Report of August 1954, entitled "The State of Food and Agriculture, 1954": "The remarkable expansion of exports during the past 50 years has gone hand in hand with the development of transport and this is still the essential basis for future progress..... Transport improvements are also essential for the integration of the subsistence producer with the rest of the economy.... Roads are required to link the hinterland with the more developed areas based on the export of agricultural and mineral products so that it becomes profitable to produce a surplus of food crops for sale."

Road making is a world problem.

A farm-to-market road in Brazil means better and lower priced coffee for consumers all over the world. In return the coffee grower, the transport agencies, the processing plants and packers in Brazil become consumers of the products of other countries.

The post-war reconstruction period gave final evidence that the adaptability of road transport in servicing areas of rapidly changing activity called for a new approach to the development of road systems and required an accelerated production of the necessary equipment to

carry out the movement of goods and persons.

The problems of providing good roads and adequate road transport in our modern society are being tackled by communities of every size, from the smallest village to world-wide organizations like the United Nations and its specialized agencies.

For example, the United Nations, following the recommendation made to the Economic and Social Council by its Transport and Communications commission, convened a conference of Governments in 1949, at which a Convention on Road Traffic and a Protocol on Road Signs and Signals were signed. Efforts are being made at present to bring about some degree of unification of signs in Europe and the United States. It is also hoped that the exchange of goods and persons between countries will be facilitated by a new convention on customs formalities for motor vehicles applicable to the entire world, which was opened for signature in 1954.

ASIA

With a road mileage of 1,63,000 and an average of one vehicle for 773 people, the economic advancement of Asia through better roads presents a major problem.

The development programmes of the specialized agencies are aiding materially in awakening the interest of Governments in developing road communication as the first step in agricultural and social advancement.

Road Expenditures

Following are some examples of present Government programmes taken from International Road Federation reports:

Iran

The United States Foreign Operations Administration is aiding Iran in a Co-operative programme designed to improve the country's highway system. Approximately £ 3,00,000 (Rs 40,00,000), equally matched by Iran dinars, were to be spent in 1954 in technical services and highway construction and maintenance.

Iraq

The Iraqi Government has recently advertised four major contracts for the construction of 112 kilometres (77 miles) of highway, estimated to cost £ 5,902,400 (Rs 7.5 crores). This is the largest public contract letting ever held by the highway department of that Government.

Israel

The Israeli Development Budget for 1953-54 provided for a total investment in the country of £ 51.8 million (Rs 69 crores). Of this sum, £ 4.5 million (Rs 6 crores) were for communications.

In Israel road transport plays a large role: there are 15,000 haulage vehicles and 16,000 passenger vehicles in the country. Many new roads are being built, involving expenditures in 1954 amounting to £ 1.8 million (Rs 2.4 crores). Two million, three hundred thousand pounds will be spent on secondary and regional roads giving access to the new settlements, especially in the Negev and Dead Sea areas.

Jordan

The Development Board programme of road construction for 1954-55 amounts to £ 630,000 (Rs 84 lakhs).

Thailand

The Government of Thailand was preparing to start construction before the end of 1954 on a modern highway to link Bangkok and the isolated north-east provinces.

Called the "North-East Highway", it will cost an estimated 7,500,000 dollars (Rs 9.8 crores) and is scheduled for completion by the end of 1955. It will run from Saraburi, near Bangkok, to Ban Phai, 320 kilometres (385 miles) north-eastward in the heart of the backward north-east plateau, passing through Korat, the North-East's principal city.

The road is seen as a key to the economic development of the potentially rich but now backward north-east region. It will strengthen the economic and social ties of the North-East with the Bangkok area, facilitating the export of more produce

from the North-East and enabling that area to import needed goods to improve its standard of living.

When the road is completed, it is expected that Thai private capital will begin to flow into the North-East to stimulate economic development. New land will be opened to agriculture, new small industries will be launched, and a trend away from the present sub-marginal one-crop rice economy will be possible. Construction of the road will result in new income for the area, since it will give employment to many local people, who may use the new and needed skills thus acquired in other pursuits.

India

Since the assumption of responsibility for national highways in India by the Central Government in 1947, expenditure on highways has increased considerably :

	Rupees (in millions)
1948-49	15
1949-50	18
1950-51	22.5
1951-52	30
1952-53	40
1953-54 (estimated)	55
1954-55 (estimated)	65

In the five-year plan, the principal emphasis was originally laid on the construction of missing sections of roads in

the National Highway network and on building 120 major bridges. To date, 300 miles of the 1,600 miles of missing road sections have been completed and work is in progress on another 450 miles. Twenty major bridges have been built and construction has started on 20 more. By the end of the five-year period, it is estimated that some two-thirds of the plan will have been implemented.

OCEANIA

New Zealand

The Central Government of New Zealand has been allocating greater amounts for highway improvements each year since 1948.

Federal Highways Budget

	Pounds sterling	Pounds sterling
1948	5,406,373	1952 8,413,713
1949	6,635,943	1953 9,834,560
1950	7,246,173	1954 10,264,410
1951	6,723,122	

Federal, state and local highway expenditures rose from a total of 10,847,265 pounds sterling in 1948 to 18,500,000 pounds sterling in 1954. From 1948 through 1953, there were 443 miles of new construction or complete reconstruction on principal highways of New Zealand.

(Extracted from 'Transport and Communications Review' — October - December 1954)

DEFINITIONS OF HIGHWAY ENGINEERING TERMS

MEAN SEA LEVEL The mean level of the sea at a fixed point on the coast.

This is the mean elevation of the tidal curve at an agreed station.

SPOT LEVEL The reduced level of a defined isolated point on the ground.

SECOND INTERNATIONAL COURSE OF LECTURES ON ROAD TRAFFIC ENGINEERING

THE 2nd International Study Course on Road Traffic Engineering sponsored by the World Touring and Automobile Organization (O. T. A.) and the Permanent International Association of Road Congresses was held, from 20th to 25th September 1954, at Burgenstock (Switzerland).

This Study Course proved highly successful as is evident from the fact that more than 300 persons attended it.

The following eight topics were discussed :—

1. Traffic characteristic and variations — Forecast of future traffic ;
2. Capacity of roads and intersections ;
3. Accident statistics and their use ;
4. Parking — Estimation of present requirements — Forecasts of future requirements and methods employed for meeting these requirements ;
5. Advantages and disadvantages of roads with three traffic lanes ;
6. The layout of intersections and traffic interchanges ;
7. Controlling and regulating urban traffic ;
8. The behaviour and education of road users.

Reports from different countries for each of the above topics were presented and discussed. Brief summaries of the reports presented are given below.

Traffic characteristics and variations Forecast of future traffic

Five reports were submitted. The first, drawn up by MM. Feuchtinger and Schlums (Germany), described the arrangement which had been proposed for linking

together in the vicinity of the City of Munich, the 3 motorways from Salzburg, Stuttgart and Nuremberg which converge Munich.

Three solutions have been investigated :

- the construction of a motorway around the city,
- the conversion of the streets surrounding the central urban area,
- the construction of a system of 'fast-traffic' roads in the vicinity of the central area (according to this plan, each of the motorways would penetrate deeply into the built-up area and would meet at a point located close to the central area of the city ; this is the so-called 'star' plan).

The Authors endeavoured to determine, by means of an origin and destination survey, to what extent traffic in the Munich area would make use of each of the three proposed road systems. They first investigated external traffic, that is to say traffic having its origin or destination, or both, outside the Munich area, and then local traffic, that is to say having both its origin and destination within the area in question. They describe the methods employed in these investigations. They reached the conclusion that from the point of view of traffic the construction of a ring of motorways would not be economically justifiable if some other solution could be found, and that the "star" plan, by which vehicles would be brought as close as possible to the centre of the city, is the most attractive solution. They point out that this conclusion is in line with the ideas of American organizations. The rapporteur general, Mr. Hondermareq, Director of Roads in Belgium, remarked that they might have reached a different conclusion if the ring of motorways had been of smaller diameter.

Two reports one on the instantaneous flow of traffic and the other on the investigation of road traffic variations in Belgium, were submitted by Belgian engineers. Both of them aim at replacing the statistical laws formulated by the Americans, which require a very large number of long and expensive observations for their application, by laws based on a mathematical study of the phenomenon. These reports are only one stage towards the achievement of this objective.

The two remaining reports were submitted by French engineers. M. Elkouby described the results of a series of censuses carried out by means of automatic apparatus. He drew attention to the similarity between his results and those of American investigations, but pointed out that there were, however, differences, particularly in the distribution of traffic between the two directions at certain peak hours (the division is in the ratio of 5.6 to 1/6 in certain cases in France, whereas in the United States it is usually 2/3 to 1/3) and in driving practice and the range of types of vehicle employed in Europe.

M. Arribehaute described the results of censuses carried out on Route Nationale No. 7 in the Department of Seine-et-Marne and concluded by suggesting that, for certain types of roads which carry tourists and have high peak traffic and serve large built-up areas, temporary traffic arrangements might be made, comprising one-way roads without intersections and requiring only a slight modification of road layout; problems of traffic flow would thus be transferred to crossings in towns and their vicinity where far-reaching solutions could be worked out.

Capacity of roads and intersections

Four reports were submitted on this topic.

A report from Belgium on an investigation into the capacity of 7 road-crossings in Brussels equipped with traffic lights reached the conclusion that the figures given in the Highway Capacity Manual of U. S. A. (1500 vehicles per hour of green light and per width of 12 ft or 3.60 meters) appear to be entirely valid.

Another report submitted by an engineer from the Belgian Department of Highways and Bridges describes the researches undertaken for formulation of a theoretical law.

A Danish report describes observations made on the capacity of roundabouts which led to the conclusion that this capacity depends on the width of the carriage way of the circular portion, the radius of the central island and the angles of the intersections. In this connection, the discussion laid stress on the fact that it is essential to make a distinction between roundabouts in open country, where the main concern is with safety, and roundabouts in towns, where the principal object is to ensure the flow of traffic.

M. Herzog (City of Paris) stated that the second consideration had led the City of Paris to favour road intersections equipped with traffic lights.

Accident statistics and their use

The reporter general, M. Pierre Mothe, Chief Engineer, Highways and Bridges, had to summarise 8 reports which, in spite of the cautiousness of their conclusions, do undoubtedly add to the knowledge of the subject.

Several reports dealt with the use of accident statistics and the preparation of card-indexes. These methods do enable accidents to be "localised" by revealing the principal danger points or "black spots", and make it possible for the types of accidents peculiar to each of them to be "catalogued". A comparison between various stretches of road is usually made on the basis of the accident rate (defined as the number of accidents per 100 million vehicle/kms).

These statistics also serve the more general purpose of guiding the authorities towards the most effective traffic regulations and the best means of ensuring that the regulations are respected.

Some very interesting information was supplied, particularly by M. Van Gils (Netherlands), on the increase in the number of accidents in relation to the volume of traffic. The graphs which were presented reveal that there is a "critical

flow" above which a serious increase in the accident rate is observed. The figures submitted by M. Van Gils are approximately 6,000 vehicles per day for a road with two traffic lanes, 8,300 for a road with 3 lanes and 12,000 for a road with 4 lanes.

There are certain differences to be observed between these figures and those given by M. Claes (Belgium), due to the fact that M. Claes made no allowance for the effect of road intersections.

The fact that the accident rate is almost constant below the critical flow, which follows from the report by M. Van Gils, was also observed by M. Smeed (Great Britain) who explains it as follows: accidents can be divided into those in which only one vehicle is involved, and for which the accident rate decreases with the increase in traffic, and those in which two vehicles are involved and for which the accident rate increases with the increase in traffic. M. Smeed also stated various laws governing the ratio between accidents to pedestrians and accidents to drivers, and between the number of persons injured and the number killed, as well as the numbers of cases of personal injury and material damage in relation to the increase in the number of vehicles in any particular country.

The experience gained on the Western Motorways, as well as that on the German motorways, has enabled M. de Buffevent (France) and M. Bitzel (Germany) to emphasise the low accident rate (one-third that of an ordinary road) of a motorway, access to which is fully controlled. The special problem of chains of collisions, which are more frequent on motorways, was also raised. Such accidents usually occur when traffic is particularly dense, due to the road being obstructed as a result of a previous accident.

Several speakers laid particular emphasis on the need for "talking the same language" in order to secure comparable statistics. M. Rumpler, Director of Roads, France, and President of Permanent International Association of Road Congresses, stressed the need for standard definitions of accidents in accordance with the recommendations of the Economic Commission for Europe. He further drew

attention to the importance of an accurate definition of roads with 2, 3 or 4 traffic lanes, and also to the considerable effects of intersections and of through roads, which statistics should make it possible to isolate.

Parking—Estimation of present requirements—Forecasts of future requirements and methods employed for meeting these requirements.

The problems of parking in the centre of large cities and the provision of adequate parking places are one of the main concerns of town planning departments.

Eight reports were submitted on this question. The reporter general was M. K. L. Kelly, Secretary of the Automobile Association of the United Kingdom.

The various questions raised are as follows:

(1) Estimation of present requirements.

Various methods for making this estimation were described.

(2) Estimation of future requirements.

These requirements are evaluated on the basis of a series of approximations and hypotheses which make allowance both for the anticipated increase in the number of mechanically-propelled vehicles and also for the construction of buildings that can be foreseen.

(3) Methods for satisfying these requirements

We should point out in the first place that the Italian report considers that parking in towns is a public utility service, but that the owners of buildings are those who benefit most from the availability of parking space and that, in these circumstances, they should provide means for parking. It expresses the hope that legislation in the various countries will be amended in order to secure that owners of buildings participate in the provision of means for parking.

The remaining reports deal mainly with technical means for meeting parking requirements.

(Continued on page 30)

DEVELOPMENTS IN PROPORTIONING, PLACING, AND FINISHING CONCRETE

AN investigation into the standard specifications for concrete mixtures was ordered by the Director-General of the Ministry of Works with a view to improving the quality of concrete economising in cement, and reducing cost by new methods. The investigations started about four years ago and some of the results are now reviewed by the Ministry. The following is an abstract of a report issued by the Ministry.

Method of Specifying Mixtures

It was decided that standard specifications were unsatisfactory; these usually called for a nominal mixture, a minimum cube strength, and frequently a definite slump, irrespective of the characteristics of the aggregates used. All the requirements of a specification could not always be fulfilled. It was therefore decided to specify the minimum strength of the concrete and any other requirements such as freedom from surface defects and watertightness that might be required, leaving the contractor free to proportion the concrete to suit the aggregates available.

Specifications of this type were introduced by the Ministry in 1952, and more than sixty contracts have been completed in which the concrete was specified in this manner. The results are considered so successful that all Ministry contracts in which there is a considerable quantity of concrete now contain specifications of this type. The Ministry advises contractors, if so desired, on the proportions that can be used in any particular case. In general, the results show that this type of specification, using mixtures proportioned for workability and strength to suit the aggregates, and compaction by vibration, can lead to a reduction in costs and to improvement in the uniformity of the quality of concrete.

The reduction in the proportions of cement used has varied from about 10 per cent in hand-placed concrete with a compressive strength of 3000 lb per square

inch at 28 days, to 40 per cent in high-quality concrete for prestressed work. Reductions in cement content of 15 to 20 per cent are common when vibration is used to produce concrete with a minimum strength of 3000 lb per square inch at 28 days. Examples are:

(1) An office building with basements 500 ft long. The concrete in the basements was in the proportions of 1 : 2.23 : 6.77 by weight with an aggregate of $1\frac{1}{2}$ inch maximum size to $\frac{3}{4}$ inch. The average cube strength was 4006 lb per square inch at 28 days. The required minimum strength was 3000 lb per square inch at 28 days and the normal mixture would have been 1 : 2 : 4 by volume. The saving was 0.93 cwt. of cement per cubic yard, or 20 per cent.

(2) For several large reinforced concrete structures the required strength at 28 days was 4000 lb per square inch. The nominal mixture would have been 1 : $1\frac{1}{2}$: 3 by volume. The mixtures used varied from 1 : 1.87 : 4.38 by weight, resulting in a saving of cement of 13 per cent, to 1 : 2 : 6 by weight showing a saving of 30 per cent depending on the quality of the aggregates available.

(3) In a prestressed structure the required strength was 5500 lb per square inch at 28 days. The mixture used was 1 : 1.74 : 4.87 by weight, having an average 28-days' cube strength of 6600 lb with a saving in cement of 40 per cent compared with a nominal 1 : 1 : 2 mixture by volume.

Savings of 15 to 20 per cent of cement are normal. As a rule the characteristics of the coarse and fine aggregates available control the mixture that can be used in any particular case.

Apart from the saving of cement the advantages obtained from these mixtures are (a) The saving of a few shillings per cubic yard in the cost of materials, (b) the production of concretes that are denser less liable to damage by frost, and less,

(Continued on Page 29)

HERE AND THERE

1. GOOD ROADS ALLOW A WIDER CHOICE OF MARKETS FOR FARM PRODUCTS, AND FOR PURCHASING SUPPLIES

● IF a man lives within three or four miles of one town and twelve or fifteen miles from another town, with bad roads he is almost compelled to sell all his farm products and to buy all his supplies in the town which is nearest to him, because it is too hard to get to the other town. On the other hand, suppose that there were good roads from this man's farm to both of these towns, so that he could make the trip quickly and with ease. If cotton is bringing a little more in the town fifteen miles away than it is in the nearby town he will not hesitate to load his cotton on his wagon and go to the town where the best prices prevail. It is the same way with all other products.

When it comes to buying supplies, we sometime finds that the prices on certain articles are better in one town than in the other. Put good roads all through the country and a man can take his choice of

the place to do his trading. But with the bad roads one is forced to sell his products and to buy his supplies in the nearest town, even though he loses money on both transactions.

Also, merchants go to a farmer and offer to buy goods at his farm at prices below those prevailing in the towns. When the roads are bad the farmer is tempted to sell his goods to the merchant. If there were good roads he will prefer to take his wares to the town and sell them at better prices. This transport costs him nothing as he maintains the bullock and the cart for his agricultural work. He buys consumable articles for his use at cheaper prices in the town.

(Adapted from the "Bulletin of the Agricultural and Mechanical College of Texas" - July 15, 1917)

2. ENGINEERS DEFINED

● DEFINITIONS of the "professional engineer" and the "engineering technician" agreed to by all the principal engineering institutions of the British Commonwealth, the United States and Western Europe, except the Institution of Engineers, Australia are reproduced below.

Professional Engineer

A professional engineer is competent by virtue of his fundamental education and training to apply the scientific method and outlook to the analysis and solution of engineering problems. He is able to assume personal responsibility for the development and application of engineering science and knowledge, notably in research, designing, construction, manu-

facture, superintending, managing and in the education of the engineer. His work is predominantly intellectual and varied and not of a routine mental or physical character. It requires the exercise of original thought and judgment and the ability to supervise the technical and administrative work of others.

His education will have been such as to make him capable of closely and continuously following progress in his branch of engineering science by consulting newly-published work on a world-wide basis, assimilating such information and applying it independently. He is thus placed in a position to make contributions to the development of engineering sciences or its applications.

His education and training will have been such that he will have acquired a broad and general appreciation of the engineering sciences as well as a thorough insight into the special features of his own branch. In due time he will be able to give authoritative technical advice and to assume responsibility for the direction of important tasks in his branch.

Engineering Technician

An engineering technician is one who can apply in a responsible manner proven techniques which are commonly understood by those who are expert in a branch of engineering or those techniques specially prescribed by professional engineers.

Under general professional engineering direction, or following established engineering techniques, he is capable of carrying out duties which may be found among the list of examples set out below.

In carrying out many of these duties, competent supervision of the work of skilled craftsmen will be necessary. The techniques employed demand acquired experience and knowledge of a particular

branch of engineering, combined with the ability to work out the details of a task in the light of well-established practice.

An engineering technician requires an education and training sufficient to enable him to understand the reasons for and purposes of the operations for which he is responsible.

The following duties are typical of those carried out by engineering technicians:

Working on design and development of engineering plant and structures; erecting and commissioning of engineering equipment and structures; engineering drawing; estimating, inspecting and testing engineering construction and equipment, use of surveying instruments; operating, maintaining and repairing engineering machinery, plant and engineering services and locating defects therein; activities connected with research and development, testing of materials and components; and sales engineering, servicing equipment and advising consumers.

(Extracted from "Engineering"—January, 21, 1955.)

3. POLICY OF THE MADRAS GOVERNMENT IN REGARD TO ROADS

● Moving the two demands "Civil works—works Establishment and Tools and Plant." in the Madras Assembly the Minister for Public Works, explained that the general policy of the Government in regard to roads was that important through roads which consisted of National Highways, State Highways and major District Board roads including portions of such roads under municipal limits should be developed and maintained by the Government and that roads of local importance should be maintained by the local bodies concerned. Accordingly about 8,624 miles of important through roads including about 1,065 miles of National Highways were under Government and the

remaining 17,301 miles of roads (including 3,321 miles of major roads which are yet to be taken over by the Government gradually) were under the control of District Boards. In 1955-56, he said, it was proposed to take over 338 miles of roads now under the control of District Boards involving an annual expenditure of Rs 6.28 lakhs on their maintenance.

It was proposed to take up the construction of 19 new bridge works in 1955-56 at an estimated expenditure of Rs 4.12 lakhs.

(Extracted from "The Hindu"—24-3-1955).

4. WHEN TO PRUNE TREES

● CERTAIN trees tend to bleed if pruned during the dormant season. Generally it is safer to prune these trees after they have come into leaf. The rule is not one which should be adhered to so rigidly as to prevent removal of an occasional branch during the dormant season. On the other hand, wherever extensive pruning is performed, adhere to it closely. Otherwise weakening of the tree through excessive bleeding is possible. Even more to be feared is the development of slime flux which is both unsightly and detrimental to healing.

Dormant pruning tends to be followed by a long type of branch growth, whereas pruning during the growing season has a general tendency to make the new growth more compact. Careful workers frequently

take advantage of this fact to obtain a desired type of growth structure.

Dormant pruning is especially advantageous for sanitation work in that during the lower temperatures and drier atmospheric conditions of winter the fungi have less chance to infect cuts.

Summer has marked advantage for clearance pruning. Workers see clearly the degree to which the weight of the foliage pulls down the branches. Many types of trouble which attack an occasional branch are most easily detected during the growing season because the withered foliage acts as a flag among the normal green branches to direct the attention of the worker to the need for removal.

(Extracted from "Roadside Development," Highway Research Board—1953).

5. IMPROVEMENT OF BLACK SPOTS ON ROADS

● IN most cases the reason why a particular place is a danger point is only too apparent. Sometimes it is insufficient visibility, or insufficient superelevation, or merely the fact that conflicting traffic streams have too much freedom of movement and drivers are left too much to their own judgment as to their procedure.

The effective re-modelling of a dangerous junction or curve is not a straightforward job, like designing a brand new road, ab initio. It is quite possible that re-planning that looks quite good on the drawing-board will be unsuccessful when translated into actual construction and, as often as not this will be due to the fact that the psychology of the driver has not been correctly anticipated.

The majority of drivers, for example, will moderate their speed when they are confronted by a sharp curve, but a sharp curve combined with poor visibility is a highly dangerous combination and may catch drivers unawares, particularly if they are strangers to the locality. It may be possible, in such cases, to improve the

visibility at a comparatively low cost, but easing the curve at the same time may give a false sense of security and induce speeds which are too high for safety. It is often better to leave the curve as it is, relying on the improved visibility to prevent trouble due to unexpected obstructions round the bend and relying on the obvious sharpness of the curve to exercise a restraining influence on speed.

In the same way, a dangerous junction with bad visibility may be opened out, but the additional space then becoming available must be treated with care. If there is too much cutting back of kerb lines and too much spaciousness given to the carriageways there will again be an inducement for drivers to negotiate the junction too fast. Too much road space, in fact, is just as bad as too little in these cases, and a large area should be broken up by suitably placed islands to channelise and restrain the speed of turning traffic. These islands, however, need not be bounded by massive kerbs with vertical faces of formidable height which will capsize a vehicle if

emergency avoiding action has to be taken. A pre-cast kerb with a concave face would be far safer than the standard type.

Any constructional measures which will extend a driver's field of view and simultaneously induce him to conform to safe driving procedure are certain to be effective in preventing accidents. Many places, at first sight, should be the blackest of black spots but statistics show that they are remarkably free from

accidents. This is undoubtedly due to the fact that the most moranic driver can see the danger of the situation staring him in the face and takes precaution accordingly. In such locations we can see the effect of planning on control carried, perhaps, to extremes, but it is at least preferable to that insidious type of danger point which leads a driver into difficulties before he is aware of it.

(Extracted from "Highways and Bridges" October 6, '54)

6. A NEW BLASTING METHOD

● A NEW blasting method, which uses charges of low velocity and high velocity explosive in alternate holes, in conjunction with millisecond-delay detonators, is available to quarry and construction men, reports "Highway Research Abstracts".

Tested in the quarry field the new method has often resulted in more breakage per pound of explosive, together with better control of throw. Need for secondary blasting has been diminished. The new system is termed "alternative-velocity loading" by the Atlas Powder Company which developed it.

In practice, the rock is placed under a powerful twisting stress by the initial

discharge of a low velocity explosive. High velocity explosive, detonated a small fraction of a second later, hits the fully stressed rock at the moment when maximum shattering action can be obtained. As in the past, millisecond-delay detonators are used with the two types of charge and contribute to the total performance.

Economy is maintained by the use of low-cast ammonium nitrate explosive, which is made to perform as a low-medium or high-velocity explosive by the insertion during manufacture of a core of ammonia gelatin.

(Extracted from "Highways and Bridges," August 4, '54)

7. PILES FORMED WITH PAPER TUBES

● Paper (or millboard) tubes were used to form more than 200 piles about 15 ft long for a warehouse at Lancaster, South Carolina, U. S. A. The site comprised loose filling on rock at a depth of 15 ft, and the water table was 4 ft from the surface. A boring machine with an auger of 20 in. diameter was used, and a paper tube of 16 in. diameter immediately dropped into the hole. Water rose rapidly in the hole, but it is stated that there was little difficulty in pumping out the water and inserting the prefabricated reinforcement and placing the concrete. The bottoms of the tubes were liable to disintegrate if too long a period elapsed between placing the tubes and concreting, and this was overcome by painting with bitumen the bottom 4 ft or 5 ft of the tube, or in some cases encasing the lower part of the tube in a thin metal collar. In a few cases where the mud could not be kept out of the holes long enough to allow the reinforcement and concrete to be placed, 10-gauge metal tubes were dropped into the holes and driven to the rock by a pile-hammer.

(Extracted from 'Concrete & Constructional Engineering,' February, 1955)

CURRENT LITERATURE

ABSTRACTS

U.D.C. No. 625.8.042.1. EFFECT OF WATER ON BITUMEN-AGGREGATE MIXTURES. Bibliography 17, Highway Research Board, Washington, D.C.

THE chronologically arranged bibliography contains 57 annotated references to literature dating from 1932 to 1953. The bibliography is indexed by authors.

U.D.C. No. 624.94. THE DEVELOPMENT OF THE ELASTIC THEORY OF CONTINUOUS FRAMES by E. H. Bateman. The Structural Engineer, March 1955.

THE historical development of methods of analysis, for use in the design of continuous frames, is traced from the introduction of the theorem of three moments, almost a hundred years ago, to the contemporary application of electronic digital computers. The types of frame under consideration range from the highly redundant skeleton of a city building to the highly deformable structure of a large span single storey building or hangar. The analysis is restricted by the conventions of practical structural engineering design, namely that axial deformations of frame members may be discounted, and that columns are not so slender as to raise problems of elastic instability. The principal methods-moment-area, slope-deflection, strain-energy, moment-distribution, relaxation, etc. are briefly summarised, and a case is presented for the need of more than one method to meet different design requirements.—*Author's Summary.*

U. D. C. No. 624.131.531.2. A THEORETICAL AND EXPERIMENTAL ANALYSIS OF SHEET-PILE WALLS by Peter Walter Rowe. Proceedings of the Institution of Civil Engineers, Part I, General, Number 1, January 1955.

THE variation of the maximum bending moment on sheet-pile walls with pile flexibility and soil stiffness is calculated

for the cases of cantilevered piling and anchored piling, assuming a modulus of sub-grade reaction which increases linearly with depth. The mathematics is too involved for direct design office use, but a final "master" moment/flexibility curve is calculated which is of universal application.

The value of the modulus of the soil is estimated from theory and simple stiff-wall tests, and results in good agreement between the theory and observations on model sheet-pile walls. The influence of seepage forces and more compressible subsoils than loose sand on the stability of sheet-piling is then readily estimated from observations of their influence on the soil modulus.—*Author's Summary.*

U. D. C. No. 625.8.036.3. DEFORMATION MECHANISM AND BEARING STRENGTH OF BITUMINOUS PAVEMENTS: C. Mack: Proceedings of the Highway Research Board, Washington, 1954, 33, 138-66.

A theory of the deformation mechanism of flexible pavements is put forward; it is based on an analysis of the relation between stress, strain and time determined experimentally and it permits determination of bearing capacity. The deformation of bituminous pavements consists of an instantaneous and a retarded elastic deformation followed by a plastic deformation which is accompanied by hardening and which primarily determines the mechanical behaviour of the pavement. As a result of the hardening process, the coefficient of plastic traction (stress/strain rate) increases with increasing compressive strength and time to a maximum within a certain region of stress and at this point the material behaves as a solid, the principal stress being the bearing strength. At greater stresses the coefficient of plastic traction decreases rapidly and the material is in the region of failure. A bituminous pavement at rest is conceived as containing simultaneously particles in the disordered and ordered state, particles moving from the disordered to the ordered

state under stress; at the maximum value of the coefficient of plastic traction the number of particles in the disordered state approaches zero. Data from bearing-plate measurements show that this theory of mechanical behaviour applies to the base course and the subsoil as well as to the bituminous surfacing.

U. D. C. No. 624.272. **WIND LOADS ON GIRDER BRIDGES** by John M. Biggs. Separate No. 587, American Society of Civil Engineers, January 1955.

THE Paper presents, in continuation of an earlier Paper, Separate No. 20, July 1953 "Wind Loads on Truss Bridges" by the Author, wind load data for several common types of railway and highway girder bridges. The railway types include single and double track bridges of both through and deck construction. The highway types include through and deck construction with two, three, and four parallel girders.

All models were tested for various angles of attack (angle between the wind direction and the horizontal plane). Also included are data which indicate the effect of angle of yaw (wind direction in the horizontal plane). Wind directions in the vertical plane containing the longitudinal axis of the bridge are also considered since the resulting forces are important in the design of bascule bridges.

Descriptions of the models are given. Five basic types of railway bridges and four types of highway bridges were included in the test programme.

The wind load characteristics of a bridge depend not only upon the basic configuration of type but also upon the proportions of the cross section. The most important variable within a given configuration is the ratio of the girder depth to the other dimensions of the cross section. This parameter varies with the span of the bridge because the girder depth is, in general, a function of span. In order to take into account the aerodynamic effect of the girder depth-bridge width ratio each basic model type, with two exceptions, was tested with three different girder depths.

Method of construction of the model and test procedures are described.

The conclusions are: (1) the A. A. S. H. O. Specification for highway bridges is conservative with respect to transverse forces in all cases considered therein. (2) The presence of longitudinal girders in excess of two does not appreciably increase the wind loads. (3) Vertical forces and overturning moments on solid deck highway bridges may be a significant design consideration.

U. D. C. No. 624.2. **PROPERTIES OF TRAFFIC LOADS ON BRIDGES** by S. O. Asplund. Separate No. 585 of the American Society of Civil Engineers, January 1955.

A proper choice of design traffic load for highway bridges is economically important. If the design is small, heavy traffic must be turned away. If it is too large, unproductive construction costs will be required. Both alternatives imply economic losses.

This Paper deals with the determination of design traffic loads for long spans from the point of view of making the probabilities for surpassing these loads small.

U. D. C. No. 625.71234. **SIGHT DISTANCE AT UNDERCROSSINGS** by Paul Hartman, Separate No. 597 of the American Society for Civil Engineers, January 1955.

Daylight sight distances on highway sag vertical curves may be limited by a structure crossing the right-of-way. Conventional formulas for the determination of this sight distance are derived for the special case when the critical edge of the structure is directly above the vertex of the vertical curve. Despite this limitation, the formulas are considered to be applicable regardless of the position of the critical edge with respect to the vertex of the vertical curve.

This Paper derives formulas which are correct for any position of the structure.

—Author's Summary.

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(Continued from page 18)

liable to cracking and crazing due to shrinkage, and (c) it is not uncommon for such a mixture to have better workability than a standard mixture even though it has a lower water-cement ratio.

Consolidation by Vibration

The full advantages of such mixtures are obtained only if vibration is used, but there are similar though lesser advantages in such mixtures placed by hand. If concrete is to be hand-compacted it is seldom necessary to use a mixture richer than 1 : 7½ by weight in order to obtain a minimum cube strength of over 3000 lb per square inch at 28 days. Such mixtures will show a saving of cement of up to ½ cwt. per cubic yard.

Provided that concrete of reasonable quality is needed (that is a concrete with a water-cement ratio below 0.6) it will usually be cheaper to use internal vibration. A good type of internal vibrator can consolidate thoroughly more than 5 cu. yard per hour, and it has been found economical to use 1½ in. aggregate for work in which this type of aggregate would not be permitted by the Code of Practice (for example, where the cover is less than 1½ inch.).

Using a carefully proportioned and vibrated concrete it has been possible to strip shutters about two hours after placing. It is possible to strip them much earlier than this, but this is not considered desirable.

(Extracted from "Concrete and Constructional Engineering"-January, 1955).

(Continued from page 17)

A report from Sweden and one from Switzerland describe the initial results obtained with parking meters at Stockholm and Basle.

All the writers of these reports are agreed that street parking cannot provide a final solution to the problem and that some parking accommodation must be provided. This raises the following questions :

- (a) Type of accommodation (above ground or underground?)
- (b) Maximum number of storeys to be provided.
- (c) Maximum capacity for each unit of accommodation and the site for the unit in relation thereto.

One of the questions which arises in this connection is whether the adjacent streets will be capable of coping with the additional traffic due to vehicles entering and leaving the parking place.

- (d) Cost and economic justification of the parking accommodation.

Lastly, the question of compulsory parking on the outskirts of a built-up area was raised, but the discussion led to no definite conclusion ; because its application would mainly depend on the ability of public transport services to convey additional passengers rapidly and cheaply between the outskirts and the centre of the town.

(Extracted from Bulletins No. 137 and 138 of Permanent International Association of Road Congresses - 1954)

(To be continued)

WORTH REMEMBERING

Health is that state of moral, mental and physical well-being which enables any man to face any crisis in life with the utmost facility and grace. —Pericles.

ORGANIZATION AND METHODS

BOSS : " This won't do. You are not following the system laid down by the efficiency expert we engaged."

CLERK : " I know that, sir, but, someone's got to get the work done."

BUDGETS AND ADMINISTRATION REPORTS

(i) GOVERNMENT OF P.E.P.S.U. BUDGET FOR 1954-55

The following extracts have been taken from the Government of P.E.P.S.U. Civil Works Budget for the year 1954-55.

CIVIL WORKS

	(Rs In lakhs)		
	Actuals 1952-53	Revised Estimate 1953-54	Budget Estimate 1954-55
REVENUE			
1. Rents	1.72	4.21	5.46
2. Recoveries of expenditure	3.32	12.01	2.62
3. Transfer from Central Road Fund	1.50	4.15	0.97
4. Receipt from workshop	0.01	—	—
5. Miscellaneous	3.61	4.54	5.23
6. Deduct-Refunds	-0.17	-0.04	-0.04
Total	9.99	24.87	14.24
EXPENDITURE			
A. Original Works			
Buildings	11.82	44.03	25.61
Communications	19.87	18.17	0.47
Miscellaneous	5.90	9.59	3.06
B. Repairs			
Buildings	7.65	8.00	10.00
Communications	14.30	16.55	13.20
Miscellaneous	2.37	2.70	2.50
C. Establishment			
D. Tools and Plant	7.78	14.19	16.65
E. Suspense	0.35	0.54	0.45
	-7.94	2.00	-3.19
F. Development Schemes			
Buildings (Original Works)	—	3.96	9.54
Communications (Original Works)	—	17.23	9.28
Tools and Plant	—	0.39	—
Total A to F	62.10	137.35	87.57

Capital Account of Civil Works outside the Revenue Account

A. Original Works			
Buildings	—	—	39.00
B. Development Schemes			
Original Works - Buildings	—	—	19.00
C. Deduct - Receipts and Recoveries			
	-0.72	—	—
Total	-0.72	—	58.00

REVENUE FROM ROADS

	(Rs In lakhs)		
	Actuals 1952-53	Revised Estimate 1953-54	Budget Estimate 1954-55
Receipts under Indian Motor Vehicles Act	4.18	5.00	5.50
Other receipts	0.73	—	—
Deduct refunds	-0.01	—	—
Sales Tax on Motor Spirit	3.96*	4.00*	4.00*
Total	8.86	9.00	9.50

* gross receipts.

GOVERNMENT OF P.E.P.S.U. BUDGET FOR THE YEAR 1954-55.

(A brief review with reference to Civil Works).

THE anticipated revenue for the year 1954-55 is Rs 733.13 lakhs and the anticipated revenue expenditure is Rs 739.92 lakhs which includes expenditure connected with the Five Year Plan schemes. According to the revised estimates for the year 1953-54, the revenue was estimated at Rs 696.00 lakhs and the revenue expenditure at Rs 726.09 lakhs resulting in a deficit of Rs 30.09 lakhs. The accounts for the year 1952-53 reveal that the revenue amounted to Rs 616.55 lakhs and revenue expenditure to Rs 540.70 lakhs leading to a revenue surplus of Rs 75.85 lakhs.

The expenditure on Civil Works including Development expenditure, met from revenues is estimated at Rs 150.32 lakhs in 1954-55 as against Rs 202.78 lakhs in 1953-54 (Revised Estimates) and Rs 98.92 lakhs in 1952-53 (Actuals). These figures get reduced to Rs 87.57 lakhs, Rs 137.35 lakhs and Rs 62.10 lakhs respectively when adjustment is made for recoveries of

expenditure. Thus the expenditure on Civil Works amounts to 10.0% of the total State revenue in 1954-55 (Budget Estimate), 19.7% in 1953-54 (Revised Estimate) and 11.9% in 1952-53 (Actuals). The decrease in the provision for 1954-55 is due, inter alia, to the transfer of certain items of works to the capital account of Civil Works outside the revenue account and less provision for construction of new roads. The expenditure on communications along (Original Works and Repairs only) amounts to Rs 22.95 lakhs in 1954-55 (Budget Estimates), Rs 51.95 lakhs in 1953-54 (Revised Estimates) and Rs 616.55 lakhs in 1952-53 (Actuals). In turns of total State revenue, it works out to 3.1% in 1954-55 as against 7.5% in 1953-54 and 5.5% in 1952-53.

No capital expenditure was incurred on Civil Works 1952-53 or 1953-54 but a sum of Rs 58.00 lakhs is provided in the budget for 1954-55.

(ii) GOVERNMENT OF WEST BENGAL BUDGET FOR 1954-55.

The following extracts have been taken from the Government of West Bengal Civil Works Budget for the year 1954-55.

	(In lakhs of rupees)		
	Budget Estimates 1954-55	Revised Estimates 1953-54	Actual 1952-53
REVENUE (Civil Works)			
Rents	5.00	5.00	5.35
Ferry Receipts	1.35	1.35	1.56
Tolls on roads	3.00	3.00	2.74
Recoveries of Expenditure	2.16	5.38	3.22
Transfer from Central Road Development Account	57.55	29.71	31.57
Miscellaneous	2.72	8.25	15.61
Deduct-Refunds	-0.01	-0.10	-0.01
Total	71.77	52.59	60.04
EXPENDITURE			
A. Original Works			
Buildings	221.07	137.80	N
Communications	74.61	58.01	O
Miscellaneous	3.25	1.56	T
B. Repairs			
Buildings	95.50	92.26	A
Communications	82.00	80.00	V
Miscellaneous	0.03	0.03	A
C. Establishment			
Tools and Plant	25.88	25.10	I
D. Grants-in-aid			
Grants-in-aid	8.83	7.55	L
E. Suspense			
Suspense	19.11	16.11	A
F. Development Programme			
(Buildings)	-0.99	-4.69	B
			L
			E
Total	618.34	487.56	

Capital Account of Civil Works outside the Revenue Account

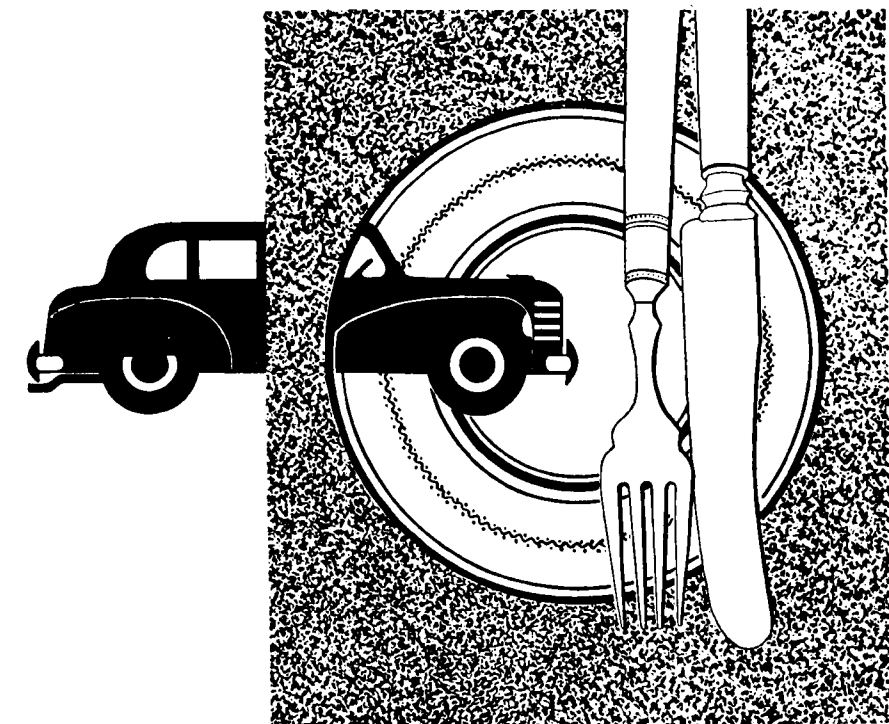
	(In lakhs of rupees)			
	Budget Estimate 1954-55	Revised Estimate 1953-54	Actual Expenditure during 1952-53	Actual Expenditure during 1951-52
Original Works } Buildings	0.23	1.26	0.97	1.62
} Communications	250.00	247.30	251.76	210.64
Establishment	16.55	18.14	20.00	15.54
Tools and Plant	13.95	13.33	9.36	17.31
Suspense	-6.38	-11.41	-25.14	-30.92
Deduct—Receipts and Recoveries on Capital Account	-2.00	-2.00	-5.54	-1.58
Total	272.35	260.62	251.41	212.61

LIST OF APPROVED WORKS ON NATIONAL HIGHWAYS

S. No.	Job No.	Name of work	Amount (Rs in Lakhs)
MADHYA PRADESH			
1.	1086 CP 26	Improvement (widening and resectioning) of Lakhnadon-Narsinhpur Section of N. H. No. 26.	3.31
2.	1099 CP 6	Improvement of N. H. No. 6 - Bombay-Calcutta Road - (Raipur-Sambalpur Section) miles 2/3 to 25/6.	9.20
3.	1100 CP 6	Improving miles 25/7 to 84 of Raipur-Sambalpur Section of N. H. No. 6.	11.29
4.	1101 CP 6	Improvement of miles 93/5 to 131 of Nagpur-Raipur Section of N. H. No. 6	9.53
5.	1116 CP 6	Construction of a new link from Nandura to Malkapur on N. H. No. 6.	9.31
6.	1133 CP 6	Widening and surfacing of miles 85 to 114/F5 of Raipur-Sambalpur Section of N. H. No. 6.	5.81
MADRAS			
7.	1087 MD 7	Black topping the WBM portions in M. 327/0 to 356/1 of N. H. 7 in Ramnad District.	2.83
8.	1088 MD 7	Black topping the WBM portions in M. 363/8 to 431/7 of N. H. 7 in Tirunelveli Division.	3.86
9.	1090 MD 7	Black topping the WBM portions including widening of appropriate reaches in M. 261/0 to 324/7 in Madurai Division, N. H. No. 7.	4.97
10.	1093 MD 45	Black topping the stretch M. 152/0-240/2 of N. H. No. 45 in Tiruchirapalli Division.	6.97
11.	1094 MD 45	Black topping the WBM portions in the Stretch M. 241/0-257/0 of N. H. 45 in Madurai Division.	1.63
ANDHRA			
12.	1102 AH 5	Upgrading the existing road from M. 17/0+170' to 18/0 on the left bank of Eluri Canal (Tadepalligudem Panchayat limits) on the diversion of N. H. 5 through the Godavari Delta.	0.37

S. No.	Job No.	Name of work	Amount (Rs in Lakhs)
13.	1122 AH 7	Providing black top surface to M. 91/0-157/7 of N. H. No. 7 Anantapur to Mysore limits.	8.43
14.	1124 AH 5	Block topping Madras-Calcutta Road N. H. No. 5 from M 377/0 to 434/1 in East Godavari District.	7.22
15.	1131 AH 5	Reconstructing the bridge over Yeluru river near Yerravaram in mile 391/1.3 of G. N. T. Road (N. H. No. 5).	7.27
16.	1135 AH 5	Formation of a bye pass road at Dowleshwar on the diversion of N. H. No. 5 through the Godavari Delta in East Godavari Delta.	1.10
17.	1150 AH 5	Formation of approach roads to Pennar Bridge on the Madras Calcutta Road, N. H. No. 5.	4.48
18.	1161 AH 9	Widening and black topping M. 74/0 to 93/2 + 330 ft of the Sholapur Hyderabad Vijayawada Road (N. H. No. 9)	7.23
ORISSA			
19.	1105 RS 5	Exploratory borings in connection with the construction of a bridge over the river Baitarni on N. H. No. 5 in Orissa.	0.07
20.	1106 RS 5	Improvement to N. H. No. 5 from Bala-sore to Bhadrak.	10.15
WEST BENGAL			
21.	1107 BG 31	Widening the Sevoke-Bagrakote Section of N. H. 31 in the approaches on either side of Railway over bridge in the 19th and 20th miles.	0.46
22.	1113 BG 34	Upgrading Malda-Pagla Section of N. H. 34 in Malda District.	5.61
23.	1120 BG 34	Upgrading the Malda-Gazole Section of N. H. 34 in the Malda district.	5.11
TRAVANCORE-COCHIN			
24.	1108 TC 47	Improvements to Kannethil-Chavara Section miles 8/5 to 13/5 of Quilon-Alleppey Section - N. H. No. 47.	5.21
25.	1110 TC 47	Improvements to miles 15/0 to 18/0 of Quilon-Alleppey Section of N. H. No. 47.	1.23
26.	1111 TC 47	Improvements to miles 5/2 to 7/0 of Quilon-Alleppey Section of N. H. No. 47.	1.29

S. No.	Job No.	Name of work	Amount (Rs in Lakhs)
27.	1112 TC 47	Improvements to miles 18/0 to 22.0 of Quilon-Alleppey Section of N. H. No. 47.	2.52
28.	1121 TC 47	Improvements to miles 7/0 to 8/3 of Quilon-Alleppey Section - N. H. No. 47.	0.91
SAURASHTRA			
29.	1115 SR 8A	Reconditioning and providing 1½ premixed carpet etc. to Dolia-Bamanbore Section between miles 21/6 and 42/6 of Ahmedabad-Nandla Road - N. H. No. 8-A.	7.50
UTTAR PRADESH			
30.	1117 UP 24	Widening Ms. 158-161 of N. H. No. 24 (local miles 148-151 of Lucknow-Bareilly road).	2.95
31.	1118 UP 28	Widening Ms. 12-17 of Lucknow-Gorakhpur road, N. H. No. 28.	3.28
32.	1119 UP 24	Widening Ms. 296-304 (local miles 2-10) of Lucknow-Bareilly road, N. H. No. 24.	4.77
HIMACHAL PRADESH			
33.	1114 HP 22	Widening of 6 ft track to full width of the second five miles of Wangtoo-Chini Section of Hindustan-Tibet Road.	7.59
34.	1134 HP 22	Widening 6 ft track to full width of second five miles of Narkanda-Luri Section of Hindustan-Tibet Road.	6.40
35.	1163 HP 22	Widening 6 ft track to full width of Wangtoo-Chini Section of Hindustan-Tibet Road N. H. No. 22, miles 10/0 - 15/0.	8.43
BOMBAY			
36.	1123 BM 8	Construction of a bridge over Jambuva river on the Bombay-Ahmedabad Road, N. H. No. 8.	4.08
37.	1138 BM 8	Construction of a diversion outside Chikhli town in miles 166-167 of the Bombay-Ahmedabad Road, National Highway No. 8.	1.79
38.	1153 BM 4	Renovating the decking of the bridge across the Koyna river near Karad in mile 101 of the Poona-Bangalore Road, National Highway No. 4.	4.08



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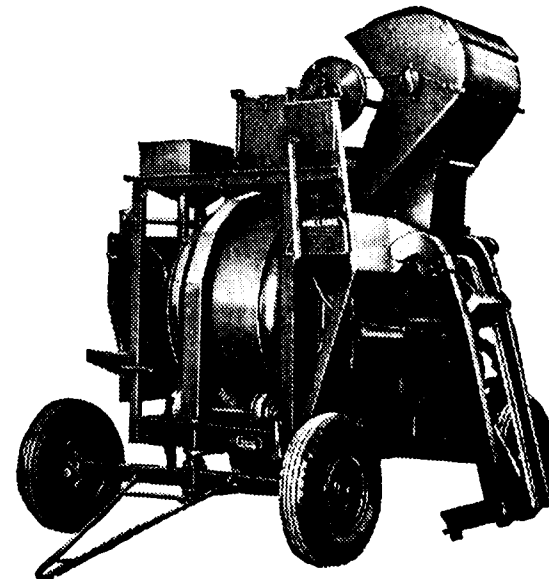
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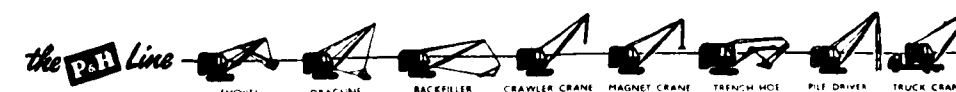
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