

596

ANNUAL NUMBER

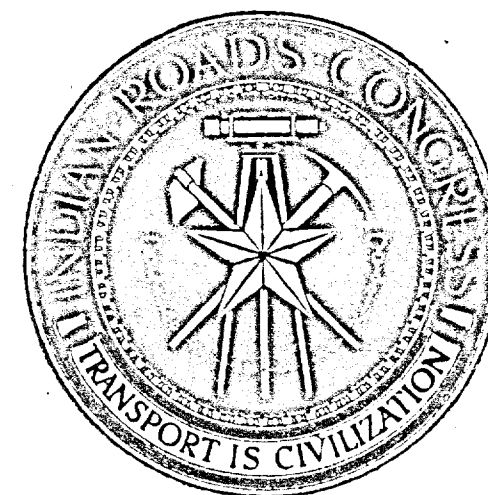
# TRANSPORT- COMMUNICATIONS

MONTHLY REVIEW

JUNE 1955—No. 98

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3-55

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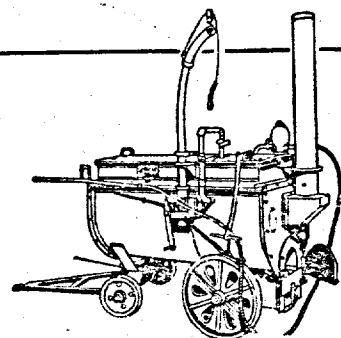


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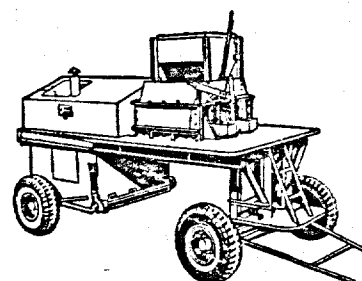
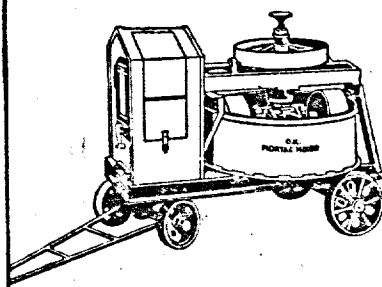
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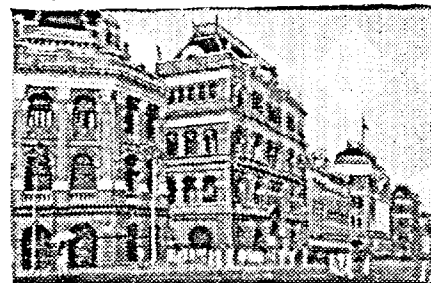
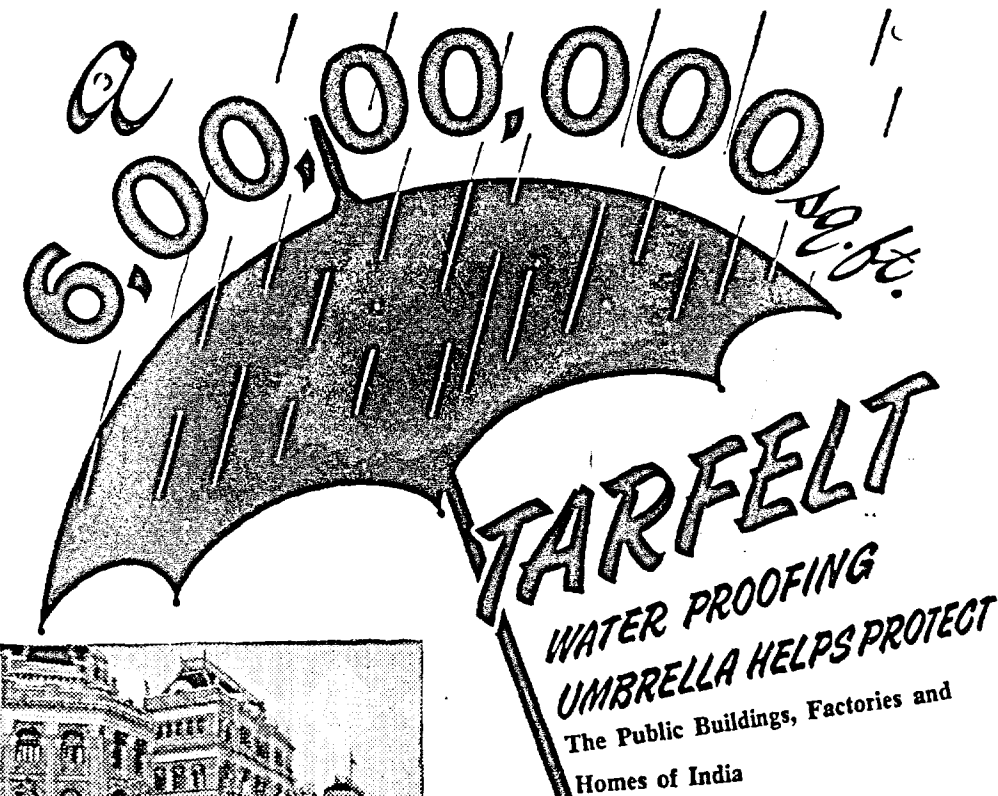
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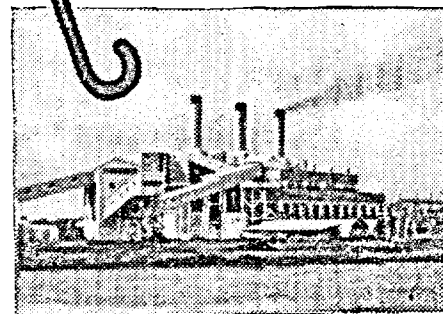
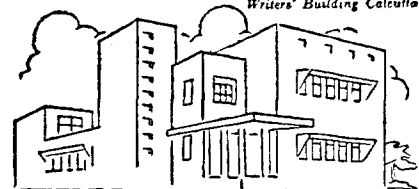
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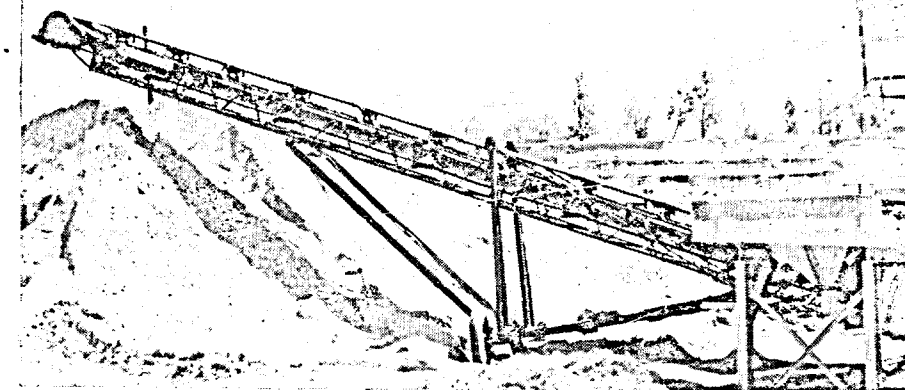
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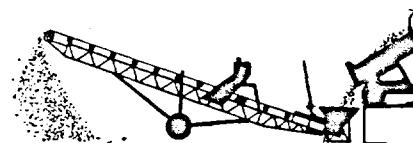
# Barber-Greene PORTABLE CONVEYOR



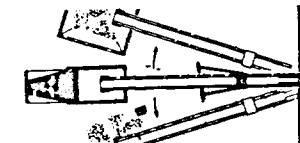
Heavy Duty – Long Reach  
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This Barber-Greene conveyor combines the heavy-duty construction of a permanent conveyor with complete portability. The model 374 handles sand, stone, wet concrete, coal—or any bulk material—at high capacities, providing savings in man-power and operating expense.

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Long reach and high discharge for high, extended storage piles.



Loading trucks or bins without moving the conveyor.

## Barber-Greene Overseas, Inc.

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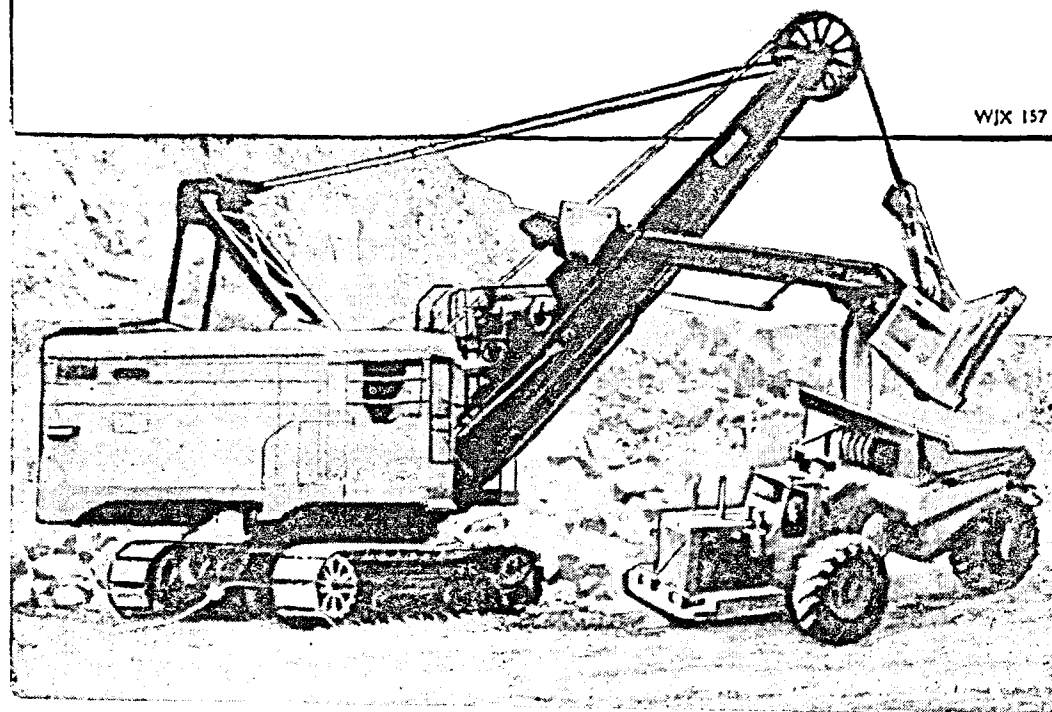
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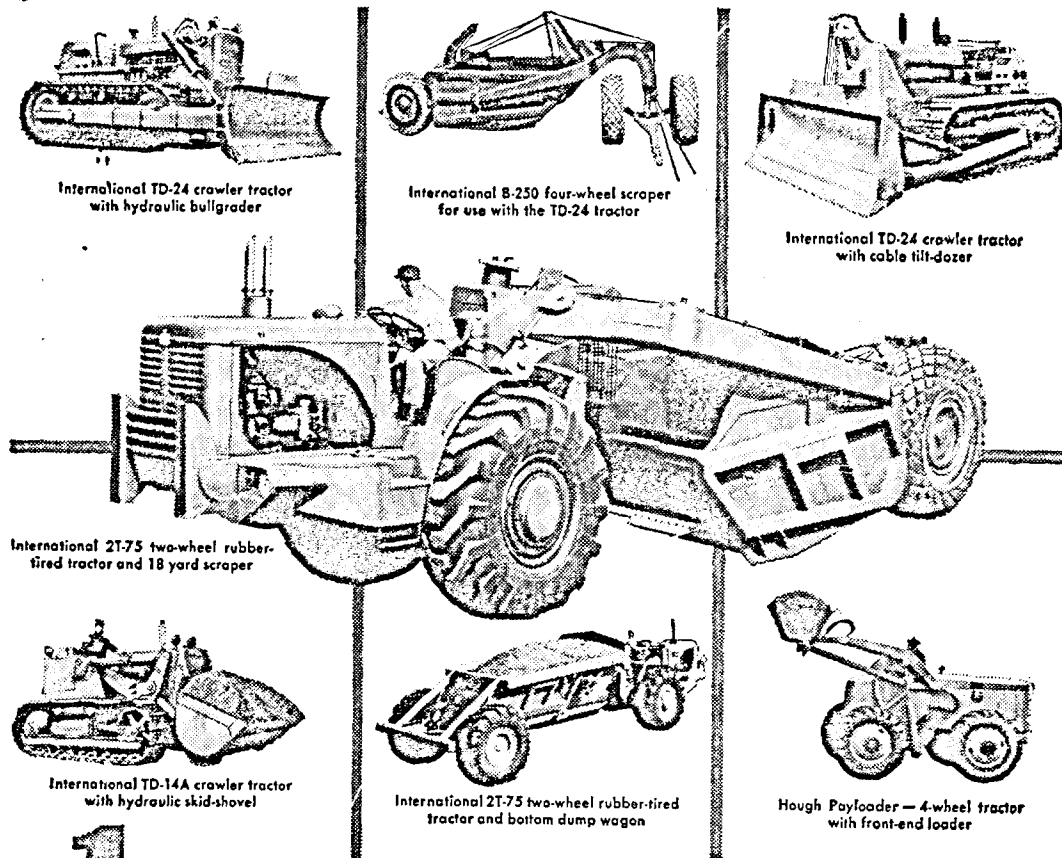
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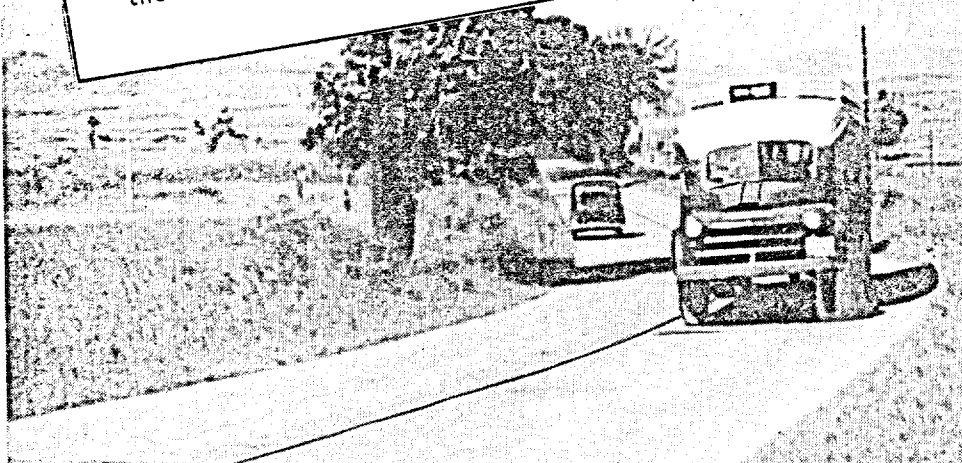
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# TRANSPORT- COMMUNICATIONS

MONTHLY REVIEW

JUNE 1955—No. 98

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**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.

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## TRANSPORT-COMMUNICATIONS MONTHLY REVIEW

A REVIEW OF  
ROAD ENGINEERING, DEVELOPMENT & TRANSPORT

JUNE 1955

### ROAD DEVELOPMENT IN JAMMU AND KASHMIR STATE

by

Shri D. N. Gupta

ALTHOUGH the State of Jammu and Kashmir is so widely known and attracts every year thousands of tourists from all-over, yet, strangely enough, it is one of the most backward State in respect of means of communication.

It was at the close of the nineteenth century that the first road, known as Murree-Kohala-Srinagar road, was constructed. Till 1914, the total milage of roads was about 350 in the provinces of Jammu and Kashmir constituting an area of 20,917 sq. miles with a population of 37 lakhs. Communication between the two capitals i.e., Jammu and Srinagar, was possible only through the Punjab via Rawalpindi.

Construction of a road, 203 miles in length, connecting Jammu and Srinagar was taken up in 1914 before the outbreak of the World War I and was completed in 1920. But this highway, even upto this day, remains open to traffic only for 8-9 months in the year, as it is not negotiable during the winter months on account of heavy snow on the Pir Panjal range.

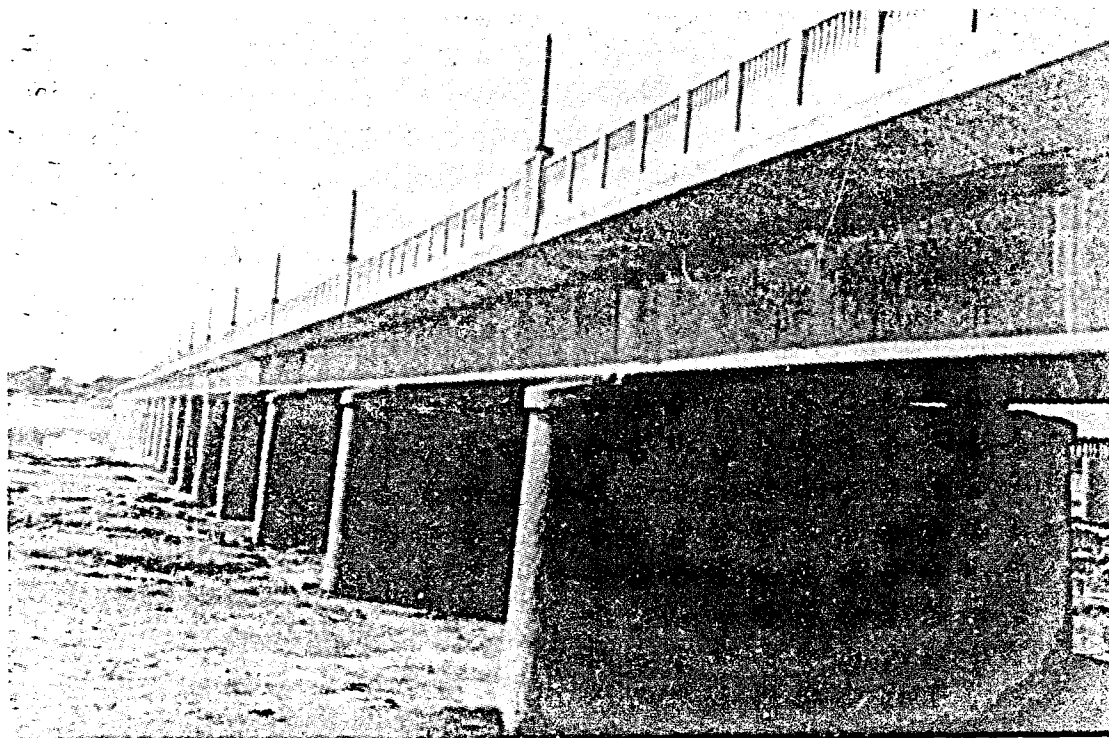
In the absence of any railways, roads are the only means of communication in

the State. Although in the early days, construction of a railway line to Srinagar was contemplated and surveys of various alternative routes were carried out through British engineering firms at a cost of about Rs 20.0 lakhs, yet nothing materialized.

The State of Jammu and Kashmir has an area of 82,258 sq. miles and according to 1941 Census had a population of 40 lakhs. The frontier districts of Gilgit and Ladakh alone constitute an area of 63,554 sq. miles. In the provinces of Jammu and Kashmir, there are about 8087 villages and 90 per cent of the population lives in them.

At the close of 1946, there were about 1273 miles of roads of all categories in the Provinces of Jammu and Kashmir which served a population of about 37 lakhs; and this meant, on the average, 0.06 mile of road per sq. mile.

For want of bridges over large streams, most of the roads could not be negotiated for part of the year and consequently certain district head-quarters such as Kathua, Reasi, Mirpur and Poonch remained isolated during rainy seasons. The Frontier district of Ladakh did not



PENNAR BRIDGE

The Bridge near Nellore on National Highway No. 5 consists of 23 spans of 71 ft clear and 10 spans of 61 ft. Roadway 22 ft with 5 ft wide footpaths on each side—cost per running ft is Rs 1350/-.



A Hill Road in Kashmir.



Jammu Srinagar Road Lined with Poplar Trees.

receive any attention in respect of roads excepting for the maintenance of 230 miles of bridle track from Srinagar to Leh, known as "Leh Treaty road", which mainly served the interests of British trade with Central Asia via the Karakorum Pass.

The appalling backwardness of road communication in the State could better be judged from the district-wise length of roads, see Table 1

It was only during the unforeseen calamity which befell the State in 1946-47 that this lack of communications, which was largely responsible for the loss of many

human lives and changes in the political map of the State, received some notice.

Development of Jammu-Srinagar road, the main artery of the State, construction of Pathankot-Jammu road and improvements and construction of other roads leading to the forward areas was taken up at the close of 1947 whereby conditions improved to a considerable extent. At the close of 1951-52, in the Jammu and Kashmir Provinces there were 1578 miles of roads of various classes maintained by different agencies as summarized below see table 2

Table 1

| Districts               |     | Area<br>in sq.<br>miles | Total<br>popula-<br>tion | Density<br>of popu-<br>lation<br>per sq.<br>mile | Length of the<br>road in the<br>district. |                  | Length<br>of road<br>in miles<br>per sq.<br>mile of<br>area |
|-------------------------|-----|-------------------------|--------------------------|--------------------------------------------------|-------------------------------------------|------------------|-------------------------------------------------------------|
|                         |     |                         |                          |                                                  | Metalled                                  | Unmet-<br>talled |                                                             |
| <b>Jammu Province</b>   |     |                         |                          |                                                  |                                           |                  |                                                             |
| Jammu and Chenani       | ... | 1147                    | 431362                   | 376                                              | 69½                                       | 75               | 0.12                                                        |
| Kathua                  | ... | 1023                    | 177672                   | 174                                              | —                                         | 51               | 0.05                                                        |
| Udhampur                | ... | 5070                    | 294217                   | 58                                               | 121½                                      | 57               | 0.033                                                       |
| Reasi                   | ... | 1789                    | 257903                   | 144                                              | 11                                        | 18               | 0.016                                                       |
| Mirpur                  | ... | 1627                    | 386653                   | 250                                              | 11                                        | 198              | 0.122                                                       |
| Poonch                  | ... | 1627                    | 421828                   | 259                                              | —                                         | 30               | 0.000                                                       |
| Total Jammu Province    | ... | 12283                   | —                        | —                                                | 213                                       | 429              | 0.05                                                        |
| <b>Kashmir Province</b> |     |                         |                          |                                                  |                                           |                  |                                                             |
| Baramulla               | ... | 3317                    | 612428                   | 185                                              | 86½                                       | 84               | 0.05                                                        |
| Anantnag                | ... | 2814                    | 851606                   | 303                                              | 178½                                      | 153              | 0.12                                                        |
| Muzaffarabad            | ... | 2408                    | 264671                   | 110                                              | 110                                       | 19               | 0.05                                                        |
| Total Kashmir Province  | ... | 8539                    | —                        | —                                                | 375                                       | 256              | 0.074                                                       |
| Total Jammu and Kashmir |     | 20822                   | —                        | —                                                | 588                                       | 685              | 0.06                                                        |

Table 2

| Agency |                                     | Surfaced miles | Metalled miles | Gravel miles | Earth miles | Tracks miles | Total miles |
|--------|-------------------------------------|----------------|----------------|--------------|-------------|--------------|-------------|
| (a)    | Maintained by the State P.W.D. ...  | 319.5          | 333.0          | 112.5        | 143.0       | 278.5        | 1186.5      |
| (b)    | Maintained by the Centre P.W.D. ... | 53.0           | —              | —            | —           | —            | 53.0        |
| (c)    | Maintained by army Engineers ...    | —              | —              | 22.0         | 122.0       | 195.0        | 339.0       |
| Total  |                                     | —              | —              | —            | —           | —            | 1578.5      |

Taking into account 230 miles of roads in the areas occupied by Pakistan, over 500 miles of new roads were constructed and 250 miles of roads were upgraded during the period 1947-1952.

It was not till 1953-54 that the road development programme was seriously taken up after the conditions had stabilized. During the two years ending 1954-55, 219 miles of existing roads have been improved and developed and 225 miles of new roads and tracks were constructed. The State has today 1893 miles of roads of all classes as under :

|               |     |              |
|---------------|-----|--------------|
| (i) Surfaced  | ... | 439 miles    |
| (ii) Metalled | ... | 354 "        |
| (iii) Gravel  | ... | 198 "        |
| (iv) Earth    | ... | 349 "        |
| (v) Tracks    | ... | 553 "        |
|               |     | <hr/> 1893 " |

During this period, construction of 20 new major bridges, aggregating 4500 ft in length and estimated to cost approximately Rs 41.0 lakhs, was also taken up. Most of the bridges have been completed. The cost of road construction and major bridges during the two years amounted to Rs 128.33 lakhs.

By the end of 1955-56, construction of 200 miles more of new roads, upgrading

of 263 miles of existing roads and construction of about 2500 rft of major bridges is expected to be completed at a cost of Rs 113.0 lakhs.

Construction of a road tunnel, 1.55 miles in length above Banihal through the Pir Panjal, at an altitude of 7300 ft to establish direct communication between the two capitals throughout the year was taken up seriously in 1952 and necessary detailed surveys were started. After necessary data had been made available, actual construction was taken up recently. This tunnel, when completed, will be one of the longest road tunnels in the world.

According to the Nagpur Formula, the State should have at least 2380 miles of National and Provincial Highways and major district roads; and 2940 miles of minor district and village roads, but, since the topography of the country is mostly hilly and mountainous and in some districts the density of population per sq. mile is between 58 and 144, this formula has to be very much liberalized.

The cost of road construction in both the provinces is much more than in many other States of India on account of the nature of the soil, non-availability of road building materials and transport difficulties.

## THE ROAD

### A Tool for Progress

*"It is the Road which determines the sites of many cities and the growth and nourishment of all. It is the Road which controls the development of strategies and fixes the sites of battles. It is the Road which gives its framework to all economic development. It is the Road which is the channel of all trade, and, what is more important, of all ideas. In its most humble function it is a necessary guide without which progress from place to place would be a ceaseless experiment; it is a sustenance without which organised society would be impossible, thus, and with those other characters I have mentioned, the Road moves and controls all history."*

—Hilaire Belloc.

## Mr. G. M. McKELVIE

THE Council of the Indian Roads Congress at their meeting on 4-2-1954 passed a resolution\* appreciating the services rendered by Shri McKelvie, Past President of the Indian Roads Congress.

The Council also decided to present Shri McKelvie a suitable present and the members of the Council made voluntary contribution for the purpose.

Edinburgh on the 25th March 1955. The presentation was made by Mr. McCallum, M. I. Mun. E., F. Inst. H. E., Chairman of the Scottish Branch. The guests of honour were Mr. G. M. McKelvie, CIE., OBE., past President of the Indian Roads Congress and Mr. R. B. Carnegie, CBE., F. Inst. H.E., President of the Institution of Highway Engineers.



Mr. McKelvie receiving the Salver.

[By Courtesy of the 'Scotman,' Edinburgh]

A silver salver, (Photo on page 11), was specially got made for the purpose with the help of Shri K. K. Nambiar.

At the request of the Indian Roads Congress, the Institution of Highway Engineers, United Kingdom kindly presented to Shri McKelvie the salver and a scroll containing the resolution passed by the Council on the occasion of their Annual Luncheon of their Scottish Branch at

Proposing the toast of "The Guests", Mr. D. B. Waters, AMICE., M. Inst. H.E., said: "I think our guests have set a great example to us. They have risen through the ranks to take the top administrative jobs. That should be an inspiration to us who think that engineers should get such jobs."

As well as doing his official job Mr. McKelvie was a foundation member

\* Resolution is given at page 10.

of the Indian Roads Congress and everywhere he contributed not only to the administration of Indian roads but also to the technical progress of work in India—a great achievement.

Mr. Carnegie replying conveyed the good wishes of the Midland branch of the Institution. He said: "I hope sincerely that this tunnel (under the Forth) as proposed can be provided. I can see difficulties—I do not know yet much about the waterproofing—but it is a most interesting idea and I should like to see Scotland to be the first country to have a tunnel of that kind. We have the finest bridge for the railway over the river



Mr. McCullum reading the scroll.

[By Courtesy of the 'Scotsman,' Edinburgh]

Forth, a bridge which is the envy of the world and to build something different alongside that bridge 150 yards upstream would detract in a great way from the wonderful bridge across the Forth.

I believe also that the tunnel will cost £3 million to £4 million less than a bridge and that the plan has been submitted to a panel of experts. I hope that the highway engineers and bridge engineers of Scotland will have the opportunity of building the tunnel under the Forth.

"From April 1st, 1956, the trunk roads and classified roads are to be vested in the Secretary of State for Scotland but I should like to point out one thing. You cannot make roads without money and the money will be money granted by the central government. As we sit here £1 million is being collected by the government in taxation on petrol, oil and licences. They collect over £400 millions a year, of which only a small proportion goes into road work in this country. I only hope that when this vesting comes along the amount of money given by the central government to the Secretary of State will be much more than you have been getting during the past ten years so that you will be able to make good roads in this country.

Mr. Carnegie continued: "In the past six months we have been told about the new developments in the highways of this country and we have been told how much money we are going to get. Some people say it is not enough. We have got to start some time. We have been on the patch and promise policy for ten years and we are not yet geared up for millions of pounds of work. Take the acquisition of land. That is most difficult today. You cannot say to a farmer 'I will give you a piece of new road if you give me five square yards of land'. You must dedicate the land if you want to give it to the county and the lawyers fees are ten guineas for each dedication. When acquiring six parcels of land occupied by six tenants in Devon I finished up with more square feet of paper than square yards of land.

"Another thing we shall be faced with is the staffing of our highway jobs. Everybody cannot get to the top—more's the pity—and you need the backroom boys of grades 1, 2, 3, 4 and 5, who do an excellent job behind the scenes. In my opinion the only way to get to the top is to take a B.Sc. in Civil Engineering. I have ten

B.Sc.'s in my Department. These boys are full of knowledge and theory when they come along from the University but it takes them two years to assimilate the practical side.

"I say that when we come to increase our staffs—and the staff increases will be about 2,000 young engineers—if we are to carry out the schemes, the men for grades 1 to 5 need not be Civil Engineering graduates. We should recruit boys from secondary and technical schools and enable them to qualify in a not so high examination to fill the jobs from £800 to £900 a year. The 'Municipals' and 'Civils' today are very difficult examinations to pass. These men can do the field work and leave the B.Sc.s to concentrate on the design. We are strong enough at the top. It is at the bottom that we are not so strong."

Mr. Carnegie concluded by saying that he was delighted to come to Scotland and that if they had any spare invitations he would be only too pleased to come for a long week-end. He hoped that the Institution would go from strength to strength.



Mr. McKelvie replying

[By Courtesy of the 'Scotsman,' Edinburgh]

Proposing the toast of "The Institution", Mr. McKelvie said it gave him

great pleasure to be with them. He felt there was a strong bond among highway engineers everywhere. "I am a stranger among you but I feel already I am among comrades and friends."

The Indian Roads Congress was a body similar to theirs but it was not an institution of engineers although, with only a very few exceptions, all its Members were qualified (Graduate) highway engineers.

He went on: "During the past few days I have been dipping into your old journals and reading discussions and speeches. One thing struck for me a familiar note—uncertainty about grants. I have been connected with roads in India for 33 years and I have heard the same complaint so often almost in the same words.

"In India in the last few years we have had bigger grants than ever before. We had, at the beginning, to deal with the problem mentioned by your President and to adjust our allotments to what we were geared to spend usefully. But now the situation is much better. In some directions we have certainty of grants and can plan several years ahead because those grants are earmarked, as they were long ago earmarked in the U.S.A. and, recently, also in Australia.

"I have come from India and you will expect me to say something about that country. In India it can be very cold in the northern part and, of course, in some parts in the south, the saying is that there are two climates, 'hot' and 'damned hot'. Actually it is when you are sitting in the office that you lack energy—not when you are out in the heat.

"The Indian Roads Congress is not an institution of engineers. They resemble the American Association of State Highway Engineers. They have the same kind of constitution and perform similar functions. I do not think there is room in India for an Institution of Highway Engineers. There is no such Institution in U.S.A. although they spend £2,000 millions a year on roads and are now proposing to spend £3,400 millions. I do not think you are spending £100 millions in this country.

"The reasons why there is a need for the Indian Roads Congress are geographical and political, the size of the country and its division into 28 States. Roads come under the State legislatures except for the National Highways which come under partial central control. The of administration and defence, there must be common standards throughout the country if there is to be free traffic from State to State, traffic control regulations must be more or less the same. "India is a big country, 40 times the size of Scotland and with 70 times the

Resolution Passed Unanimously By the Council of  
The Indian Roads Congress on 4th February 1954

"The Council of the Indian Roads Congress places on record their great appreciation of the services rendered by Shri G. M. McKelvie to the cause of road development in general and the Indian Roads Congress in particular. With his retirement from the service of the Government of India in May 1953, the Indian Roads Congress lost the services of an able engineer and an ardent worker for this Society. His association with the Congress started in 1934 as one of the founder members of the Society. Under his fostering care as the Honorary Treasurer and later as the President, the Society was able to stabilize its finances. He was responsible for starting the publication of the "Transport-Communications Monthly Review". His great ability as an engineer won him the admiration and respect of all who knew him. He was always ready to place his long experience and great technical ability at the disposal of the Congress. Under his initiative and guidance the Indian Roads Congress undertook to lay down road standards and draft the Indian Roads Congress Bridge Code. His genial but firm personality and burning enthusiasm will be greatly missed at the future meetings of the Society."

*G. M. McKelvie*  
President  
Indian Roads Congress

THE SCROLL

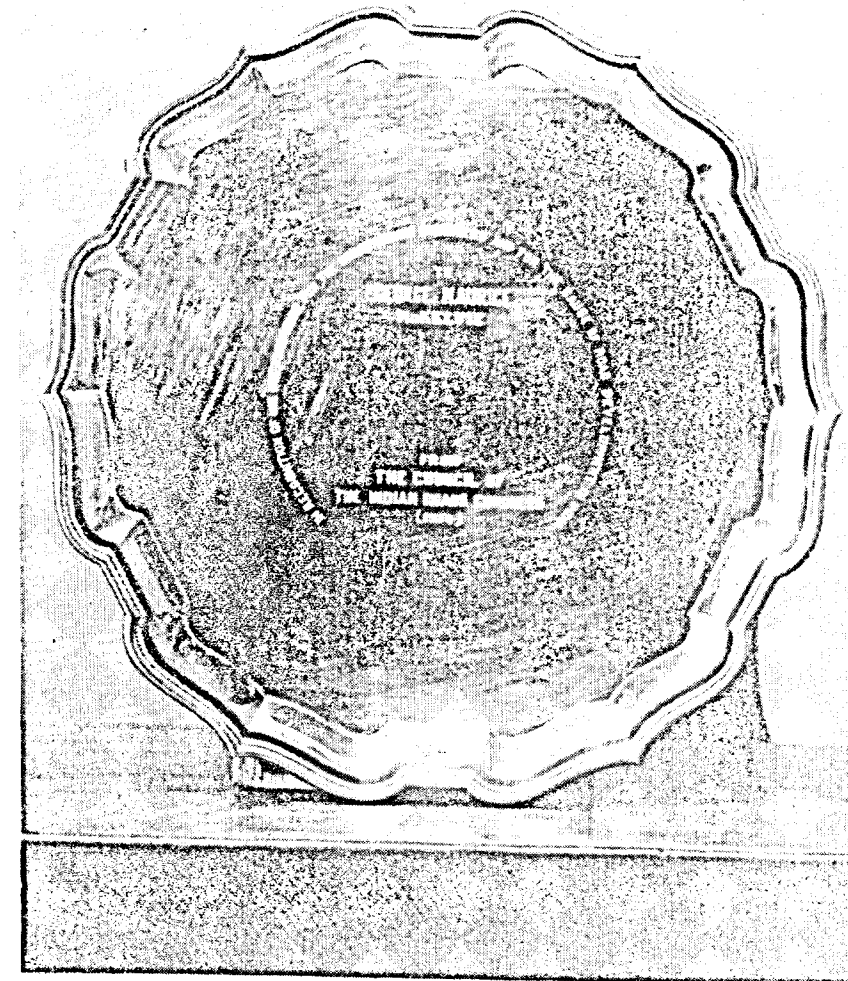
States are jealous of their rights and are apt to resent interference from the centre. On the other hand, roads by their nature concern the country as a whole. They connect States together and if there is to be inter-State commerce and for reasons

population. There must be common principles of taxation; otherwise you would have thousands of customs barriers where the roads cross from State to State. The Indian Roads Congress advises the government not only on road standards

but also on traffic regulation and taxation.

"Geographically, you have extreme conditions in India. You have the deserts of Rajasthan—about 50 per cent greater

In the central plains we have rivers 1000 miles long and, at places, a mile wide. In the Deccan and the South, vast areas of black cotton soil pose a peculiar road problem of their own.



THE SALVER

than the U. K.—and the very wet areas of Bengal and Assam with from 200 to 500 inches of rain a year. At one place 800 inches has been recorded. You have mountains in the Himalayas and recently we have suffered badly from earthquakes.

"Engineers in India have different backgrounds and experience and they have to put in hard work on common standards for a country like that where conditions vary so much. That is not peculiar to India because in U.S.A., Canada and

Australia we have big unions of semi-independent States and the same sort of variety of conditions. In all these countries they have associations of State highway officials who advise the Government on priorities, road policy, and on technical matters.

"In the American association the chief engineers of the 48 states are active members and other engineers are associate members. The active members do most of the business. Under the less rigid constitution of the Indian Roads Congress we have contractors' engineers, district engineers and state engineers. Any graduate highway engineer is qualified to be a member. We have 18 committees all of which do valuable work, especially the contractors' engineers, who are the specialists and experts. They are more expert than the ordinary run of municipal or state highway engineer.

"I remember attending a meeting of the Bridges Committee of the Roads Congress—one of our most important committees. There were many experts present discussing a proposed "Code of Practice" on

bridge building and they were becoming hot under the collar. One expert, who I shall call Dr. A got up and said, 'Mr. Chairman I cannot conceive.....' The chairman replied rather heatedly 'Dr. A I'll make you conceive'.

"The Congress has produced 170 Papers so far and of these 20 have been produced by the expert committees on specifications and standards, highway widths, curves and especially on bridge design. We have our own loading, which corresponds more to the French than to the British and American because of our peculiar conditions. We issue as part of our Journal an "information service" giving type designs and specifications. We have also a monthly magazine in the Transport Communications Monthly Review and we have culled a lot from studying papers read to your Institution.

"You were talking about having to submit construction estimates to people in Edinburgh. In India we have to submit national highway estimates to the central government for approval and the Indian Roads Congress has got the States to adopt



Mr G. M. McKelvie (seated centre), with the silver salver and scroll. The group also includes (seated) Mr R. B. Carnegie, president of the Institution of Highway Engineers and Mr T. McCallum, chairman of the Scottish branch. Looking on are Mr W. F. Munro, Montrose, honorary secretary, Scottish Branch and Mr D. B. Waters.

[By Courtesy of the 'Scotsman,' Edinburgh]

certain common standards which makes the checking of these estimates much easier.

"It gives me great pleasure to ask you to drink the toast of this great Institution."

Mr. McCallum thanked Mr. McKelvie for his kind words and went on: "In your capacity as adviser on roads to the Government of India you will know how difficult it is to convince government departments that we as highway engineers do know something about roads and that governments should at least ask our opinion on road progress.

"As our president has said in April, 1954, the 400 miles of red tape that bind us—the Scottish Roads Committees—to London is going to be cut. When that time comes I do not know whether we are to be left dangling at the end with a noose round our necks or be tied in a beautiful bow. I think it is going to be the latter. I feel that the Secretary of State has made a great debut in making the government promise to make a start within four years at the latest crossing of the Forth either by way of bridge or tunnel. That augurs very well for the future of the roads in Scotland.

"You spoke about planning for several years ahead. We have also been planning for years ahead. You spoke about the

American Association of Engineers. In America they have what are called 'material' engineers, the men who get in the prices and estimate the local material. We here have 'immaterial' engineers because it is immaterial whether we do engineering or not (laughter). I hope that the plans before us now will turn our 'immaterial' engineers into 'material' engineers."

Mr. McCallum then presented the salver and scroll to Mr. McKelvie. In doing so he remarked that as Consulting Engineer to the Government of India, Mr. McKelvie held a position equivalent to that of Chief Engineer to the Ministry of Transport. He regarded it as an honour that the Institution should have been asked to make the presentation.

Mr. McKelvie returned thanks.

Mr. W. F. Waters, who had acted as croupier proposed a vote of thanks to the chair and to Messrs Alastair Crane and John Hobdell, who had arranged the luncheon.

Mr. McKelvie has thanked the Council of the Indian Roads Congress and says: "It (the salver) is a fine piece of work and I am very pleased with it...Let me say how much I appreciate the kindness of the Council of the Indian Roads Congress in making me this magnificent gift."

## CALL TO ENGINEERS

*"Our need today is for individuals who can both think - and do: young people who have set their sights toward positions of constructive leadership. The engineering profession opens unlimited areas of service to young men and women who will master the ability to see not just the technical aspects of a problem but the wider implications and potentialities as well. If we would maintain our freedom and continue to hold our national production at highest levels, we must have engineers who can evaluate the present and the past and accept the challenges of the future."*

**—Dwight Eisenhower.**

## ROAD DEVELOPMENT IN WEST BENGAL FIRST FIVE YEAR PLAN

By

Shri R. C. Roy

IN the prepartition days the village economy in West Bengal was at a low ebb as road communications between rural areas and the regional markets and industrial were absent. There was a tendency for people to flock to urban areas and village crafts and industry were on the point of extinction. War, famine and the partition of Bengal greatly accelerated the pace of these trends. As a result, West Bengal has virtually become the most urbanised state in the whole of India.

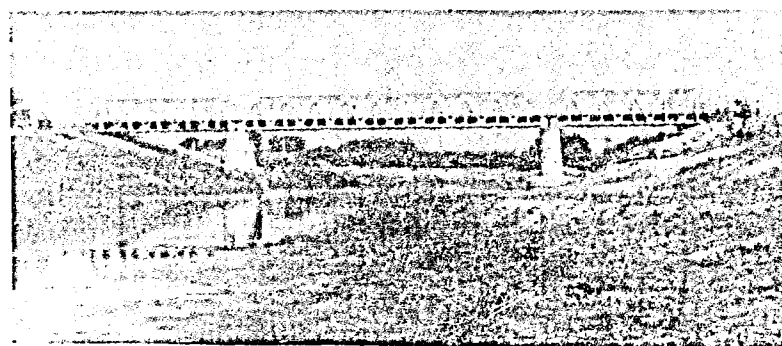
Absence of a progressive road policy, lack of suitable road materials and the geographical handicaps rivers were the impediments to the development of road communications and so, undivided Bengal had a poor road communication system. The State Government maintained only a few important roads while the main responsibility of road construction and maintenance devolved on the District, Local and Union Boards.

The absence of planned programme of road construction was keenly felt and the State Government formulated a road plan in 1947-48. Due consideration had to be

given, while formulating the plan, to rehabilitation, border areas, and road communications disrupted by the partition. Larger attention had to be given to the pressing needs of long-distance trunk communication. The first five-year plan just made a beginning to meet the special problems and pressing needs.

A glance at the map of West Bengal would show how the state stands divided into three distinct regions or sectors. The Northern region comprising the districts of Darjeeling, Jalpaiguri and Coochbehar is isolated from the rest of the state. The Central sector consists of the districts West Dinajpur and Malda while the southern sector is made up of the districts of Murshidabad, Nadia, 24-parganas Howrah, Hooghly, Burdwan, Birbhum, Bankura and Midnapore.

The linking of the northern sector to the central and the establishment of an all-weather connections between all the sectors were naturally given top priority. At this stage, the Government of India came to assist the State Government and took up the construction of the above



Gadadhar Bridge on the 13th mile of Coochbehar-Baxirhat Road Portion of N. H. 31 Span-1 No. 100'-0" and 2 No. 50'-0

link which is now called the National Highway No. 34.

The first five-year Road Development plan 1951-56 estimated to cost Rs. 13.85 crores as approved by the Planning Commission, probably for construction of :

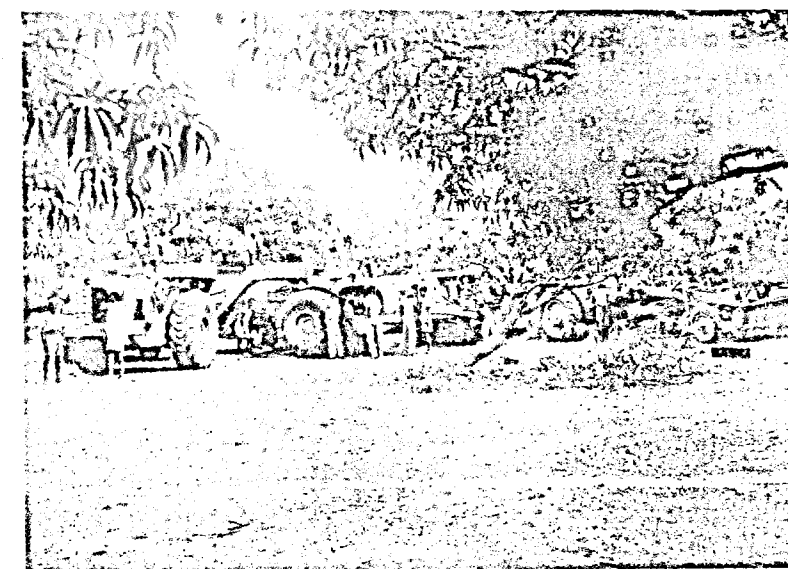
|                            |           |
|----------------------------|-----------|
| (1) State Highways -       | 380 miles |
| (2) Major Dist. Rd. -      | 1060 "    |
| (3) Village Roads -        | 196 "     |
| (4) Bus Routes -           | 145 "     |
| (5) Municipal Link Roads - | 15 "      |

Total 1796 miles  
and 3894 rft. of bridging.

Adding 251 miles of National Highways taken up under the first five-year plan, the State will provide 2951 miles of additional roads. Before partition only 1131 miles of road were in charge of the State Govt., but at the end of the first five-year plan, the State Govt. will have 5125 miles of road under direct charge.

The expenditure at the end of the 1st five-year plan on development of roads will be Rs 29.43 crores. Out of this 3.4 crores will be on National Highways and 3.8 crores from Central Road Fund.

After partition and prior to the commencement of the plan period, a sum of Rs 7.0 crores had been spent by the State Govt. on the development of Roads.

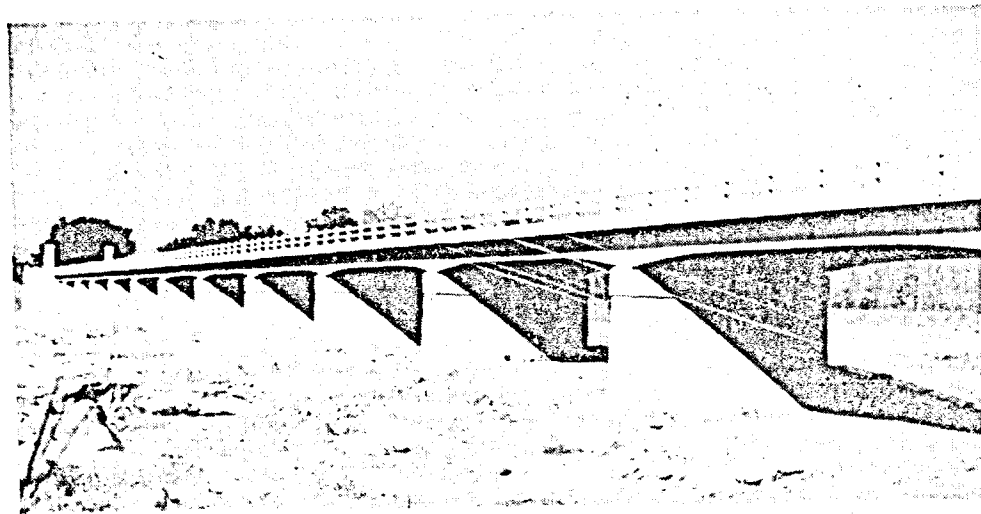


Earth moving machinery unit, having a check up.

The first five year plan State allocations supplemented by Coochbehar Fund and C.R.F. allocations covers new construction and development of 2034 miles of roads of all categories. The recent sanctions (54-55) of Central Road fund and special grants of the Govt. of India for distressed areas in the Sundarbans, would further increase the road mileage under construction by 185 miles and 230 miles respectively.

In the plan, the programme of work has been so phased as to make it a continuous process, that is, in each year the optimum volume of work in the different categories viz earth work, soling etc. has been scheduled for completion. Therefore, there will be an over-flow of work into the second plan period.

The soil conditions vary widely and there are also wide variations in rainfall



DWARAKESWAR BRIDGE IN BANKURA  
ON BANKURA-MIDNAPUR ROAD.

Overall Length—1020 ft

Spans—11 of 70 ft and 2 of 48 ft

Roadway—22 ft with 3 ft footpaths on either side.

Total Cost—Rs. 17.36 lakhs

Loading—2 lanes class 'A' or one lane class 'AA'.

Type—Balanced cantilever (R. C.) solid slab 70 ft span with 22 ft cantilever and 26 ft fully suspended

Bearings—Sliding Type with R. C. C. Rockers

Piers—R. C. Slender Type clothed in C. C. face block

Height of Pier—18 ft

Wells—R. C. Twin-Pocket Dumbbell shaped.

in the different districts. Collection of road metal was also a great problem as the natural resources of suitable stones are almost absent in the southern and central regions. The bulk of collection had to be made from the border areas of Bihar State. The bottleneck in Rly. transport had to be faced at every stage. The long haulage over Railway and Roads naturally

added to the high cost of road construction in the State.

In West Bengal the pressing need for more and more road construction under successive Programmes will continue. Starting from scratch, the achievement made in the plan period is no doubt remarkable.

### NO PLACE IS COMPLETE WITHOUT TREES

*No place is complete without trees - a home without trees is charmless, a road without trees is shadeless, a park without trees is purposeless, a country without trees is hopeless.*

### SEED MONEY

*Money spent on Road Research is the seed money by sowing which the public reap benefits by way of increased Road-Rupee Ratio.*

## HIGHWAY ACTIVITIES IN TURKEY

ROADS have played a very important part in the History of Turkey in all ages. Because it is situated as a bridge between the east and the west, armies of all the big Empires have had to cross it time again. Also trade had to follow the caravan routes through Turkey. With the discovery of the great sea routes and during the period of the decline of the Ottoman Empire the roads in Anatolia were not used as thoroughfares and therefore, were neglected.

After a long period of such neglect a real attempt was made by the middle of the XIXth century to equip Turkey with a good system of roads. Unfortunately, continuous wars and internal troubles interfered with the development of roads. New legislation was passed several times. Finally in 1929 a new law was passed designating a system of National Highways and creating a road tax to finance the road building activities. Later the law was modified repeatedly reducing its effectiveness each time, until only 15 per cent of the revenues of the road tax was available for the Ministry of Public Works for road building.

The increase of motor traffic all over the world, and the exigencies of the Second World War made the need for good roads keenly felt in Turkey. This, and also the extension of American Military aid to Turkey in 1947, followed by the creation of the Marshall Aid helped to establish favourable conditions under which modern Highway equipment and expert American advice could be obtained in order to accelerate road building activities.

Making use of past experience and of proper counsel from the United States Bureau of Public Roads, the whole framework of the Turkish Highway Department was reorganised along the most modern lines.

The law establishing these new principles was passed on March 1950, and the General Directorate of Highways was created replacing the department of Roads and Bridges.

The new law sets aside certain revenues for Highway purposes, defines the different road networks, establishes the programming procedures and fixes the framework of Headquarters and field organisations.

It is under this set-up that within the last four years great steps have been taken in the direction of increasing the mileage of all-weather roads and in the proper maintenance of those that are already in good condition.

### The duties of the General Directorate of Highways

The duties of the General Directorate of Highways stated in the law can be summarised as follows:

- To establish the system of National Highways.
- To establish the priorities of roads in the system for construction and betterment.
- To make economic and financial studies leading to the establishment of road systems.
- To make surveys and prepare designs for all the roads and bridges on the system.
- To establish all the facilities and means of the proper maintenance of all the roads on the system.
- To take proper measures to insure safe travelling conditions and traffic flow on the Highways.
- To approve the provincial Highway Programs prepared by the provinces, and, the design and estimates of such roads, before they are let to contract.

### Highway Networks and Programmes

Even before the General Directorate of Highways was established as an autonomous agency, a programme for the construction of National Highways had been drawn up and put into effect in 1949. The

Highway Agency at that time was functioning as a department of the Ministry of Public Works. The programme envisaged the completion of 23,000 km. of National Highways in nine years starting from 1949. This involved the building of new roads as well as the improvement of the existing ones to accepted standards. After the General Directorate was created this system was modified in March 1951 to include 24,306 km. and instead of tying it to a 9 year period its realization was carried on by yearly programmes showing the work of the current year in detail and the work of the succeeding two years in outline form.

Work done so far in this manner on the National System brought to light more strikingly than ever the insufficiency of the existing provincial i.e., the secondary roads. During the last few years extensive data were collected on the conditions of roads, and detailed highway-need studies were made, all of which indicated the need for an over-all road programme in Turkey, divided up into different categories. The activities on all the categories should be programmed so as to complement each other in order to insure the most efficient use of funds. It was found out that the best plan would be to consider the road networks of Turkey in three categories :

1. The National Highways System.
2. The Provincial Roads System.
3. The Village Roads System.

As the names imply the National System is a closed network including roads that connect the main centres of population, areas of production, areas of consumption, and main ports. This system includes 24,306 km. The Provincial Roads System is a system including roads of secondary importance connecting local communities to the National Highways. This system is estimated to be 25,000 km. long. The Village Roads are local roads connecting villages and farms to the provincial roads or to the National Highways. It is estimated that such roads will amount to 150,000 km. in length.

The construction and maintenance of the National System is handled entirely by the General Directorate of Highways. Construction and maintenance of the

Provincial Roads is handled by the Provinces. However, the approval of the plans, programmes, and design of the Provincial Network submitted by the local provincial Governments is done by the General Directorate of Highways. The General Directorate also sets the standards for these roads, handles the distribution of funds appropriated each year by the Government for aid to the provinces for the construction of Provincial and Village roads, and extends any technical help asked by local authorities. It is planned that the total administration of Provincial road activities will gradually be taken over by the General Directorate of Highways.

The construction of the Village roads is handled by local village communities. The General Directorate only distributes the yearly aid funds and trains personnel to supervise the construction. The following table gives an idea of what this over-all road programme means for Turkey and how it compares with some other countries.

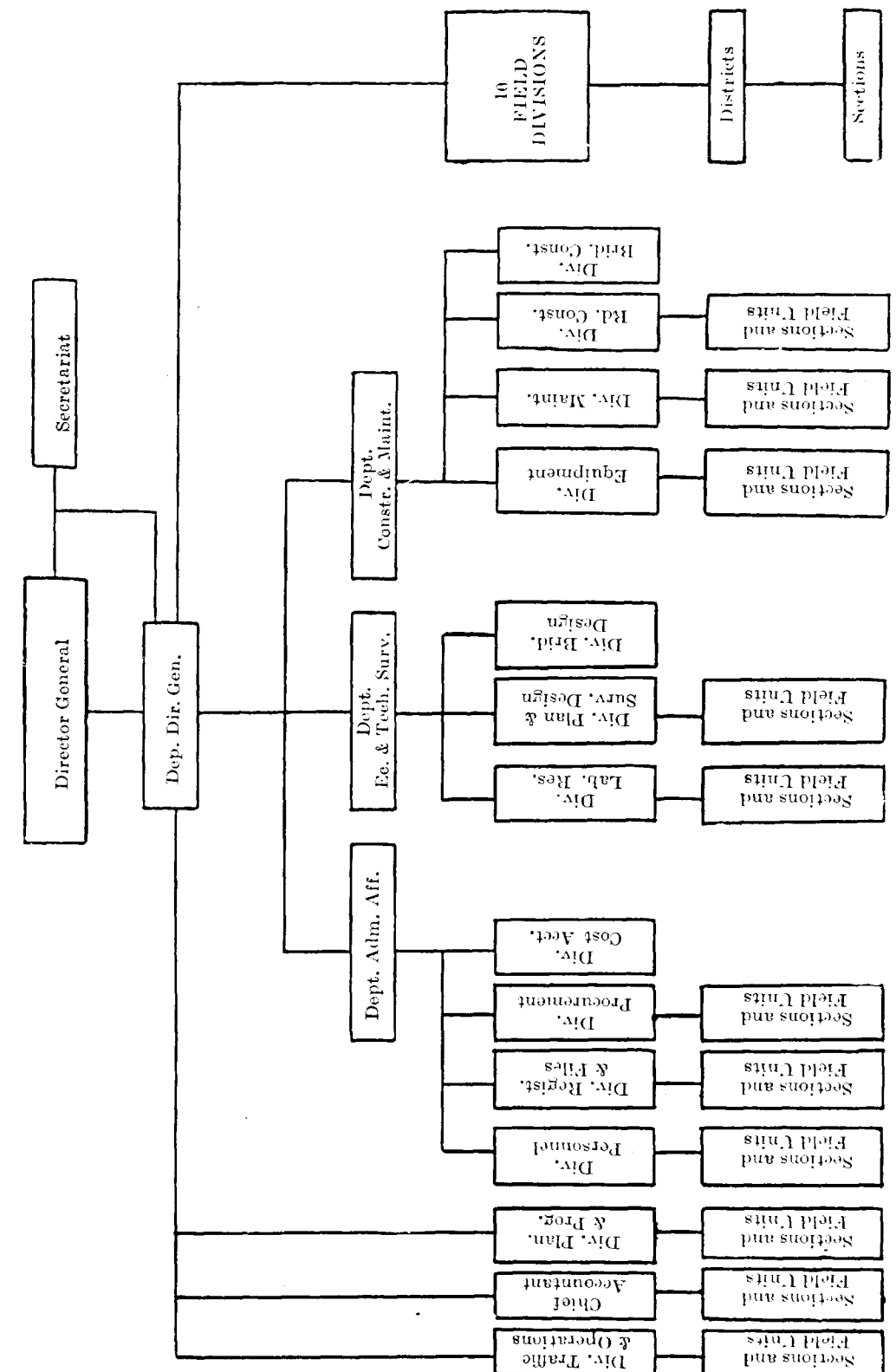
ROAD SITUATION IN 1948

| Country  | Total Length of Roads- (kms). | Length of Road per Km <sup>2</sup> of Area - (Meters) | Length of Road per person (Meters) |
|----------|-------------------------------|-------------------------------------------------------|------------------------------------|
| Turkey   | 43,978                        | 57                                                    | 2.34                               |
| France   | 638,388                       | 1,157                                                 | 15.77                              |
| Belgium  | 10,351                        | 339                                                   | 1.22                               |
| Sweden   | 89,379                        | 199                                                   | 13.00                              |
| Italy    | 204,069                       | 679                                                   | 4.40                               |
| England  | 295,773                       | 1,280                                                 | 5.90                               |
| U. S. A. | 4,811,046                     | 620                                                   | 34.00                              |

When the road programme is realized the figures for Turkey will be as follows: (taking into account the increase in population).

| Total Length of Roads Km. | Length of Road per Km <sup>2</sup> of Area (Meters) | Length of Road per Person (Meters) |
|---------------------------|-----------------------------------------------------|------------------------------------|
| 200,000                   | 258                                                 | 7.70                               |

One Kilometer=0.62 Mile.



Design Standards

The following tables show the Standards for the different classes of roads and bridges.

that most of these roads would have to be improved to conform to the accepted standards in each category while also new ones would have to be built to bring the total length up to 200,000 km. This situ-

HIGHWAY STANDARDS

| Highway Type                  | Criterion                | Pavement Width | Shoulder | Width | Min. Radium of curv. | Max. Slope per cent | Bridge sur-face | Right of way |
|-------------------------------|--------------------------|----------------|----------|-------|----------------------|---------------------|-----------------|--------------|
| National Highways             | High Traffic Standard    | 7              | 2.5      | 12    | 500                  | 6                   | 8               | 50           |
|                               | Low Traffic              | 7              | 1.5      | 10    | 300                  | 6                   | 8               | 35           |
|                               | Very Mountainous Terrain | 6              | 1.5      | 9     | 250                  | 6                   | 8               | 35           |
| 1st Class Provincial Highways | Flat Terrain             | 6              | —        | 7     | 100                  | 7                   | 8               | 35           |
|                               | Undulating Terrain       | 6              | 1.5      | 9     | 250                  | 7                   | 8               | 35           |
|                               | Mountainous              | 6              | 1.6      | 9     | 150                  | 7                   | 8               | 35           |
| 2nd Class Provincial Highways | Very Mountainous Terrain | 6              | 0.5-1.5  | 7-9   | 100                  | 7                   | 8               | 35           |
|                               | Flat Terrain             | 6              | 1        | 8     | —                    | 8                   | 7               | 20           |
|                               | Undulating Terrain       | 6              | 1        | 8     | 100                  | 8                   | 7               | 20           |
| 1st Class Village Roads       | Mountainous              | 6              | 0.5      | 7     | 50                   | 8                   | 7               | 20           |
|                               | Very Mountainous Terrain | 6              | 0-0.5    | 6-7   | 30                   | 8                   | 7               | 20           |
|                               | Flat Terrain             | 6              | —        | 6     | —                    | 10                  | 6               | Road width   |
| 2nd Class Village Roads       | Undulating Terrain       | 6              | —        | 6     | 100                  | 10                  | 6               | „            |
|                               | Mountainous              | 4              | —        | 4     | 50                   | 10                  | 6               | „            |
|                               | Very Mountainous         | 4              | —        | 4     | 30                   | 10                  | 6               | „            |
| 1st Class Village Roads       | Flat terrain             | 6              | —        | 6     | —                    | 12                  | 4               | „            |
|                               | Undulating Terrain       | 6              | —        | 6     | —                    | 12                  | 4               | „            |
|                               | Mountainous              | 4              | —        | 4     | —                    | 12                  | 4               | „            |
| 2nd Class Village Roads       | Very Mountainous         | 4              | —        | 4     | 25                   | 12                  | 4               | „            |

The basic factor in fixing the standards is the safe driving speed on the road. First a design speed is decided upon, and then widths, maximum grades and minimum radius for curves are established so as to provide safe driving conditions at the design speed.

Systems and Methods

In 1948 there were 43,978 km. of roads of all categories in Turkey. It is evident

ation led to the adoption of the system of stage construction for the realization of the programme. According to this system each section of roadway is built or improved to standards and a type of surfacing which is only good enough to meet the present and the near future traffic needs. The surfacing will be improved subsequently to stand higher volumes of traffic. The adoption of such a system allows for the construction, improvement, and main-

tenance of a greater length of roads with a given fund.

Work on the National system is carried out by force account or by contract. Improvement jobs of small volume that do not ordinarily interest contractors are done directly by the forces of the General Directorate of Highways. Improvement jobs of large volume and all new construction work are done by contract. Work on the Provincial roads is almost totally done by contractors. Village roads are built by community labour. Necessary materials and supplies being procured by the Provincial Government.

All the estimates and specifications for National Highways are based on the use of road construction machinery. Also maintenance is done to a great extent by mechanical equipment. Over 15,000 km. of the National System is already under machine maintenance. This mileage is increasing each year.

To carry out its construction programme and to keep its existing roads under machine maintenance the General Directorate uses at present, the various kinds of equipment: totaling 4004 in all.

The General Directorate of Highways takes care of the proper servicing of this equipment by its various Division shops and the district's service garages. There will be 10 Division Shops and (60) district service garages in all. (7) Division shops and (34) district garages are already built and put to service. Spare parts for equipment are kept in stores in Field Division Headquarters. There are smaller stores at each district. In addition to these, one Main Spare Parts Warehouse is built in Ankara, and two others, in Istanbul and Iskenderun, are planned. These Warehouses will handle all spare parts stocks and distribute them to the Field Divisions. There is already a depot functioning in Iskenderun as receiver for all Marshall Aid equipment and spare parts.

Organization of the General Directorate of Highways

The General Directorate is organized in the following manner to carry out its functions.

Headquarters organization

The general Directorate has an immediate staff as follows:

- Assistant General Director
- Head of the Department of Administration
- Head of the Department of Technical and Economic Research
- Head of the Department of Construction and Maintenance
- The Legal Adviser
- The Chief Accountant
- Division of Traffic Safety and Operations
- Division of Planning and Programming

The Administrative Department is divided into four divisions taking care of (a) purchases; (b) cost accounts and fiscal control; (c) personnel management and, (d) correspondence, files, etc.

The Department of Technical and Economic Research is also divided into 3 divisions taking care of (a) Road Surveys and Design, (b) Bridge Surveys and Design, and (c) Materials Research and Laboratory.

The Department of Construction and Maintenance has four divisions taking care of (a) Road Construction, (b) Bridge Construction, (c) Maintenance and (d) Equipment, a bureau attached to this department takes care of the design and construction of shops and buildings.

The construction and maintenance activities all over the country are carried out by ten (10) field divisions. The Division Engineer is helped by the

1. Chief of Location and Survey
2. The Chief of Construction
3. The Chief of Maintenance
4. The Chief of Equipment
5. The Chief of Administrative Service

For maintenance purposes each division is divided into districts and sections. The Districts Engineer takes care of the roads in his district. There are on the average 6 districts in each division. Also each

district is divided into sections with about 3 or 4 sections to each district.

### Highway Revenues

The following list shows the summary of different revenues designated by law for the General Directorate of Highways, to build and maintain the National System.

1. 45 per cent of fuel taxes.
2. Income from taxes levied from the consumption of fuel.
3. Funds derived from Customs duties collected from liquid fuels.
4. Aids from the National Budget.
5. Other minor revenues from various sources.

It is seen that all of these taxes are based upon the consumption of fuel which in turn depends upon the service rendered by the roads. The General Directorate can increase its revenues by a healthy development in its construction and maintenance activities. Evidently this makes more funds available for further improvements. On the other hand if the Directorate does not use its funds wisely it will suffer directly and immediately of low revenues resulting in reduced highway use, which means reduced fuel consumption. As yet the highway revenues do not meet all the expenditures on the National System. The balance is covered by the government from the general budget. It is estimated, though, that the Highway revenues will meet the expenditures in about 5 or 6 years, as such revenues show a considerable increase each year. The revenues for Provincial roads are as follows :

1. 40 percent of fuel taxes.
2. Allocations from the General Provincial Budgets.
3. Aids from the National Budget.

These funds are spent by the provincial governments according to the yearly road programmes approved by the General Directorate of Highways. Out of these funds also materials and supplies for the village roads are purchased and given to the village communities who build their roads with local labour.

### Achievements

At the beginning of 1948 the length and conditions of roads in Turkey were as follows :

|                                       | Total length (km.) |
|---------------------------------------|--------------------|
| Surfaced.....                         | 1,049              |
| Good Macadam.....                     | 11,374             |
| Bad Macadam.....                      | 8,221              |
| Grading.....                          | 12,308             |
| (with or without drainage structures) |                    |
| Trails.....                           | 11,026             |
| Total.....                            | 43,978 km.         |

Out of this 22,826 km. were taken into the National System, as shown in the following list :

|                   | Length (km.) |
|-------------------|--------------|
| Surfaced.....     | 829          |
| Good Macadam..... | 8,225        |
| Bad Macadam.....  | 5,093        |
| Grading.....      | 4,782        |
| Trails.....       | 3,897        |
| Total.....        | 22,826 km.   |

It is clear that the balance between this sum and (24,306) km., (the total length of the National System) did not exist at all.

The state of the roads in the National System at the end of 1953 was as follows :

|                        |            |
|------------------------|------------|
| Surfaced.....          | 1,322      |
| Stabilized Gravel..... | 7,317      |
| Good Macadam.....      | 7,878      |
| Poor Macadam.....      | 3,132      |
| Graded.....            | 2,070      |
| Trails.....            | 2,587      |
| Total.....             | 24,306 km. |

In six years 6,791 km. of new roads were built or improved to standards, and during the same period 355 bridges of a total length of 20,497 meters were built. Also 10 division shops and 33 district shops and garages were built.

This leaves 17,500 km. of state highways to be taken in hand for new construction or for improvement to accepted standards.

The result of this activity is such that

(Continued on page 37)

## BRIDGING ACTIVITIES IN UTTAR PRADESH

By

Shri P. N. SRIVASTAVA

IN Uttar Pradesh, traffic is disrupted in the rainy season for some months because many of the river crossings are unbridged. Ferries exist only at a few crossings. During the war, some of the railway bridges were decked but this did not prove satisfactory as rail traffic had priority and road vehicles had to wait for long periods before they could use the bridges.

Realising the importance of bridging the crossings, the State Government drew up a scheme for constructing bridges. A separate Bridge and Planning Division

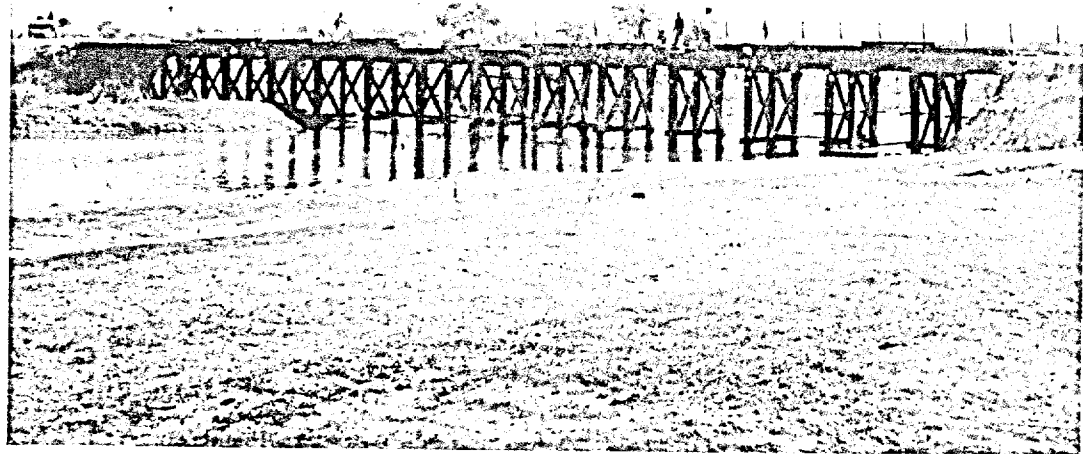
under the Superintending Engineer (Planning) was created for collecting data and designing the bridges. Fifty-three bridges of various types, costing Rs 275 lakhs, have been designed so far.

### Completed Bridges

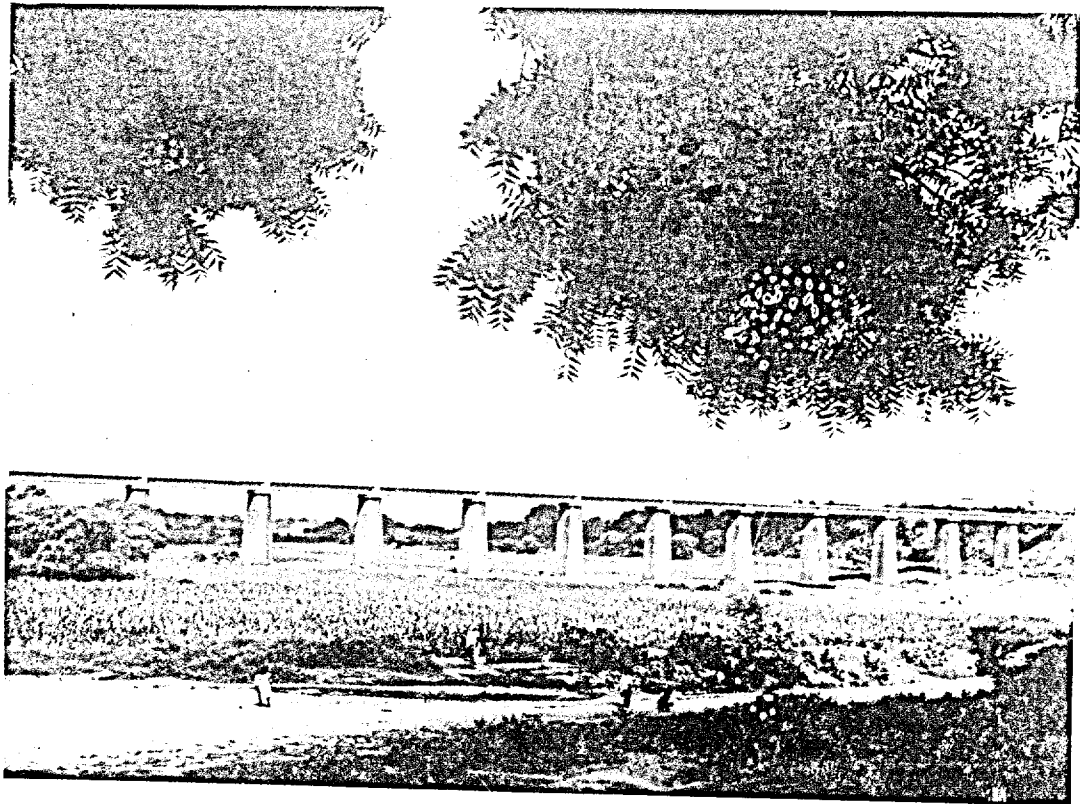
Since Independence, 17 major and 4 boat bridges, costing Rs 76.28 lakhs, have been constructed. These bridges have a total ventway of 3,624 ft and cost Rs 16.2 lakhs. Table 1 below gives the type, the spans, and the cost of these bridges.

Table 1  
Bridges Constructed in Uttar Pradesh since 1947

| Sl. | Name of river                      | Name of Road                      | Spans                         | Types of Bridge          | Cost Rs (lakhs) |
|-----|------------------------------------|-----------------------------------|-------------------------------|--------------------------|-----------------|
| 1.  | Khakra                             | Bareilly-Takanpur-Pithoragarh     | 5 of 40 ft each               | Masonry Arch             | 3.00            |
| 2.  | Paisuni                            | Allahabad-Banda                   | 5 of 60 ft each               | -do-                     | 4.00            |
| 3.  | Pharen                             | Gorakhpur-Deoria                  | 7 of 40 ft each               | Brick Masonry Arch       | 2.625           |
| 4.  | Satpuli                            | Najibabad-Dogadda-Pauri           | 120 ft                        | Steel Truss              | 1.5             |
| 5.  | Nandakini                          | Karanprayag-Chamoli               | 120 ft                        | -do-                     | 1.63            |
| 6.  | Asan (Reconstruction)              | Saharanpur-Chakrata               | —                             | —                        | 4.49            |
| 7.  | Sot -do-                           | Bareilly-Mathura                  | 349 ft-9 in. 12 spans         | —                        | 6.00            |
| 8.  | Pindar                             | Karnaprayag-Chamoli               | —                             | Steel Truss              | 2.99            |
| 9.  | Baigool                            | Meerut-Bareilly                   | 4 of 120 ft each              | R.C.C. Bow String Girder | 11.88           |
| 10. | Bhakra                             | -do-                              | -do-                          | -do-                     | 11.56           |
| 11. | Aril                               | Moradabad-Chandausi               | 2 of 90 ft each               | -do-                     | 3.00            |
| 12. | Bridge in Mile 27 (Reconstruction) | Fatehpur-Banda-Sagar              | —                             | —                        | 3.075           |
| 13. | Bruces Bridge on Gomti (widening)  | Lucknow City                      | —                             | —                        | 1.11            |
| 14. | Jhinga Ghat Sarju                  | Bahraich-Nanpara                  | 18 No. 12½ each               | Wooden Pile              | .75             |
| 15. | Gomti (Baragadia-ghat)-Redecking   | Sitapur-Misrikh                   | —                             | —                        | 0.422           |
| 16. | Tamsa                              | Gosainganj-Ranewa                 | 2 of 27 ft-4 in. & 3 of 27 ft | Wooden Pile              | 1.235           |
| 17. | Uttangan                           | Ashram Road Agra-Bah              | 12 of 65 ft                   | Prestressed Girder       | 5.76            |
| 18. | Son at Chopan                      | Mirzapur-Dudhi                    | —                             | Boat Bridge              | 2.00            |
| 19. | Ujjar Ghat (Ganga)                 | U.P.-Bihar Border in Ballia Dist. | —                             | -do-                     | —               |
| 20. | Sanju (Katra)                      | Bahraich-Gonda                    | —                             | -do-                     | 0.55            |
| 21. | Mohana Ghat                        | Orai Rath                         | —                             | -do-                     | 1.6             |



Pile Bridge under construction over Ghaghawa Nala in Mile 16 of Lakhimpur-Isanagar Road in Kheri Distt. 15 Spans of 10 ft each.



Uttangan Bridge on Agra Bah Road in Agra District

Amongst the bridges under construction, special mention may be made of the following:

Little Gandak river on Captainganj Tamkoshi road is a R.C.C. balanced cantilever suspended type of a bridge having spans of 96 ft each. The bridge over Ladhiya Nala at Chalthi on Bareilly-Pilibhit-Pithoragarh road is a single span

R.C.C. arch bridge of 325 ft, which is said to be the largest single span arch bridge in India. The bridge over Alaknanda at Kirtinagar on Hardwar-Badrinath road is a stiffened suspension bridge having middle span of 230 ft.

Table 2 below gives the bridges which are under construction at present.

Table 2  
Bridges under construction in Uttar Pradesh

| Sl. No. | Name of River                 | Name of Road               | Spans                        | Type                                      | Cost Rs (Lakhs) |
|---------|-------------------------------|----------------------------|------------------------------|-------------------------------------------|-----------------|
| 1.      | Barwa Nala                    | Allahabad-Banda            | 4 of 60 ft each              | Stone Masonry Arch                        | 3.55            |
| 2.      | Jhuria Nala                   | do                         | 5 of 25 ft each              | do                                        | 1.61            |
| 3.      | Isan Nadi                     | Chhibramaun-Swarikh Road   | 5 of 36 ft each              | do                                        | 3.81            |
| 4.      | Little Gandak                 | Captainganj-Tamkoshi       | 3 of 96 ft & 2 of 70 ft each | R.C.C. Balanced Cantilever Suspended Type | 6.7             |
| 5.      | Karamanasa Bridge (Extension) | G. T. Road                 | 3 of 53 ft on each side      | R.C.C.                                    | 4.68            |
| 6.      | Baghain                       | Allahabad-Banda            | 13 of 60 ft each             | Arch Bridge                               | 18.04           |
| 7.      | Ladhiya Nala                  | Bareilly-Pilibhit-Tanakpur | 325 ft span                  | R.C.C. Arch                               | 3.55            |
| 8.      | Ghat                          | do                         | 225 ft span                  | Steel Truss                               | 3.00            |
| 9.      | Rohini Nala                   | Hamirpur Kalpi             | 3 of 60 ft each              | R.C.C.T. Beam                             | 2.8             |
| 10.     | Chatesar over Bunna Nadi      | Mahoba-Rath Rd.            | 5 of 60 ft each              | do                                        | 2.06            |
| 11.     | Kewar                         | Agra-Jagner-Tantpur        | 3 of 40 ft                   | Stone Masonry Arch                        | 1.13            |
| 12.     | Neem                          | Atrauli-Ramghat            | 3 of 30 ft each              | R.C.C. Bridge Stiffened                   | 1.06            |
| 13.     | Alaknanda (Kirtinagar)        | Hardwar-Badri              | 230 ft                       | Suspension Br. R.C.C.                     | 5.912           |
| 14.     | Hindan (Widening)             | G.T. Road                  | 5 of 90 ft each              | Prestressed Girder                        | 4.23            |
| 15.     | Hindan                        | Meerut-Baghat              | 8 of 60 ft each              | R.C.C.T. Beam Br.                         | 5.5             |
| 16.     | Dhara                         | Sherkot-Agzalgarh          | 3 of 50 each                 | R.C.C.T. Beam                             | 1.028           |
| 17.     | Kali                          | Etah Aliganj               | 6 of 50 ft each              | Brick Masonry Arch                        | 4.45            |

Table 3 gives the position of bridging activity in the State.

Table 3

| Particulars                                                    | Nos. | Total waterway (ft)                                 | Approx. cost<br>Rs lakhs |
|----------------------------------------------------------------|------|-----------------------------------------------------|--------------------------|
| 1. Bridges completed up to 31-3-55                             | 21   | 3,624 + 4 boat<br>bridges and other<br>improvements | 76.28                    |
| 2. Bridges under construction                                  | 20   | 5,050                                               | 75.82                    |
| 3. Bridges to be started shortly                               | 8    | 6,509                                               | 152.48                   |
| 4. Bridges for which detailed designs are<br>under preparation | 19   | —                                                   | 81.00                    |

Table 4 gives details of bridges work on which will be started shortly

Table 4

| Sl.<br>No. | River (name)             | Road (name)                       | Span No. &<br>size                                       | Type                                       | Cost<br>Rs.<br>(lakhs) |
|------------|--------------------------|-----------------------------------|----------------------------------------------------------|--------------------------------------------|------------------------|
| 1.         | Ganga Garhmuk-<br>teshar | Meerut-Bareilly                   | 13 spans of<br>160 ft and<br>2 spans of<br>111½ ft       | Balanced canti-<br>lever suspended<br>type | 100.00                 |
| 2.         | Rapti                    | Bansi                             | 5 spans of<br>106 ft and<br>2 spans of<br>78.5 ft        | do                                         | 12.87                  |
| 3.         | Betwa (Jharar-<br>ghat)  | Jhansi-Sagaur                     | 31 spans of<br>66 ft 8 in.                               | do                                         | 24.4                   |
| 4.         | Jaghura                  | Bareilly-Takanpur-<br>Pithoragarh | 3 spans of<br>98 ft each<br>and 2 spans<br>of 24 ft each | do                                         | ...                    |
| 5.         | Song                     | Dehra Dun-Rishikesh               | —                                                        | Submersible type                           | ...                    |
| 6.         | Sarain                   | Lucknow-Bareilly                  | —                                                        | —                                          | 4.6                    |
| 7.         | Ami                      | Khalilabad-Mehanda-<br>wal        | 50 spans of<br>50 ft each                                | Masonry arch                               | ...                    |
| 8.         | Khanwan                  | Bagauch Ghat                      | 4 spans of<br>40 ft each                                 | do                                         | 1.61                   |

## Bridge Equipment

For construction of bridges it is very essential to have modern equipment. The Uttar Pradesh P.W.D. has already purchased equipment worth Rs 4 lakhs. The main equipment and machinery consist of the following :

- (a) Aerial Cableway Costing about Rs 1.25 lakhs, for erecting steel and suspension

- (b) Diesel Generating Sets (25 k.w.) Costing Rs 25,000, for running pumps and other electrical equipment at site of works lying out of the way places.
- (c) Steam Winch 3-ton capacity.

## SLIPPERINESS OF ROADS

THE Committee on slipperiness of the International Association of Road Congresses reached the following conclusions at its meeting on 10th December 1954 under the chairmanship of M. Bressot, Inspector General of Roads and Bridges (France).

## 1st conclusion

On dry roads a coefficient of the order of 0.8 is obtained and usually no difficulty is experienced in braking.

On wet roads it does not appear easy to achieve such conditions, but it is certain that although with a coefficient of more than 0.6 skidding seems to be unlikely, below 0.2 the road is in a definitely slippery condition. Between these two values there is a wide range where it is difficult to be precise. Experience indicates that in most cases a coefficient of 0.4 is very lowest value which would be admissible.

## 2nd conclusion

It has been proved that - provided the tyre being tested is actually sliding - methods in which the sideways force coefficient or the braking force are measured give comparable results.

## 3rd conclusion

It follows from observations already made by various research workers that some idea as to the development of the slipperiness of a surfacing with time can be obtained by adding together the ordinates of three curves which are characteristic for that particular surfacing.

(1) Curve showing the results of bleeding and wear (fall in the value of the coefficients due to the binder rising to the surfaces; increase in the coefficients on account of the wear of the binder; further drop caused by the polishing of the aggregates).

(2) Curve of seasonal variations (peaks during the winter, troughs during the summer).

(3) Curve of changes due to diurnal variations in temperature.

A single test is therefore usually insufficient to enable the value of a surfacing to be estimated from the point of view of slipperiness, since the coefficient for the same surfacing is liable to vary widely during the life of the surfacing.

Attention should be drawn to the following points :

- too much binder is liable to result in a slippery surfacing ;
- certain binders may be less slippery than others or can be made less slippery by a suitable treatment ;
- the use, as aggregates of chippings which are liable to become polished may give a slippery surfacing even though there is no binder on the surface ;
- an isolated measurement of slipperiness should be regarded with caution.

(From Bulletin No. 139, 'Congress De La Route'—1955).

## KEEP YOUR DISTANCE

Drivers who are travelling faster than most of the traffic should never drive close to a car they intend to pass. If you drive too close to the car ahead you cannot see around it and may be confronted by an oncoming vehicle just as you decide to pass.

## HERE AND THERE

### 1. SURVEYOR OF WORKS IN CENTRAL P.W.D.

● THE Government of India are setting up a new unit called the Surveyor of Works Organisation under the CPWD in pursuance of Government's policy to introduce internal concurrent and continuous audit in all large spending departments.

The organisation will undertake planning of various projects which at present is being done by Superintending Engineers of the two planning circles in the CPWD. These circles which will now be merged into the organisation, assist the Chief Engineer in all technical matters like designing of works and preparation and checking of estimates. They also draw up standard schedules of rates, fair wages and specifications, etc., but no concurrent technical audit of the expenditure is done by them.

The organisation will, in addition, be responsible for the drafting of contract documents with particular reference to rates and specifications, checking of measurements, and technical examination of a part of the contractor's bills before payment. It will also deal with legal and arbitration cases.

The proposal to set up such an organisation of quantity surveyors in the Central Public Works Department was mooted as early as 1917, and again examined by a Committee in 1948, but could not be proceeded with earlier because of financial stringency. In England the functions of engineers and quantity surveyors were separated professionally more than a hundred years ago.

(From "The Hindu," dated the 10th May, 1955)

### 2. ENGINEERS AND LEADERSHIP

● THE engineer's concentration has been too much perhaps on the parts—on tar, bitumen, aggregates and their relationship, on concrete, on steelwork and stresses and strains, to the neglect of the vision of the whole, which is the achievement of a first class system of communications.

Thomas Telford was a genius who, in addition to possessing an inquiring mind and a considerable knowledge of the part, had also the vision of the whole, good highway and canal systems. Telford was an engineer with political stature, capable himself of influencing Government decisions.

Nowadays it is unfortunate that the engineer keeps himself in the background, busily studying the details of highway technique, until some politician or

economist takes it upon himself to tell the Government of the vision of the whole, the transport advantage of a modern highway system.

It is not the engineer's job solely to sit back in placid acceptance of the tasks of technical scrutiny, awaiting the decisions of the politicians. The engineer should be a dynamic force, locally and nationally. No one is better qualified to be an economist than an engineer, and it is his views and pictures of streamlined communications that should be in the headlines and command the attention of the politicians the administrators and the masses. Engineers have the opportunity and capacity to be amongst the leading ranks.

(From "Highways and Bridges and Engineering Works," January 12th, 1955.)

### 3. ROAD BUILDING IN CHINA—ATTEMPT TO REMEDY LONG NEGLECT

● THE first all-China highway workers' congress which closed in Peking on May 11 after nine days of discussion underlines (says the Times Hongkong correspondent) the intention of the Government to give greater attention to road building, which is one of China's weakest transport links, a matter to which Admiral Radford referred in a recent statement to Congress on China's strategic potentialities.

Hitherto Peking has devoted its chief attention to the restoration and expansion of railways and large-scale conservancy works. Stimulated by road, as well as by the spectacular achievements in building great highways across Tibet through Chinghai and Sikang to Lhasa, Peking is preparing to carry out plans for 1955 calling for 23 new highways, including four in the southwest, mostly to reach resources at present unavailable because of lack of roads.

Most of the new highways planned for this year are in industrial and mining

districts and remote areas inhabited by national minority peoples. The total mileage of new roads is not disclosed, but Peking claims that nearly 100,000 miles of highway are now open to traffic—double the length in 1949. It is also claimed that road traffic has increased sevenfold.

This underlines the need for more road building. Of a total of 6,000 miles of newly built roads most is accounted for by two highways to Lhasa. Hitherto the coastal provinces have remained roadless in the modern sense of the term and trunk railways are fed by medieval carts using sunken dirt tracks, or by river.

Peking announces that work has started on 10 steampower plants and two hydro-electric stations, of which some have been designed by Russians. They will serve the new textile centre of Shihchia-chuang, the railway centre of Lanchow, the mining town of Huainan, and other centres.

(From "Statesman"—18-5-1955)

### 4. SYMPOSIUM ON WINTER CONCRETING

● A symposium on Winter Concreting, Theory and Practice will be held in Copenhagen, Denmark, from 13th to 18th February 1956.

The work of the Symposium is planned to take place in three Divisions

1. Theoretical questions dealing with the influence of temperature on the hardening of concrete, frost resistance of concrete at early ages etc.
2. Practical questions dealing with choice of materials, heating and insulation, winter concreting on

the job site, procedure and equipment.

Membership at the Symposium is open to everybody who is working on the problems of winter concreting. Those interested may obtain particulars about registration fees, etc., from:

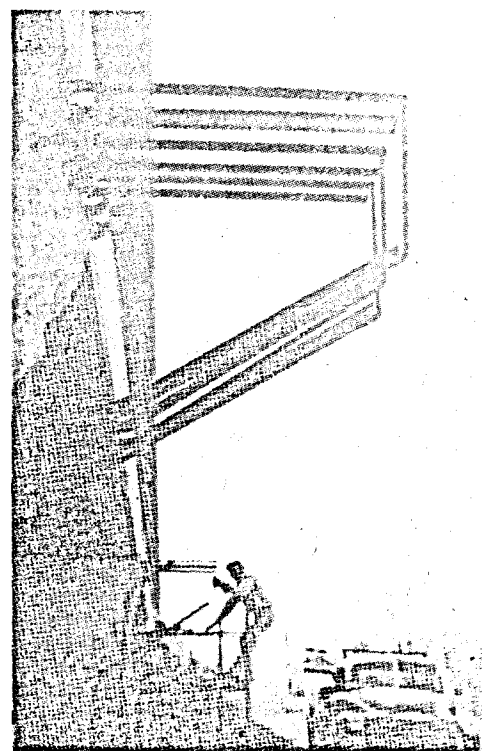
The Organizing Secretary,  
RILEM Symposium 1956,  
c/o The Danish National Institute  
of Building Research,  
20 Borgergade,  
Copenhagen, K.  
Denmark.

## 5. BRIDGE WIDENING

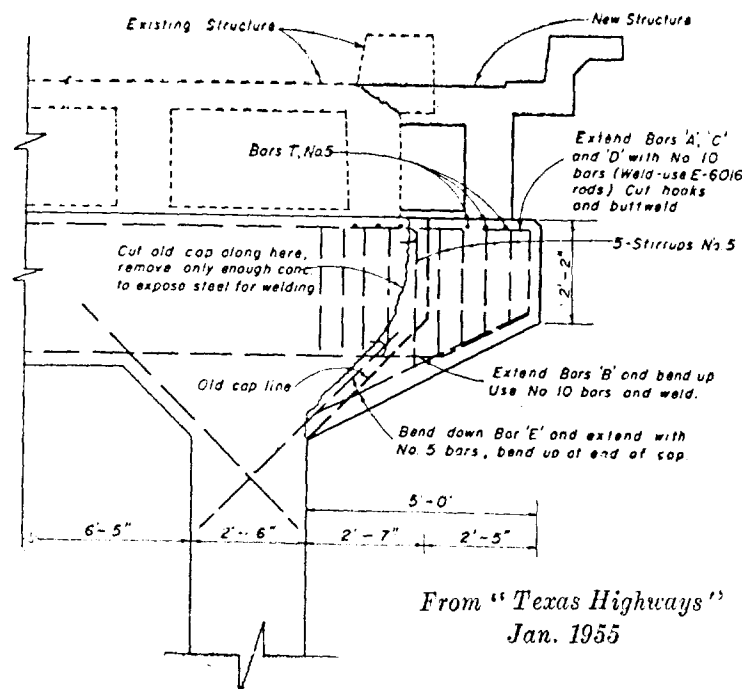
● THE 20-ft wide bridges on U.S. Route No. 87 were widened to 28 feet. The widening was done by welding additional reinforcing steel to the old reinforcement. The Photographs and the sketch illustrate this.



Old reinforcement exposed.



Additional reinforcement welded on.



From "Texas Highways"  
Jan. 1955

## CURRENT LITERATURE

### ABSTRACTS

#### TENTATIVE INDIAN STANDARD CODE OF PRACTICE FOR PRESERVATION OF TIMBER

PRESERVATIVE treatment of timber, is very important to conserve the material resources of the country, and to achieve their most economic utilization.

The Code specifies four types of preservatives, namely Type 1 (Oil Type), Type 2 (Organic Solvent Type), Type 3 (Water Soluble 'Leachable' Type), and Type 4 (Water Soluble 'Fixed' Type). It gives brief description of the preservatives of each type and includes clauses on preparation of timber for treatment; the types of treatment; such as surface application and soaking; choice of treatment for various timbers for a number of uses and inspection of plant equipment.

The Code includes a table and four appendices. The table gives the type of treatment and recommended preservatives for timbers used for each of the six specified different purposes. Of the three appendices, one gives the durability and degree of treatability of different species of timber and the other two give the methods for the determination of moisture content and penetration of preservatives respectively.

DESIGN CHARTS FOR PRESTRESSED RECTANGULAR BEAMS AND SLABS by R. G. Robertson, Proceedings of the Institution of Civil Engineers, Part III., Vol. 4., April 1955, Number 1.

THE Paper deals primarily with the development of equations for the design of prestressed rectangular section beams with bonded or unbonded cables.

From these equations, design charts which have not hitherto been available

have now been prepared which give all the quantities required for the design of a beam for any specified moment due to superimposed load and for any specified concrete stresses, tensile or compressive. These equations contain no approximations except those of the normal elastic theory of bending.

Next the economy resulting from the use of tensile stress in the concrete, the danger from the use of excessive tensile design stress and of subsequent cracking, and the effect of untensioned reinforcing in such cases are examined both for rectangular and for I-beams.

Thirdly, the use of the charts is illustrated by examples.

Finally, the equations are recast into simple form of similar nature to the equations currently used instead of charts for the design of normal reinforced concrete beams, and it is hoped that they will perform an equally useful service for prestressed rectangular beams.

In the Appendix an equation ignoring the dead load of the beam itself is shown to be applicable only when there is a range in the superimposed load moment such as is present with reversal of live load and with continuous beams subject to moving loads. (Author's Summary).

PERFORMANCE OF CONCRETE PAVEMENTS WITH 90-ft CONTRACTION JOINT SPACING by C. N. Gaylord and C. N. Laughter, University of Delaware Engineering Experiment Station, Bulletin No. 3, July 1952.

CERTAIN observations resulting from a two-year study of five sections of concrete pavement constructed without expansion joints and with weakened-plane contraction joints spaced at 90 ft intervals

are presented in this report. Two sections of plain concrete, one 7-in. thick and one 8-in. thick, two reinforced sections 8-in. thick, and one dual highway with a 9-in. reinforced traffic lane and an 8-in. thick passing lane are included.

All sections were constructed on a select borrow material and no pumping has occurred. The riding quality of all pavements is excellent. Transverse cracks and joints have not faulted although some spalling has occurred. The cracks in the reinforced sections remain tightly closed while those in the plain section open as much as  $\frac{1}{4}$  inch. A large number of longitudinal cracks have occurred at contraction joints probably due to infiltration of incompressible material. No longitudinal cracks have formed on the passing lane of the dual section.

The 9-in. traffic lane is more seriously damaged than the 8-in. passing lane, suggesting that the heavier truck loading is contributing to the damage.

**THE PERFORMANCE DURING THE FIRST FIVE YEARS OF THE EXPERIMENTAL CONCRETE ROAD AT OXTON, NOTTINGHAMSHIRE** by J. A. Loe, Proceedings of the Institution of Civil Engineers, February 1955.

The Paper gives an account of the structural performance of the experimental concrete road at Oxtun, Nottinghamshire, during the first 5 years after being opened to traffic in February, 1948; it also includes information on the horizontal movements occurring at some of the joints during this period.

The experimental road at Oxtun is planned to form one of a series of experimental roads designed to determine the most economical thickness of concrete construction on various types of soil. It has not yet been possible to proceed with the construction of the other roads and it is important to emphasize that the interim conclusions drawn from the performance of the Oxtun road may apply only to roads on soils similar to the gravelly-sand occurring at Oxtun.

The Oxtun experiment includes slabs of 4-to-8 in. thickness laid directly on the subgrade, slabs of 3-to-6 in. thickness laid on bases 2 and 4 inches thick, and slabs of 3-to-5 in. thickness laid on 6-in. bases; the bases in all cases consist of sand stabilized with 7 per cent by weight of cement. A length of 180 ft of each thickness of construction was laid, half being reinforced with 7 lb per sq. yard of oblong-mesh reinforcement and half being of plain concrete. Expansion joints were placed at 90-ft intervals, with intermediate contraction joints 30 ft apart in the reinforced concrete and 15 ft apart in the plain concrete. All the transverse joints include dowel bars but the longitudinal joint has no dowel-or tie-bars.

The experimental road, which forms part of one carriageway of a dual-carriageway road, carries about 700 vehicles per day in winter and about 850 vehicles per day in summer; about 35 per cent of these vehicles consist of heavy lorries.

The Paper includes a number of interim conclusions and observations on the performance of the road after use by traffic for 5 years. (*Author's Summary*).

### MODERNISATION OF ROADS

*Modernization consisting merely of improved surfacing without adequate geometric features such as sight distance, curves and superelevation will not make for a good road.*

### SELECTED RECENT LITERATURE IN ENGINEERING JOURNALS

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3. Stresses in Short Beams Experimental Analysis; J. S. CASWELL, *Engineering*, November 12, 54, pp. 625-628.
4. The possible Use of Prestressing for Strengthening Non-Pressure Sewer Pipes; N. W. B. CLARKE, *Civil Engineering and Public Works Review, Part I*, November 54, pp. 1189-1191.
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(Continued from page 26)

- (d) Large Size Dredgers of various capacities for excavating clay during sinking of wells for bridge foundation.
- (e) Diving Equipment
- (f) Pile Driving Equipment
- (g) Bridge Testing equipment including deflectometers, tensometers, etc.
- (h) Boring equipment
- (1) Diamond Drill, for taking undisturbed samples up to 150 ft of various strata including rock.
- (2) Percussion drill for taking samples of clay.
- (i) Pumps, Vibrators, Compressors, etc.
- Some of these equipment have already been under use in bridge construction.
- Orders for more equipment costing about Rs 4 lakhs have already been placed.

(Continued from page 22)

within 6 years from 1948 to 1953 (inclusive) more work was done than in the 15 years preceding 1948.

During the same period the average cost of motor transportation per ton-kilometer has been reduced by almost 60 per cent the number of motor vehicles has increased by 300 per cent the average daily volume of traffic on the roads has gone up by 200 per cent and the road revenues have increased by 110 per cent. The national saving due to reduced fuel consumption, increased average speed of travel, decreased wear and tear, etc. made possible by the improvement in the condition of the roads is estimated to be twice the amount of the total expenditures on the roads during the same period.

It is clear that by proper planning, by proper organizing, by a proper financing policy and by a lot of hard work very remarkable results can be obtained in a comparatively short time even on such a large-scale work as the building of a National road system.

## ANNEX

The major contributing factors to the outstanding achievements of the Turkish highway programme have been :

- (a) An autonomous organization as outlined on page 19 with a budget independent of the budget of the Ministry of Interior.
- (b) Level of salaries paid to the engineers and technicians in relation to their responsibility and experience.
- (c) Decentralization of operation on a well thought out overall programme.
- (d) Delegation of authority and responsibility to the respective Directors of Departments and Divisions with reference to decision and action.

At present the Turkish Highway Department enjoys a staff of roughly 2,000 employees composed of clerks, technicians, operators of light and heavy equipment, draftsmen and about 350-400 engineers.

## WHITE LINES AID NIGHT DRIVING

A white line placed 18 in. from the edge of the pavement allows higher night speeds with greater safety.

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## DEFINITIONS OF HIGHWAY ENGINEERING TERMS

**BORROWPIT:** An excavation (generally regular shaped) for obtaining the material for a fill or an embankment.

**CLEARING Stripping:** The operation of removing from the site of works, grass, weed, brushwood, and other objectionable material.

## BUDGETS AND ADMINISTRATION REPORTS

## GOVERNMENT OF VINDHYA PRADESH BUDGET FOR 1955-56

The following extracts relating to Civil Works have been taken from the budget publications of the Government of Vindhya Pradesh for the year 1955-56.

## CIVIL WORKS

|                                                           | (In lakhs of rupees) |                                |                               |
|-----------------------------------------------------------|----------------------|--------------------------------|-------------------------------|
|                                                           | Actuals<br>1953-54   | Revised<br>Estimate<br>1954-55 | Budget<br>Estimate<br>1955-56 |
| <b>REVENUE</b>                                            |                      |                                |                               |
| Rents                                                     | —                    | 0.80                           | 0.75                          |
| Ferry Receipts                                            | —                    | 0.10                           | 0.06                          |
| Recoveries of expenditure                                 | 4.06                 | 0.03                           | 0.01                          |
| Miscellaneous                                             | —                    | 1.00                           | 0.71                          |
| Transfer from Central Road Fund                           | —                    | 1.30                           | 3.38                          |
| Deduct—Refunds                                            | -0.39                | —                              | —                             |
| <b>Total</b>                                              | <b>3.67</b>          | <b>3.23</b>                    | <b>4.91</b>                   |
| <b>EXPENDITURE</b>                                        |                      |                                |                               |
| <b>I. Buildings</b>                                       |                      |                                |                               |
| Original Works                                            | 13.59                | 18.37                          | 18.52                         |
| Repairs                                                   | 6.63                 | 7.71                           | 5.00                          |
| Establishment                                             | 3.40                 | 8.44                           | 4.89                          |
| Tools and Plant                                           | 1.57                 | 2.44                           | 0.50                          |
| Suspense                                                  | -0.73                | —                              | 0.25                          |
| Lump provision for revision of scales of pay              | 0.49                 | —                              | —                             |
| Development Schemes                                       | —                    | 10.47                          | 33.00                         |
| Deduct probable savings                                   | —                    | -15.95                         | -16.00                        |
| <b>Total I Buildings</b>                                  | <b>24.95</b>         | <b>53.48</b>                   | <b>47.16</b>                  |
| <b>II. Communications (other than National Highways).</b> |                      |                                |                               |
| Original Works                                            | 7.50                 | 4.31                           | 1.93                          |
| Repairs                                                   | 26.80                | 25.00                          | 23.00                         |
| Tools and Plant                                           | 1.18                 | 1.00                           | 0.38                          |
| Development Scheme                                        | —                    | 14.85                          | 20.77                         |
| Deduct—Probable savings                                   | —                    | -4.27                          | -10.68                        |
| <b>Total II Communication</b>                             | <b>35.48</b>         | <b>40.89</b>                   | <b>35.40</b>                  |
| <b>Total I &amp; II Civil Works</b>                       | <b>60.43</b>         | <b>74.37</b>                   | <b>82.56</b>                  |

## Capital Expenditure on Civil Works outside the Revenue Accounts

|                                              | (Rs In lakhs)      |                                |                               |
|----------------------------------------------|--------------------|--------------------------------|-------------------------------|
|                                              | Actuals<br>1953-54 | Revised<br>Estimate<br>1954-55 | Budget<br>Estimate<br>1955-56 |
| <b>I. Buildings</b>                          |                    |                                |                               |
| Original Works including Development Schemes | —                  | 17.07                          | 13.89                         |
| <b>II. Communications</b>                    |                    |                                |                               |
| Development Schemes                          | —                  | 15.69                          | 9.00                          |
| <b>Total I &amp; II</b>                      | <b>—</b>           | <b>32.76</b>                   | <b>22.89</b>                  |

## Revenue from roads

|                                                   |             |             |              |
|---------------------------------------------------|-------------|-------------|--------------|
| Receipts under State Motor Vehicles taxation Act. | 5.70        | 6.43        | 7.00         |
| Sales Tax on Motor Sprit                          | —           | 1.50        | 3.50         |
| <b>Total</b>                                      | <b>5.70</b> | <b>7.93</b> | <b>10.50</b> |

## GOVERNMENT OF VINDHYA PRADESH BUDGET FOR THE YEAR 1955-56

## (A brief review with reference to Civil Works)

THE total revenue of the state including grants-in-aid from the Central Government is estimated at Rs 574.18 lakhs for 1955-56 as against Rs 515.56 lakhs (Revised Estimate) for 1954-55 and Rs 466.26 lakhs (Actual) for 1953-54. The corresponding revenue expenditure figures are Rs 581.71 lakhs for 1955-56, Rs 505.51 lakhs for 1954-55 (Revised Estimate) and Rs 371.42 lakhs for 1953-54 (Actuals).

Revenue expenditure on Civil Works (Original Works and Repairs only) is placed at Rs 48.45 lakhs for 1955-56 while the revised estimate for 1954-55 and the actuals for 1953-54 amount to Rs 55.39 lakhs and Rs 54.52 respectively. In terms of total State revenue, the expenditure amounts to 8.4 per cent in 1955-56, 10.7

per cent in 1954-55 and 11.7 per cent in 1953-54. The provision for Communications alone under "Original Works of Repairs" for the year 1955-56 is Rs 24.93 lakhs which forms 4.3 per cent of the total State revenue. In 1954-55 and 1953-54 the corresponding ratios were 5.7 per cent and 4.3 per cent respectively.

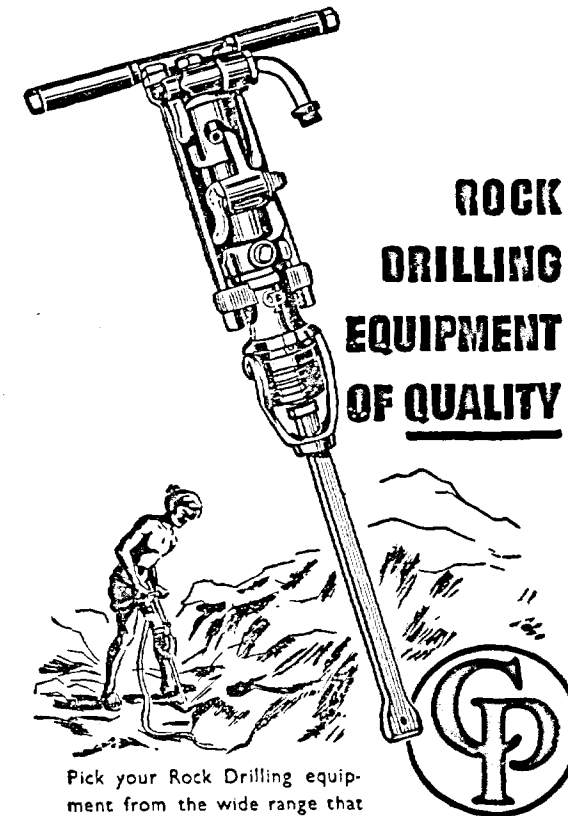
Capital Expenditure on Civil Works outside the revenue account is estimated at Rs 22.89 lakhs for the current year while the revised provision for the previous year amounts to Rs 32.76 lakhs. The sum of Rs 9.00 lakhs shown in the current year's budget under "Communication" is meant as an initial provision to meet the cost of execution of the final phase of the Five-Year Plan relating to development of Communications.

## LIST OF APPROVED WORKS ON NATIONAL HIGHWAYS

| S. No.             | Job No.     | Name of work                                                                                                                                                            | Amount<br>(Rs in Lakhs) |
|--------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| <b>WEST BENGAL</b> |             |                                                                                                                                                                         |                         |
| 1.                 | 1167 BG 34  | Protection works of the Nagar river and construction of a bund between the Nagar and Gandhar rivers at bridge site on the Raiganj Bihar border section of N. H. No. 34. | 1.97                    |
| 2.                 | 1201 BG 31  | Permanent restoration of the collapsed culverts at Chalsa on Bagrakote-Chalsa Section of N. H. No. 31 damaged by the extraordinary floods of 1954.                      | 1.39                    |
| 3.                 | 1204 BG 31A | Permanent restoration works of damages caused by heavy rains of 1954 in Siliguri-Gantok Road on the 22nd mile 3rd quarter of T. V. Road.                                | 0.29                    |
| 4.                 | 1205 BG 31A | Replacing existing damaged culvert by a causeway in the 19th mile 2nd quarter of T. V. Road, N. H. No. 31-A.                                                            | 0.85                    |
| 5.                 | 1206 BG 31A | Replacement of existing culvert by a causeway and restoration of Khud side breaches in the 17th mile (1st qr. of T. V. Road) N. H. No. 31A.                             | 0.71                    |
| 6.                 | 1207 BG 31A | Permanent restoration of damages caused by heavy rains of 1954 in the 20th mile (2nd qr.) of T. V. Road, N. H. No. 31A.                                                 | 0.79                    |
| 7.                 | 1208 BG 31A | Permanent restoration of damages caused by heavy rains of 1954 in the 19th mile (4th qr.) of T. V. Road, N. H. No. 31A.                                                 | 0.52                    |
| 8.                 | 1210 BG 31  | Construction of approaches to the Chel Bridge on N. H. No. 31.                                                                                                          | 0.81                    |
| 9.                 | 1211 BG 31  | Construction of approaches to the Mal Bridge on N. H. No. 31.                                                                                                           | 1.50                    |
| 10.                | 1212 BG 31  | Construction of approaches to the Wori bridge on N. H. No. 31.                                                                                                          | 1.33                    |
| 11.                | 1219 BG 31A | Permanent restoration of damages caused by heavy rains of 1954 to N. H. No. 31A at 19th mile 2 qr. of Teesta Valley Road.                                               | 1.73                    |
| 12.                | 1220 BG 31  | Construction of a diversion of N. H. 31, near Patalakhowa.                                                                                                              | 0.58                    |
| 13.                | 1221 BG 34  | Construction of a diversion of N. H. 34 at Krishnagar in Nadia Distt.                                                                                                   | 8.49                    |
| 14.                | 1222 BG 34  | Improvement of the Krishnagar-Dhubulia Section of N. H. 34 in Nadia District.                                                                                           | 1.65                    |

| S. No.        | Job No.     | Name of work                                                                                                                                                                                 | Amount<br>(Rs in lakhs) |
|---------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| 15.           | 1224 BG 31A | Permanent restoration works of damages caused by heavy rains of 1954 in Siliguri Gangtok Road on the 24th mile 4th qr. of Teesta Valley Road, N. H. No. 31-A.                                | 2.44                    |
| 16.           | 1225 BG 31  | Permanent restoration of the collapsed culverts and flood breaches near Ovdalbari in the Bagrakote-Chalsa Section of N. H. No. 31.                                                           | 3.11                    |
| 17.           | 1226 BG 31  | Collection of stone and shingle required for the construction of embankment along the East bank of river Chel at Damdim for the protection of N. H. 31 and the areas on either side thereof. | 1.20                    |
| 18.           | 1242 BG 31A | Provision of pucca drains in place of kutcha drains between 20th and 32nd miles of Teesta Valley Road.                                                                                       | 1.52                    |
| 19.           | 1253 BG 6   | Construction of sub section Alampur to mile 3/5 of Joypur Bil-Alampur section of the bypass from Willingdon Bridge to Andul on N. H. No. 6.                                                  | 8.61                    |
| 20.           | 1257 BG 6   | Construction of approaches to the Rupnarayan bridge on N. H. No. 6.                                                                                                                          | 6.86                    |
| 21.           | 1279 BG 31A | Permanent restoration of damages in the 1st mile of Teesta Valley Road (N. H. No. 31A) between Anderson bridge and junction of Lachan Road.                                                  | 0.43                    |
| 22.           | 1282 BG 34  | Construction of culverts on the Berhampore Raghunathganj Section of N. H. No. 34.                                                                                                            | 4.74                    |
| 23.           | 1296 BG 31  | Construction of a diversion of N. H. No. 31 in Nilkuthi area to avoid from curves in Cooch Behar town.                                                                                       | 4.95                    |
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| 24.           | 1168 AS 38  | Reconstruction of culvert No. 336/2 on Makum-Ledo Lakhapani Road N. H. No. 38.                                                                                                               | 0.42                    |
| 25.           | 1278 AS 37  | Reconstruction of a bridge in mile 253 of the Assam Trunk Road (East)-N. H. No. 37 across the river Tiloijan river.                                                                          | 4.38                    |
| 26.           | 1283 AS 31  | Construction of a diversion road at Bilashi-para near river Gaurang crossing on N. H. No. 31 between miles 137 and 141.                                                                      | 7.36                    |
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| 27.           | 1169 RS 6   | Construction of a jeepable track of 10 to 12 ft wide on the short cut new alignment of N. H. No. 6 (19th to 46th mile between Kriher to Pallabara.                                           | 3.15                    |
| 28.           | 1176 RS 42  | Construction of 10 culverts on N. H. 42 between Chauduar and Nuapatna near Cuttack.                                                                                                          | 1.62                    |

| S. No.        | Job No.    | Name of work                                                                                                                        | Amount<br>(Rs in Lakhs) |
|---------------|------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| 29.           | 1188 RS 48 | Providing a diversion road at Dumniput from mile 42/6 to 43/6 of Itikavalsal-Jaypore Road (Koraput Division) N.H. No. 43.           | 0.67                    |
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| 44.           | 1274 PB 1  | Widening the formation width to 38 ft on G.T. Road (N.H. No. 1) in Jullundur Provincial Division miles 199 to 250.                  | 1.42                    |
| 45.           | 1284 PB 22 | Improvements to Kalka-Simla Road, mile 71/5, 76/7-8 and 88/1 on N.H. No. 22.                                                        | 0.61                    |
| 46.           | 1288 PB 10 | Special repairs to P.W.D. Inspection Bungalow at Mehm on Delhi-Hissar-Sulemanki Road (N.H. No. 10) in Rohtak District.              | 0.01                    |
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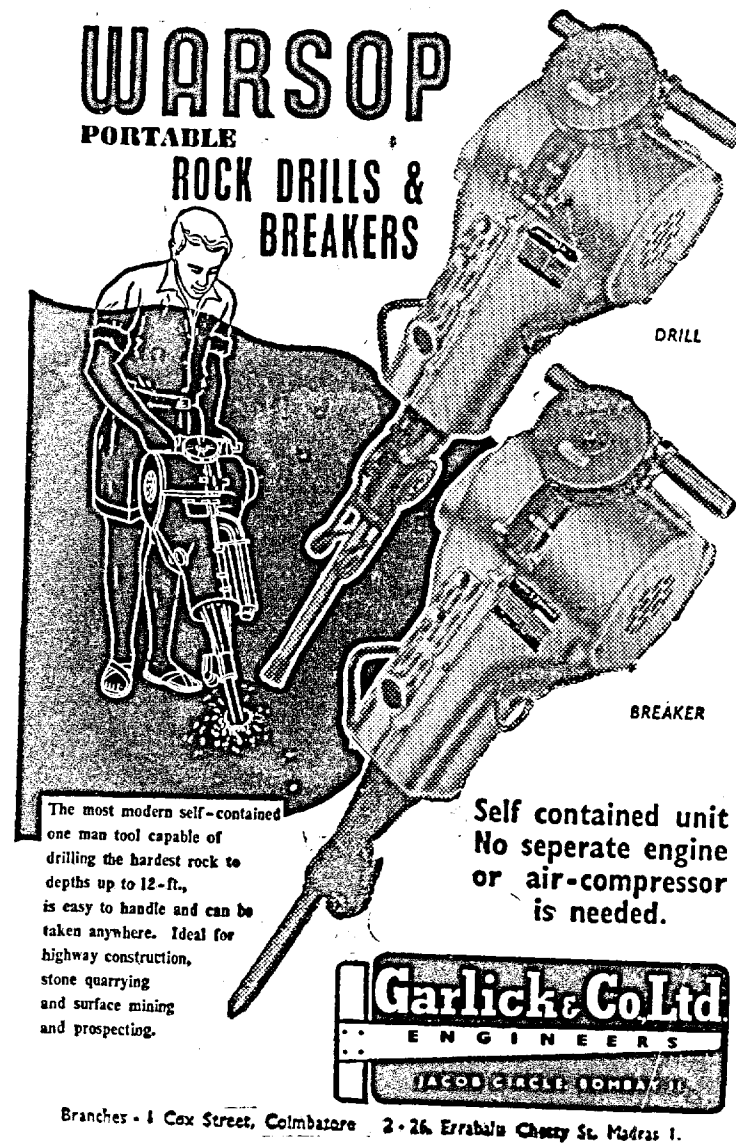
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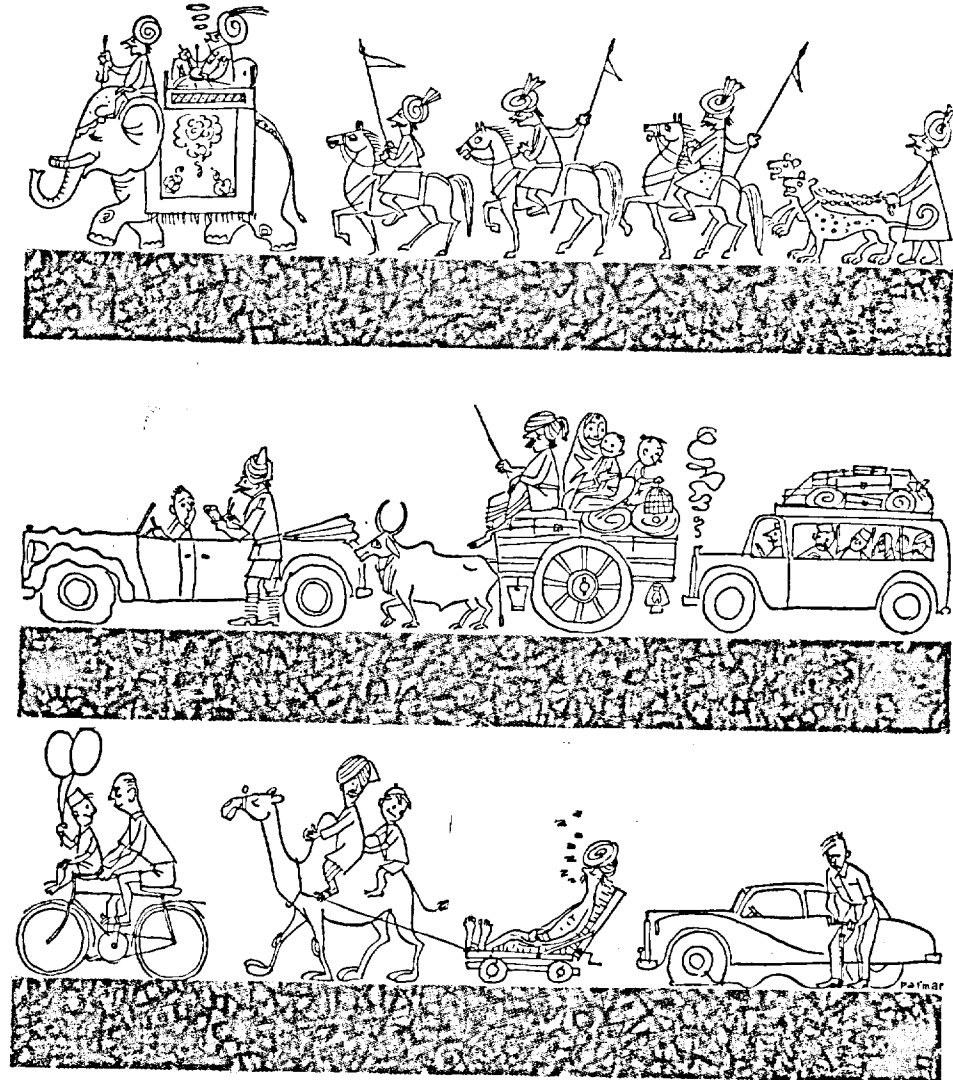
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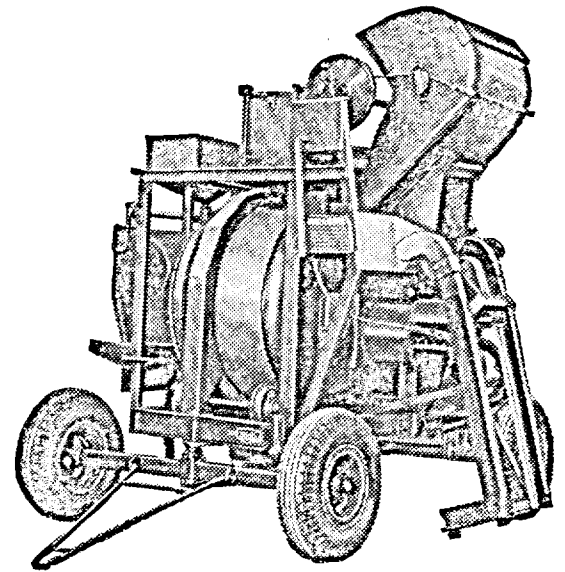
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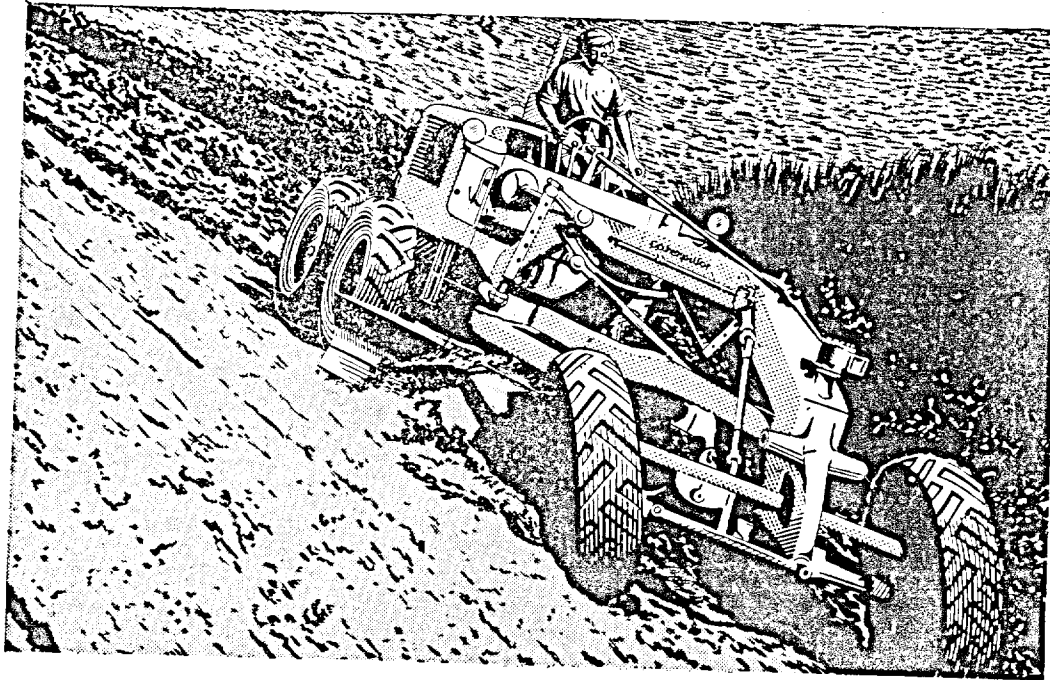
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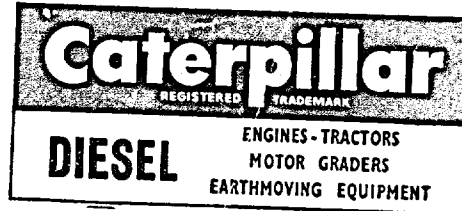
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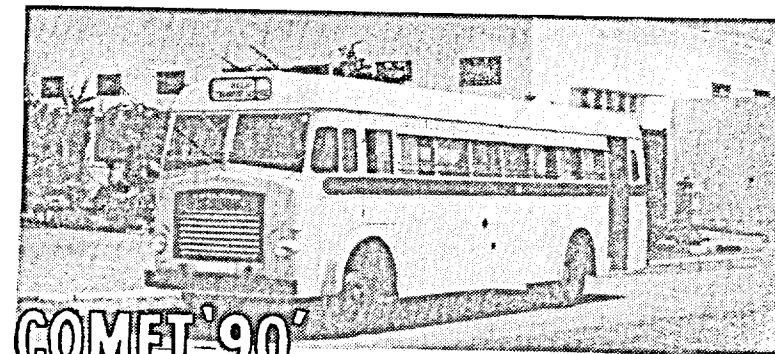
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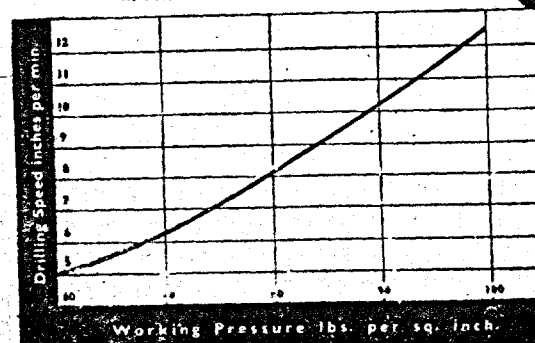
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