

Transport-Communications

MONTHLY REVIEW



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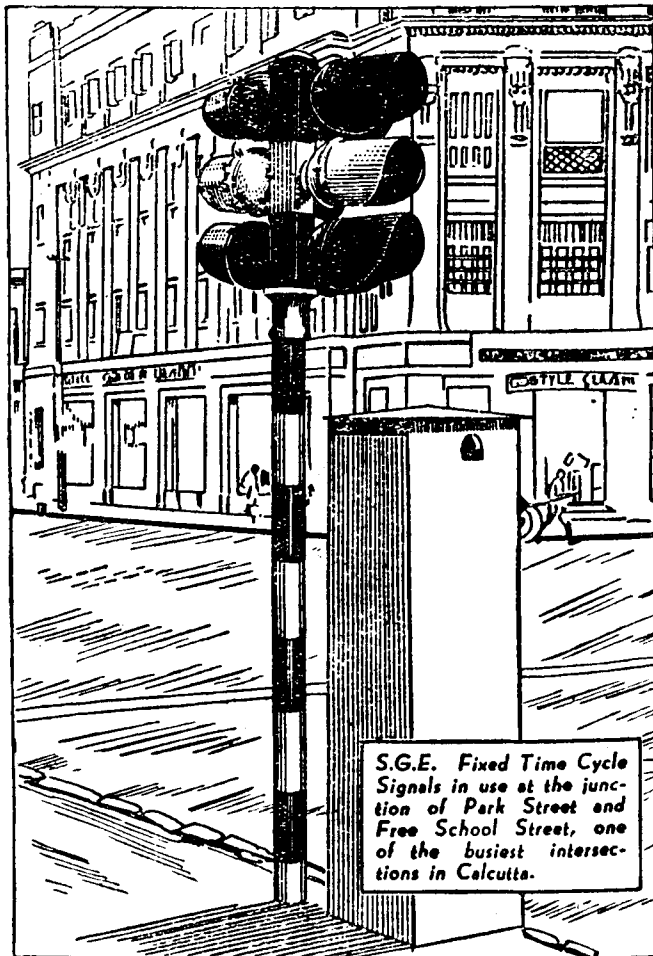
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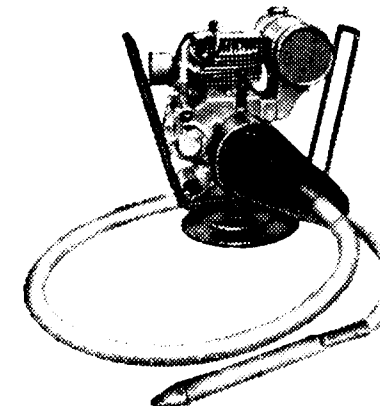
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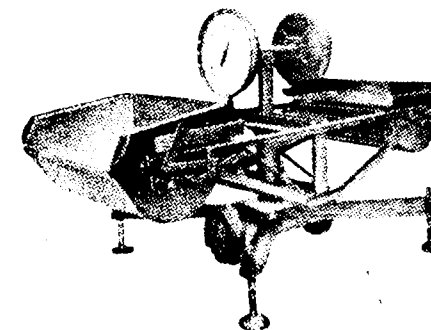
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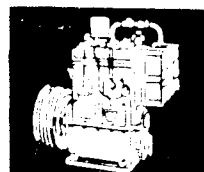
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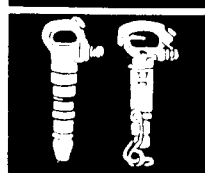
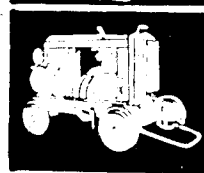
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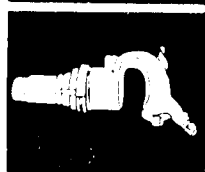
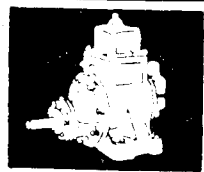
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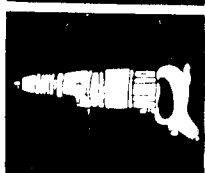
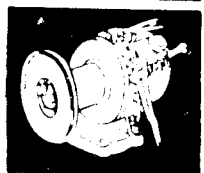
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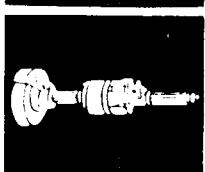
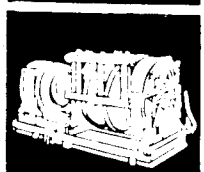
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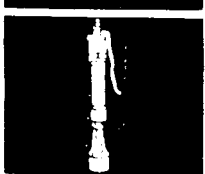
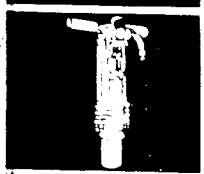
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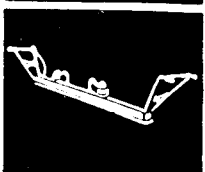
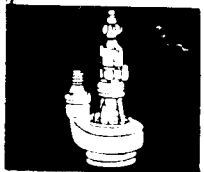
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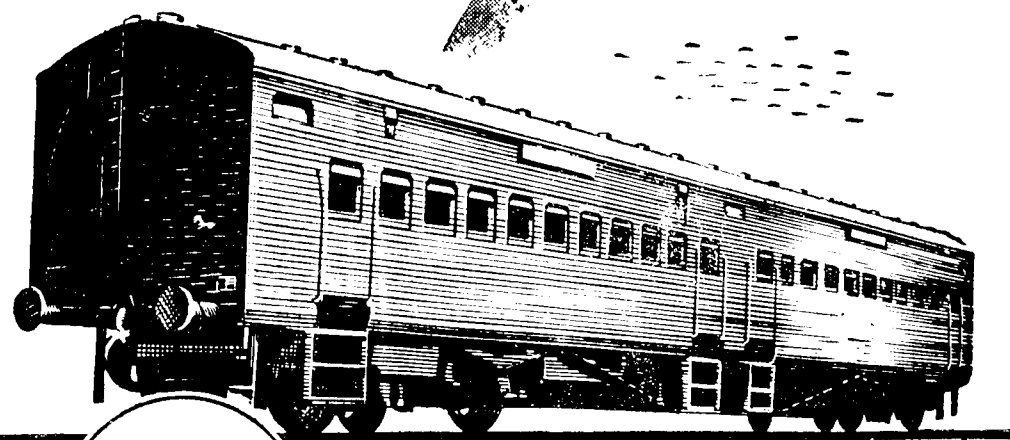
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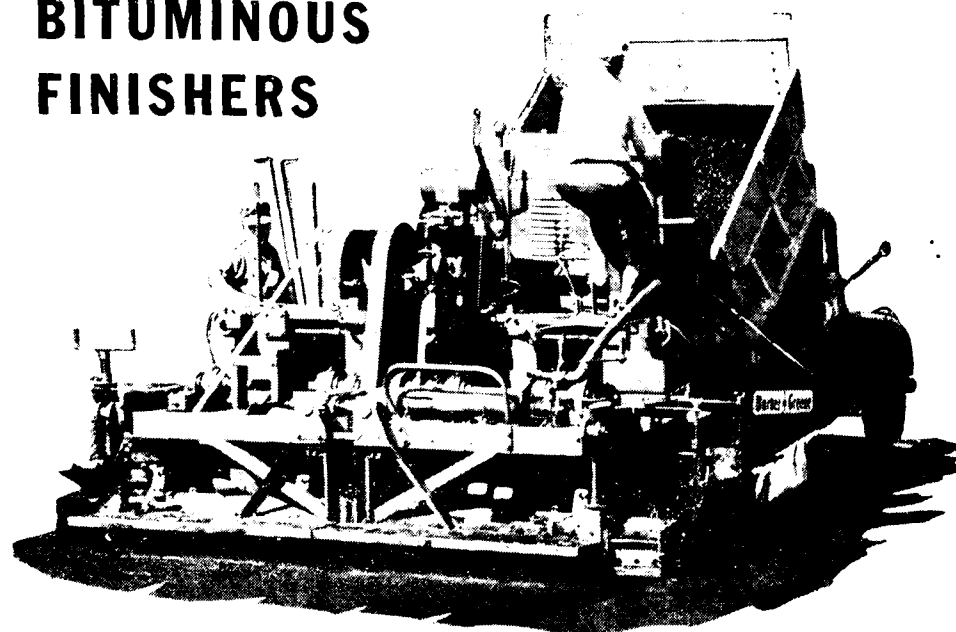
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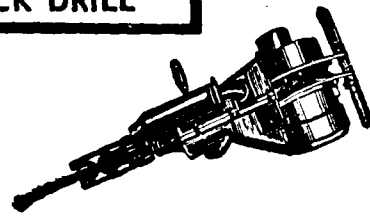


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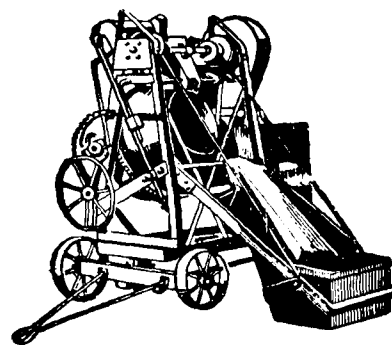
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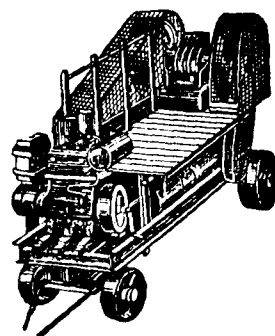
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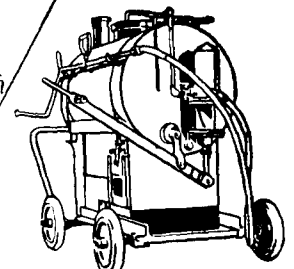


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The Seventeenth Session

THE Seventeenth Session of the Indian Roads Congress was held at Madras on the invitation of the Government of that State. The Session was inaugurated in the Rajaji Hall on the 8th February 1953 by Shri N. Ranga Reddi, the State Minister for Public Works. About 230 delegates from all parts of India attended the Session. This was the second meeting of the Congress in Madras, the first having been held there in 1945.

Shri T. Mitra, Chief Engineer, Works and Buildings, West Bengal, delivered the Presidential Address (published in full in this issue). The main theme of the President's speech was the necessity for non-lapsing funds for road works and the prevention of diversion of road-user revenues to non-highway purposes. The President gave Government credit for increasing grants for road works greatly in recent years as compared to the average annual expenditure over the period 1914-1949. But he hoped for something even better if the demand, often reiterated by the Congress, for non-lapsing funds were

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The President's address to the Congress was heard with rapt attention.

accepted and if highway revenues were applied exclusively to highway improvements.

From the technical point of view, the Session was a great success. Although there were only four Papers for discussion the list of speakers was so long that time had to be rationed strictly and some members were requested to send in their comments in writing.

For the first time Research Notes were also thrown open for discussion. Two notes contributed by the Central Road Research Institute on bituminous and concrete runways and the compaction of some alluvial soils of India (a study of the performance of plant) were discussed. These discussions were very instructive and were highly appreciated. They helped to bring out the useful work which is already being tackled by this young Institute.

Another novel feature of the Session was a panel discussion on the practices prevalent in India regarding the construction of cement concrete roads. An attempt had been made to hold a panel discussion at the Simla session also. The discussion did not, however, make much headway at that session for want of time. This year the session was extended by one day and a whole day set apart for this purpose.

There was the usual round of Committee and Council meetings, at which much important business was transacted. An important decision was to form a National Group of the International Association of Bridge and Structural Engineering. The formation of such a Group is expected to be particularly useful at this time when extensive bridge construction is being planned in every State. Another decision was to pursue more vigorously the question of "provincialization" of district and local body engineering services in every State. The Council of the Congress undertook to take up this matter with the Central Government. The Education Subcommittee drafted a model syllabus for highway engineering to be introduced in selected engineering colleges and universities.

The social and cultural engagements provided at every session to entertain the overworked delegates had to be cancelled this year owing to the sad demise of Shri N. Gopalaswami Iyengar at Madras on the 10th February when the session was in full swing. Shri Iyengar had been the Union Minister for Railways and Transport and out of respect for his memory the Congress adjourned for a day. The programme of meetings on the subsequent days became all the more crowded on account of the adjournment on the 10th.

A large majority of the delegates—almost every one who came from outside the Madras State—was accommodated in the two M.L.A.'s hostels adjacent to the Rajaji Hall where all meetings were held. The efficacy of such an arrangement was demonstrated by the well attended meetings.

RAIL AND ROAD TRANSPORT AT HIGH ALTITUDES

(Extracted from 'The Journal of the Institute of Transport', September, 1952)

IT may truthfully be said that both road and rail transport all over the world have, as far as regularity of service and comfort are concerned, reached a very high standard. Equipment and rolling stock have been adapted to the configuration of the country and, as far as possible, to the physical operating conditions. Transport both by road and rail at low altitudes and in comparatively flat country presents few difficulties. It is seldom, and even then to a small extent, affected by the forces of nature, especially unpredictable and often sudden changes in weather conditions.

When we come to a mountainous country like Switzerland, these conditions alter or rather worsen with every 1,000 ft elevation. It is evident that both rail and road follow the course of least resistance. They keep as far as possible to the bottom of valleys and often run parallel with mountain torrents which, when in spate, are as much a danger to transport as ice, snow and avalanches in the winter. In the British Isles there is generally speaking little to fear in this respect. In Switzerland, and for that matter in all countries of the alpine region, conditions are quite different. The danger of blocked or cut railway lines and roads is present from November until the late spring.

* * *

Road surfaces are covered with a coating of ice and are sometimes impracticable even for large vehicles with heavy chains. But the most serious traffic impediment is snow in its various forms and effects. A heavy blizzard will reduce visibility to a few yards. Falls of snow to a depth of five to six feet in twelve hours are by no means uncommon. Strong winds either with, or following, a heavy fall often cause, especially in cuttings, an accumulation which takes heroic efforts to clear. All this may happen at

comparatively low altitudes where there is little danger from avalanches. In the mountains, however, nature adds this new handicap. How real and terrible in its effect this can be was shown during the winter 1950-51 when an avalanche disaster of great magnitude overtook Switzerland, with grievous loss of life, extensive material damage and disorganization of rail and road traffic. Avalanches are common in the alpine region. They are a natural phenomena there, but almost unknown in this country. You will therefore perhaps allow me to give you a rough idea how they happen and behave.

I should perhaps start by mentioning that snow varies a great deal in consistency, weight and texture. Freshly fallen dry powder snow weighs roughly 30 kg. per cubic metre. Wet snow which generally falls in large flakes may weigh as much as 120 kg. per cubic metre. Snow is not a static material. It, so to speak, breathes and changes in consistency, in weight and crystalline texture under the influence of varying temperatures and other factors. This causes in any snow field interior strains and stresses. The adhesional force which makes it adhere to its base, that is to say to a greasy or rocky slope, alters constantly. Therein lies the danger.

Needless to say, certain precautions are taken to guard against avalanches long before the winter sets in. Some of them are permanent. Of these I shall speak later. They are, however, in themselves not sufficient. As soon as the snow season starts, in the mountains as early as October, a very careful watch is kept on danger areas, and especially on weather conditions, variation in temperature, type and direction of the wind, etc. Nature's whims are often unpredictable, but it is possible to classify the various degrees of danger, roughly as follows:—

(a) Air temperature under freezing-point, powder snow up to 2 ft, light wind clear or nearly clear sky, mean safety.

(b) Air temperature above freezing-point for some time, wet snow to the depth of two to five feet, light warm wind, (called "Fohn"), or light rain, constitute a warning.

(c) Air temperature consistently above 12 degrees F., heavy snow fall followed by rain or persistent Fohn gales, spell great danger.

Late winter, early spring and, at very high altitudes, early summer are therefore especially dangerous periods.

Avalanches

Avalanches are of two main types: *Staublawinen* and *Grundlawinen*. Literally translated the former means "dust avalanches." It is so to speak "airborne" and consists of loose dry snow which travels with ever increasing speed more or less parallel to the ground. Its main destructive power lies in the tremendous air pressure created by its downward swoop. This force is sufficient to flatten whole forests, carry away buildings, road vehicles and to derail trains.

The *Grundlawine* or "ground avalanche" consists of a mass of solid snow which has accumulated high up on a slope. Through interior strains and stresses caused by changes in temperature, rain or warm winds, it starts first to "creep" and cracks appear on its surface. As the adhesional force to the base diminishes, the movement increases and the whole weight, in many cases thousands of tons, is precariously balanced on the slope. At this stage a shout, a sound of a shot, or an animal, human or otherwise walking or skidding in the vicinity, will start the avalanche. With tremendous force, preceded by a roaring gale of compressed air, it rushes valleywards, gathering not only speed but large rocks, tree trunks and almost anything else in its way. Torrents and rivers on its course are dammed and overflow. Roads and rail tracks are either carried away or buried under a huge pile of snow and debris. Some of the worst features of these avalanches are the suddenness with which they occur and the havoc and human misery they create. They are by no means

infrequent, as the following figures show. In January last year Switzerland suffered the following avalanche casualties: 98 people lost their lives, 162 head of cattle and 368 sheep and goats perished, 919 houses were destroyed.

The winter of 1950-51 was, however, exceptional. Unusually heavy falls of snow and adverse weather conditions generally were responsible for these disasters. In normal years the danger is less acute, although always present. But the normal precautions against the adverse effect of heavy snow falls are sufficient to keep communications open. Avalanches do occur every winter, but their courses are known and each of them has a tendency to come down at a certain time, (so much so that they have their names like for instance crack trains). This facilitates measures to harness or to divert them. It is therefore the avalanches in unexpected places and at unpredicted times which are so dangerous.

The railway companies, the Swiss Federal Post Office (which runs its own coach lines), and the motoring organizations all do their utmost to protect their installations and the lives of their passengers against the special dangers to traffic at high altitudes, and measures vary according to the type of transport and locality.

Protection of Low-Altitude Railways

Precautions are taken long before the onset of the winter, and plans are made to assure smooth running under all conditions. All outdoor signal installations are kept clean and well oiled. Special tools for snow and ice clearance are reconditioned and made available in sufficient quantities. A supply of dry sand for use on platforms, running boards, etc., is kept ready. Water pipes and tanks are protected against frost and bursts with insulating material. High and low tension electrical installations are carefully examined. Motive power Sections check the good working order of snow ploughs and centrifugal rotary snow sweepers. Alarm rotas for additional personnel required day or night in case of emergency are prepared.

The winter season's first traffic handicap is dense mist, followed later by frost and snow. Each presents its own problem. Fog will reduce visibility to less than a few yards and deaden sound. Special care is therefore required in shunting yards where accidents and great delays are not infrequent. Often frost adds to the difficulty by rendering brakes less effective.

Protection of High Mountain Railways

The battle against the forces of nature, the efforts to guard against them and the cost of safety installations are greatest where we have to deal with high mountain railways. The same applies to motor traffic over the alpine passes. I would therefore now like to give you an idea how and at what cost in effort and money some of these undertakings manage to keep open to traffic under the most adverse conditions.

The only normal gauge international main line in Switzerland which is not nationalised is the Berne-Lotschberg-Simplon Railway. The Lotschberg is a typical alpine railway. It was built between 1906 and 1930 at the cost of about £9 million. The passenger who travels through this enchanting and often awe-inspiring mountain fastness hardly realises that an additional £½ million were spent on special safety measures and constructions to protect the line against rock falls, avalanches and damage by mountain streams which in early summer when the snow and ice melt turn into raging torrents. There is above Goppenstein at the northern exit of the main tunnel a section of the line especially exposed to danger by avalanches. Its length is 443 metres, and the amount spent on constructional work was 650,000 francs or 1,470 francs per metre. Almost for the whole distance of 23 miles from the southern exit of the main tunnel to Brigue, the line is carried high up on the rocky walls of the Lonza and Rhone valleys, where avalanches are frequent. As a result, the train passes through a succession of avalanche galleries. I am almost certain that their number is a record for so short a distance. Curiously enough they hardly interfere with the magnificent view, as most of them are open towards the valleys. Many of these constructions

all along this railway are models of their kind and often visited by interested experts from abroad.

The central administration of the mountain railways does everything in its power to keep communications open. In the summer, apart from careful watch on mountain torrents and possible rock falls, this presents few difficulties. The winter season, however, needs additional precautions. On the Furka-Oberalp Line the train service between Oberwald and Realp is suspended, as it would be too costly and therefore uneconomical to protect it sufficiently against avalanches. In order to save the bridge spanning the Steffenbach Gorge situated in this section from being carried away, it is dismantled and sorted out of harm's way until early June. So proficient are the crews who tackle this difficult task that one day is as a rule sufficient to pack the three spans away and to reassemble them in early summer. With the onset of heavy snow falls the security and watch service on all the lines is intensified.

All vulnerable sections are constantly observed for avalanches and snow slides by local people thoroughly familiar with the country and the weather conditions. They are in constant touch by telephone with the technical services at headquarters. This facilitates immediate mobilisation of crews and mechanical means for snow and avalanche clearance. Four wedge-shaped ploughs and three rotary power sweepers are kept ready for this purpose. Both types are especially suitable for cutting through heavy falls and drifts. Avalanches present more serious problems. More often than not they are, as already mentioned, mixed with tree trunks, boulders and other debris gathered on the way. In such cases snow excavators are used. They run on caterpillar tracks and can be used away from the railways. They are extremely efficient and clear away in ten hours as much as 45 men would by hand in the same time.

However, prevention is better than cure, and here, as elsewhere, nothing is left undone to shield the track by means of snow and avalanche barriers, galleries, and thousands of trees planted for this purpose. The galleries mean of course absolute safety, but are expensive to build. Barriers, of which there are many

types, are generally situated high up the slopes, above the tree line. Where and how to place them is of great importance and needs an intimate knowledge of the country, great familiarity with weather conditions, especially the force and direction of the wind. It speaks well for the foresight, the vigilance and the technical skill of the engineers as well as the staff that not a single passenger has ever lost his life through an avalanche. The financial burden due to snow clearance and the great strain of winter traffic on rolling stock, permanent way and constructions caused by snow, frost and ice is of course great. During the winter of 1950-51 the four railways spent 140,000 francs or roughly £12,000 on snow clearance alone.

* * *

Mountain Road Traffic

If we look at the map of Switzerland, we find a well-developed system of main roads, not only in the lowlands but also in the alpine districts. Many years before man's ingenuity brought the railways up to and through the great alpine wall, the Gotthard and Simplon road carried passengers and goods over the watershed between the North Sea and the Mediterranean. These two roads are by no means the only ones. From east to west, from the Grisons to the shores of Lake Geneva, passing through the Bernese Oberland, the principal mountain passes can now be crossed by private car or in one of the comfortable motor coaches run by the Swiss General Post Offices. These alpine roads were originally built to assist and further the economic development of otherwise inaccessible regions, and to provide connexions to places beyond the rail heads. Needless to say, they are also an important factor in the development of tourist traffic, especially in the summer. Thousands of holiday makers travel over these passes merely in order to enjoy the wonderful scenery.

Not so many years ago it was considered impossible or inadvisable to keep these roads open in the winter. If motorised traffic can now get to—and even over—the mountains, the merit lies mainly with the progress made in road building and motor engineering. In order to facilitate traffic, many aids have been

devised. I would only mention the following :—

(1) Wind-screen defrosting by means of electric heating wires let into the glass.

(2) Great improvements in the design of head and fog lamps with great intensity of light.

(3) The use of heavy, deeply grooved tyres which provide a good grip on the snow covered road surface.

(4) Re-designed and more efficient snow chains.

To these technical improvements on the vehicles must be added the greater experience gained by the ordinary motorist and the professional driver. Both have learnt to drive slowly but regularly, never de-clutched and at a speed which makes the use of wheel brakes unnecessary. Most of the alpine coaches are provided with motor brakes, which are a great help. Starting very slowly on icy roads will avoid skidding or, if chains are fitted, prevent them digging into the thin layer of snow on a frozen road.

The professional road builder has done a great deal to make mountain roads safe for winter traffic. Cantonal authorities responsible for maintenance, recognising the importance of service throughout the year, are also helping financially towards this end and, in addition, thereby provide employment for local labour. It should perhaps be mentioned in this connexion that in Switzerland it is not central Government but the cantonal authorities who build and maintain the roads, although the Confederation does, if necessary, grant subsidies.

Winter traffic on mountain roads is for these reasons made much easier today. They are built with a hard surface, and by applying the most modern principles of civil engineering both in the straight sections and in bends. The almost flat cross-section of the present alpine road renders the clearance of snow by mechanical means much less difficult, less costly and quicker.

It is now recognised that in order to keep the road open and in good traffic condition throughout the winter, the work of clearance should start after the first snow fall. The whole width is freed, but a depth of three to four inches is left on the surface. As further snow falls and drifts occur, the work is repeated. This layer of a few inches is necessary for the wheels to get a grip. If the snow is cleared down to the road surface, the latter will ice up and become dangerous both to horse-drawn traffic and motors, especially the former.

Wherever the roads are exposed to danger from drift snow, wooden palisades are built. They break the force of the wind and cause the snow to bank up behind them.

Considerable improvements have been made in the design of snow ploughs. The simplest form is a wedge shaped triangle fixed to the front of large vehicles. They are comparatively light, soon fixed and travel normally at a speed of 15-20 miles per hour in fresh snow to a depth of three feet. By fitting an extension to one side of the triangle, the snow can be thrown to one or the other side of the road. When the snow surface is made uneven through changes in the weather and deeply rutted by heavy traffic, a snow plane is used to turn the uneven surface into a smooth track.

Rotary power-driven snow sweepers are used on certain mountain roads, especially in the Grisons. They run on caterpillar

tractors and their progress in deep snow is fairly rapid. Under favourable conditions they should clear about 1 km. per hour.

New and improved snow chains have greatly helped towards the maintenance of regular services, and most of the postal motor coaches are now fitted with them. There are various types. Some can be mounted by one man in 10 minutes, others are more elaborate and garage fitted. They consist of caterpillar tracks fixed on the endless chain principle to the two rear tyres on each side. This permits on some roads the use of skids under the front wheels.

Summing up, it can be said that the Automobile Section of the Swiss General Post Office has done pioneer work in this field and now possesses the technical knowledge and means to assure traffic over some alpine passes throughout the winter. On the other hand, not all the questions concerning efficient and quick snow clearance have been answered yet and new ways are constantly under review. In any case, what has been achieved benefits not only the postal coach services but opens the way to private motor traffic. Winter motoring in the mountains puts a heavy strain on men and machines. In spite of all the precautions and safety measures, accidents and breakdowns do happen. This is where the S. O. S. telephone boxes installed by the Swiss Automobile Club at many points along the roads render excellent service. * * *

FIRST PRIORITY

After a tour of India's north-eastern border Shri Jawaharlal Nehru said in a Press Conference at Delhi on the 2nd November.

The tribal folk are a very fine lot, very attractive, hard working and intelligent. What they want is,

**First of all, communications,
Secondly schools,
and Thirdly hospitals and dispensaries.**

CONCRETE ACTS LIKE A LIVING TISSUE

(Extracted from 'Indian Concrete Journal'—Oct. 15, 1952)

CONCRETE is like a living tissue. Like the latter, it is affected by any external action—variation of pressure, temperature, or humidity—and since part (of the effect is irreversible there remains a part) which is never completely effaced. Thus **it has a memory**, and I think that the memory—even in its highest manifestations—is no more than a hysteresis phenomenon as in the case of cement. **It has its age**; when the circulation canals have reduced their sections to the extreme, its properties approach those of true solids. **It has its sleep**, for its activity may be slowed down or stopped by lack of water, and re-started by wetting.

Of all its similarities to a human being, that which interests us most is **its faculty of healing its wounds** and its ability to overcome causes of failure.

I will translate my thoughts into more familiar terms.

It can be shown that plastic extension results in a reduction of pressure in the interstitial liquid and thus a decrease of the solubility of the hydrates. On the other hand by enlarging the canals, the movement of ions is made easier. Consequently the process of the formation of hydrates recommences, and a "scab tissue" is formed in the enlarged canals.

This is not simply an idea; experiment proves categorically that fractures will heal themselves if the distance between the surfaces is not excessive and if there is sufficient moisture present.

On the other hand an increase of mechanical pressure causes an increased pressure in the interstitial liquid*, and an increased solubility of the hydrates.

The consequent reduction of pressure in the over-loaded zones thus reduces the risk of failure due to high local stresses.

The importance of these phenomena cannot be over rated. The ratio compression strength for concrete is of the order of 10 or 12, which, as far as brittleness is concerned, puts it far behind cast iron or porcelain for which the ratio is generally between 4 and 8.

However, if cast iron is used up to its fracture strength, accident after accident will result. Iron is only used up to very limited tensile stresses.†

Now in reinforced concrete we often use concrete right up to its tensile breaking strength; if we didn't, our structures would be in a very bad way. Moreover, even with concrete stretched to the limit—the limit which precedes rupture—we still do not hesitate to apply an overload, and the concrete takes it.

In fact, under the self-weight of a reinforced concrete bridge the concrete is always stretched to its rupture strength in the region of the reinforcement. With external loading it is not the stress which is increased (this is already a maximum) but the extension. This is only possible because concrete, like a living being, has a great ability to adapt itself to circumstances, as long as sufficient time is allowed for it to adjust itself.

Without this adaptability no concrete structure could exist. Moreover, this is a necessary condition for any possibility of even very limited elastic deformation of concrete.

* The liquid in the interstices is actually in a state of triaxial tension; there is thus a reduction of the tension.

† Cast iron may equally undergo a yielding if its deformation is controlled; it will not, however, heal the cracks.

PRESS COMMENTS ON THE SEVENTEENTH SESSION OF THE INDIAN ROADS CONGRESS

"Hindu" Madras, February 10.

NO small credit goes to the Indian Roads Congress, which is holding its seventeenth annual session in Madras this week, for the realisation that prevails to-day among Governments as well as the public of the importance of a well-developed network of roads for the national economy. To-day the argument is not over how much length of roads we need, what type of roads must be built or the like, **but how we can finance the programme already drawn up in the well-known Nagpur Report.**

Lack of funds has compelled the Central and State Governments to go slow on the Nagpur Plan..... Rising prices have upset the Nagpur estimates so much that what the engineers originally reckoned would cost about Rs 450 crores (at the 1943 level of prices) would now involve over Rs 1,000 crores.

The problem of financing of road construction and maintenance has received considerable attention at the hands of the Roads Congress since its inception. It was largely at its instance that the Central Road Fund was instituted. The Congress has continually urged that the expenditure on road development should have relation to the taxes collected from the road users, principally motor transport. It has been scientifically demonstrated that improved roads can make a direct contribution to economy in operation of motor vehicles and thereby reduce the cost of motor transport.

There is one aspect of road finance which should be considered by the Central and State Governments as well as by those interested in the development of motor transport in the country. In discussing the state of motor transport in India or the paucity of roads in the country, it is usual to draw uncomplimentary comparisons between conditions here and the position obtaining in the more

advanced countries like the United States, Britain and Canada. But the vital fact should not be missed that there is a close relation between the pace of road development and the growth of motor transport. Paradoxically enough India has a more favourable motor-vehicle-road-milage ratio than the U. S. or Britain. This, however, is not something to gloat over, because it only means that the expansion of motor transport lags behind road development. It suggests that our road development programme will be hopelessly lop-sided unless we combine it simultaneously with a programme for rapidly increasing motor transport in the country, especially commercial vehicles like buses and lorries.

It may be that improved roads may themselves lead to an expansion of motor transport, but obviously more direct incentives will be needed if expansion is to be large enough. Motor taxation in India has long been the target of criticism. **Our present system seems calculated to get the maximum possible revenue from each vehicle on the road and is thus a severe deterrent on the expansion of motor transport.** A different policy, which aims at securing more vehicles on the roads by less onerous taxation, may in the end prove no less fruitful to the exchequer while stimulating the maximum expansion of motor services. The Indian Roads Congress should impress on the Government the need for such a change of policy as much in the interest of road development as of improved motor transport.

"Indian Republic" Madras, February 9.

Mr. Mitra, presiding over the Roads Congress, has drawn pointed attention to the lack of funds.

This is a perennial complaint..... All resources must be pooled so that

there might be no neglect in regard to communications.

Three kinds of authorities are involved in the matter of roads, the Centre, the State Government and the Local Bodies. The co-ordination among these three authorities must be established in a perfect manner.

Then again Mr. Mitra makes a legitimate complaint that in State budgets when an allotment is made for roads the allotment lapses if the whole allotment is not spent. He wants that unspent amounts should not lapse and a non-lapsable Road Fund should be built up so that there might be no lack of funds. This is a suggestion which the Government must take into serious account.

It is legitimate that all the income coming from users of road should go back to the maintenance of roads. It is common ethics and Mr. Mitra rightly lays emphasis on that.

The importance of roads in the proper implementation of the Five-Year Plan must also not be lost sight of by the Government.

—
“Indian Express” Madras, February 9.

Roads have been the most important means of communication from the dawn

of civilisation, and though the use of railways and aeroplanes has influenced progress, the value of the roads has but increased with the passing of years. In a country like India particularly, the main feature of this progress has been the rescue of our roads from their original insular economy. Inter-communication among the villages on the one hand and between them and the town—nay, the whole country—on the other, has reacted favourably for developing mileage as well as standards, and the demands made and the discussions taking place at the annual sessions of the Indian Roads Congress of late provide a clear index to the importance that roads have come to acquire. The advent of the motor vehicle has but accentuated the different facets of road-building and road maintenance, as well as the need for securing transport economy for millions of the country's population. The emphasis, therefore, is on extension.

The President of the Madras session of the Congress rightly quotes the familiar saying: “A country pays for its roads whether it has them or not, and it pays more when it does not have them,” and his recommendation that the roads in India should be extended and technically perfected deserves wholehearted support in this era of mobility to enable the rural population to share in the new types of life visualised in Free India.

ENGINEER'S BAPTISM

“The first thing to do with the (mining) student would be to put him in a basket and lower him into the mine. Work as pitman should be exacted to a sufficient extent to scare away that fastidious and deplorable class who continually defrauded the Government by using technical scholarships as a means of preparation for a clerical career. There should be a thorough baptism of coal.”

— H. W. Orange, Director-General of Education, Government of India, writing in 1903

PRESIDENTIAL ADDRESS TO THE SEVENTEENTH SESSION OF THE INDIAN ROADS CONGRESS

By

SHRI T. MITRA

Madras, February the 8th, 1953.

Hon'ble Sir, Ladies and Gentlemen,

IT is the pleasant duty of the President to welcome each year in our midst, besides our own Members, distinguished guests whose presence has always been a source of inspiration to this Society. When we meet together in such company, we naturally feel lifted from the sense of isolation that would otherwise afflict an exclusive professional organization such as ours. It is this presence of our guests—persons distinguished in various spheres of public life—which greatly helps us to put our deliberations in proper perspective and make us realize that ours is an effort which must find fruition as a part of the social whole. We therefore extend our grateful welcome to you, Sir, and to our other guests who have graced this occasion with their presence. To members and delegates we wish happy re-union for years to come.

OUR HOSTS

It is eight years since we met last in Madras in February 1945, with Mr. J. Vesugar in the chair. Great changes have occurred in India since then and Madras has also partaken of the fruits of such changes. This Congress is now meeting in Madras for the first time since Independence; but Madras has not meanwhile lagged behind any of her sister States in her solicitude for “roads.” Of all the States in India, Madras collects the largest revenue from her road-user taxes; and it must be said to her credit that she spends the largest amount on the maintenance, improvement, and new construction of roads in the State. She has also been the first State to create a separate Highways Department in her administration. Madras is an advance mile-post in our highway to progress. To the Government of Madras we convey our warm appreciation of the hospitality they have extended not only to this Society but to its cause as well.

OURSELVES

It is customary for the President every year to say something to remind ourselves of the cause which the Indian Roads Congress stands for, namely, the promo-

tion and encouragement of the science and practice of the building and maintenance of roads in India. This Society exists to provide opportunities to its members to pool their collective experience and ideas on matters relating to highway engineering. Discussions at our annual meetings and deliberations in the various committees and in the Council have enriched our experience. Our Congress has interested itself in research activities connected with highway engineering, in designs, standards, and specifications; it has looked forward to the training of our engineers in advanced techniques in the construction and maintenance of roads and also to the improvement and rationalization in the methods of highway finance.

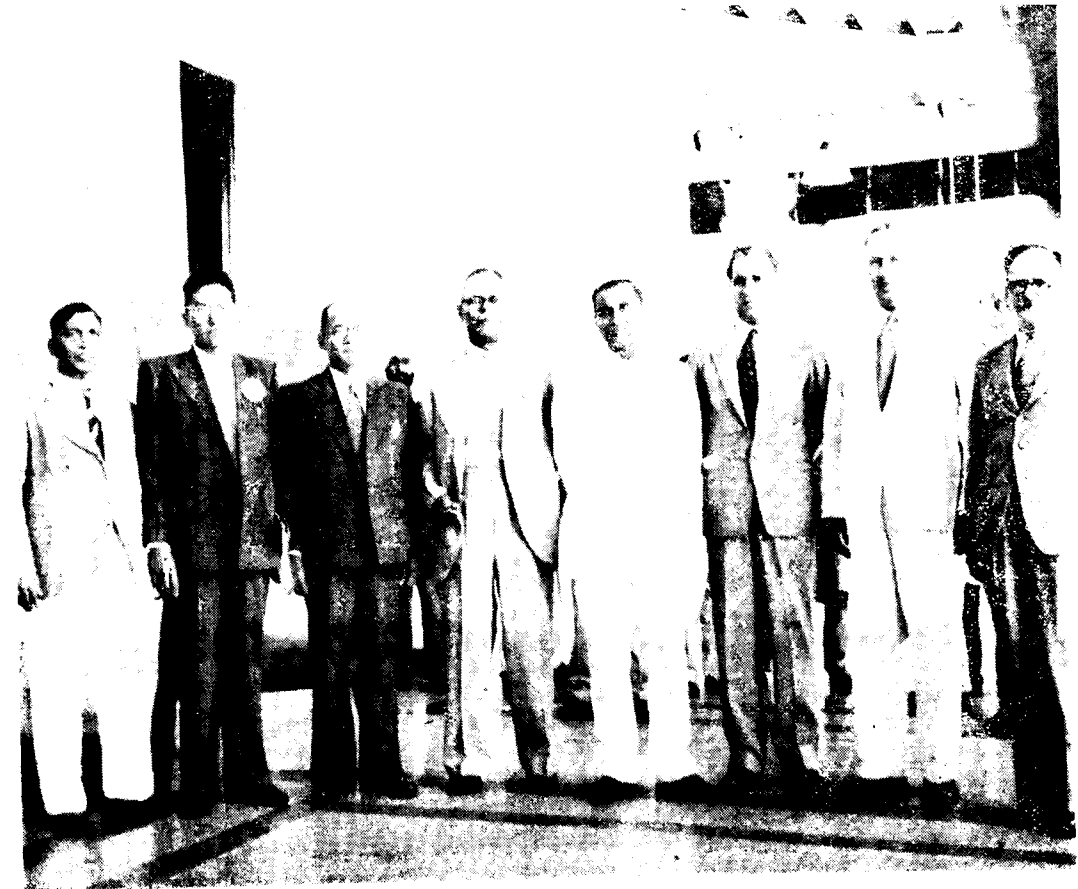
We have also interested ourselves in various legislation relating to the improvement, co-ordination and regulation of inland transport. Through the I. R. C. Journal and the Transport-Communications Monthly Review, we have been trying to explain our task to engineers and laymen alike. It is a matter of special pride to us that this Society was the first in the field to put forward a development plan in 1943, even before similar plans in other spheres came to be discussed. The first Five-Year Plan recently published by the Government of India has many facades of which the part relating to the development of roads is a direct outcome of what this Congress proposed at its Gwalior Session in October, 1943.

As in all previous Sessions we shall be discussing interesting Papers on different subjects of highway engineering. Many of our Members, I am sure, will exchange a lot of useful ideas and our junior members will listen in and benefit from this contact with their elders. Ours is a subject of perennial interest not only to engineers but to civilization itself. Roads have been the most important means of communication from the dawn of civilization. The steamship, the railways and the aeroplane have in recent times evoked justified admiration for the inventive genius of man and they have revolutionized our concept of mobility through the space. But when all is said and done, these new inventions have not obviated the use of roads. On the contrary, they have only increased the demand for roads and in many ways contributed to the improvement of roads themselves and of road transport.

INDIAN ROADS

In India throughout the ages the insular local economy of the village has been the characteristic social organization. A village or a group of villages used to form a closed economic unit producing all that it required with little need for outside contact. This insular economy of the village laid down the conditions of communication and transport in India. While the village remained the "unconnected atom", inter-communication was necessarily fragmentary and primitive. The extreme self-sufficiency of the village communities and the absence of inter-communication amongst them reacted on each other. The isolation of the village was at once the cause and the effect of the absence of communications.

Village self-sufficiency rendered long-distance communication unnecessary, and lack of communication facilities perpetuated the exclusiveness of the villages. On this plan, the community existed on an unalterable scale of low conveniences and lacked the necessary urge for social advance. Occasionally, an ambitious emperor would build trunk roads effectively to control his sprawling dominions. But when dynasties broke up, the lines of communication were fragmented to suit the limits of the mutually exclusive principalities.



On arriving to inaugurate the Session the Minister Shri N. Ranga Reddi was received by the Executive Committee of the Congress. In the centre of the photo are Shri T. Mitra & the Minister.

The trunk system built by an Asoka, a Sher Shah, or an Akbar would then degenerate into patches of carttracks incommunicable in stretch. Locomotion was also slow; the quickest means of transport was riding on horseback or in the horse-drawn carriage, so that the speediest movement in distance recorded in the history of pre-British India was the movement in 1573 of Akbar's army which "with hurricane speed traversed a distance of six hundred miles from Sikri to Ahmedabad in eleven days."

ADVENT OF THE RAILWAYS.

Things, however, began to change with the rise and growth of the British empire in India. New conditions were now laid for the improvement of inland communications; firstly, as a vehicle of commerce; and then, as a means of sustaining a unified, centralised administration in a country of continental dimensions. Simultaneously, however, with the consolidation of the British Indian empire in the middle of the nineteenth century came the advent of the steam engine and the railways. In his minute to the East India Company's directors in 1853, Lord Dalhousie argued his case for the establishment of railways in India in the following words:—

"England is calling aloud for the cotton which India does already produce in some degree and would produce sufficient in quality and plentiful in quantity if only there were provided the fitting means of conveyance for it from the distant plains to the several ports adapted for its shipment."

On the obverse side, Lord Dalhousie also noted the part that the Indian Railways were expected to play in the marketing of industrial goods from England:

"Every increase of facilities for trade has been attended with increased demand for articles of European produce in the most distant markets of India.....New markets are opening to us on this side of the globe under circumstances which defy the foresight of the wisest to estimate their probable value or calculate their future extent."

The primary duties of the railways in India were therefore to get, at diminished expenses, the raw materials for the manufacturing interests in England in exchange for imported industrial goods from that country. Whatever the purposes behind the introduction of railways in India, the steam engine, however, broke the self-sufficient inertia of the Indian economy. In a country possessing large natural resources for industrialization on her own account, the railways laid the material premises for a change in the socio-economic pattern of the country from the *local* economy of the isolated village to an expanding *national* economy.

Internally, the railways opened up the country-side and connected distant places: big towns and cities grew up at the terminal points and along the main line: trade and commerce of the country and the whole organization of its social life underwent a revolutionary change. If the railways, tearing through the length and breadth of the country, helped to integrate the loose sub-continent into a single economic whole, the needs of internal economy soon cried out for other means of communication to sustain it. When the isolated village came out of its shell, it looked up to its neighbours and wanted to reach them. Roads, and more roads became the economic urge of this process itself.

THE PUBLIC WORKS DEPARTMENT

In the early decades of the East India Company's rule, public works policy of the Government confined itself to the construction and repairs of military buildings and some roads of military importance. Indeed, till the time of Lord Dalhousie, the authority for construction of roads and buildings was vested in a Military Board in each Presidency. Even after the setting up of a Civil Department of Public Works in 1854, 'roads' was a subject still regarded as only of local importance fit to be disposed of by devolution to subordinate authorities. The Central Government transferred the responsibilities to the provincial governments, who, in their turn, passed them on to the various "local bodies". With the development of representative institutions in India, however, this country's needs, rather than the colonial requirements of British rule in India, began to be considered.

As the economic organization of the country outgrew the extreme isolation of the village, localisation of industrial efforts necessarily ensued. Organization and growth of such localised industries depended for their very sustenance on the existence of an adequate system of roads which alone could make available to a community goods that were produced in large-scale under conditions of concentration. Even after several decades of intensive railway construction in India, the country had, after World War I, barely 2 miles of railroads for every 100 square miles of its area and 12 miles for every lakh of its population. It was increasingly felt that in the continental dimensions of the country, the railways could at best serve the purpose of trunk communication over large distances and could not by themselves satisfy the entire needs of transport in this country. They could only form the larger framework leaving the roads to reach into the depths.

ADVENT OF THE MOTOR VEHICLE

The emergence of the motor vehicle in the present century and its mass production for public use revolutionized the outlook for road transport. Motor transport became as rapid, if not more, on short hauls, and had the advantage of being more tractable than the railways. It was also capable of being worked by small and cheap haulage units.

Prior to World War II, however, the question of road-rail competition had continued to trouble many serious minds and successive meetings of the Transport Advisory Council had been stalled by an interminable controversy about the respective claims of road and rail transport. Despite the deliberations of the Mitchell-Kirkness Committee, the Wedgwood Committee, and a host of other official inquiries, apprehensions had been shown alround that a considerable part of the "legitimate" custom of the railways was being lost to road transport.

As "railways" was a Central subject and "roads" provincial, the consequent emphasis of administrative policy laid down by the Government of India in these circumstances was on a restriction of road transport wherever it seemed to compete for custom with the railways. Such a policy also affected indirectly the interests of road development in the country, as roads came to be looked upon by the railway interests (and therefore, in a way, by the Government of India) as a sort of equipment in the hands of an "enemy". Transport conditions in the country during World War II and after have changed the emphasis in this matter. Transport needs of the country have in recent years increased to such an extent that the combined resources of the railways and the roads have been extended to the utmost and yet failed to catch up with the requirements of traffic.

The railways have not been able to accept all the traffic offered and have therefore had no cause for complaint against roads as trying to poach on the railways' preserves. Road-rail competition, as it had been known in the thirties, has ceased to exist. Development of roads, even roads running parallel to railway lines, would not now be regarded as hostile to railway interests. The Motor Vehicle Taxation Enquiry Committee, 1950, have now gone on record with a full recognition of these conditions and have recommended that short-haul railway traffic, where it is not required for heavy industrial purposes and where other means of transport are available, should be discouraged and that many existing short-distance feeder and link railway lines that are not paying their way should be dismantled unless they are required for purposes of defence.

CENTRAL ASSISTANCE

Ever since the Jayakar Committee reported in 1928 calling for a change in the whole road policy of the Government, road transport has been recognised as a matter of wider national importance and Governments, Central and Provincial, have been taking greater and more active interest in them. This interest, as has already been noted, gained special significance during World War II and after. If the institution of the Central Road Fund was the humble beginning for a planned road development in the country, the Nagpur Conference of Chief Engineers, in 1943 was a great landmark in this direction. We have not had to look back since then and the horizons of our forward vision have been gradually extending.

It is gratifying to note that the principles of the Nagpur Report have since been accepted by the Government as the basis for a planned development of the road system in India. The Government of India have now accepted direct responsibility, financial and administrative, for the development of a system of "National Highways" which had first been proposed by this Congress at its Gwalior Session in October 1943.

The final Five-Year Plan, just published, indicates a layout for 12,500 miles of National Highways, besides 20,600 miles of State roads of various categories. Actual plan of work for the National Highways during the five years ending 1955-56 provides for the construction of 450 miles of new roads and 43 very large bridges, besides a large number of small bridges. In addition, about 2,200 miles of roads will be improved. Besides such original works, nearly 10,000 miles of existing roads will be maintained in the country's system of National Highways. A sum of Rs 27 crores over a period of five years has been provided in the Central Government's plan for the development of National Highways.

A separate provision of Rs 4 crores has also been made in the Central sector for the development of certain selected roads (other than National Highways) for which financial liability has already been accepted by the Centre. Further, a sum of Rs 21.15 lakhs will be spent on the Central Road Research Institute. The total provision for road development in the Plan in the States' sector is Rs 73.54 Crores out of which Part 'A' States account for Rs 50.59 crores, and Part 'B' States for Rs 16.68 crores, the balance being for Part 'C' States. Roads' share of expenditure in the Rs 2,069 crore Plan thus works out at Rs 104.75 crores, or a little more than 5 per cent.

The Nagpur Report envisaged improvement and construction of roads making for a total of 1,47,000 miles of hard crust roads and 2,53,000 miles of earth roads as against the existing mileage of 79,000 and 1,63,000 respectively and estimated the total cost, at the 1943 level of prices, at Rs 450 crores. The Nagpur estimate of costs was computed at 50 per cent above the pre-war prices : at the present level of prices the estimate of works envisaged in the Nagpur Report would be in the neighbourhood of Rs 1,000 crores. Making allowance for the parts of the country now falling in Pakistan, the Five-Year Plan, as now formulated, would cover only one-eighth of what the Nagpur Report recommended.

Financial considerations have limited the scope and extent of the Plan and we cannot but feel a little disappointed that 'roads' had to bear more than their proper share of the cut. Having said so much we should also take note of the other side of the picture. Between 1914 and 1949, in 35 years, the total expenditure incurred in Part 'A' States on new construction and improvement (as apart from maintenance) was Rs 75 crores, against which must be seen the Part 'A' States' share of proposed expenditure of Rs 50.59 crores on road development during five years from 1951 to 1956. While in 18 years, between 1928 and 1946, the total credit to the Central Road Fund, the sole source of Government of India's road expenditure, amounted to Rs 25.31 crores only, and while even after the assumption of responsibilities for the National Highways, the Government of India spent in three years upto March 1950 Rs 3.90 crores only on original works on National Highways, the Government of India have now undertaken to spend Rs 31.21 crores in five years in the Central sector alone. This is a large progress indeed, much though we might hope for larger things.

ROAD FINANCE

Now that the *necessity*, as such, for the maintenance and development of an adequate system of roads has been recognised on all hands, our present problem is how to carry out the tasks set before us and how to find the necessary funds for the purpose. Since the Nagpur Plan was formulated in 1943, the scope and magnitude of the works proposed and the costs involved have "appalled" many who looked at the problem through financial considerations alone : they called the Plan "too ambitious." When a country has to build almost from scratch and make good the deficiencies of hundreds of years, the plan for construction must necessarily be ambitious. The realization of such ambitions is, however, limited by considerations of available resources, technical and material, most of all financial.

Roads in India are in dire need of funds for their maintenance to proper standards and for improvement. Money is also needed for the construction of new roads. With the growth of motor traffic and rise in prices of labour and materials, the "road bills" of the country have increased considerably in recent years. Types of pre-war surfaces have become inadequate and efforts made to maintain inferior surfaces have entailed too frequent renewal.

Upgrading of surfaces would be more economical in the long run if requisite funds could be found for this purpose. The Motor Vehicle Taxation Enquiry Committee, 1950, assessed that the total annual requirement of funds for the maintenance of India's roads to reasonable standards and for **normal development** (i.e., small scale development works not involving new construction) would be about Rs 35 crores at the present level of prices. This amount excludes new construction to be done on a planned basis for which works envisaged in the Nagpur Report would require an outlay of Rs 1,000 crores as against which funds provided in the final Five-Year Plan now amount to Rs 104.75 crores from 1951 to 1956. Financial eyebrows would at once be raised at this "appalling" demand. But with the phenomenal growth of motor transport as a source of taxation since 1920 funds for road works have already suggested themselves.

MOTOR VEHICLE TAXATION

The Jayakar Committee (1928) had recognised that motor taxation was "a source of revenue for road development." In the year 1948-49 the Government of India and the Governments of part 'A' States taken together collected Rs 28 crores—such collections have further increased in the following years from various taxes on motor transport factors including customs duties on motor vehicles, parts and accessories, customs and (countervailing) excise duties on motor fuel, motor vehicle taxes, and a host of other imposts.

The total road expenditure of the Governments, Central and Provincial, during this year was Rs 21.68 crores only. While the States Governments collecting Rs 6.77 crores from motor vehicle users spent Rs 14.00 crores on road works, the Central Government collecting Rs 21.05 crores from taxes on motor vehicles and commodities required for their working and maintenance spent only Rs 4.78 crores including contributions to the Central Road Fund. It will thus appear that while the Part 'A' States spent on road works from their revenues more than double the amount collected from their "road-user" taxes, the Government of India who collected 75 per cent of such "user" taxes diverted more than 72 per cent of these tax receipts to non-road purposes.

GOVERNMENT A PARTNER IN THE ROAD-TRANSPORT INDUSTRY

The Motor Vehicle Taxation Enquiry Committee, 1950, recommended that Government should regard themselves as partners in road transport undertakings as a national industry irrespective of whether particular forms of transport were state-owned or not. Government in the exercise of their public functions, supply and maintain the roads which constitute the main capital assets for transport undertakings. Government spend money from public funds for supplying good roads to the community and charge the other partners, the transport users, equitable rent in the shape of various "road-user" taxes on motor vehicles and motor fuel, for the use they make of the roads. Looked at from this point of view, such taxes on motor transport factors are composed of two separate elements :

- (i) an element of 'rent', or required tax, which is paid by the transport factors as a charge, **quid pro quo**, for the use they make of roads supplied and maintained by the Government ; and
- (ii) an element of 'tax' proper or unrequited payment, which every constituent in the community has to contribute to the general revenues of the Government. It is only plausible and reasonable that this,

'rent' portion of the taxes on motor vehicles and commodities required for their maintenance and working should be ploughed back in full for the benefit of the road account by spending it specifically on road purposes.

In addition to the share of the road-user taxes, representing the "road-rent" portion of such taxes paid by motor transport factors, additional contributions are also required from the general revenues of the Centre and the States as **quid pro quo** for the "community use" made of the roads (apart from the use made of them by the motor transport factors).

The Salter Committee in the U. K. (1932) had laid down the principle that motor transport factors should pay for two-thirds of the "road bills" of a country, the remaining third being contributed by the general revenues. If these principles were accepted, the "road rent" portion of Rs 30 crores "user" taxes, together with a third as much from the general revenues, would form the basis of a road fund which might be utilized for the maintenance to proper standards of the existing roads and their normal development.

THE FUTURE

For new construction envisaged in the Nagpur Report, or provided for in the Five-Year Plan, further funds would be necessary. The Motor Vehicle Taxation Enquiry Committee, 1950, suggested that finances for this construction programme should be found from a "ways and means fund" made up of savings and surpluses, additional "development" grants from the general revenues and of loans raised for the purpose. The execution of a construction programme of the magnitude envisaged in the Nagpur Report, the beginnings of which have been made in the Five-Year Plan now under way, cannot be financed entirely from revenues however husbanded: resort to capital sources outside the revenue account will be necessary.

The Royal Commission on Agriculture in India, 1931, were of opinion that road development in India should look to capital sources for necessary funds instead of relying solely on current revenues. The Jayakar Committee, 1928, while deprecating large schemes for road expansion financed from loans for the servicing of which the revenues might have to be mortgaged for long periods, recommended that construction and reconstruction works might be suitably financed from short-period loans against revenues clearly in sight to cover interest and sinking fund charges. The Nagpur Report expressed the view that "if national debt could be incurred for war, it could be incurred for more constructive ends," and suggested that the amortization of loans for road construction might be "extended over the longest period economically possible."

Objections are often raised to the financing of road construction works from capital sources. Road works, it is said, are unproductive expenditure in as much as they do not produce goods themselves. This view, if fallacious, needs examination and refutation. As Mr. McKelvie, last year's President of the Congress remarked, "We are too apt to take roads for granted as we take mountains and rivers and the air we breathe," and as such we too often fail to see the obvious benefits arising from good roads. If good roads cost money, an effective system of roads can very well be likened to a well-planned business.

It is a long-term investment. The Indian Road and Transport Development Association, some years ago, conducted a survey in certain areas of Bombay. The investigations revealed that the financial benefits from road development in the area examined amount to Rs 11.97 lakhs a year, whereas the roads so developed would cost, including construction and maintenance, something like Rs 4.32 lakhs annually.

This would indicate that for every Rs 100 spent on roads the return to the community in various benefits would amount to Rs 277. Better communications

would undoubtedly bring about a direct increase in national wealth and a considerable increase in revenues. Roads pay for themselves after they are built, not before or simultaneously, and in the end they show up as the triumph of many hands. **"A country pays for its roads whether it has them or not, and it pays more when it does not have them."** How many times these words have been uttered from the platform of our organisation and elsewhere. A belief gained currency sometime ago that a lie repeated a hundred times could assume the plausibility of truth. But no one would suppose for the matter of that, that a truth repeated a thousand times can ever depreciate into its opposite.

COMPARISONS.

I would quote here a few passages from an authoritative publication on the American Highway Policy which describes the condition of roads in that country at the end of the nineteenth century in the following words:—

"Of all the great nations of the world America had the worst roads..... The American rural community permitted itself to remain literally mired in the mud, seasonally isolated from the energising currents of social and economic life.....It was a pattern that had grown out of community self-sufficiency....." With respect to transportation rail-roads largely monopolised the popular imagination.....With the trend toward urbanism, it became apparent that wide disparities had arisen in the rates at which improvements were being made in the different media of transportation. Rail-road service was being extended and technically perfected: highway service, constituting an integral part of practically all traffic movement, had undergone little if any net improvement for fifty years. The rural economy was restricted by eighteenth century standards of mobility in an era when the urban population was reaping the direct benefits of modernised technology and organisation. There arose a national undercurrent of pressure for adjustments that would enable the rural population to share in the new ways of life emerging from industrialisation. Road Reform was hit upon as one of the most direct and obvious methods of achieving this objective."

This description of the American highway system, fifty-five years ago, reads strangely similar to conditions obtaining in India to-day. Yet, America was able by persistent application of the "road-user" taxes to road expenditure completely to transform these conditions: at present she has the best developed highway system in the world. This rapid growth of the highways in the U. S. A. is attributable to two factors: firstly the enormous increase in motor traffic in the country bringing with it large revenues on account of registration fees and the "gasolene taxes," and, secondly, the determination of the State and Federal Governments to devote the proceeds of such special "user taxes" to the improvement of the highways over which the motor vehicles operated.

In the U. S. A. these "user taxes" are mostly collected by the constituent States and all but 10 per cent of such collections are spent for highway purposes. In 21 States the use of any part of these funds for non-highway purposes is prohibited by law. Even then, with the present level of development of motor traffic in the U.S.A. these "user taxes" pay for 61.8 per cent of all highway expenditure, the balance of funds being found from the general revenues of the Federal Administration and of the States. Methods of highway finance in the U.S.A. have amply demonstrated the proposition that the main highways can be made self-supporting if the revenues from road users are devoted exclusively to highway improvement.

THE CHIEF PROBLEM

A former Chairman of the Highway Transport Committee of the International Chamber of Commerce once remarked that "the chief problem in the highway field at

present is one of finance." In India, especially, such considerations of finance have clouded the horizons of the most imaginative of our planning enthusiasts. The number of motor vehicles in India has not yet reached the figure that the U. S. A. passed nearly forty years ago. Multiplying the number of motor vehicles will not avail while roads do not for the most part exist and while, even where they do exist, they remain incapable of bearing any appreciable volume of motor traffic.

Total revenue receipts from "user taxes"—till now such special "user taxes" are paid only by motor transport factors—will therefore not be nearly enough to feed the funds for our roads. But even to the extent to which they are available, diversion of these "user taxes" to other than road purposes thwarts the interests of transport planning in the country. Urban traffic congestion remains unrelieved: village roads remain unbuilt; and sound long-term road planning suffers in consequence. Such diversion frustrates the country's programme for road development which works under constant inhibitions in having to depend on the vagaries of annual legislative sanctions instead of being fed from "road user" taxes which can be foreseen with a fair degree of accuracy.

Speaking of highway finance, we have always felt that it is not enough to provide requisite funds for our road works. The present budgetary system pursued by the Government also needs revision. At present grants are given for road works on a yearly basis, unspent moneys lapsing at the end of a financial year. Such yearly grants, moreover, are subject to curtailment before allotments are actually handed out, and allotment of funds made late in the year would often entail wasteful and uneconomical working for fear of lapse.

We in Bengal have experienced especial difficulties in this financial procedure which cuts across our working season from November in one financial year to June in the next. The Nagpur Report had recommended that, in the interest of continuous road development in the country on a planned basis, the Road Plan should be enjoined as a statutory authority. The Motor Vehicle Taxation Enquiry Committee, 1950, endorsed these recommendations and suggested that funds for this Road Plan should be set apart by a statute and made over into non-lapsable Road Funds, so that expenditure at an even minimum pace might be ensured and violent fluctuations from year to year might not occur.

The Motor Vehicle Taxation Enquiry Committee cited the example of the U.S.A. where the State authorities knew, two years in advance before work on a project commenced, as to what Federal grants would be available for the purpose. Such grants, once announced, could be taken on a "matching" basis (the State authorities undertaking to raise equivalent funds from their own resources within three years after constructions actually commenced; and the grants would not lapse but would be available for expenditure till the particular project was completed.)

This Congress has been urging for years past that the Central Highway Fund and the States Road Funds be instituted on the same non-lapsable basis, and that all moneys to be made available for road expenditure of the various administrative authorities be credited to such non-lapsable Road Funds. The authorities responsible for the roads will then be tolerably sure within reasonably close limits as to what funds will be available for roads in their budgets for a number of years ahead. It is gratifying to learn that the Government of India is now considering legislation embodying these very principles.

Before I close I must apologize to you for the length of my address and thank you for giving me a patient hearing. I now request you, Sir, to inaugurate this, the 17th Session of the Indian Roads Congress.

—o—

INAUGURAL ADDRESS

Delivered by Shri N. Ranga Reddi, B.A., B.L.,
Minister for Public Works, Madras State at the 17th Session of the
Indian Roads Congress
AT MADRAS
on the 8th February, 1953.

Mr. President, Ladies, and Gentlemen,

I am very grateful for the great honour done to me in asking me to inaugurate the 17th Session of the Indian Roads Congress.

When I look at the list of the great men like the Governors of Provinces and the Chief Ministers who have inaugurated the previous sessions of the Indian Roads Congress, I feel very diffident whether I can successfully perform the duty allotted to me. But with your co-operation and goodwill, I feel that my task can be considerably lightened.

Before I begin to say a few words, I would like to extend a hearty welcome to the President and the Delegates of this Conference. We have all listened to an interesting and instructive address of the President of this conference. The President has told you that the Indian Roads Congress met last time in Madras in the month of February 1945 and I hope that between then and now you would find much in Madras State which would justify the creation of the Highways Department. I find from the records that the Indian Roads Congress was started in 1934 and that the membership of the Congress has risen from 73 in 1934 to 1672 in 1952. This increase in the membership testifies to the popularity and usefulness of this society though the membership does not hold out any material rewards. I find that the Congress advises the Government on technical matters connected with roads. It is really gratifying to note that the Nagpur Report of 1943 really a very valuable document connected with the improvement of roads, is the result of deliberations in these conferences. As you all know, the roads had been under the control of either the District Boards or the Taluk Boards and the Engineers who were in-charge of roads upto the district level were under the control of the local bodies. It was felt by many that when there were slow-moving vehicles on the roads, the roads did not require much attention; at any rate not as much as they require now. But after the advent of the motor vehicles, better roads were required for plying motor vehicles and everyone has been asking for a better road. The State has been expending considerable sums of money over the making of new roads like cement concreting, etc. and maintenance of roads, taking into consideration the intensity of traffic on the particular roads. Every effort is made to give a better kind of road, consistent with the allotment made by the State. The Highways Department comes in for a great deal of criticism for the simple reason that most men use the roads every day and therefore they come under the fire of public criticism. Very often adverse criticism on the condition of roads is not justified. The ignorant layman without knowing the real cause for the condition of the road blames the engineer for the bad condition of the road. Lack of finance is rarely accepted little knowing that the maintenance of roads is only one of the many duties and obligations that this State has to discharge. Projects in Irrigation and Electricity are given top priority to make up the food deficit and provision for Highways is considerably cut. That is so in the Five-Year Plan relating to the Madras State.

I am grateful to the President for the compliment paid to the Madras State that Madras is an advanced mile-post in our Highway to progress. Let me in this connection pay my tribute of praise to the engineers working in the Highways, Irrigation and Electricity in the Madras States for the good work they have been doing and for the efficient discharge of their duties and the very high standard of proficiency and integrity they are maintaining. As Minister for Public Works, I get requests from the Centre as well as from other States that the services of the Madras Engineers might be loaned to them on higher salaries. Very often I have to displease the engineers by refusing to lend them as this State can ill-afford to part with any of its trained engineers in view of the large projects that this State has undertaken. Very soon this State would be confronted with a serious problem of how best to continue the engineers working in projects which are nearing completion.

You have paid a compliment in your Presidential address that Madras has been the first State to create a separate Highways Department. The Madras State has taken into account the views expressed by organisations like yours and has created that department and it is up to the department to justify its continuance. Let me assure this conference that the resolutions passed by you will be given the greatest consideration by this Government.

Madras has been spending a considerable sum over roads. The expenditure has risen from Rs 375 lakhs in 1946—47 to more than Rs 800 lakhs in 1951—52. This amount has been found inadequate to meet the needs of the roads. Madras State has got the largest mileage of roads (i.e., 43,498 in 1951). Still it must be observed that most of the villages are not accessible for want of roads. There are 36,000 villages in the Madras State and only 12,000 villages containing about 64% of the population is being served by the existing road system. A very large number of villages is still away from the road system. Even the so-called rural roads in most cases are passable only in dry conditions. I should like to mention in this connection that there are large tracts in our State known as REGADU or black-cotton soil and this soil presents a very difficult problem for engineers in road-making. When the soil is dry it can stand a very high pressure and presents a very smooth surface which can carry even very heavy motor vehicles; but after rains, the soil becomes so soft, when it is wet that even a man cannot walk without sinking his feet in the mud. It is very gratifying to note that our engineers are tackling this problem and there is a Soil Laboratory established in Madras State which is carrying out tests and experiments to maintain roads satisfactorily in black-cotton tracts with sand admixture to correct proportions. The lack of bridges and crossings is also a serious obstacle to traffic of all kinds in Madras State. There is a great need for providing suitable crossings and we have been taking up number of bridge works; but we have not been able to provide bridges over all streams and rivers wherever necessary as our finances are limited. During the short period that I have been as Minister of P.W.D., I have been faced with the problem of eliminating expenditure which the public criticise as wasteful. It is not that I always accept their criticism, but in certain cases there is some ground for justification. In the highways Department in the Madras State all works big or small with very rare exceptions have been entrusted to contractors for execution and very often the contractors quote much above the estimate rates and the Highways Department is compelled to entrust the work to a contractor not having any other method of execution. Under similar circumstances, the Irrigation Department in the Madras State undertakes to execute the work departmentally. It has yielded very good results. It has provided an opportunity for gaining experience to our young engineers and it has also saved some money to the State. We are not at the mercy of big contractors and I would like you to discuss this question, viz., whether departmental execution of works cannot be undertaken in the Highways Department also. There is also another point which I would like you to consider. Very often on the floor of the Legislative Assembly I have been faced with questions relating to the revision of estimates—one estimate going higher than the other for the same work and sometimes the estimate is revised thrice. It is very necessary that both in the interests of the State and the people it should be known definitely what the State has to spend when it embarks on a particular project. These

two problems might appear to be simple to you; but to a layman when he undertakes to justify the actions of the engineers in public or on the floor of the Assembly, they are all difficult. It will be good if an authoritative solution can be given by the Indian Roads Congress.

I have detained you for a very long time. I hope that you will find your stay in Madras very comfortable and congenial for your discussions.

Let me once again thank you for having asked me to inaugurate this Session.

MESSAGE FROM

SHRI O. V. ALAGESAN,
DEPUTY MINISTER, TRANSPORT & RAILWAYS, INDIA,

to

the Seventeenth Session of

THE INDIAN ROADS CONGRESS

at Madras on the 8th February 1953

I SEND my greetings to the Highway Engineers who have gathered at Madras for the 17th Session of the Indian Roads Congress.

India has embarked upon her first Five-Year Plan with high hopes. The success of almost every phase of the Plan depends to a large extent on India's Engineers. The Central and State Governments of India place great reliance on the country's engineering talent and are confident that it will bring to fruition the plans on which the future of the country largely depends.

India's Highway Engineers have been in the vanguard of planners; it is they who showed the way by producing the Nagpur Plan. I have full confidence that they will also lead the way in executing the Five-Year Plan.

MESSAGE FROM HIS EXCELLENCY SHRI K. SANTHANAM,

Lt. Governor, Vindhya Pradesh

I have great pleasure in sending my good wishes for the success of the Session.

I am well aware of the significant role played by the Indian Roads Congress in stimulating thought and research regarding the construction and maintenance of roads and bridges. I consider that the roads programme of the Five-Year Plan is its most important part. I hope this Session of the Indian Roads Congress will discuss the means and ways of executing this programme as speedily and efficiently as possible.

MESSAGE FROM THE PRESIDENT, THE INSTITUTION OF ENGINEERS (INDIA)

On behalf of Institution of Engineers (India) I send most cordial greetings and good wishes to the Seventeenth Session of the Indian Roads Congress.

EXHIBITION

A technical exhibition was organized on the Government House Estate where the Session was held.

The exhibition which is now a regular feature of the annual Session is organized to bring home to the layman the importance of roads in the national economy of the country and to educate the engineer about the latest methods and machinery used in road and bridge construction.

The exhibition was opened on the 8th February 1953 by Shri C. Subramaniam, Minister for Finance, Madras, who went round all the Stalls.

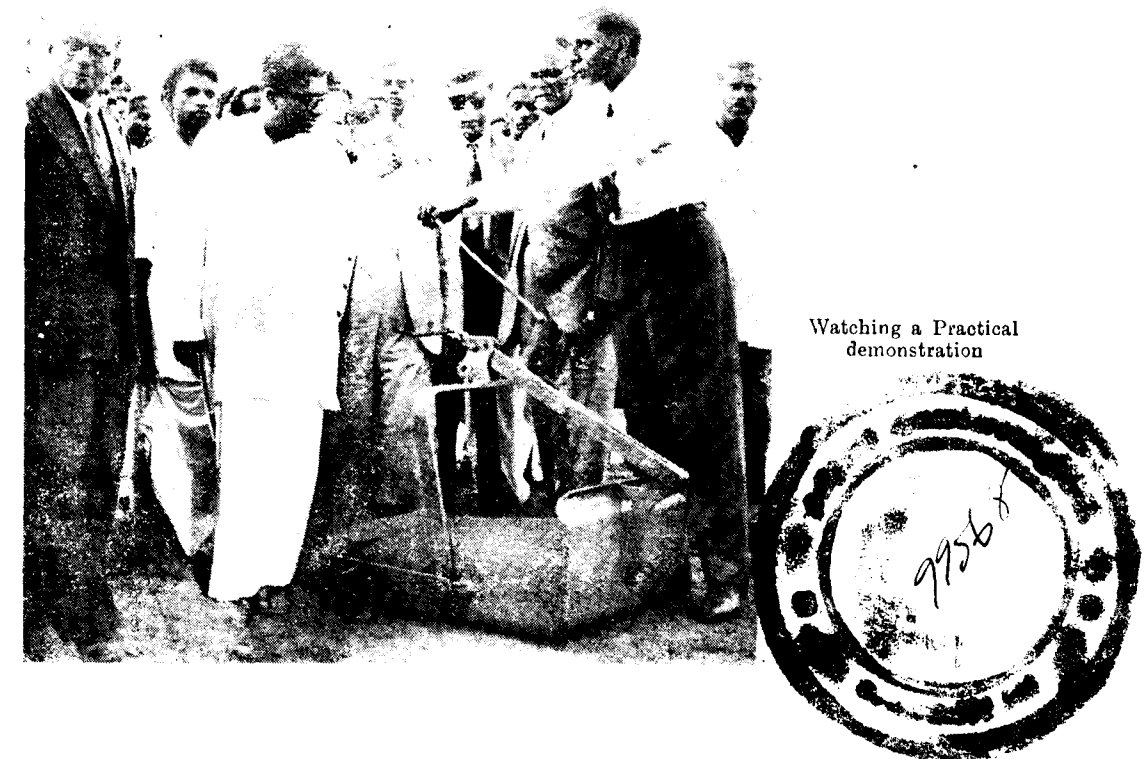
observed that communications were the nerve centre of the various developmental activities and naturally they were greatly interested in the development of these communications. In this connexion he stressed the duty of the engineers in making the Five-year Plan a success, as far as communications were concerned.

He expressed the hope that the public at large would take advantage of the exhibition and get therefrom an idea of the intricate processes involved in road-making. In these days of democracy, the Minister remarked, it was necessary that the people should know what the experts



Shri C. Subramaniam, addressing the delegates when he inaugurated the exhibition.

Speaking on the occasion, the Minister said that the State Government was vitally interested in road development. He were doing. "We have to satisfy the taxpayer that he is getting his money's worth."



Watching a Practical demonstration

The Minister further said that at present they were importing raw materials like bitumen at a high cost for road-making. No doubt bitumen roads were better and lasted longer. But there was great need for developing local materials of construction. In this connection, he referred to the lignite mines in South India and said that if they were successfully exploited, it might be possible to manufacture bituminous binders locally and at cheaper costs.

The exhibition remained open throughout the Session week and attracted large crowds. Many educational institutions of Madras brought their students to see the exhibits which were highly educative and informative.

The exhibits included models, photographs and explanatory charts of roads and bridges, and machinery and materials used for the construction of the modern roads. Demonstrations of the actual working of the equipment were given.

The following organizations took part in the exhibition :

1. Government of India, Roads Organization

Statistical and graphical presentation of data regarding road development, vehicles, etc. Broadsheets entitled "Roads for Tomorrow" as programmed in the Nagpur Plan. Proposals for road development under the Five-Year Plan. Sample copies of periodicals received in the library of the Roads Organization.

2. Buildings and Roads Research Laboratory, Karnal, Punjab.

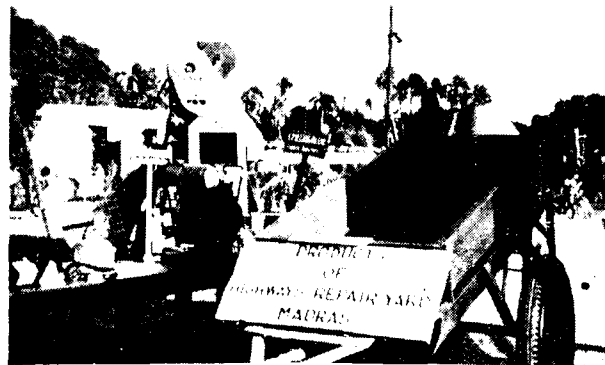
3. Highways Deptt. Research Laboratory and Highways Deptt. Workshops, Madras.



After inaugurating the exhibition the Minister went round the stalls. He is seen inspecting the Stabilised soil models in the Karnal Laboratory stall.

4. Some State Governments contributed charts and maps depicting their road development plans for the future.

3. M/s Insulated Cables
4. M/s Concrete Association of India
5. M/s Dalmia Cement (Bharat)
6. M/s Dunlop Rubber Co., Ltd.
7. M/s Garlick & Co., Ltd.
8. M/s Greaves Cotton & Co., Ltd.
9. M/s Heatly Gresham Ltd.
10. M/s James Engineering Co.
11. M/s Kailash Bros.
12. M/s Kamani Engineering Corporation Ltd.
13. M/s Larsen & Toubro Ltd.
14. M/s Marshalls Sons & Co. (India)
15. M/s Millars Timber & Trading Co. Ltd.,
16. M/s Shalimar Tar Products (1953) Ltd.
17. M/s Simpson & Co.



This needs no caption

5. Firms

1. M/s British Insulated Callender Cables.
2. M/s Burmah Shell Oil Co.

18. M/s Standard Vacuum Oil Co.
19. M/s Stressed Concrete Construction Ltd.
20. M/s Turner Hoarse & Co.
21. M/s William Jacks.

Lectures, Panel Discussions, and Technical Films

Lectures

An interesting talk on the "New Punjab Capital at Chandigarh" was given by Shri P. L. Varma on the 11th February. The same afternoon, Shri B. D. Puri, Secretary, Board of Engineering Research, spoke on the functions of his Board.

Panel Discussions

In order to exchange views on the practice adopted in India for the construction of cement concrete pavements and to take stock of the experiences of various members, a "panel" discussion was arranged on the 11th February. Earlier a brief

questionnaire to indicate the basis for discussion and a summary of the replies received from the States were circulated. Information collected by the Concrete Association of India was also circulated. The Panel discussion proved to be very popular and attracted many speakers.

Technical Films

In the evenings technical films connected with highway engineering were shown. In spite of the many attractions of the City of Madras, the shows were well attended by many local people besides the delegates.

Technical Discussions at the Session

Record Attendance

THIS year there were only four technical Papers for discussion at the Session. On account of the small number of Papers two research notes were also thrown open to discussion

classification were discussed. Various methods of soil-cement construction were described and a code of practice was suggested.

The first paper, discussed on the 8th February, dealt with the "Investigation, Design and Construction of the Cauvery Bridge at Pugalur." The total length of bridge is 2,634 feet with 40 equal spans of 66 feet. Several speakers took part in the discussion which was continued even on the next day. On the 9th February the discussion on the remaining three Papers was completed.

The fourth Paper described the test to destruction of a 96 feet 'U'-shaped prestressed concrete girder. The details of the design and construction of the prestressed girder, the method of test, the instruments used, the observations recorded, and an interpretation of results were given.

The second Paper on "Some Examples of Prestressed Concrete Bridges" gave the reasons justifying the use of prestressed concrete in bridge construction and described the design of two bridges. This Paper was contributed by two British Engineers from England.

The two research notes contributed by the Central Road Research Institute were discussed on the 12th February. The note entitled "Some Observations on Airfield runway Surfaces" gave the results of the examination of runway pavements of two aerodromes in India. The other note dealt with the study of "Compaction of Some Alluvial Soils of India."

The third Paper entitled "Soil-Cement in Road Construction" described in detail the properties of soil-cement and advocated its use in road construction as the most economic specification for certain purposes. The importance and methods of soil

The spacious Rajaji Hall was always packed during the discussions. Impressed with this a senior member, who represented a sister Society, remarked that he had rarely seen any technical meetings so well attended. Later he wrote to congratulate the organisers on this on behalf of the Society he represented.

HERE AND THERE

1. INTERNATIONAL CHAMBER OF COMMERCE MEETING

THE Road Transport Committee of the International Chamber of Commerce met in Paris in July. The main points of the resolution of road development plans adopted by the Committee were:—

- (i) That a higher proportion of the taxes levied on road transport should be spent on road development and maintenance.
- (ii) That adequate means of access should be provided to the terminal points of other forms of transport
- (iii) That when improving national road systems the possibility should be borne in mind of linking the national roads with the International Highway Network.
- (iv) That adjacent customs offices should be established at frontiers to eliminate loss of time due to the duplication of formalities.

(Extracted from 'World Highway Report No. 17/18'—September 1952).

2. ROAD CONSTRUCTION IN THINLY POPULATED AND UNDERDEVELOPED COUNTRIES

IN a report presented at the ninth Congress of the International Association of Road Congresses held at Lisbon in September last, the British Ministry of Transport writes: "It has not been found possible to produce any formula for deciding widths of very lightly trafficked roads, and these must be determined by the judgment of the engineer, bearing in mind existing traffic and traffic likely to be attracted to the road when it is improved. Many miles of existing roads have carriageways of about 12 ft in width, which is reasonably adequate for the traffic of the neighbourhood, but extensive realignment, passing place construction and visibility improvements are required. On more heavily trafficked routes carriageways of 16-22 ft width are normally provided with two verges varying in width from 3 to 10 feet.

The Ministry of Transport suggests that in designing road capacity the road should be planned to accommodate the hourly volume which is expected to occur at least 30 times in a year, extra provision being made for the estimated growth of traffic. On this formula a two-lane

carriageway of 22 ft width will take up to 3,000 vehicles per day. In the north-west of Scotland it has been found that where there was a possibility that traffic within 10 years would reach 400 vehicles per day, a two-lane carriageway of 18 ft or 16 ft width was justified, otherwise a single-lane carriageway of 10 ft or 9 ft width was provided. On such carriageways inter-visible passing places are constructed at intervals of not less than 150 yards.

By reason of the large number of accidents at road junctions, particular attention is being given to the layout of inter-sections.

Limiting horizontal radii and gradients cannot generally be defined for this class of road. A maximum gradient of about 1 in 10 is aimed at, and visibility distances are related to the speed value of the road, varying, for example, from 900 ft for a 60 m.p.h. road to 150 ft if the road is suitable only for speeds of 20 m.p.h.

(Extracted from 'Contractors Record and Public Works Engineer'—December 1951)

3. COST OF INADEQUATE ROADS

A typical example of a traffic artery which falls short of even the reasonable needs of motor transport is the Birmingham to Bristol trunk road, A. 38.

This road carries heavy industrial traffic and passes through narrow and congested areas. For the greater part of its length the road is only wide enough for two lines of traffic, and more than 25 per cent of its length is subject to the 30 miles an hour speed limit for built-up areas. Sight distances are generally poor.

The extent to which just this one road is a burden on the national economy is indicated by the savings that would result if a proper road were built. A motorway of 76 miles is projected between Birmingham and Bristol (as against the present route of 88 miles). This would cost some £7,000,000 to construct. Writing off the cost over 25 years the annual cost would be £516,000, made up of £76,000 for maintenance, £280,000 for interest (4 per cent) and £160,000 for the sinking fund.

A census shows that 4,400 vehicles use the present road every day and, after allowing for the different operating costs of various types of vehicle, the expenditure incurred by this Birmingham-Bristol traffic is about £3,200,000 a year.

In analysing this expenditure it is convenient if the numbers of the different classes of vehicle using the road are taken

as weights to give a notional typical vehicle. Such a vehicle would have an average speed of 27 m.p.h. and would cost 14s 7d. an hour, or 6.5d. a mile, to operate on the present road, and, of this sum, 3s. 10d. an hour would be a variable dependent solely on the time element. The notional vehicle would be able to cover the 76 miles of an unobstructed motorway between Birmingham and Bristol in 2 hours, at an average speed of 38 m.p.h., thus saving 1 hour 15 minutes on the whole journey, equivalent to 0.75d. per mile run. But the saving in time is by no means the only saving to be expected from a motorway. Owing to the easy gradients and curves and the possibility of maintaining an economical speed without any stopping or slackening, the fuel bill would be cut by at least 40 per cent, equivalent to 0.52d. per mile; the cost of tyres by 15 per cent (0.06d. per mile); and maintenance and repairs by 10 per cent or 0.06d. per mile. Thus a total saving of 1.39d. per vehicle-mile for vehicles using the road would result, which amounts to £700,000 a year for all vehicles on this route.

A saving of £700,000 a year against the cost of £516,000 gives a profit of £184,000 or 35 per cent.

(From "B. R. F. Bulletin"—3rd June, 1922)

4. A SUBSTITUTE FOR PETROL

Sludge Gas as Traction Fuel

THE Croydon Corporation uses its sewage and sludge to provide gas fuel for the Corporation boilers, and for eight-cylinder gas engines which provide the motive power for the Corporation alternators (270 KW).

A third use for the sludge gas is as a fuel for traction purposes.

Vehicles

Vehicles running on the sludge gas are fitted with traction cylinders which are 8 inches outside diameter by 6 feet 6 inches

long overall, and weigh 150 lb. The water capacity is 1.76 cubic feet and they store about 400 cubic feet free gas compressed to 3,000 lb. per square inch. Further equipment comprises high and low pressure reducing valves, gas air mixing valve pressure gauges and isolating valve. The operation of charging through the flexible hose is easily effected and occupies no more time than filling with petrol.

It is also a simple two minute operation to change over from gas to petrol when necessary. Generally speaking vehicles are equipped with four cylinders, which

when fully charged give the equivalent of about 10 gallons of petrol. The consumption varies fairly widely between 15 and 30 cubic feet per mile, the former figure being attained when running light on a long run and the latter on the ordinary work of a refuse collecting vehicle with constant stopping and starting and a considerable mileage in the lower gears.

Over 60 vehicles have been converted to run on gas and are effecting a saving of about 85,000 gallons of petrol per annum.

Bombay has also used Sludge Gas as Tractor Fuel

The following is an extract from the I.R.C. Journal Vol. IX for 1944-45.

This description occurs in the Tour notes of the 20th Council Meeting relating to the 25th March 1944.

"A special feature of the (Sewage disposal) works is the utilisation of sludge gas for cooking and heating in the local hospital and also (for running some Corporation lorries). The gas is compressed to 5000 lbs. per square inch and followed at a pressure of 3,500 lbs per square inch into cylinders fitted on the lorries.

"A point of interest is that the output of gas from the Sewage is 0.7 cubic feet per inhabitant and 1,500 cubic feet is required to run a ten-ton lorry for 55 miles.

(Extracted from "The Surveyor"—January 1953).

5. U. R. F. STUDY ON FISCAL CHARGES

The Union Routiere de France has recently published a Report on the fiscal charges levied on vehicles in the various countries.

The vehicle used as a unit of comparison is the average type of private car with the following specifications:—

Taxable power	8 cv
Consumption	10 litres petrol per 100 km*.
Cost price (new)	700,000 Frs.
Amortization	8 years.

A distinction has been made between: permanent charges (registration fees, circulation tax, import duty and annual circulation tax) and variable charges (fuel taxes).

RUPEES

Countries	Annual Charges	Fuel Tax	Total
U. S. A	38	68	156
Australia	219	58	277
Sweden	224	231	455
Netherlands	300	238	538
Belgium	321	275	596
Germany	265	340	605
Switzerland	333	327	660
France	238	503	741
Italy	88	697	785
Spain	614	335	949
United Kingdom	645	333	978

(Extracted from 'World Highway Report No. 17/19—September, 1952).

6. THEORY AND REALITY IN ENGINEERING CALCULATIONS

[I]t is possible to be at one and the same time an outstanding mathematician and a mediocre engineer for, in engineering as in many other arts, pure science is of little avail unless it is directed by sound commonsense.

Two principal considerations must be borne in mind: First reality, which is independent of any ideology or preconceptions; Secondly theory, which is of human origin and of arbitrary character, which seeks to impart a simplified and compre-

* 10 litres per 100 kms. = 2 3/16 gallons per 62 miles.

hensible image of reality, enabling reasoning and the formulation of conclusions to be made with the least risk of error.

No theory coincides exactly with reality, and their divergencies are the principal cause of most of the false reasoning of theorists. Who has not, in identifying an approximate image (which is the theory) with the object itself (which is the reality), followed indefinitely the thread of his reasoning oblivious of the fact that he has long before left the track of healthy logic?

In metal construction the working of most structures depends on a smaller number of factors than does reinforced concrete structures, because the latter are subjected to the factors of monolithism and variations with the weather of the characteristics of some of their components. This is why builders in reinforced concrete are particularly exposed to the vices of impenitent theorists-(from a translation of "La Pathologie du Beton Arme" by Henry Lossier, appearing in "Concrete and Construction Engineering").

7. CONVERSION FACTORS

Products:		Products:	
Superior Kerosine	280 Gals to a ton	Furnace Oil	241 Gals to a ton
Inferior Kerosine	272 " " "	Light Diesel Oil	258 " " "
Motor Spirit	317 " " "	High Speed Diesel Oil	271 " " "
Aviation Spirit 100 O.N.	324 " " "	Jute Batching Oil	250 " " "
Aviation Spirit		Mineral Turpentine	284 " " "
Other Grades	313 " " "	Solvent Oil	308 " " "
Aviation Turbine Fuel	281 " " "	Vaporizing Oil	278 " " "

8. PARALLEL SERVICE ROADS TO PREVENT RIBBON DEVELOPMENT ALONG NATIONAL HIGHWAYS

NOTICING that ribbon development along National Highways in expanding towns was becoming acute and that this had necessitated the construction of new bye-passes at considerable cost every time the highways got congested, the Government of India have suggested to all State Governments that:

(i) Two parallel service roads should be provided on either side of the National Highway in built up urban areas before building construction is permitted on new areas. These service roads should have access to the National Highway at a few points (roughly half a mile or farther apart.)

(ii) The necessary land for the service roads should be acquired simultaneously

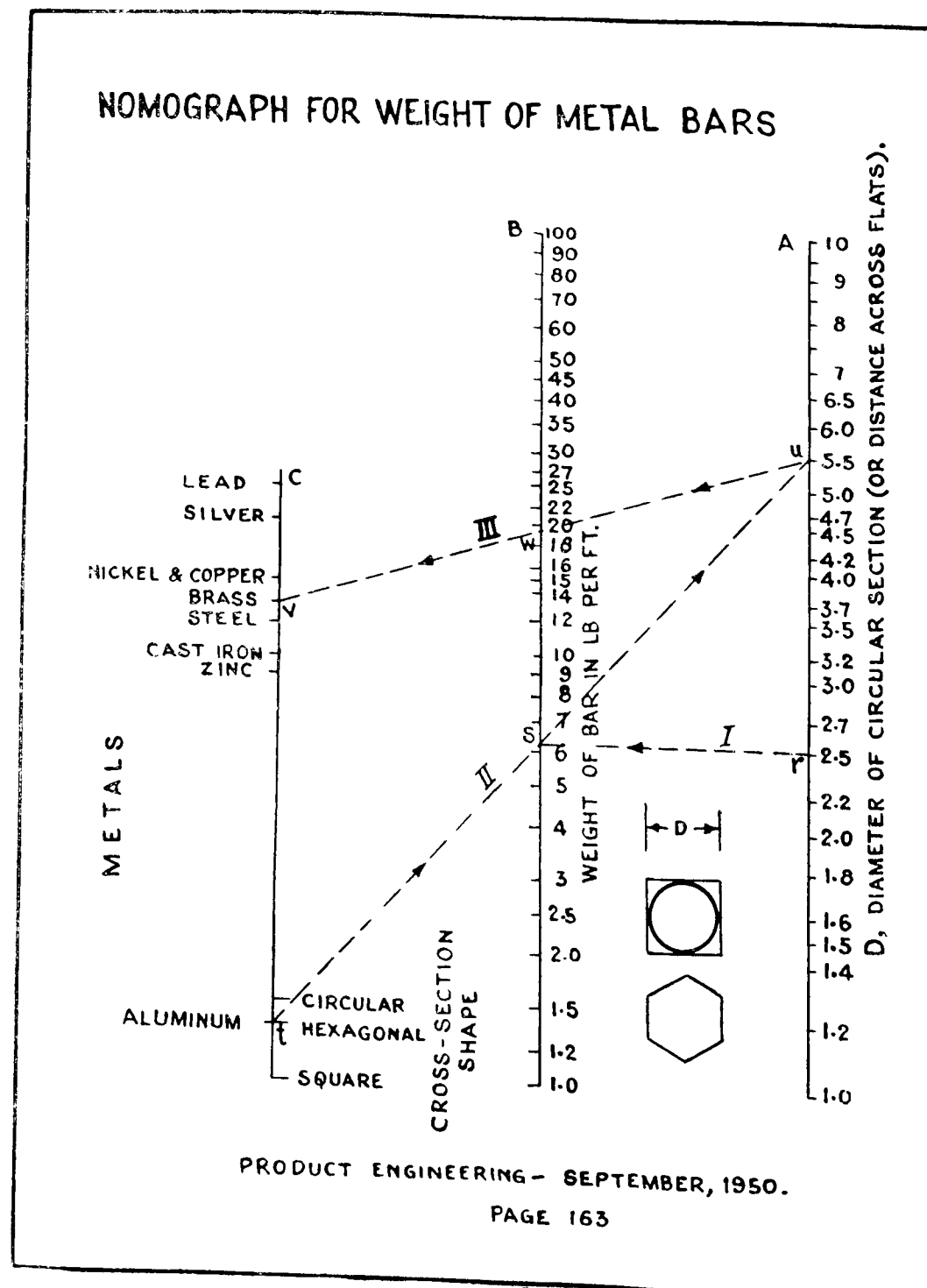
with the acquisition of land for the National Highway at the cost of the State Government or the local authority concerned. Generally, a minimum width of 80 ft of land should be acquired for the National Highway and additional strips of at least 35 ft each for the service roads. Where heavy traffic is expected on the service roads their land width should be increased.

These considerations should be borne in mind by authorities sanctioning schemes of town expansion or development near the National Highways, and provision for parallel service roads should be made from the very beginning.

TECHNICAL INFORMATION

(i) NOMOGRAPH FOR WEIGHT OF METAL BARS

THIS nomograph provides a convenient and simple means of determining the weight of metal bars which may be either circular, square or hexagonal in shape. Chart has been constructed to include the densities of several different metals.



To use this chart :

1. A line (I) is projected horizontally from point r on the A Scale to point s on the B Scale. The point r corresponds to the cross-sectional dimension, D , of the bar.
2. Draw a line (II) from point t on the Lower C Scale (which defines the shape of the bar) through point s and extend it to intersect the A Scale at turning point u .
3. A line (III) is drawn from turning point u to point v on the upper C scale which identifies the proper metal.
4. The intersection of line III on the B Scale gives the weight of the metal bar in pounds per foot.

Example: Determine the weight of a brass Hexagon bar of 2.5 in. (across flats).

At 2.5 in. on the *A* Scale a horizontal line (*I*) is drawn to intersect the *B* Scale.

Using this point and choosing the hexagonal point on the Lower *C* Scale, a line (*III*) is projected to the *A* Scale. A line (*III*) is then drawn between this point and the brass metal on the upper *C* Scale. The intersection of line *III* and the *B* Scale provides the weight of 19.4 pounds per foot.

By increasing the Metals Scale *C*, this nomograph can be used for other materials. This is done by first calculating the weight of 12 cubic inches of the material in question. Then, the numerical value of this weight on the *A* Scale is horizontally projected to establish the proper point on the *C* Scale.

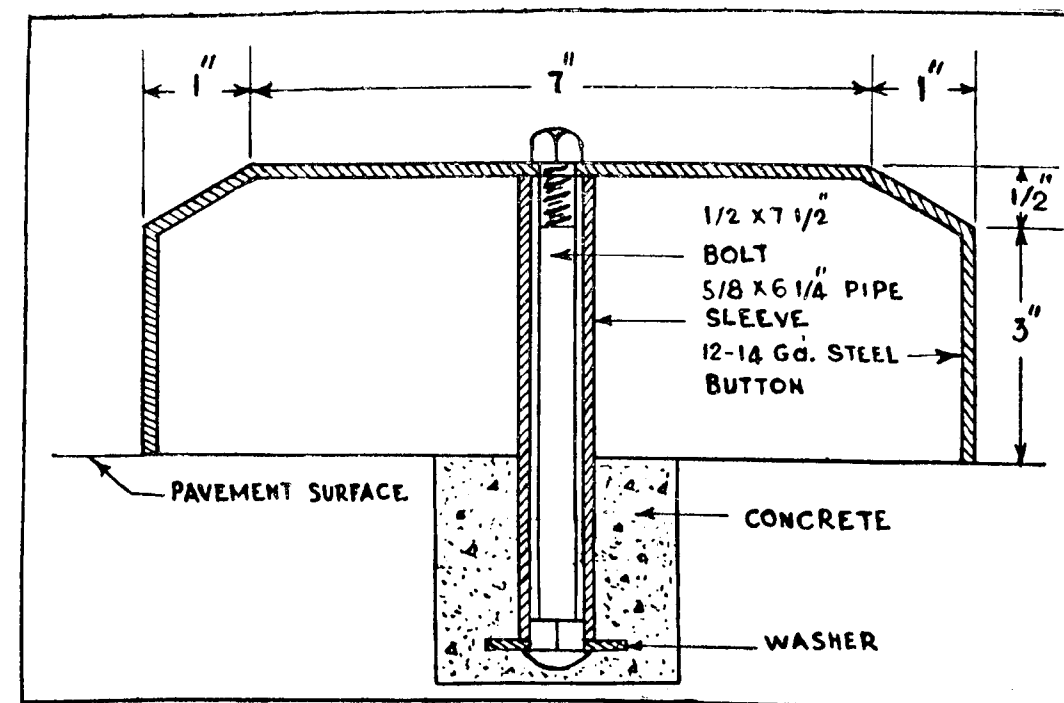
The weight of hollow bars can be determined from this chart by means of subtraction. It is to be noted that this chart is applicable for bars with a cross-sectional dimension of from 1 to 10 inches.

(ii) CHANNELISATION

THE accompanying illustration depicts a simple and effective method of intersection channelisation that requires a minimum amount of time and labour

with little cost involved. The " buttons " are stamped from discarded metal signs, 12 and 14 gauge, at a cost of seventy-five cents each. The total labour and

(Continued on page 35)



ABSTRACTS

(1) 624.21—BRIDGES (GENERAL)

“Prestressed concrete footbridge tested to destruction”—(Highways and Bridges, 14th May 1952, p. 4).

The bridge, consisting of plain beam construction supported on columns 76 ft apart with 12 ft wide deck, was designed and built according to the Freyssinet system, the prestressing being with 24 Nos. 12-wire cables and wire anchorage in precast cement concrete blocks, to carry a load of 35 tons. The testing was for the design load at first and then for a 25 per cent overload, next for a 50 per cent overload which was left overnight, and then the whole weight released next morning and loading done that day up to 70 tons and the next day up to destruction. The actual load at collapse was 85 tons as against 90 tons predicted and provided for at site. A view of the bridge at moment of collapse is also published.

(2) 625.73—ROAD STRUCTURES

“New Road Testing Machine” developed by Shell Research (Highways and Bridges, 12th March, 1952, p. 10).

Mention is made of a machine used for studying the behaviour of road structures under dynamic or moving loads. The machine is also used to ascertain the effects of traffic vibrations on the strength of the road.

(3) 625.731.824—ROADBED, FLEXIBLE BASE WITH AGGREGATES

“Oklahoma Turnpike”—(Highways and Bridges, 18th June 1952, pp 1 & 3).

Design details of an 88-mile flexible paving are given. Subgrade was of special soil, with a CBR value 10 or more, P. I. less than 9, obtained by mixing non-plastic granular soils with 20 to 40 per cent of soils having P. I. greater than 8 and less than 15. Final subgrade material was made to pass 2 in. sieve.

The stabilised aggregate, base course was obtained by blending coarse aggregate,

sand, stone dust, or other inert fines of mineral matter and soil binder.

(4) 625.746—TRAFFIC REGULATION DEVICES

“Testing a traffic circle for possible Capacity” by B. A. Lefevre. (Abstract of Paper to the Highway Research Board) — (Highways and Bridges, 14th Nov., 1952).

This deals with tests conducted on a traffic circle of 200 ft island diameter with two 15 ft lanes and four entering highways which give two 210 ft and two 105 ft weaving sections measured along the centre line and from centre to centre of the Highways. Counts showed the existing traffic peak as 1,000 vehicles per hour, which was considered insufficient for test. So 30 test cars were used in addition to the traffic. On shorter segments the capacity varied between 1,200 and 1,300 vehicles per hour, with speeds varying between 16 and 21 m. p. h., while on longer segments it varied between 1,800 and 2,000 vehicles per hour with speeds varying between 17 and 24 m. p. h.

(5) 625.746—ROAD WORK (FEATURES AFFECTING THE USE OF ROAD BY TRAFFIC)

“Driver Reaction” — A link between Road Design and Road Safety by B. G. Manton — (Highways and Bridges, 25th June, 1952).

The article, while discussing the reactions of drivers to road conditions and improvements, suggests that driving habits of regular local drivers and the possibility of new drivers acquiring false security in speeding their vehicles must be given due and careful consideration in effecting road improvements. Examples of accidents caused by failure to observe the above suggestions are quoted.

(6) 625.75 TREATMENT OF ROAD SURFACES

“Research into the ageing of Bitumens” — (Highways and Bridges, 28th May, 1952).

This refers to research made by sensitive methods and reported to the ‘Institute Technique des Batiment et des Travaux Publics’ by M. Dubrise. Experiments at temperatures between 65 and 110 deg. C. disclosed oxidation of bitumen, besides the increase in the rate in case of asphaltenes (very rapid at 115 deg. C. slow at 65 deg. C. and much slower at lower ordinary temperatures). Products insoluble in toluene formed at 115 deg. C. Experiments showed ageing of bitumens to be due to oxy-polymerization.

(7) 625.76—MAINTENANCE OF ROADS

“Highway Research Board Meeting” — (Highways and Bridges, 30th January, 1952, p. 4).

Synopses of papers on the following which came up before the Highways Research Board meeting at Washington in January 1952 are given: Stability and durability of plant-mixed macadam; Group pile loads in plastic soils; Parking turnouts and rest areas; Tyre design; Vehicle design and vehicle mobility; and Load distribution on highway bridges having adequate transverse diaphragms.

(8) Highway Research Board Meeting January 1952 - (Highways and Bridges, 19th March 1952).

Synopsis of papers on the following subjects are published: Entrained air on the strength and durability of concrete; Geophysical methods of surface exploration applied to materials surveys; Application of plain and beaded traffic paints; Curing of soil cement bases.

(Continued from page 33)—CHANNELISATION

material costs, in conjunction with the installation of one button, is less than what would be required to install one traffic sign post.

To insure proper night visibility, holes are drilled in the sides of the buttons and 7/8 inch crystal reflectors are inserted.

These traffic markers, or buttons, have been in service in Houston for almost a year at some locations, and except for occasional re-painting of the buttons

and replacement of the reflectors there has been little maintenance required.

The edge of the button that is in contact with the pavement surface is sharp and will penetrate a bituminous surface, thereby reducing the possibility of any shifting or sliding. If the surface of the area to be channelised in concrete, the button may be filled with concrete to minimize the possibility of shifting.

(From ‘Traffic Engineering’—September, 1951).

PRECISE LANGUAGE

A Professor of English had a very pretty secretary. One day his wife, entering his study unexpectedly, found the secretary sitting on his knee.

“Eustace,” she said, “I am surprised at you!”

The professor turned around. “No, my dear,” he said. “We are surprised; you are astonished.”

BUDGETS AND ADMINISTRATION REPORTS

MYSORE STATE BUDGET 1952-1953

BUDGETS AND ADMINISTRATION REPORTS

	(Rs in lakhs)		
	Budget Estimate 1952-53	Revised Estimate 1951-52	Accounts 1950-51
Total Revenue	2001.62	1893.93	1440.38
Total expenditure on revenue accounts	2103.34	1861.80	1351.59
Surplus (+) or Deficit (-)	(-)101.72	(+)32.13	(+)88.79
Total Capital expenditure out side revenue account.	504.99	391.39	386.85
I. Revenue (Civil Works)			
1. Rents	1.28	1.135	1.63
2. Recoveries of expenditure	12.16	3.98	3.04
3. Transfer from Central Road Fund	23.54	-	-
4. Miscellaneous	3.72	3.88	3.18
5. Deduct - refunds	- 0.05	- 0.05	- 0.08
Total	40.65	8.95	7.77
Expenditure:			
1. Original Works (Bldgs. and Communication)	81.59	33.14	39.90
2. Repairs	47.25	43.21	22.03
3. Establishment	19.23	15.43	6.51
4. Tools and Plant	3.90	4.87	3.30
5. Grants-in-Aid	19.87	5.55	8.68
6. Suspense	28.00	8.01	6.48
7. High Price Allowance	-	-	3.46
8. Development Schemes	64.36	96.49	61.76
Total	264.20	206.70	152.12
II. Expenditure on (Communications only)			
Revenue Expenditure	13.40	20.17	5.77
Original Works			
Development Expenditure met from revenue	47.36	21.31	10.21
Total	60.76	41.48	15.98
Revenue Expenditure	39.03	35.10	17.65
Repairs			
Development Expenditure met from revenue	13.00	13.54	15.86
Total	52.03	48.64	33.51

	(Rs in lakhs)		
	Budget Estimate 1952-53	Revised Estimate 1951-52	Accounts 1950-51
Receipts under Motor Vehicles Acts			
Motor Licence fees and taxes	35.82	34.82	29.52
Milage cess	13.53	13.53	9.71
Fees for issue of brake Certificates	0.72	0.72	0.23
Fees for motor lorries	-	-	1.09
Tolls on roads	1.53	1.53	1.33
Miscellaneous	0.50	0.50	-
Deduct - refunds	(-)0.06	(-)0.06	-
Total	52.04	51.04	41.88

A BRIEF REVIEW OF THE MYSORE STATE BUDGET FOR 1952-53

(With special reference to Civil Works)

THE estimated total revenue for the year 1952-53 is Rs 2001.62 lakhs and the total expenditure on revenue account Rs 2103.34 lakhs. The deficit of Rs 101.72 lakhs compares with a surplus of Rs 32.13 lakhs in the revised estimates of the previous year and a surplus of Rs 88.79 lakhs in 1950-51.

The revenue estimated for 1952-53 from Civil Works is Rs 40.65 lakhs as against only Rs 8.95 lakhs in the previous year. The increase is mainly due to grants from the Central Road Fund and contributions from District Boards for Roads.

The expenditure on Civil Works during the year exceeds that in the previous year

by Rs 57.50 lakhs. The increase is the result of additional provision for completion of several works in progress, increased grants for repair of roads, purchase of stores etc.

Revenue expenditure on Civil Works during the year 1952-53 is 13.2% of the total State revenue as against 10.9% in 1951-52 and 10.6% in 1950-51.

The expenditure on communications during the year forms 42.7% of the expenditure on Civil Works as against 43.6% in 1951-52 and 32.5% in 1950-51. Also, expenditure on communications forms 5.6% of total revenues and 5.4% of total revenue expenditure during the year.

List of Approved Works on National Highways

S. No.	Job No.	Name of work	Estimated Cost Rs (Lakhs)	Remarks
MADRAS				
1.	680 MD 5	Black topping certain reaches in the Nollore section of the Madras-Calcutta National Highway.	1.87	
BOMBAY				
2.	673 BM 8	Construction of the remaining length of approaches to the bridge over the Shidi river at Ratanpur on the Bombay - Ahmedabad National Highway.	0.34	

S. No.	Job No.	Name of work	Estimated Cost Rs. (Lakhs)	Remarks.
<i>(Continued)</i>				
3.	681 BM 8	Acquiring additional land for providing dust proof surface in mile 149/3-330' to 150/2-25' of the Bombay-Ahmedabad National Highway.	0.16	
4.	683 BM 8	Providing cross drainage works in the Harijala-Kanera-Bareja Section of the Bombay-Ahmedabad National Highway.	0.99	
5.	685 BM 8	Land acquisition for Raigadh-Rattanpur section of the Bombay-Ahmedabad National Highway.	1.25	
6.	693 BM 8	Land acquisition for constructing a diversion in miles 136/4 to 138/7 of the Bombay-Ahmedabad National Highway.	0.33	
BIHAR				
7.	670 BR 6	Construction of culverts on Northern approach road to Subarnarekha bridge from junction of National Highways No. 33 and 6.	1.26	
UTTAR PRADESH				
8.	687 UP 7	Painting miles 44-66 of National Highway No. 7 (miles 4-26 of Mirzapur-Rewa Road).	5.81	
MADHYA PRADESH				
9.	686 CP 7	Improvement of National Highway No. 7 from mile 33 to 122/4 excepting two miles lying in Seoni town in Chhindwara District.	13.22	
10.	689 CP 6	Improvement of miles 113 to 118 and 132 to 145 of the Great Eastern Road (N. H. No. 6).	6.44	
11.	692 CP 7	Improvement of Great Northern Road in Jabalpur District, N. H. No. 7.	3.87	
PUNJAB				
12.	671 PB 22	Widening miles 27 7 to 33/4 of Ambala-Kalka Road (N. H. No. 22) from 12 ft to 22 ft.	1.48	
13.	672 PB 10	Widening the metalled width of miles 234/4 to 236/4 of Delhi-Hissar-Sulemanki National Highway.	0.38	
14.	677 PB 1	Widening the bridge in furlong 3 of mile 247 of the Grand Trunk Road in Jullundur Sub-Division.	0.27	
15.	678 PB 1	Widening the bridge in furlongs 1 & 2 of mile 245 of the Grand Trunk Road in Jullundur Sub-Division.	0.21	

S. No.	Job No.	Name of work	Estimated Cost Rs. (Lakhs)	Remarks.
16.	679 PB 1	Survey for a bypass of the Grand Trunk Road at Ludhiana.	0.04	
17.	688 PB 2	Widening Delhi-Mathura National Highway from mile 20 to 58 in Gurgaon District.	14.46	
ORISSA				
18.	684 RS 42	Acquisition of land for straightening the curve from 11 4 to 11/6 of the Cuttack-Sambalpur National Highway.	0.01	
MADHYA BHARAT				
19.	676 MB 3	Widening and black topping different stretches of the Indore-Gwalior Section of National Highway No. 3 between miles 13/6 and 45/5.	3.86	
TRAVANCORE COCHIN				
20.	690 TC 47	Construction of a bridge over the Chavara on the Quilon-Alleppey National Highway.	3.60	
RAJASTHAN				
21.	669 RJ 8	Widening Alwar-Delhi section of National Highway No. 8 from mile 1 to mile 24 in Rajasthan.	2.12	
22.	682 RJ 8	Widening miles 0-33/3 of Alwar-Jaipur National Highway in Rajasthan.	2.50	
HIMACHAL PRADESH				
23.	694 HP 22	Purchase of special tools and plant for the Hindustan-Tibet National Highway.	3.33	
24.	695 HP 22	Improvement of Hindustan-Tibet National Highway at mile 14/2 to mile 15 (cutting of over-hanging rocks).	0.80	
25.	696 HP 22	Construction of a magazine for storage of explosives at Fagu on the Hindustan-Tibet Road.	0.06	
26.	697 HP 22	Construction of a magazine for storage of explosives at Luri on National Highway No. 22.	0.06	
DELHI				
27.	674 DLH 1 & 2	Land acquisition for construction of bypass connecting National Highway No. 1 with National Highway No. 2.	3.97	
28.	691 DLH 10	Widening miles 10/2 to 16/0 of Rohtak Road (N. H. No. 10)	1.65	

Books added to the Roads Organisation Library during January 1953

The Manager of Publications, Delhi.

1. **The Northern India Ferries Act, 1878 (Act XVII of 1878) as modified upto the 1st June, 1902.**
2. **Account Code Vol. II-Treasury Accounts (1st edition) (Reprint). Incorporating Collection Slip Nos. 1 to 26.** Issued by the Auditor General of India.
3. **-do- Vol. III-Departmental Accounts (Incorporating Correction Slips No. 1 to 27. (1st edn. Reprint).** Issued by the Auditor General of India.
4. **-do- Vol. IV-Accounts Kept in Account Offices, (Incorporating Correction Slips Nos. 1 to 105) 1st edn. (reprint).** Issued by the Auditor General of India.
5. **Compilation of the General Financial Rules-Vol. I (1st edition).** Issued by the Auditor General of India.
6. **Book of Financial Powers-corrected upto 31-12-1949 (Second edition)** Issued by the Auditor General of India. 2 copies
7. **Rail and Road Problems in the U. S. A. being a summary of recommendations of the Joint Committee of the Rail-Road and Highway Users, United States-PWD. 3** by C. E. R. Sherrington.
8. **Census of India-Paper No. 2, 1952—Population Zones, Natural Regions, Sub-Regions and Divisions.**
9. **A Report to the Railroads of America** (Chrysler Corporation, Engineering Division, USA, 1950).
10. **Lift Irrigation Projects in Bombay State** (Issued by the Directorate of Publicity, Govt. of Bombay).
11. **Examination of quarry Sites for road metals in the Sabar Kantha District, Bombay, by Burjor Mehtra** (Geological Survey of India).
12. **The general Secretariat in Zurich of the I. A. B. S. E., Zurich, Switzerland.**
13. **Tenth Volume of the Publication of the International Association for Bridge and Structural Engineering, Zurich.**
14. **Eleventh -do- -do-, 1951.**
15. **B. S. CODE of Practice CP3-Chapter V (1952) Code of Functional Requirements of Buildings Chapter V. Loading.** (The Council for Codes of Practice for Buildings Construction and Engineering Services, Lambeth Bridge House, London S. E. 1.)
16. **Handbook of British Standards for Building Materials and Components for Housing—Addendum No. 1, 1952 to B. S. Handbook No. 3: 1950 Edition.** (British Standards Institution, 24 Victoria Street, London, S. W. 1.)
17. **Proceedings of the Symposium on the Rajputana Desert—National Institute of Sciences of India Bulletin No 1.** (National Institute of Sciences of India, New Delhi, 1952).
18. **Transportation, Principles and Problems (2nd edition) by Truman C. Bigham and Merrill J. Roberts.** (McGraw Hill Book Co., Inc., New York, 1952)
19. **Technical Dictionary of Road Terms in 6 Languages.** (Permanent International Association of Road Congresses, 2, rue Paul Cezanne, Paris (VIII^e), 1951).
20. **Productivity Team Report—Steel Construction Report of a Visit to the U. S. A. in 1951 of the Productivity Team on Constructional Steel Work, Fabricated Platework Mechanical Handling Plant.** (Publi-

shed for the team by the Anglo-American Council on Productivity, 21, Tothill Street, London, S. W. 1. 1952)

21. **Details Specifications of the Public Works Department of Rewa State.** (The Chief Engineer and Secretary, PWD, Rewa State).
22. **The Road Tar Manual.** (The British Road Tar Association, 9, Harley Street, London, W. 1.)
23. **Thoughts and Theories on Penetration Surfaces—Twenty-Sixth annual Highway Short Course, Texas A & M College, March 6, 1952.** by Jerome P. Kearby. (Obtainable from the Author, Texas Highway Department, District 2, Fort Worth, Texas.)
24. **Highway Sufficiency Rating Survey Federal Aid Urban Highway System, 1951** (State of Washington, The Washington State Highway Commission, Department of Highways, Olympia, 1951).
25. **An Explaining and Pronouncing Dictionary of Scientific and Technical Words** by W. E. Flood and Michael west. (Longmans Green & Co., London).
26. **The Association of Public Lighting Engineers, 22, Surrey Street, Strand, London, W. C. 2.**
27. **Methods of Controlling Street Lighting Paper No. 2.** by N. Axford
28. **"Street Lighting—U.S.A."—Paper No. 4.** by A. D. Dickerson.
29. **Street Lighting—A Wise Compromise — Paper No. 5** by Norman Hudson.
30. **Know your Materials-Design, Manufacture and Erection of Concrete Lighting Columns—Paper No. 6** by D. F. Orchard.
31. **The Caxton Publishing Company Ltd., Morley Hall, George Street Hanover Square, London, W. I.**
32. **Modern Concrete Construction—A Comprehensive and Practical Treatise dealing with every Phase of Concrete, Materials and modern construction (New and revised edition) Vol. I.** edited by W. H. Glanville.
33. **do, Vol. II** edited by W. H. Glanville
34. **do, Vol. III** do do
35. **do, Vol. IV** do do
36. **The Principles and Practice of Prestressed Concrete—Vol. I** by P. W. Abeles. (Crosby Lockwood and Son Ltd., 39, Thurloe Street, London, S. W. 7).
37. **Underpinning and Strengthening of Structures** by L. E. Hunter. (Contractors Record and Municipal Engineering, Lennox House, Norfolk Street, London, W. C. 2)
38. **Sixth Annual Report of the Motor Industry Research Associations—1. 7. 50 to 30. 6. 1951.** (The Council of the Motor Industry Research Association, Great West Road, Brentford, Middlesex, 1951).
39. **Case Study data on Productivity and factory performance — Single Decker Bus Bodies — termed "School Bus Bodies" in the U. S. A.** Prepared for the Mutual Security Agency Productivity and Technical Assistance Division by the U. S. Deptt. of Labour. (Distributed in Great Britain by the British Institute of Management Management House, 8, Hill Street London, W. I.)
40. **STRASSE UND AUTOBAHN, Vol. I. No. 11, November, 1950—Containing an article on Siting of Petrol Pumps.** (FORSCHUNGSGESELLSCHAFT Fur das STRASSENWESEN e. v. VERBANDSMITTEILUNGEN der LANDESTRASSEN — HAUBEAMTEN, KIRSCHBAUM verlag, Bielfeld)
41. **Fire Protection through the Bureaus Model Building Regulations (cyclostyled).** (Reproduction of article published in the South African Standards Bulletin, July 1952, Vol. 9, 11, pp 234-242)

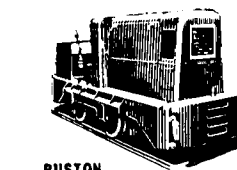
H. M. S. O. LONDON

39. **Sources of Road Aggregate in Great Britain** (2nd edition) by DSIR, R. R. L. and Geological Survey and Museum.
40. **Concrete made with Lightweight Aggregate - Building Research Station Digest No. 32.**
41. **Concrete in Sulphate-bearing Clays and Ground Waters-Building Research Station Digest No. 31.**
42. **Economic Survey of Asia and the Far East 1951.** (United Nations Department of Economic Affairs, New York, 1952).
43. **Report on Quarry Sites for Road Metals in Parts of the Banas Kantra Division** by B. C. Roy (Geological Survey of India, September, 1952).

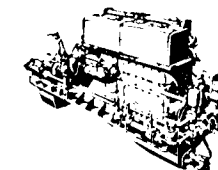
National Research Council of Canada, Associate Committee on Soil and Snow Mechanics, Ottawa, Canada.

44. **Proceedings of 1949 Civilian Soil Mechanics Conference-Technical Memorandum No. 17.**
45. **Proceedings of 1950 Soil Mechanics Conference-Technical Memorandum No 19** by F. L. Peckover and Margaret Gerard.
46. **Soil Stabilisation Conference at M. I. T. Reviews Military Research-** an article contained in BUDDOCKS Technical Digest, No. 25, July 1952, (United States, Bureau of Yards and Docks, Washington).
47. **The Investigation of the State of Strain in Transparent Three-dimensional Models in a Parallel Beam of polarized Light** (Isslyedovaniye rapryazkennogosostoyaniya na prozrachnach ob'yomnykh modelyakh V Puchkye Parallyelnykh luchei polyaris ovannogo svyeta) DSIR/4331/ C. T.) (Typed copies) (DSIR U. K.) 3 copies

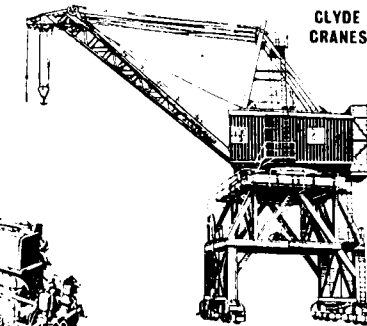
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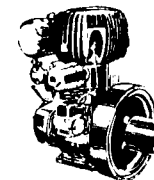
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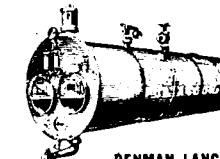
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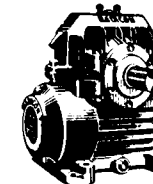
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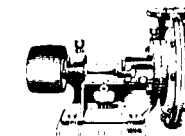
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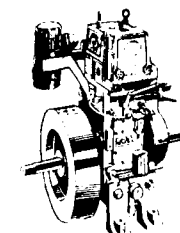
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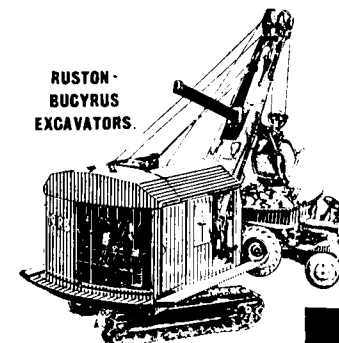
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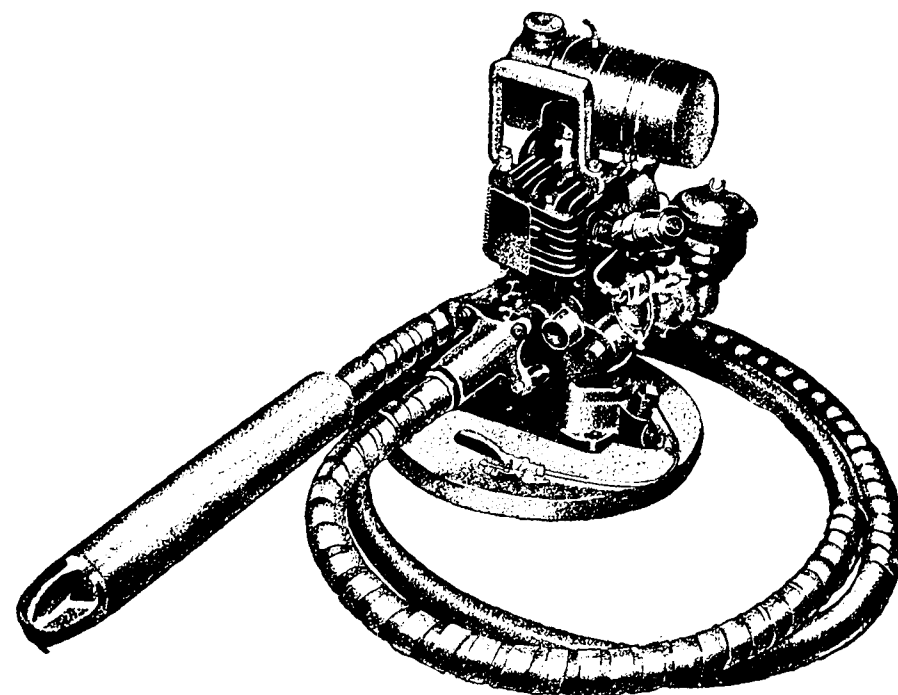
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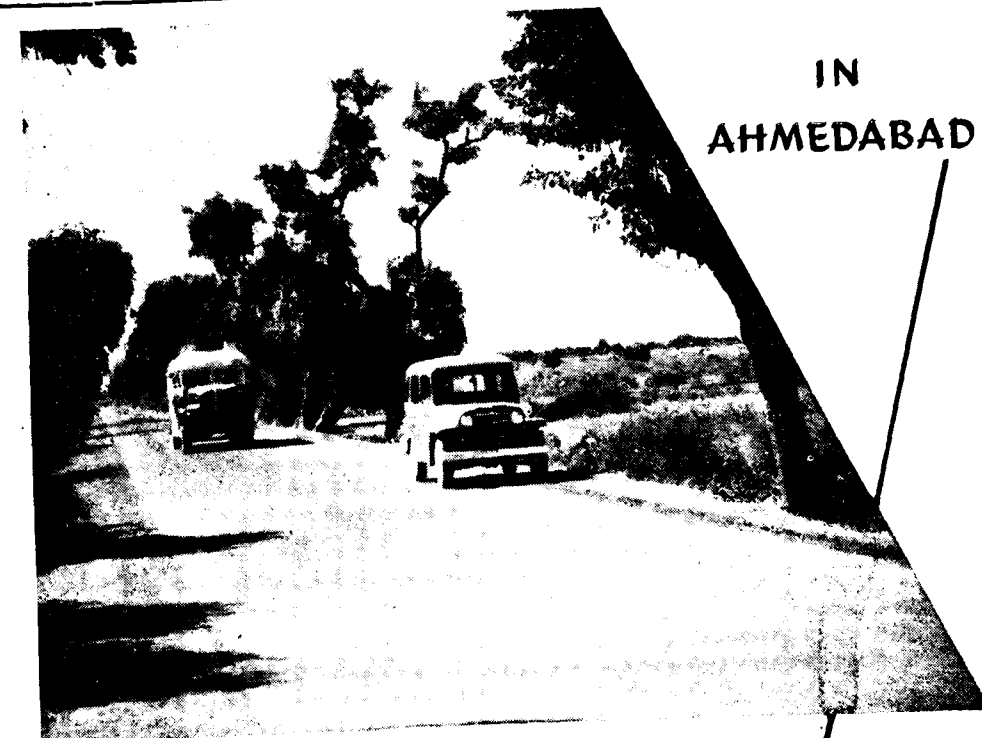
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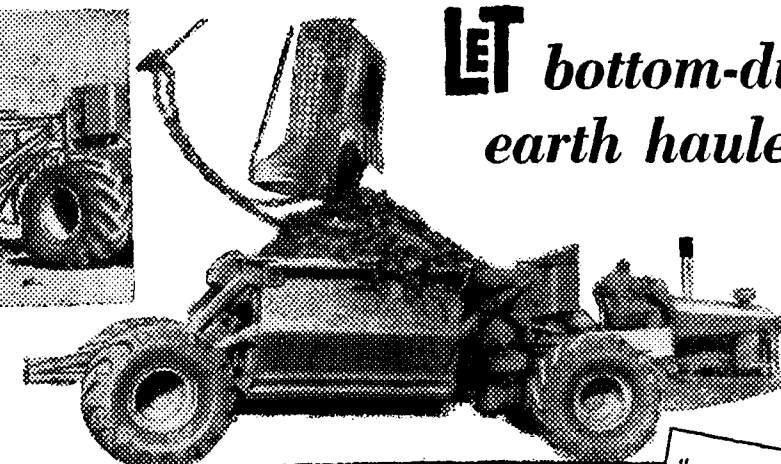
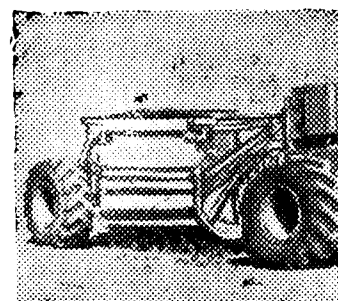
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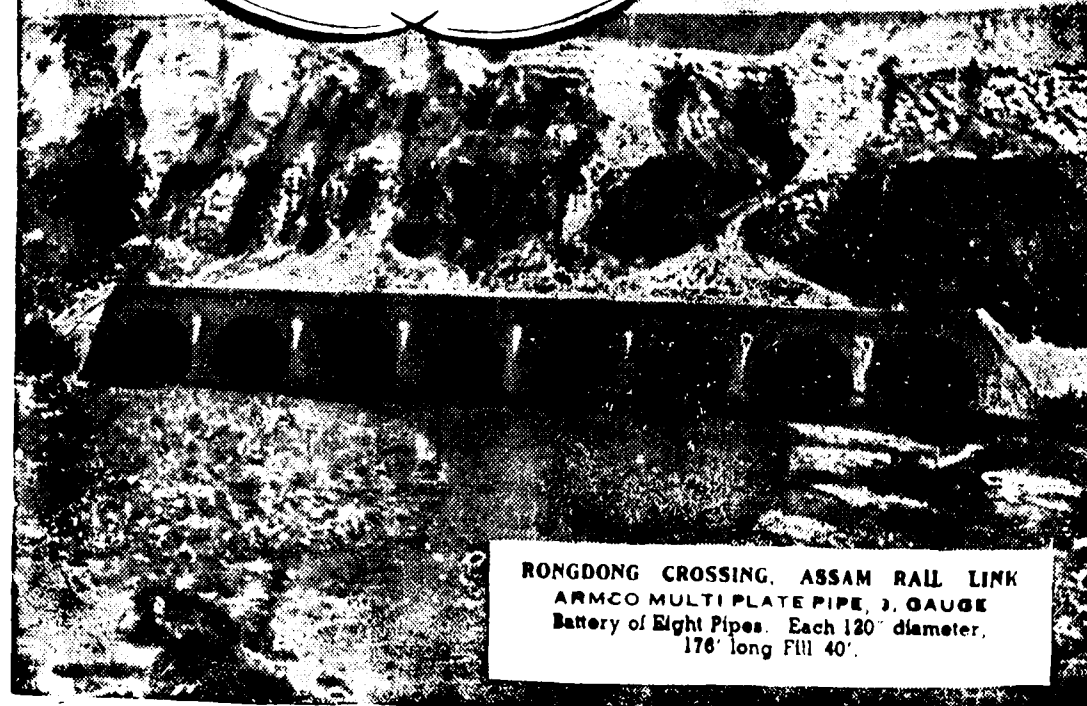
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