

42

Transport.
Communications.
Monthly Review.
April — 1953.
NO — 72.



JL
D411m2, N48
N53-72
99569

339 Transport-Communications

MONTHLY REVIEW

339
2.53



No. 72

April 1953

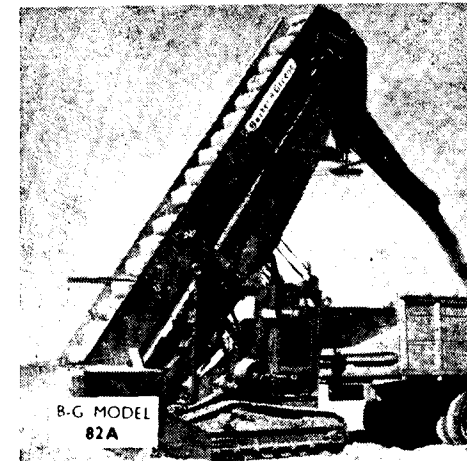
In this issue		Page
1. Time Clauses in Engineering Contracts	...	1
2. Indigenous Motor Manufacture	...	3
3. Road Transport in Canada	...	7
4. A Novel Method of Testing Concrete	...	8
5. India's Road Plans	...	10
6. HERE AND THERE—		
(i) How Many Bumps Per Mile?	...	13
(ii) A 101-mile Road Saves 347 Miles Detour	...	13
(iii) Centre Lining saves Lives	...	13
(iv) Thames Bridges	...	14
(v) Channel formed by Explosive Charge	...	14
(vi) Photography and Roads	...	15
(vii) Five-Year Plan depends on Transport	...	15
(viii) Manufacture of Motor Vehicles in India	...	15
(ix) U. K. Investment on Roads	...	16
(x) Movable Headlights for Cars	...	16
7. Roads in Parliament	...	17
8. Procedure and the Schemes for the Training Abroad of Indian Highway & Bridge Engineers	...	18
9. Road Research in the United Kingdom	...	19
10. TECHNICAL INFORMATION—		
(i) Road-making with Sand	...	21
(ii) Moving a Highway Bridge in Switzerland	...	22
11. ADMINISTRATION REPORTS AND BUDGETS—		
Assam Civil Works Budget for 1952-53	...	23
12. ABSTRACTS	...	25
13. List of Approved Works on National Highways	...	26
14. List of Books added to the Roads Organization Library during February 1953	...	27

Also :—The Lessons of War and Peace are the same.

Annual Subscription: Rs Fourteen Including Postage. PRICE RUPEE ONE
For Members of the I.R.C., Subordinate Engineering Staff and Engineering
Students: Rs Eight. Copies can be had from the Secretary, Indian Roads
Congress, Jamnagar House, Shahjahan Road, New Delhi-2.

Barber-Greene

LOAD TRUCKS WITH MINIMUM FORCE . . .



WITH  TRUCK LOADERS

One Man can load a three-yard truck in one minute with a Barber-Greene Truck Loader.

One Man with a B-G Loader can keep a whole fleet of trucks on the move. The B-G Loader travels from pile to pile quickly—loads sand, stone, gravel, fertilizer—any free-flowing material—at up to 3 yards per minute.

One Man without special training, quickly becomes an expert operator of a B-G Loader. Write for full information.

IMPORTANT FEATURES

B-G MODEL 543. A Pneumatic-Tired Loader with capacity to 3 yards per minute. Self-propelled at speeds up to 15 m.p.h. With hydraulically controlled trimming conveyor, it loads highest trucks.

B-G MODEL 82A. Has crawler-mounted chassis. Loads sand, gravel, limestone, coal, etc. Also for bank-loading, topsoil stripping and light excavation. Capacity to 3 yards per minute.

Long hydraulic swivel conveyor available, to enable it to load highest, longest trucks, trailers and railroad cars.

Barber-Greene Overseas, Inc.

DISTRIBUTORS OF BARBER-GREENE PRODUCTS MANUFACTURED BY:

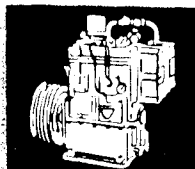
BARBER-GREENE COMPANY, AURORA, ILLINOIS, U.S.A.

BARBER-GREENE OLDING COMPANY, LTD., ENGLAND · BARBER-GREENE CANADA, LTD., CANADA

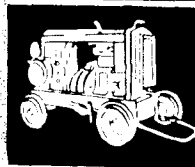
Please mention this journal when replying to advertisements.

COMPRESSED AIR EQUIPMENT

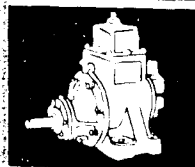
STATIONARY COMPRESSORS
Two Stage. Displacements from 80 c. ft./min. to 638 c. ft./min.



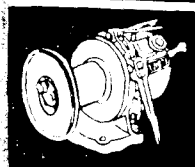
PORTABLE COMPRESSORS
Two Stage. Displacements from 130 c. ft./min. to 380 c. ft./min.



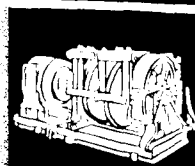
ROTOMOTORS
Vane type air-motors from 1½ b.h.p.



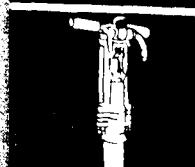
AIRWINCHES
Lifting capacities from 1400 lbs. at 100 ft./min. to 3000 lbs. at 100 ft./min.



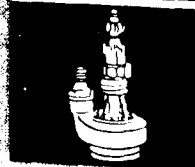
SCRAPEHAULERS
Specially designed for scraper loading. Rope pulls from 2200 to 6600 lbs.



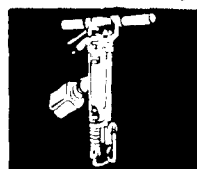
HANDRILS
Hand-held Rock Drills. Weights from 24 lbs. to 84 lbs.



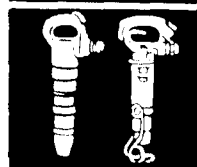
ROTOPUMPS
For water, oil or sludge. Will give 10 g.p.m. with 140 ft. head to 140 g.p.m. with 10 ft. head.



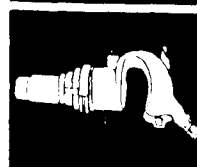
ROAD RIPPERS
Weights from 43 lbs. to 75 lbs.



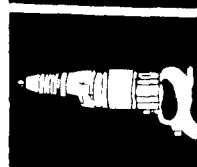
PICKS & SPADERS
Weights from 20 lbs. to 26½ lbs.



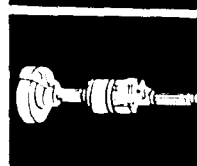
HAMMERS
Weights from 7½ lbs. to 13½ lbs.



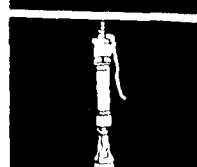
ROTODRILLS
Hand and screw-feed. Capacities to 1½ ins.



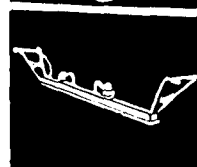
ROTOGRINDS
Radial and surface types. Taking 2" to 6" wheels.



RAMMERS
Weights from 9 lbs. to 40 lbs.



CONCRETE COMPACTORS
A new machine for Concrete Compaction.



The machines and tools illustrated here are but a few of the products manufactured by Holmans. There are also Drifters, Sinkers, Stoppers, Airlegs, Holbits and tungsten carbide tipped Drill Rods, all of which are world famous.

SOLE AGENT IN INDIA

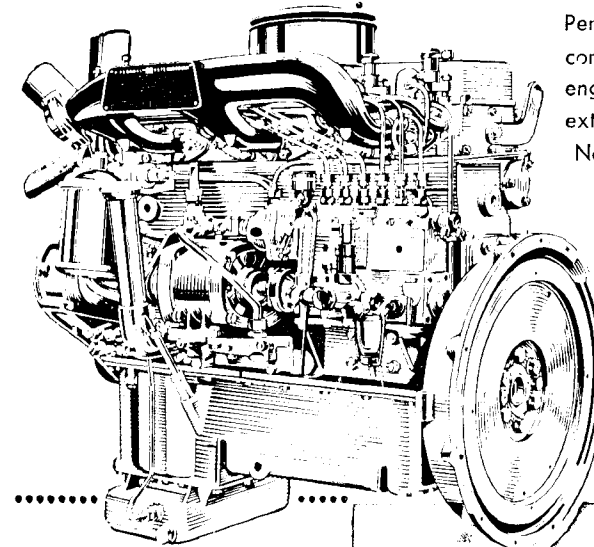
BIRD & CO., LIMITED
CALCUTTA . DELHI . KANPUR

SELLING SUB-AGENTS:
KILLICK NIXON & CO. LTD. | **SIMPSON & CO. LTD.**
BOMBAY. | MADRAS.

Please mention this journal when replying to advertisements.

Perkins

THE POWER BEHIND MODERN TRANSPORT



Perkins Diesel Engines give all the smoothness, compactness and low weight of the petrol engine — plus the Diesel's proved economy, extra pulling power and greater reliability. No petrol fire risks, no electrical ignition systems to cause mechanical trouble. Reliable running is the first essential to every transport operator; Perkins reliability has been tested over millions of miles throughout the World, and has led to many famous vehicle manufacturers offering Perkins Diesel Engines as standard units with their own vehicles.

Perkins Diesel Engines are available as original equipment or Conversion units for:

Austin, Bedford, Commer, Dennis, Dodge, Ford, Guy, JNSN, Seddon Trojan, Van Doorne and Vulcan vehicles.

Also Perkins Industrial, Tractor and Marine Engines, with outputs up to 100 B.H.P.



Distributors for all India:
SIMPSON & CO. LTD.,
202-203, Mount Road,
Madras

Perkins
HIGH QUALITY DIESEL ENGINES
Service and spare parts facilities are available throughout the world

MILLARS' MACHINERY

Concrete Mixers—Tilting and non-Tilting Types.

Asphalt Mixers—for Hot and Cold Mix.

Roller Pan Mixers—for Mortar.

Diaphragm Suction Pumps for effective lift up to 25 ft.

Self-Priming Pumps for handling Seepage at lowest possible cost.

Tower Hoists for speedy construction.

Wellpoint Pumping Equipment for dewatering—the only successful method of combating running sand.

TIMBER

HARDWOODS - SOFTWOODS - PLYWOODS

MILLARS' TIMBER & TRADING CO., LTD.

(INCORPORATED IN ENGLAND)

VICTORIA HOUSE, VICTORIA ROAD, BOMBAY-27.

Telephone: 41077

Telegrams: JARRAH

Branches and Agents throughout the World.

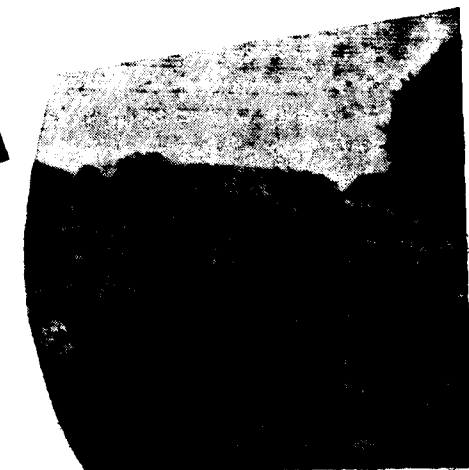
Please mention this journal when replying to advertisements.

BSY-644



Dhantoli Road—Two coats surface dressing work. First Coat—30 lbs. Mexphalte 80/100 6 c ft. 1/2" to 5/8" Chips. Second Coat—40 lbs. Mexphalte 80/100 4 c ft. 3/8" Chips. Executed in May, 1950.

IN NAGPUR



Pach Pawli Road—5½" Full Grout
Specification:—30 c ft. 1½" to 2" metal 125 lb. Mexphalte 30/40 6 c ft. 3/4" to 5/8" chips 30 lb. Mexphalte 80/100 4 c ft. 3/8" to 1/2" Chips. Executed in March 1948.

BURMAH-SHELL ... IN INDIA'S LIFE AND PART OF IT

Please mention this journal when replying to advertisements.

TIME CLAUSES IN ENGINEERING CONTRACTS

(Extracted from 'Engineering'—October 3, 1952)

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

THE old legal rule that "Time is of the essence of the contract" is no longer of universal application. Time may, however, be made "of the essence" by a plainly expressed stipulation in the contract, but such a condition is not to be inferred. Engineering contracts of any magnitude now embody clauses which specify dates of commencement and completion, provide for extensions of time necessitated by unforeseen delay in execution, and deal with the question of damages payable by the contractor in the event of delay being due to his default. There have been several recent High Court cases affecting the interpretation of such clauses. It might, therefore, be helpful to consider the question of extension of contract time and penalty clauses in the light of modern decisions.

Delay in completion may be caused by events over which neither contracting party has control, or it may be due to the fault of the purchaser or his engineer, or the contractor may be to blame. The first cause will obviously provide grounds for the extension of time, whereas the last will invoke the penalty clause against the contractor. The second should, and generally does, entitle the contractor to an extension; but it is customary for the purchaser to ensure that delay on his part, or by his engineer, cannot found a claim for damages by the contractor, however unfair and inequitable that might be in some cases.

The term "Penalty clause" is a misnomer. The Courts have always refused to recognise attempts to exact any sum in the nature of a penalty, even though no objection is raised by the contractor. In theory, only the actual loss suffered by the purchaser as the result of the contractor's default will be allowed. In practice, if a fixed sum or percentage of the contract price has been agreed as payable for

each day or week by which the contract time, including extensions, is exceeded, and that sum or percentage is reasonable in all the circumstances, it will be accepted as being a sum fixed by way of pre-estimated (or "liquidated") damages; but the use of such expressions as "liquidated damages" or "liquidated and ascertained damages" does not ensure that the Courts will not look behind those words in order to find the true purport and intention of the clause as a whole.

The actual point at which a contract may be said to be completed is sometimes difficult to determine. It is of some importance in connection with lump sum contracts, for, *prima facie*, payment cannot be claimed until the work has been completed. This question has received judicial consideration on a number of occasions, and in the result it may be said that when the work is "finished" or "done" in the ordinary sense, though some details may be lacking, the contract is "complete." Even actual defects in the work would make no difference, unless they were of such magnitude as to go to the very root of the contract, for the purchaser's remedy is a claim in damages if the defects are not put right. The principle is applicable when deciding whether the contractor has completed to time, and is recognised by those who use the phrase "practical completion."

In contracts for constructional work, or for the supply of machinery with erection, it is usual to include a clause permitting the contract time to be extended to meet unpremeditated eventualities; but where the contract is for the supply and delivery of goods or equipment, there being no question of erection or work on site, such provision is seldom made. A recent decision by the Court of Appeal* is of interest in this connection. The facts of the case, which concerned the sale of a motor-car, need

* Charles Richards, Ltd. v. Oppenheim (1950), Law Reports 1 K. B. 616.

not be detailed here. Time was of the essence of the contract. After the stipulated date for delivery had passed, the buyer continued to press the seller, and by so doing he waived his right to rescind the contract on the grounds of non-performance. The Court held, however, that he could thereafter fix a fresh date for delivery, which was a reasonable one in the circumstances then prevailing, and by such action time would again become of the essence. At the expiration of the new period, the buyer would be entitled to cancel the contract (if delivery had still not been made), despite any supervening circumstances not previously contemplated by either party.

Failure by a contractor to complete to time will, if there is a properly drafted penalty clause, involve him in the payment of liquidated damages. Suppose that these damages are fixed at the rate of 1 per cent of the contract price for each week by which the contract time is exceeded, with a maximum total of 15 per cent. This means that the contractor, after the expiry of 15 weeks, is liable for no further damages, and if he finishes in 20 weeks he is still liable only for the 15 per cent. If, however, he has still not finished, even at that stage, the question arises whether the purchaser may then, or, for that matter, at any time after the first 15 weeks, repudiate the contract. This is a matter upon which there has been as yet no decision; there is, therefore, no certain answer. Any decision will depend to some extent upon the wording of the relevant clause or clauses. On the face of it, it would seem that no right of repudiation could arise in such a case, for the mere limitation of the liquidated damages to a fixed maximum cannot, in itself, create a fresh time for completion. The only certain way is to make time once more of the essence, by the purchaser and contractor agreeing a new completion

date, as in the motor-car case already mentioned.

Extension-of-time clauses need careful drafting, and proper exercising, if they are to fulfil their object. For example, it has been held* that a clause empowering the engineer to grant "such extension of time for completion of the work, and that either prospectively or retrospectively, and to assign such other time or times for completion as to him may seem reasonable," does not enable him to do so after the work is completed. All that the word "retrospectively" implies is that he may wait until the cause of delay has ceased to operate, and then fix a new completion date to which the contractor can work. In such a case, where the extension is a proper one, but is granted out of time, no damages will be payable by the contractor.

On the other hand, a clause which allows the engineer to "make a fair and reasonable extension of time for completion of the works," where he is satisfied that the delay has been due to one or other of certain specified causes, covers the granting of an extension even after the contract has, in fact, been completed. In giving this decision in the Court of Appeal,** Lord Justice Denning pointed out that there may be a continuing cause of delay, such as shortage of labour and materials or inclement weather, which is operative right up to the finishing of the work. It follows that, in such circumstances, the engineer should, as a matter of business, be able to grant an extension whether or not the original, or previously extended, contract time has expired.

In fairness to all concerned, decisions by the engineer under an extension clause should be referable to arbitration. This is generally recognised, though there are still forms of contract conditions which, somewhat autocratically, make such decisions "final and conclusive."

* Miller, v. L. C. C. (1934), 50 The Times Law Reports 479.

** Amalgamated Building Contractors, Ltd., v. Waltham Holy Crosses U. D. C., (1952), 2, The Times Law Reports, 269.

INDIGENOUS MOTOR MANUFACTURE

Encourage Gradual Vehicle Manufacture on Sound and Economical Lines

I.R.T.D.A.'S Memorandum to Tariff Commission

"THE Association is firmly of the opinion that the establishment of key industries of the type of the automobile industry in India must be encouraged and assisted. While naturally anxious that India must have a full-fledged motor manufacturing industry as quickly as circumstances will permit, the Association recognises firstly that the foundations of the industry must be laid on the most economical and enduring lines possible, secondly that the industry must make its proper contribution to the general economic development of the nation and thirdly the interests of the consumer must by no means be sacrificed to those of the manufacturer."

The industry should therefore be established gradually but firmly over a period of years, says the Association; and greater attention than in the past should be devoted to the development of ancillary industries. Moreover, the existing high import duties should be lowered and to some extent replaced by judicious subsidies, supplemented in due course by regulation of imports of those standardised parts which indigenous manufacturers are able to produce in adequate quantities.

To give effect to such a policy the existing stipulation that all vehicles sold in the country must be assembled here should continue to be enforced; and with this minimum stipulation a gradual general increase in the use of Indian products should, in the Association's opinion, be brought about, taking into consideration the availability of raw materials, and possibilities of economical development of those processed and semi-processed materials which besides being needed as motor components have other varied industrial uses as well.

At the same time, as the volume of production is the controlling factor in ensuring

economical manufacture, Government should take immediate steps to remove those factors that have throttled motor transport development in India. These factors include (a) the crushing burden of taxation on motor vehicles and motor fuel, (b) restrictions on the free movement of motor vehicles under the Indian Motor Vehicles Act of 1939, (c) a poor and totally inadequate road system, and (d) the threat of extension of nationalisation of road services.

Amplifying the above recommendations, the Association has forwarded to the Tariff Commission a detailed memorandum, some extracts from which are given below:

"**Cheap transport the basic need.**—In the present stage of India's economic development, the Association is convinced that the country's basic need is cheap transport, not only because over 80 per cent of the population live in villages and depend for their economic pursuits on the availability of increased transport facilities, but also because industry, agriculture or trade in India has no more valuable tool than the transport vehicle. The development of the agricultural and industrial resources of the country is becoming increasingly dependent, day by day, on expansion of motor transport which in turn is dependent on our ability to lower its present excessive cost.

"While India's population is growing at the rate of more than 10,000 per day, it is obvious that unless the country's general national wealth is similarly increased through the development of its resources, the country has to become poorer day by day. And how far do present conditions encourage the development of the country's resources? Not far indeed, when we realise that the cost of transport has a direct bearing on whether or not a commodity can be economically produced and

marketed. Transport of materials between sources of supply and demand is a very big factor in the cost of producing any article, whether it be agricultural produce, other raw materials or manufactured goods. This transport cost enters into the cost of production at every successive stage, and at the present moment, high transport costs handicap India severely in holding her own against foreign countries which enjoy the benefits of cheaper means of transport.

"It is needless to point out that the effect of increasing the cost of any machine tool would be to put a brake on every economic activity requiring the service of that tool; and as motor transport is a most valuable tool to any country's industry and agriculture, national production cannot but suffer from the excessive cost of the transport vehicle. Transport being thus the industry upon which all others are dependent to a greater or less extent, it is in the interests of all to make the cost thereof as economical as possible.

"Crushing tax burden.—Prior to the last war, the cost of operation of motor transport was 1½ annas per ton-mile, but today, due to increases in taxes, of which import duties constitute one of the major factors, the incidence of taxation alone works out to 20 pies, which will be increased to 24 pies in Bombay State under Bombay's new Bills relating to motor vehicle and motor spirit taxation. The sorry spectacle we witness today is that goods, which railways carry at an average rate of 10 pies per ton-mile have to bear in taxation alone an amount equal to double the average railway freight if they need the 'luxury' of transport in motor vehicles. Can anything be more suicidal to the growth of motor transport and to the development of an indigenous motor manufacturing industry?

"Recommendation in 1925 for reduction of duties.—It may be recalled here that as long ago as in 1925, the Taxation Enquiry Committee of the Government of India said: 'It is difficult to exaggerate the political and economic advantages of rapid means of transport in India and the development of motor transport services should, in the opinion of the Committee, be encouraged by Government.' The Committee recommended that the import

duty then prevailing—of 30 per cent on motor cars—should be reduced and shortly thereafter Government reduced the duty to 20 per cent while lorries continued to bear a duty of 15 per cent. The subsequent increases in duties and other taxes have been considered by the Motor Vehicle Taxation Enquiry Committee of 1950 whose finding is conclusive that the high import duties have greatly retarded the normal growth of motor transport in this country.

"Further recommendation for duty reduction in 1950.—The Motor Vehicle Taxation Enquiry Committee of 1950 has referred to the present import duties on motor vehicles and has unequivocally recommended that the duties revert to where they stood on 1st March 1950. Remarking that high tariff (as high as 94½ per cent in some cases) and low cost transport do not go together, the Committee's report says:—

"In the Indian Finance Act, 1950, import duties on component parts and accessories of motor vehicles have been considerably increased, reaching in some cases to 90 per cent on the ad valorem value of the commodities taxed. Coming as it did on the top of successive enhancement of duties since 1949-49 and in the aftermath of devaluation, the Committee heard many complaints against the new enhanced duties and the opinion was expressed by almost all of the witnesses examined that the new duties were not serving the purpose for which they had been levied, they were not providing protection to the nascent Indian industry'.

"High duties defeat their purpose.—As pointed out by the Motor Vehicle Taxation Enquiry Committee, the protective duty is defeating its purpose of fostering an economic Indian automobile industry because the increased prices, consequent mainly on increased customs duties, is reducing the demand for vehicles in direct proportion. Examples of the considerable price increases of truck chassis are listed below:

	Price Rs	
	September 1949	July 1952
30 cwt. Bedford	...	7,350
180 in. wheel base Dodge	...	7,262
195 in. wheel base Studebaker	...	10,750
		11,398
		12,945
		16,250

"The present high Tariff introduced in 1950 has thus made the purchase and operation of automobiles beyond the power of a very large class of consumers. The

result is that normal vehicle replacements are not effected and whereas the average consumption of new vehicles prior to 1949 was 25,000 the present figures show a drop of 7,000 to 8,000 units annually. It is the considered opinion of the Indian Roads and Transport Development Association that import duties have to be revised with the object of increasing the volume of motor transport so that motor manufacture can be established on an economical basis, it being doubtful whether the present demand for automobiles would admit of economical manufacture

"Importance of ancillary industries.—

Looking to the pattern of industries, the Association is of the opinion that the development of ancillary or subsidiary industries should be encouraged as a preliminary to the establishment of the total manufacture of automobiles. Such subsidiary industries as steel bodies, transmissions, rear axles, carburettors, electric fittings, clutches, pistons, brakes, etc., deserve special mention. By encouraging such industries we can look forward to the birth of several specialist companies which would be able to concentrate on the production of standardised parts for the service of the motor manufacturing industry as a whole. To our knowledge, economic manufacture of motor vehicles in other countries has been made possible only because very large manufacturing units exist in those countries whose main function is to supply the whole industry. All motor manufacturers depend upon such subsidiary companies for the supply of many items of equipment fitted to their vehicles. The encouragement of such subsidiary industries is specially important to a country like India because the overwhelming majority of the parts required for the maintenance of the 3,00,000 vehicles on the roads today are met by imports. Having regard to the fact that India, because of its low purchasing power, keeps a vehicle on the road much longer than it is kept in use in wealthier countries, and further that an old vehicle requires a constant supply of new parts to replace those worn out, it will be seen that in point of volume and costs the manufacture of the replacement parts needed by the vehicles that are in use, is in fact, of greater importance to the economy of the country than new vehicles themselves.

"Subsidies.—We have stated above that a reduction in the import tariff is necessary in order both to bring down the initial price of motor vehicles and to give relief to motor vehicle users from the crushing tax incidence they now have to bear. While this view is fully supported by the Motor Vehicle Taxation Enquiry Committee of 1950 as already stated earlier, that Committee goes on to say that 'to the extent to which the motor vehicle user in India, already probably the highest taxed in the world is made to pay protective tariffs, he obviously cannot pay for the proper upkeep of roads,' and the Committee expresses the view that it is for the general taxpayer to bear such costs as protection may entail. Methods of protection of industries are also dealt with in detail by the Fiscal Commission of 1950 who say:

"Instead of raising the price of the imported commodity to the level of the fair selling price of the domestic product through a protective duty, Government may choose to reimburse the domestic producer through a subsidy for any loss that he may sustain by having to sell his product at the landed cost of imports. As a general rule, subsidies would be preferable to tariff protection in the following cases:

- (1) When domestic production meets only a small fraction of domestic demand;
- (2) When the commodities concerned are essential raw materials or adjuncts of production.

It is possible to reduce the burden on the exchequer by combining subsidy with a low protective duty. The rate of the protective duty should be so fixed and regulated from time to time that its yield is sufficient to cover the subsidy.

"The Commission goes on to point out by way of illustration that prior to 1949 the Government fixed the price of aluminium to the Indian consumer at a figure half-way between the landed cost and the fair selling price. 'The domestic costs were nearly twice as much as the imported costs' and it was considered unjust that the consumer should be called upon to pay the full amount of the difference.

"If we examine the steps so far taken for the protection of the motor manufacturing industry it will be seen that a very useful principle underlies the classification of parts into three groups which was adopted by the Government of India in 1950 for the purpose of the levy of import duties. Under that classification, protection is afforded particularly to

items under customs schedule 75 (10) which are subject to a duty of 90 per cent plus surcharge. This Association would suggest that in revising the duties, this category of parts should be assessed to a duty of 30 per cent and that the portion of the duty which is to be cancelled might be converted into a subsidy. At the same time, subsidies should be given to manufacturers of ancillary equipment wherever justified.

"Regulated imports.—A further direction in which the Indian manufacturer can be assisted is the regulation of imports. We have in mind the instance of piston rings, on the import of which a qualified ban has recently been imposed by the Government of India. The ban applies to piston rings below 6" in diameter, with the following exceptions:

Piston rings imported with the original equipment, C. K. D. or assembled, piston rings fitted to pistons when imported completely assembled, etc.

"It will be possible, in the Association's opinion, to enforce import regulations of a similar character when manufacturers of ancillary equipment are in a position to manufacture components to *proper standards* and in sufficient volume and variety to take care of the demands of the various types of vehicles operating in the country in respect of the parts that are sought to be so regulated.

"Healthy competition essential.—In making the foregoing comments we would emphasise the need to foster a highly competitive spirit among the several manufacturers and assemblers and producers of ancillary parts, because it is only by healthy competition that all concerned can be compelled to exploit every possible

means of reducing the manufacturing costs, thereby making more and more vehicles available to potential buyers at economical prices. Doubtless, a monopoly will be desired by every manufacturer in his own interests, but without healthy competition the large-scale development of the industry which it should be our aim to foster will be greatly impeded.

"Defence needs.—This memorandum relates exclusively to civilian requirements of motor vehicles in the country, since the Association does not know to what extent defence considerations will have to influence the Tariff Commission's investigations, but the Association would urge that if a particular course of action is dictated by the needs of defence, the costs of putting such special action into force should be borne by the Government so that the present crushing burden of tax imposed on the consumer, against which he is appealing for redress, can be lowered.

"Conclusion.—In conclusion, it is the opinion of the Association that the establishment of the industry be encouraged but on sound and economical basis to ensure that the country's transport system, both in respect of road development and expansion in the volume of transport, is not retarded by any adverse measures. The Association particularly requests that the Commission should, in its investigations, keep constantly in mind the need to provide cheap and efficient transport within the purchasing power of the average consumer and to increase the volume of transport by implementing the country's road development schemes, without which the produce of villages, principally agricultural, cannot be economically marketed."

—o—

"What are these spots on the wall?"

"Well, the man who lived in this room was an inventor. He invented some kind of an explosive."

"Oh, the spots on the wall are the explosive?"

"No, the inventor."

ROAD TRANSPORT IN CANADA

[From the Transport-Communications Review, July-September, 1952].

IN Southern Ontario and Quebec the main travelled highways are virtually as good as the trunk roads in the adjacent section of the United States. Only five cities in the world have more private passenger automobiles than Greater Toronto. Urban transportation in this city and in Montreal is sorely congested. Outside the St. Lawrence, roads are hardly up to United States standards but are being steadily improved.

The construction and maintenance of public roads is legally a responsibility of the provinces and the municipalities. Chiefly by means of gasoline taxes, the provinces finance all the through roads connecting the larger centres with one another, and with the United States. The municipalities get their income from taxes on real estate and grants-in-aid from the province. They look after city streets and the secondary roads in rural districts.

The role of the Dominion Government in highway transport has been limited. It deals with roads in the far northern regions which have not yet been included within the boundaries of any province and it takes care of highways running through national parks. Recently it undertook to advance 300 million dollars to the provinces for building a hard-surfaced road from the Atlantic to the Pacific. The existing trans-Canada highway is travelled throughout most of its length. Some provinces were hesitant about hard-surfacing roads through the thinly-settled sections which frequently lie between one province and another. Their reluctance can also be explained by the ease, in most cases, of dipping below the United States border, travelling over first-rate roads and then re-entering Canada later. Newfoundland, the most recent entrant into confederation, had barely started a trans-island highway so that the federal grant will be especially helpful to that province. It will also be of marked assistance to Saskat-

chewan where road-building materials are scarce and expensive, and to British Columbia with its mountains. The Dominion pays for highways out of general tax revenues.

The regulation of highway transport is too diverse for brief summarization. The protection of life and property is a prime consideration. All provinces require common carrier trucks and buses to obtain certificates of public convenience and necessity. The readiness with which certificates are granted varies a good deal from one jurisdiction to another. Private truckers, i.e., individuals or companies who own the vehicles and the goods carried in them, are free to enter and withdraw from the industry as they see fit. British Columbia, Saskatchewan, Manitoba and Nova Scotia strictly control the rates charged by common carriers within their boundaries. Quebec, New Brunswick and Prince Edward Island have regulations which they do not enforce, while the remaining, provinces Alberta, Ontario and Newfoundland do not officially supervise rates at all. Associations of truckers are active in exhorting their members not to slash rates. In some instances, especially in the carriage of household effects, the associations have been instrumental in getting all their members to use identical tariffs.

Though often urged to do so, the Dominion Government has not tried to control highway transport. Under the Canadian constitution, the federal Government has practically complete jurisdiction over railways and their traffic except that it has refrained from exercising its authority over lines owned by provincial governments. The Dominion technically has control over "trade and commerce" but interpretation of this clause by the courts has so circumscribed its meaning that, in so far as transportation is concerned, it

(Continued on page 12)

A NOVEL METHOD OF TESTING CONCRETE

THE quality of concrete as actually placed in the forms is of the greatest importance in concrete construction. For this reason, sample test cylinders or cubes are made while concrete is being poured. It is, however, generally felt that the compressive strength obtained from tests of the sample cylinders or cubes may not always be truly representative of the concrete in the structure. For example, the sample may be rodded more thoroughly than the concrete in the structure which may have been vibrated while the sample was hand-rodded. The curing conditions may be different for the structure and the sample.

Sometimes cores of concrete are cut from the structure and tested in a laboratory. This method is, however, expensive and difficult. Moreover, cores can-

not be cut at certain points without weakening the structure and it is precisely at these places that it is often important to know the strength of the concrete.

practice, gives useful qualitative results—viz., the practice of striking the concrete with a long-handled light hammer and judging its quality from the sound of the blow and the rebound of the hammer.

The Concrete Test Hammer is shown in the accompanying photograph. The longitudinal section illustrates the constructional details of the apparatus. In it a light-weight steel hammer, free to travel in a tubular frame, is drawn against spring tension by means of a trigger. The base of the frame is firmly pressed against the concrete, and when the hammer is fully drawn, the trigger is released, allowing the fully-extended spring to drive the hammer against the concrete. A small sliding pointer indicates the rebound on a scale. The amount of rebound "R" shown on the scale is a measure of the compressive strength of the concrete as determined by the hardness at the point tested. "R" is a characteristic indicating the strength of the mortar close to the surface of the structure.

Test Procedure

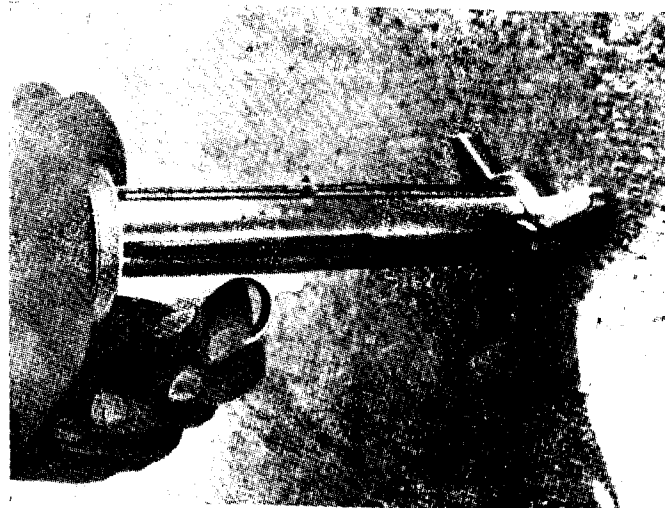
To make inspections of concrete with the test hammer, the following procedure is used:

1. Select the location for testing. Any surface produced by formwork is suitable, including a troweled surface. Rough spots, honeycombs, etc., should be avoided.

2. When necessary, prepare the surface over a 3 or 4-in. area by stoning flat with carborundum.

3. Take six to ten rebound readings with the test hammer at the selected area, and determine the mean rebound number "R".

The relationship between the rebound number "R", and the compressive strength of the concrete has been investigated by the Swiss Federal Testing Labo-



Concrete Test Hammer.

not be cut at certain points without weakening the structure and it is precisely at these places that it is often important to know the strength of the concrete.

To overcome these difficulties and to test concrete structures in the field, a Swiss engineer, Ernst Schmidt, has developed a novel instrument which measures the compressive strength of concrete by observing the rebound of a hammer off the concrete surface. He bases the instrument on the common procedure which, with some

ratory by means of an extended series of compression tests on some 550 specimens. Each concrete specimen was subjected to ten impacts with the test hammer, and the mean value of "R" recorded with the compressive strength as obtained in a testing machine.

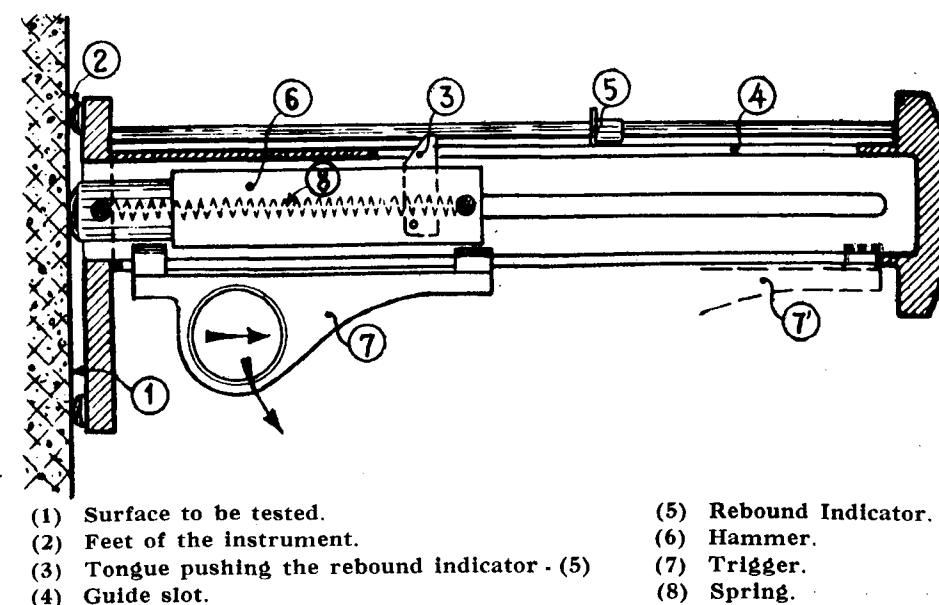
About 90 per cent of the tests were made on specimens prepared at various job locations and sent to the laboratory for testing. They represented any and all conditions of preparation, curing, and handling. The remaining 10 per cent of the specimens were laboratory prepared for the specific purpose of studying the influence of rebound hardness on compressive strength.

Special Concretes

It should be noted that the tests carried out until now are only concerned with concrete having the usual proportions of sand and stone aggregate specified for structural work. Should the test hammer be used for inspecting the quality of special concrete made from other aggregates, such as brick, pumice, ashes, slag, or other materials, laboratory correlation between compressive strength and rebound number "R" would be necessary for the type of concrete to be tested.

A Time Saver

The Concrete Test Hammer is not intended in any sense as a substitute or



replacement for control test cubes. On the contrary, it should be regarded as an adjunct to the control cubes in construction work. It can be used to check the uniformity of concrete quality in the actual structure. It is also useful in determining the rate at which concrete reaches a required strength on the job. Thus it enables the engineer-in-charge to establish the safe time for the removal of formwork.

If it cannot eliminate the need for taking core samples the apparatus can at least reduce the number of such samples required for compression tests.

The apparatus is calibrated for use in the horizontal position and therefore for the examination of surfaces in vertical planes. When the apparatus is used on horizontal or inclined surfaces, the reading on it must be modified to get the correct figure for rebound.

INDIA'S ROAD PLANS

INDIA has at present 2,55,000 miles of roads of which about 36 per cent are surfaced. This is not sufficient for a big country like India with an area of 1,139,000 sq. miles. There is an urgent need for more roads, and as the Prime Minister put it, "roads of all kinds, not only very up-to-date and bituminized or cemented roads but roads of any kind to open out vast areas of this country which are closed up today and to which you cannot go unless you walk or ride some kind of an animal, either a horse or an elephant."

From the point of view of defence and peacetime progress alike, roads are indispensable. They can help to tap the country's potential wealth and solve its food problem. In India for every 100 acres of land sown there are 50 acres lying uncultivated. The main reason for this is that it is uneconomic to cultivate these lands due to the lack of roads linking them with marketing centres. On the other hand, it is only by providing an easy access to raw materials that India can become industrialised. The development of roads must, therefore, precede all rural or industrial development in this country.

Road Development Plan

India's Chief Engineers in 1943 prepared a plan for road development. The objective underlying this plan (known as the Nagpur Plan) was that no village in a well-developed agricultural area should remain more than five miles from a main road, while in a non-agricultural area no village should remain more than 20 miles from a main road.

The Nagpur Plan still forms the basis of all road planning in the country. The Planning Commission have embodied its principles in the first Five-Year Plan

Significant Step

In 1947, the Central Government assumed complete financial liability for the

maintenance and development of a system of trunk roads of about 13,400 miles, classed as national highways, or "main highways serving predominantly national, as distinct from State, purposes running through the length and breadth of India which together form a system connecting (by routes as direct as practicable) major ports, foreign highways, capitals of States and including highways required for strategic movements for the defence of India."

This significant step was taken in recognition of the fact that in the development of roads a national conception was necessary. It was also hoped that by relieving the States of expenditure on this item they would be able to devote greater attention to the improvement of district and village roads.

This mileage of 13,400 included at that time approximately 1,600 miles of 'missing' road links and about 120 'missing' bridges over very large rivers in addition to many other bridges large and small. The progress of development of this system during the last five years although slow owing to the prevailing financial stringency, and shortage of labour, materials, and trained personnel has been steady, balanced and continuous. During the five years ending 1951-52, a total expenditure of Rs 930 lakhs was incurred by the Central Government on the development of this system and Rs 1,311 lakhs on maintenance and repairs. As a result, 160 miles of new roads and 17 very large bridges, besides numerous smaller bridges, were constructed and 1,315 miles of road were improved.

Tempo of Work Increasing

The current Five-Year Plan for the period 1951-52 to 1955-56 provides Rs 27 crores for the development of national highways, of which about Rs 3 crores were spent in the first year and the expenditure expected to be incurred during

1952-53 is Rs 4½ crores. The tempo of work is increasing and will reach its peak between the third and the fourth year.

The works in progress on three important highways are worthy of mention. On the Bombay-Ahmedabad section of the Bombay-Rajputana-Delhi highway, 120 miles of new roads with bridges are under construction at a cost of about Rs 3 crores. On the Calcutta-Siliguri highway improvement and construction of 82 miles of missing links are in progress. This will cost Rs 125 lakhs. Some 75 miles of missing links are also nearing completion at a cost of about Rs 65 lakhs on the Orissa section of the Bombay-Calcutta highway.

The two important highways that have recently been completed are the Jullundur-Pathankot and the Assam Access highways. The former which links Kashmir with the rest of India cost Rs 80 lakhs and was opened to traffic in 1952. The Assam Access road, which had to be re-aligned after partition to provide road connection with Assam entirely through Indian territory, cost Rs 106 lakhs and was opened to traffic in 1950. Modernisation work on this road costing another Rs 30 lakhs is still in progress.

There are at present under construction 20 major bridges, totalling more than 22,000 running feet, and costing altogether Rs 3.40 crores. A few of the important ones are the Gowtami-Godavari, Pennar, Palar, Champavati, Mahanadi, Brahmini, and Baitarani. Some of these bridges are being built to designs which are new to India and the Palar bridge near Chingleput will perhaps be, for some time at least, the longest pre-stressed concrete bridge in the world. The construction of 410 miles of new sections of national highways is in progress and, in addition, 1,320 miles are being improved.

The Five-Year Plan provides for the completion of the work in hand and the taking up for 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 are to be improved. Of this programme about two-thirds will be completed by 1955-56, and the rest will be in progress.

Help To States

The Central Road Fund was created in 1929. From this over Rs 32 crores have so far been allocated to State Governments for road development. The Fund is now a powerful source of help to the States as it provides something like Rs 4½ crores annually for aiding the development of roads other than national highways. During the Five-Year period 1947-48 to 1951-52, a total expenditure of Rs 721 lakhs was incurred from the Central Road Fund in Part 'A', 'B' and 'C' States, and schemes costing in all Rs 1,628 lakhs were approved by the Government of India. Some hundreds of road development works in progress in the various States are financed from the Central Road Fund either wholly or partly, and for these a provision of Rs 3.74 crores has been made in the current year. Grants aggregating nearly Rs 150 lakhs from the Central Road Fund Reserve have recently been offered to States having poor communication facilities and they have been invited to put forward proposals for suitable road and bridge schemes which could be financed from these grants.

According to the schemes envisaged by the State Governments and to be financed by them, the mileage of metalled roads will increase from 10,007 miles in 1950-51 to 12,453 miles by 1955-56 in Part 'A' States and from 7,588 miles to 8,129 miles in Part 'B' States. During the same period the mileage of unmetalled roads will be reduced from 2,199 to 757 miles in Part 'A' States and from 526 to 206 miles in Part 'B' States.

The road development plans of Part 'C' States are being framed to provide for the construction of as many new roads as possible for opening up areas, which are at present inaccessible, while improvement and reorientation of the existing roads to meet the changed administrative requirements and the economic development of the areas is also being emphasised.

A Model Scheme

The Roads Organization have formulated a 'model scheme' for village road development on a co-operative basis and has made an initial offer of a grant of Rs 15 lakhs from the Central Road Fund

Reserve as a contribution towards specific projects. There is considerable scope for the development of village roads on co-operative basis by mobilising the local population for executing local projects.

The above programme is exclusive of likely road development under the community development projects. Tentatively it has been estimated that 16,000 to 17,000 miles of *kutch* roads will be constructed in the village units falling under those projects.

Opening Up Land-Locked Areas

The Transport Ministry assumed administrative control over road development in all Part 'C' States (except Coorg), Andaman and Nicobar Islands, North-East Frontier Agency, and Sikkim, from April 1, 1950. Since then, a total expenditure of Rs 195 lakhs has been incurred on road development and Rs 159 lakhs on

maintenance and repairs up to March 31, 1952. The expenditure during 1952-53 on development works is expected to be Rs 186 lakhs. Most of the roads which are being constructed in the newly-formed Part 'C' States are designed to open up 'land-locked' areas and to facilitate the physical and economic integration of these States as well as to meet the changed administrative requirements.

The Central Government's plan also provides Rs 4 crores for the development of certain roads of inter-State importance, other than national highways, which are required to link up some of the isolated States in India and to meet the administrative and strategic needs. These roads are the Passi-Badarpur road together with the Assam border-Agartala road, which will provide through road connection between Shillong and Agartala, the Pathankot-Jammu road and the west Coast road in Bombay and Madras States.

(Continued from page 7)

covers no more than highway traffic between the various provinces and with the United States. Canadian provinces are large and trucking is not yet as fully developed as in the Republic to the south. The volume of inter-provincial and international trucking is only from 3 to 5 per cent of the total and perhaps Dominion intervention is not justified for such a small

proportion. Provincial governments at present regulate highway transportation in its entirety by reason of their jurisdiction over property and civil rights, local public works, and so on. By contrast, in the United States it is the federal Government that does the lion's share of regulating highway transport.

Before a music department recital at a south west university a local soprano boasted to the other singers in the dressing room, "I insured my voice for 10,000 dollars."

"And what," queried a rival soprano, "have you done with the money?"

* * *

HERE AND THERE

1. HOW MANY BUMPS PER MILE?

THE Ministry of Transport have available a machine known as the "Bump Integrator," which measures the longitudinal deformation of a road surface in inches per mile. It is, therefore, possible to obtain a figure which expresses the smoothness of a road surface. Experience has shown that roads with a value of less than 150 can be considered satisfactory to good and with values exceeding 200, uncomfortable to bad.

and typical results are set out below:

Before	After
254	120
197	109
216	105
209	124
423	128
234	126
219	119

Tests have been made on a number of roads before and after reconstruction,

(Extracted from 'The Surveyor'-January 24, 1953).

2. A 101-MILE ROAD SAVES 347-MILE DETOUR

A NEW direct road from Simla to Mandi in Himachal Pradesh was opened to traffic on the 14th November, 1952.

This new road which branches off from the main Simla-Kalka road near Boileau-ganj is 101 miles in length, out of which a stretch of 66 miles is on an entirely new alignment.

This road shortens the distance between Simla and Mandi by 347 miles. The cost of travel between these two places is reduced to one-fourth the previous rate, as prior to the opening of this road, one had to travel via Kalka, Ambala, Amritsar and Pathankot.

Buses are now regularly plying on this road between Simla and Mandi, and the people of the areas, which this new road has opened up, are quick to realize its importance and the great benefits that will accrue to them when the numerous feeder roads to connect with this main State Highway are completed.

There are no sharp gradients on this route, and with further widening and metalling it will become a first-rate road link between Simla and Mandi, and then to Manali and Kulu in the Kangra District of the Punjab.

3. CENTRE-LINING SAVES LIVES

CENTRE-LINING primary highways costs the South Carolina State Highway Department approximately 250,000 dollars annually. The Department believes that the marking programme is worth what it costs, because a clearly visible centre-line helps prevent accidents and saves lives. Approximately 155,000 dollars are spent for paint, 35,000 dollars

for glass reflector beads, and 60,000 dollars for labour and equipment use. Each of the seven engineering districts has one or more units equipped for this work.

* * *

The objective at the present time is to find a permanent or nearly permanent line. There still is no permanent line,

but reflectorization has so far proved the best answer to adding durability to centre-lines.

The addition of reflectorized materials to wet paints has been found the most satisfactory and economical method of reflectorizing centre-lines in South Carolina. All centre lining now includes the separate application of paints and reflectorized beads, but the two operations

are performed simultaneously with one machine. Although the use of beads increases the initial cost of centre-lining, the ultimate cost is actually lowered, the department has found. The best available estimate indicates that paint treated with the beads lasts about twice as long as paint applied without reflectorizing beads.

(*'Better Roads'*, April, 1952).

4. THAMES BRIDGES

INTERESTING facts about Thames crossings were given by Mr. E. Granter in his recent presidential address to the Institution of Structural Engineers. For over five centuries, he said, old London Bridge was the only bridge over the Thames and although London was extending westwards and growing rapidly in size and importance, the building of a second bridge was so vigorously opposed by the City of London that it was not until 1729 that a second bridge was built at Putney. This was followed by the opening of old Westminster Bridge in 1750, old Blackfriars Bridge in 1769 and old Battersea Bridge in 1772. With the rapid growth of the population in the nineteenth century nine new road bridges were built and the five earlier ones rebuilt. Since 1900, although bridges on new sites have been proposed, none has yet been built, but five have been rebuilt.

All the Thames bridges with the exception of London, Blackfriars, Westminster and Chelsea Bridges, built in the county before 1877, had been constructed by private companies for profit, tolls being payable for both vehicular and pedestrian traffic. However, people would travel considerable distances to avoid paying a small toll; consequently the enterprises

were not generally financially successful. In 1877 was passed the Metropolis Toll Bridges Act providing for the purchase by the London County Council's predecessors, the Metropolitan Board of Works, of all bridges, with the exception of Westminster, from Waterloo to Hammersmith inclusive, in order to open them to the public free of toll; by the end of 1880 all the bridges had been freed. Compensation paid by the Board to comply with the Act amounted to £1,376,825. Blackfriars and Southwark Bridges were freed from toll in 1811 and 1864, respectively. Most of the bridges purchased had to be strengthened to carry the greatly increased traffic which resulted from the removal of the tolls, while Hammersmith, Putney and Battersea Bridges had to be rebuilt.

Today there are 14 road bridges over the Thames in the County of London, ten are owned and maintained by the London County Council and the remaining four—Tower, London, Southwark and Blackfriars—by the City Corporation. All the original bridges, with the exception of Tower and Albert, have been rebuilt.

(Extracted from *'Modern Transport'*—January 10, 1953).

5. CHANNEL FORMED BY EXPLOSIVE CHARGE

THE construction of the new refinery at Coryton for the Vacuum Oil Co., Ltd., has provided an unusual example of the use of explosives. In order to provide an outfall to the sea at low tide and across the intervening foreshore, for the cooling

water from the power plant, it was decided that it was necessary to excavate a channel some 6 ft deep and 200 yards long, as measured from the sea wall bounding the refinery site. The foreshore, however, would have bogged down any normal type

of earth-moving equipment, and this presented a problem which was solved by the somewhat unusual expedient of laying charges in groups along the chosen alignment, and detonating them at approximately 10-minute intervals. Tons of mud and slush were thrown into the air and a channel sufficient for the purpose was

formed. It is anticipated that as soon as the discharged cooling water begins to flow (of the order of 15 million gallons daily), the channel will keep itself open and clear.

(Extracted from *'Engineering'*—January 16, 1953).

6. PHOTOGRAPHY AND ROADS

IN building roads we make constant photo-records, say Florida's engineers. (Here's what Photographic section does: as soon as a definite centre line is established on a proposed new road or reconstruction, a photographer makes preliminary shots. They show things like worn-out pavement and traffic bottlenecks. All

property that may be affected by proposed construction is photographed. Locations of all driveways, sidewalks, ornamental masonry and shrubbery are recorded on film).

(*Industrial Photography*, V. 1, No. 1, Fall 1952.)

7. FIVE-YEAR PLAN DEPENDS ON TRANSPORT

THE current Five-Year Plan and subsequent progressive economic planning envisage tremendous economic activities on industrial and agricultural fronts. This will naturally mean transport of raw materials from producing centres to industrial towns and thence to consumers spread all over the country. The increased income will also find outlet in movement of vast number of men and materials from place to place. These factors compel re-assessment of our transport position.

It is common knowledge that shipping and railways serve only the coast and strategic towns and the interior of our sub-continent consisting of 600,000 villages

where 80 per cent of our people live, will have to be reached only through the roads. Of course to-day the bulk of road transport is borne by a primeval mode on bullock carts. For an efficient and cheap system of transport this ought to be replaced by the automobile. This means an increase of automobiles by a hundredfold than at present. The inevitable role of automobiles in the execution of Five-Year Plan together with the tremendous part it plays in the defence scheme of the country compels us to aim at self-sufficiency in this vital, though very complex industry.

(Extracted from *'Transport'*—January 1953).

8. MANUFACTURE OF MOTOR VEHICLES IN INDIA

THE question of manufacture of automobiles has been before the Government of India for some years past. The main factor which is retarding the manufacture of motor vehicles in India is the low volume of demand. The low demand is principally due to three causes, namely, the average low income of the people, the high cost of manufacture, and the backwardness of the road system. Each of these affects the others and creates a vicious circle. What is true of the manufacture of motor vehicles, is also true of the

manufacture of components and parts. The position is further aggravated owing to the multiplicity of types and models of motor vehicles which makes the production of components and parts for use as original equipment or for purposes of replacement unduly expensive.

On the basis of motor vehicles sold in India during recent years, it is estimated that the demand for passenger cars, trucks and buses would not exceed 20,000 per year if the high level of prices remains as

at present. Of these 20,000 vehicles the demand for passenger cars would be about 10,000 and for commercial vehicles, that is trucks and buses, another 10,000. This demand, compared with the demand of countries with a much smaller population in Europe or America, is very meagre.

Among the reasons which make the establishment of an automobile industry desirable, the following important reasons may be mentioned :

- (1) India spent during the five years ended 1951-52 foreign exchange exceeding Rs 55 crores and Rs 37 crores, respectively, on motor vehicles and motor parts. It goes without saying that, if the domestic industry is developed, a large portion of the foreign exchange can be saved and utilised for capital needs and machinery for the new industry.
- (2) The automobile industry will create a demand for products of a large number of engineering and other industries and accelerate the process of industrial development.

(3) The automobile industry, besides opening up a fresh field of employment, will be in a position to provide the skill and technical knowledge for the establishment of other allied industries such as tractor manufacture, tank manufacture, internal combustion engine manufacture, etc..

(4) The automobile industry will serve as a medium to further national integration by providing facilities for communications between different parts of the country and thus increasing opportunities for contacts between rural and urban communities.

(5) In times of national emergency the automobile industry can be switched over to the production of vehicles, ammunition, etc., required for defence.

(Extracted from 'Transport' — January, 1953).

9. U. K. INVESTMENT ON ROADS

DURING his Presidential Address to the Institute of Transport, Mr. C.T. Brunner gave some interesting calculations. If the 1929 cost of moving a certain commodity, say oil, by water, rail, and road respectively, is placed at 100, the present day corresponding costs would work out at 180, 170 and 100.

76 per cent of all current spending on inland transport was on road transport, 22 per cent on rail transport and 2 per cent was on water and air transport combined.

—From 'World Highway Report No. 21/22'—Nov. 1952.

10. MOVABLE HEAD LIGHTS FOR CARS

AN ingenious system of movable headlights for cars which throw their light round a corner before the car takes the bend is reported to have been invented by an Italian engineer. The system, which is now being tried out on the Swiss 48-seater mountain buses, is regarded by test drivers as a success.

Two fog lamps built on swivels are fixed by a cable underneath the chassis of the car which joins to a block fixed to the front wheel brake drums. When the driving wheel is turned to the near side the left-hand fog lamp is turned. When

the car turns to the right the left fog lamp remains idle and the right lamp turns in the direction the car is taking. The turning distance of the swivelling lamps is greater than the angle taken by the car and therefore, shows up the kerb and bend before the car has turned.

On winding roads or in fog the system is said to be excellent. It can be fixed to any car at a moderate price.

(Extracted from 'Hindustan Times'—5-12-1952).

ROADS IN PARLIAMENT

IN the House of the People, Shri K. Subrahmanyam asked on the 26th February 1953 whether any further progress had been made in the construction of a road-bridge over Krishna river at Vijayavada, and when the construction of the bridge was expected to be completed. The Deputy Minister of Transport, Shri O. V. Alagesan, replied that the surveys had been completed according to plan and alternative designs were under consideration. It was too early to say when the project would be completed. Everything possible would, however, be done to expedite its completion.

In reply to Shri Rishang Keishing, the Deputy Minister of Transport stated in the House of the People on the 17th March that the Mizo people, with the help of the Assam Rifles, had improved the existing Aijal-Lungleh bridle path in sections over a distance of about 75 miles to make it "jeepable" and built about 15 miles of new road 8 to 12 ft wide. A grant of Rs 1.08 lakhs had been so far sanctioned by the Assam Government towards the cost of this project and a proposal to make a further grant from the Road Fund was under consideration. The State Government had also undertaken maintenance of 72 miles of this road at an annual cost of nearly one lakh of rupees. The intention was to maintain

this road as an all-weather jeepable road for the present.

In reply to another question by the same Member, the Deputy Minister stated that 35 per cent of the total amount of money allotted for the development of the people in the North East Frontier Agency was expected to be spent on the construction of roads during 1952-53. Thirteen roads had been completed and two improved and five were under construction. The milages were 145 miles newly constructed and 90 miles improved. The Government of India were planning to build more roads in the North East Frontier Agency during the next three years. The construction would be carried out by the Engineering Department of the North East Frontier Agency and Army Engineers.

In reply to Shri Biren Dutt, the Deputy Minister of Transport stated that excepting a short strip of land just requisitioned for the Khowai-Kalacherra Road, only 80.76 acres of land had recently been acquired for the Khowai-Taliamura road. The Udaipur-Agartala road had been constructed long ago and no land had been acquired recently for it. No compensation had been given so far to peasants who have been evicted from these lands. Compensation would be made after the rate of compensation had been fixed by the Land Acquisition Court.

"Good gracious!" gasped the young man, collapsing heavily on the carriage seat. "I've accidentally pulled the communications cord while searching in my luggage. What shall I do? I'll be fined five pounds."

"The Scot in the corner looked thoughtful."

"Don't worry, laddie, don't worry," he said calmly.

"Just gi'e me three pounds and I'll throw a fit."

Procedure and the Schemes for the Training Abroad of Indian Highway and Bridge Engineers

AN important feature of the post-war world economy is a conscious effort on the part of some of the advanced countries to help in the economic development of the under-developed countries. One form of such assistance has been by way of providing technical knowledge for expediting the development work in under-developed areas. Programmes of such assistance exist with the United Nations and its specialized agencies, with some of the member countries of the Colombo Plan, with the United States of America under Point 4 Aid, and with a few private organizations like the Ford Foundation. India is mainly a recipient of such assistance which is taken advantage of by either sending suitable professionals for advanced practical study in various technical or scientific fields or by securing the services of "experts" from the countries offering such assistance. Road and Bridge Engineering is one of the various fields of study available under these assistance programmes.

Enquiries are often received from ambitious road engineers both by the Ministry of Transport (Roads Organization) and the Indian Roads Congress seeking information about such training schemes in the field of highway and bridge engineering. Light on these schemes and the procedure for taking advantage thereof by the interested engineers is shown in the following paragraphs.

Facilities for advanced study of modern techniques and practical training in the field of Highway (including 'Bridges') Engineering are offered to the Government of India (through the Ministry of Finance, International Aid Co-ordination Unit) under the following three Schemes, namely:

- (1) **Colombo Plan - Technical Assistance Programme**, for a period of about five or six months. The Government of the (Commonwealth) country which agrees to provide training, bears all costs (including maintenance allowance) of trainees arising within

its own territories—the expenditure in India (internal travel and Indian pay) to be borne by the sponsoring State Governments concerned.

- (2) **Point-Four Aid Programme**, training usually lasts six months. The United States Government bears all costs **ex-India**, the local costs which include internal transportation up to the embarkation point are met by the sponsoring State Government.
- (3) **United Nations Economic Development Fellowships/Scholarships Scheme**. The cost of training is met by the United Nations excepting that incurred in Indian currency which is met by the sponsoring State Government. Fellowships are usually for three to six months and Scholarships for twelve months.

The training available under these Schemes is of post-graduate standard and preference is given to candidates with about eight years' good service in a responsible position and who have shown keen interest in the theory and practice of road and bridge construction.

Whenever offers for training are received under these Schemes, the State Governments are supplied with relevant details and application forms and are invited to nominate suitable road engineers for training abroad; and after scrutiny of the applications suitable candidates are selected and nominated by the Ministry of Transport (Roads Organization) depending upon the number of places for training offered.

The Ministry of Transport entertains applications of only such road engineer officers who are employed under a State Government or the Central Government. It is, therefore, for each State Government or Central Government Department concerned to put forward proposals for the training of engineers in their service.

ROAD RESEARCH IN THE U. K.

(Extracts from the 'Report of the Road Research Board, 1950'.)

SKIDDING.—Data continue to be accumulated from various parts of the country on the resistance of road surfaces to skidding as measured by their sideway force co-efficients. These measurements have been studied to throw light on two important problems—"What standard of skidding resistance is required to prevent the bulk of the skidding accidents?" and "How does the performance of present-day roads compare with this standard?" The observations suggest that the great majority of skidding accidents occur on roads with co-efficients less than 0.4 at 30 miles per hour and that many roads are below this standard.

COLLECTION OF STATISTICS AND OTHER DATA.—Observations were made of the changes in the flow of traffic entering a junction produced by parking a car at different distances from the "stop" line. In the six junctions studied, when the traffic was at its heaviest, a car 15 ft from the stop line reduced the saturation flow by 29 per cent; even at 100 ft, this flow was reduced by 7 per cent.

Several groups of results were obtained in "before and after" studies in Central London. The use of a new type of bus 6 in. wider than former types produced no serious effect on traffic. "No waiting" regulations increased speeds by some 3 per cent in areas where they were imposed.

SURFACE DRESSING.—Early in 1948 we undertook a detailed survey of the research programme of the Laboratory, with the object of selecting for special study items which would strengthen the economic position of the nation. One of the items chosen in which particularly useful progress has been made is surface dressing. The basic requirements for successful work

were laid down in 1947 in Road Note No. 1, "Recommendations for tar surface dressings", which contains tables giving the correct rates of spread of tar for different sizes of chippings, relating them to the conditions of traffic and of the road surface as established by the Laboratory's experiments. Over 12,000 copies of this note have been issued. The same information has also been made known to the road engineers responsible for carrying out surface dressing through the publicity services of the British Road Tar Association—the body co-operating with the Laboratory in the whole investigation.

One of the most fundamental problems in road engineering is that of "pavement design", that is, the determination of the most economical thickness and the type of surfacing required for any given set of conditions of soil, traffic and climate. A promising beginning was made to this long-term research by the construction in 1946 of the concrete experimental road near Oxton in Nottinghamshire, on a gravel-sand. At the same time other sites offered by the Ministry of Transport were surveyed and found to be suitable for further experiments, notably a length of Oxford clay at Alconbury Hill, forming a dual-carriageway on A-1, and a weald clay at Hailsham.

SOIL STUDIES.—The most interesting outcome of the work during the period now under review is the advance made in the studies of the laws of the movement of moisture in soils. After a road has been constructed the waterproofing action of the surfacing sets up a condition in which the fluctuations in moisture content in the underlying soil are relatively small, the value of the moisture content at any point being largely determined by the

nature of the soil and the position of the water-table. The prediction before a road is built, of the mean value about which this moisture content will fluctuate, using data obtained from a soil survey, would form a useful guide both to the treatment of the soil and the design of the surfacing to be put on it. In particular the soil would be compacted as nearly as possible at the maximum value of this fluctuating content likely to be reached, thus reducing to a minimum any shrinkage or swelling of the soil arising from changes in its moisture content during the life of the road. The advance towards this ideal is substantial but more knowledge is required before the laws of moisture movement are sufficiently well known to enable the effect of all conditions to be predicted.

** **

COMMITTEES.—In 1949 we set up a joint committee with the Ministry of

Supply to co-ordinate civil and military researches on soil problems. This Committee has concentrated its attention on the development of rapid methods of road construction essential in military operations. Two specific investigations have been put in hand; the first is concerned with the development of tests by which the potentialities of any particular soil can be simply and quickly assessed, the second has as its aim the improvement of machines and methods of soil stabilization particularly for dealing with clays and other "difficult" soils.

The detailed review of existing knowledge relating to the design and construction of concrete roads undertaken by the Committee for Co-operative Research with the Cement and Concrete Association has now been published jointly by the Department and the Association with the title "Questions and Answers on Concrete Road Construction."

THE LESSONS OF WAR AND PEACE ARE THE SAME

In Peace

"I have come to the conclusion that one thing to which we must give topmost priority is roads—roads of all kinds, not only very up-to-date bitumenized or cement roads, but roads of any kind, to open out vast areas of this country which are closed up today and which you cannot reach unless you walk or ride.....I give roads first priority."

Jawaharlal Nehru.

"Among the social services, I put communications first since I do not see how it is possible to effect any great improvement to health and education in the villages of India unless they can be reached surely and quickly at all times."

Lord Wavell.

In War

"The more experience I have had of both peace and war, the more I appreciate its general truth. After some years in high military command, I am inclined to put forward as a parallel dictum that 'War is Transportation.' Certainly it is the ruling factor in military operations; and no campaign has better illustrated this than that on the North-East frontier of India and in the north of Burma."

Lord Wavell.

TECHNICAL INFORMATION

1. ROAD-MAKING WITH SAND

AN extensive programme of road-building, using an oil-bound sand admixture, is now in progress in the Seria oilfield in British Borneo. Seria lies in a narrow coastal strip, five miles long, between the South China Sea and dense jungle, and the new roads are being laid to open up communications generally, as well as to provide access to a residential area recently built to accommodate employees at the oilfield. No local stone is available for use either as a foundation material or for surfacing, the nearest source of good-quality stone being about 150 miles away. Sand, however, is readily obtainable from the beach and has been used as the basic material for building the roads, thereby avoiding the use of the country's transport system, which is already fully occupied.

The first stage in the construction of these roads consists in the preparation of the sub-grade by removing the top-soil, which has a high content of decayed vegetation, and the cutting of side drainage adequate for the surface water during a tropical rainstorm. For the most part, the sand is being pumped from the beach to the road edge, where the mixing—91 per cent sand, 4 per cent hydrated lime (as an activator), and 5 per cent special "cut-back" bitumen—is carried out in a simple paddle mixer operated by unskilled labour. The mixture is spread over the subgrade by rakes to a depth of 4½ in. and consolidated by rollers. A curing period of between two and three weeks is allowed before applying the sealing coat; during this time the road is periodically rolled and it is open to light traffic. The

sealing coat consists of a cut-back bitumen sprayed on to the surface, and on to it is thrown a thin layer of a mixture of sand and fine material obtained from rock crushing. The roads are immediately made available to all traffic, which includes trucks that may occasionally carry loads of 25 or even 30 tons. Where the traffic can be described as "medium," these roads have proved to be adequate, but where they are subjected to an intensive loading by heavy traffic, it has been found necessary to lay an additional surface after a lapse of three to six months. This additional surface consists of a chip carpet, 2½ in. thick, made from ¾-in. wet gravel mixed with bitumen and lime, and sealed by a bitumen spray and fine gravel. During the period of placing, it has been found that these mixtures will remain stable and workable through the heaviest of tropical rain, although it may prove necessary to cease work because of the arduous conditions.

The Seria oilfield is operated by the Shell Petroleum Company, Limited, St. Helen's Court, London, E. C. 3, who state that they developed this method of road-laying during the war, when it was used with success for the rapid construction of airfields. It is believed that the work at Seria, where 10 miles of roadway with a surface area of more than 100,000 square yards have already been laid, is the first extensive application of this method in the tropics.

(Extracted from 'Engineering'
— January 30, 1953).

2. MOVING A HIGHWAY BRIDGE IN SWITZERLAND

JUST before the building of a new bridge over the River Aar at Olten, the old bridge was moved sideways a distance of 25.65 m. (84 ft). The displaced bridge is now being used as a temporary structure during the construction of the new bridge. It was considered more economical to adopt this solution rather than to dismantle the old structure and to build a service bridge. Details of the operation were given by Herr W. Kolross in the *Schweizerische Bauzeitung*.

The old Olten bridge was 104.50 m. (340 ft) long and had a central span 40 m. (131 ft) long and two side spans. The decking accommodated a 5.4 m. (17½ ft) wide roadway and two footpaths each 2.5 m. (about 8 ft) wide. The bridge, which was built about 70 years ago, was widened and strengthened in 1923 in order to ease the flow of traffic between the railway station and the new residential areas of the city. Structurally, the bridge consisted of two lattice girders 2.93 m. (9.6 ft) high and 5 m. (16.4 ft) apart; inter-connected by means of transverse beams, with cantilevered arms carrying the footpaths. The weight to be moved was estimated at 840 tons, but in practice the weight moved was 880 tons.

The moving operations were carried out in the following way. Four rolling paths were used, two of them being placed along the centre line of the river piers and two others slightly offset from the centre line

of the abutments in order to reduce as far as possible the secondary reactions. The rollers were 50 cm. (about 20 in.) long and of 16 cm. (6½ in.) dia., spaced 26 cm. (10 in.) apart on the piers and 33 cm. (13 in.) apart on the abutments. On the central paths, bogey units were formed by rollers assembled in groups of 5 by 5 and carrying elements consisting of three rolled steel joists 32 cm. (12½ in.) high, inter-connected by two R.S.J.'s in the transverse direction. Each of the two central rolling paths rested on two rows of piles 1.5 m. (5 ft) apart; 39 piles with a carrying capacity of 35 tons were used for each path. The side rolling paths rested on transverse beams over a row of piles; each bogie in this case consisted of two rolled steel joists 30 cm. (12 in.) high. On the left bank, piles were used in addition to a retaining wall. For the moving operation itself, the contractors used a capstan and a 12 mm. (½ in.) dia. rope, and the operation was carried out in a series of elementary displacements of 50 cm. (about 20 in.).

The whole operation was completed in one night, and traffic was interrupted for only 14 hours.

The new Olten bridge will be a concrete structure, 23 m. (75 ft) wide and carrying a 14 m. (46 ft) roadway and two footpaths.

(Extracted from 'Civil Engineering,'
—January, 1953).

Usher (at wedding, to cold, dignified lady): "Are you a friend of the groom?"

The Lady: "Indeed, no, I am the bride's mother."

From a Government Report.

The rent for private buildings not only is heavy but difficult to secure and in most cases unsuitable for office purposes.

ADMINISTRATION REPORTS AND BUDGETS

ASSAM CIVIL WORKS BUDGET FOR 1952-1953

The following extracts relating to Civil Works have been taken from the Assam Budget for the year 1952-3

	(Rs in lakhs)		
	Actuals 1950-51	Revised Estimates 1951-52	Budget Estimates 1952-53
I. Revenue (Civil Works)			
1. Rents	1.65	2.02	2.07
2. Ferry receipts	4.53	3.14	3.20
3. Tolls on roads	.31	.45	.50
4. Recoveries of expenditure	1.93	.26	.26
5. Transfer from Central Road Development A/c.	13.08	16.88	33.95
6. Miscellaneous	1.29	.64	.64
7. Contribution for development of Rural Areas, Village roads	.01	...	...
8. Transfer from Post-War Reconstruction Funds	.75	1.09	.66
9. Contribution from the Government of India	...	10.00	30.00
10. Receipts on A/c of Food Bonus Deduct :	...	12.00	7.09
11. Amount transferred to Capital outlay A/c.	...	— 12.00	— 7.09
12. Receipts from Assam Civil Engineering School fees etc.	.12	...	...
13. Deduct - Refunds	— .23	— 0.10	— 0.10
Total	23.44	34.38	71.18
II. Expenditure (Civil Works)			
1. Original Works	49.02	102.40	225.92
2. Repairs	60.74	79.99	79.18
3. Grants-in-aid for communications	12.74	14.50	8.40
4. Stock and other suspense A/c.	— 9.06	3.46	2.07
5. Establishment charges	19.14	24.08	32.63
6. Tools and Plant	2.84	1.93	4.31
Total	135.42	226.36	352.51

	(Rs in lakhs)		
	Actuals 1950-51	Revised Estimates 1951-52	Budget Estimates 1952-53
III. Expenditure (Communications only)			
1. Original Works—Ordinary	28.43	51.14	126.37
2. Development Scheme under 5-Year Plan	...	...	19.28
3. Repairs	50.34	68.97	67.94
Total	78.77	120.11	213.59
IV. Receipts from Roads :			
1. Receipts under the Motor Vehicles Acts	30.49	29.17	29.67
2. Receipts from taxes on sale of Motor Spirit	15.13	18.74	16.24
Total	45.62	47.91	45.91

A BRIEF REVIEW OF THE ASSAM BUDGET (1952-53)

THE total revenue receipts of Assam for the year 1952-53 are estimated at Rs 1005.43 lakhs and revenue expenditure at Rs 1260.08 lakhs leaving a deficit of Rs 254.65 lakhs. The revised estimates for 1951-52 indicate a smaller deficit of Rs 62.85 lakhs with the revenue receipts amounting to Rs 1024.83 lakhs and expenditure to Rs 1087.68 lakhs.

Revenue expenditure on Civil Works for 1952-53 estimated at Rs 352.51 lakhs forms 35.1 per cent of total State revenue in the year, the corresponding percentage

figures for the previous two years 1951-52 (revised estimates) and 1950-51 (actuals) being 22.1 and 13.6 respectively.

Revenue expenditure on communications (original works and repairs) in 1952-53 is estimated at Rs 213.59 lakhs out of which Rs 19.28 lakhs is earmarked under the Five Year Plan Development Schemes. The communications expenditure in 1952-53 forms 21.2 per cent of State Revenues. The corresponding figures for 1951-52 and 1950-51 are 11.7% and 7.9% respectively.

He took her hand in his and gazed proudly at the engagement ring he had placed on her finger only three days before.

"Did your friends admire it?" he asked tenderly.

"They did more than that," she said. "Two of them recognized it."

ABSTRACTS

(1) 625.768.8—PETTY REPAIRS TO ROADS, LIGHTING MAINTENANCE.

"Illuminated Bollards and Islands Reflectors to safeguard against Power Cuts"—(Highways and Bridges, 2nd January, 1952, p. 2).

Deals with circular recommendations by the Ministry of Transport, London, regarding illumination of cuts in road surfaces for repairing underground services. In marking obstructions by reflectors, red is to be used where all wheeled traffic goes to the right of the obstruction and white in other cases.

(2) 625.8—ROAD PAVINGS.

"Ideal Road Surface yet to come"—by 'Observer'—(Highways and Bridges, 7th May 1952, pp. 1 & 3).

While observing that road surfacing techniques have been changing like fashions without really giving an ideal surface, the 'Observer' ends by saying that "the ideal surface must be permanently non-skid in all weather conditions except freezing sleet, and should never require gritting except during the formation of ice films or in snow; it should be light enough in colour to give ample luminosity with head lights in the dipped position, but no glare in blazing sunshine; it should be homogeneous and require no joints; it should have a low tractive resistance, but high adhesion for braking, even in worst weather conditions; it should be cheap in first cost and the road surveyor would like it to last for ever."

(3) 625.84—CONCRETE ROADS.

"Concrete Road Design and Construction" by Civil Engineer—(Highways & Bridges, 16th April 1952, pp. 4, 12 & 18).

Discussing the Westergaards formula for design thickness it is mentioned that intelligent consideration of subgrade conditions and experience ought to be the guiding factor rather than empirical or theoretical formula and that uniform thickness seems to be universal. Spacing of expansion joints in reinforced concrete roads is generally at 120 ft with dummy

joints 30 to 40 ft apart. So far as American practice is concerned all expansion joints are dowelled and use of reinforcement appears to be common. A case is described where joint failure had to be prevented and adjacent slabs had to be reinforced with dowels.

(4) "Evaluation of concrete curing methods" by Melville and R. W. Czaban—(Highways and Bridges, 9th April 1952, p. 6).

This briefly describes the object of curing. Electrical methods were chosen to secure the desired data. The following order of effectiveness to maintain low and uniform temperatures was noticed: liquid membrane seal with whitewash, damp burlap, waterproof paper, no cure, liquid membrane seal.

(5) 625.85—ASPHALT AND BITUMINOUS ROADS.

"Underlays and Bases for Mastic Asphalt" by G. G. Smith—(Highways and Bridges, 9th April 1952, pp. 1 to 3).

Enumerates the cases where mastic asphalt surfaces required bases. Comments in detail are given. These are grouped under two categories where an underlay is known to be essential at the design stage and where it is not known to be so.

(6) "Underlays and Bases for Mastic Asphalt" by G. G. Smith—(Highways and Bridges, 16th April 1952, pp. 1 to 3). This is concluded in the Journal.

(7) "New Agent for Surface Dressing"—(Highways and Bridges, 18th June, 1952).

Mention is made of a new agent, D.S. 2274, for use in bitumen dressing in wet weather, tested at the Road Research Laboratory and found satisfactory and recommended in place of 'cetyl pyridinium' which is at present very much in short supply. D.S. 2274 is stated to be in adequate supply and is to be applied as a solution in creosote either by mixing with chips or sprinkling over bitumen-sprayed surface before application of chippings.

List of Approved Works on National Highways

S. No.	Job No.	Name of work	Estimated Cost Rs. (Lakhs)	Remarks
BOMBAY				
1.	700BM-4	Providing cross drainage works in miles 104/5 to 106/2 of the Poona-Bangalore National Highway.	.64	
2.	702BM-9	Widening miles 55 to 90 of the Poona-Sholapur National Highway.	.20	
3.	705BM-4	Asphalting miles 30/0 to 180/0 of the Bombay-Poona-Bangalore National Highway No. 4 in Satara and Kolhapur Divisions.	28.22	
WEST BENGAL				
4.	706BG-31	Construction of the Rajerhat-Falakata diversion of National Highway No. 31.	19.02	
PUNJAB				
5.	701PB-22	Improving blind corners on Kalka-Simla cart Road (National Highway No. 22).	1.77	
6.	A-704PB-1	Surveying the Northern Bye-pass of the Grand Trunk Road at Jullundur.	.04	
7.	708PB-22	Constructing a high level bridge over Sukhna Nadi in mile 37 of Ambala-Kalka National Highway.	1.95	
SAURASHTRA				
8.	707SR8-A.	Construction and improvement of the Bhamanbore-Wankaner section of the Ahmedabad-Kandla National Highway.	1.54	
RAJASTHAN				
9.	698RJ-8	Widening miles 7-10 of Ghat section (Chirwaka Ghata) of Udaipur-Nathdwara National Highway in Rajasthan.	.97	
HIMACHAL PRADESH				
10.	703HP-22	Construction of a magazine for storage of explosives at Rampur on the Hindustan-Tibet National Highway.	.06	
DELHI				
11.	699DLH-1	Remodelling culverts on miles 4/6 to 15/2 of the Grand Trunk Road in Delhi State.	.56	

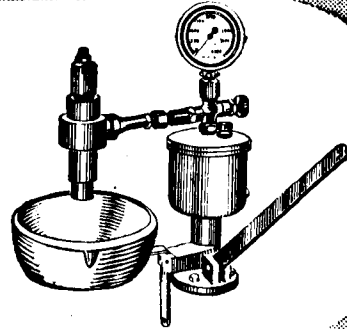
Books added to the Roads Organisation Library during February 1953

- McGraw Hill Publishing Co., Ltd., 95, Ferrington Street, London, E. C. 4, 1952.
1. Prestressed Concrete Structures by August E. Komendant.
 2. Buckling Strength of Metal Structures by Friedrich Bleich.
 3. Hardy Cross Engineers and Ivory Towers by Robert C. Goodpasture.
 4. Mathematics for Engineers (revised 3rd edition) by Raymond W. Dull and Richard Dull.
 - Verlag Von Wilhelm Ernst and Sohn, Berlin, 1951.
 5. Neuere Methoden Zur Statik der Rahmentragwerke Und der elastischen Bongentrager by Albert Strabner.
 6. Hutte's Engineers Pocket Book, Vol. III, Part 2, 27th edition (Hutte Des Ingenieurs Taschenbuch, III Band, Bauingenieur-wesen) by Akademischen Verein Hutte.
 7. Combined Bending and Torsion of 1 Beams of Monosymmetrical Cross Section-A non-Linear Theory Taking into Account the risk of Lateral Buckling-Bulletin No. 10. By Ove Pattersson (The Division of Building, Statics and Structural Engineering at the Royal Institute of Technology, Stockholm, Sweden).
 8. Memorandum on Non-destructive methods for the examination of Welds. No. T-29 (British Welding Research Association, 29, Park Crescent, London, W.I.).
 9. The Structure and Properties of Mild Steel by C. A. Edwards (J. Garnet Miller Ltd., London).
 - H. M. S. O. London.
 10. The Preparation of Standard Sand as used in the British standard method for the determination of the agglutinating Value of Coal (B.S. 705: 1936) Fuel Research Tech. Paper No. 56, 2 copies.
 11. Notes on the Public Utilities Street Works Act, 1950 by Ministry of Transport, U. K.
 12. Sands for Plasters, Mortars and Renderings—National Building Studies Bulletin No. 7 by A. D. Comper.
 13. An improved method for determining Vehicle speeds from spaced serial Photos—Research Report No. 9-2 by T. W. Forbes and G. W. Fairman (The Institute of Transportation and Traffic Engineering, University of California, September, 1951).
 14. A Summary of the First Five Year Plan (The Government of India, Planning Commission, New Delhi) 2 copies.
 15. List of Members of the House of People. (Parliament Secretariat, New Delhi, December, 1952).
 16. Formulae for Street Improvement Priorities. An address presented at the annual meeting of the American Public Works Association in Detroit, Mich. on 17-9-1951 by Richard Gallagher (Richard Gallagher, Director of Public Works, City of Berkeley, California).
 17. BEOBACHTUNGEN AN BETON-FAHRBAHNDECKEN (Observations on Concrete road surfacings). (KRISHHBAUM Verlag, BIELEFELD, 1952).
 18. Quarrying Stone for Construction Projects by Jr. H. Streefkerk (Uitgeverij Waltman Delft—The Netherlands, 1952).
 - The Manager of Publications, Delhi.
 19. Import Trade Control Policy for the licensing period January—June, 1953. Compiled by the Ministry of Commerce and Industry.

20. **General Rules and Orders under the Constitution.** Compiled by Ministry of Law.
21. **Manual of Election Law—A compilation of the Statutory Provisions governing Elections to Parliament and the State Legislatures.** (Compiled by Ministry of Law).
22. **Basic Road Statistics of India Second (1951) Supplement.** (Compiled by the Consulting Engineer (Roads). 3 copies.
23. **Role of Private Enterprise in India—In Retrospect and Prospect.** (The Secretary, Employers' Association, 15, Park Street, Calcutta, 16).
24. **What Bombay Government Did and Said—July-September 1951.** (The Directorate of Publicity, Government of Bombay, Bombay).
25. **Studies of Compressive Stress Distribution in Simply Reinforced Concrete near the Point of Failure—Engineering Experiment Station Bulletin No. 144** by Lester A. Herr and Louis E. Vandegrift. (Engineering Experiment Station, College of Engineering, The Ohio State University, Columbus).
26. **Roads to National Security.** (National Highway Users Conference, Inc., National Press Building, Washington 4, D.C., 1951).
27. **Soil Cement Roads—Construction Handbook (6th edition).** (Portland Cement Association, 33, West Grand Avenue, Chicago 10, Illinois, 1949).
28. **Welded Bridges of Department of Main Roads, N. S. W., Australia** [Reprinted from "Commonwealth Engineer" Sept, Oct., and November, 1949] by V. Karmalsky (Australian Trade Press Agency, 15, New Bridge Street, London, E. C. 4).
29. **Specifications for Works, Schedule of Rates.** [Government of Bhopal, Department of Public Works (revised 1948)].
30. **Annual report for year 1951-52 of the Central Water and Power Commission, (Power Wing), Simla.** (Government of India, Ministry of Irrigation and Power, Central Water and Power Commission, (Power Wing), Simla, 1952).
31. **Bibliography on Durability of Concrete Physical Reactions, Annotated—Bibliography No. 8.**
32. **Highways with a Narrow Median—Bulletin No. 35.**
33. **The Polarized Head-light System—Highway Research Board Bulletin No. 11,** by Edwin H. Land and Others.
34. **Gurley Manual of Surveying Instruments (52nd edition).** (W. & L. E. Gurley, Troy, New York, 1951).
35. **Salvaging Old Pavements by Resurfacing—Bulletin No. 47.** (National Academy of Sciences, National Research Council, Highway Research Board, Washington 25, D. C. 1952).
36. **The Twenty-Fifth Annual Highway Conference of the University of Colorado Highway Series No. 25.** (The University of Colorado, 1952).
37. **Four Place Influence Line Tables for Moments, Shears and Reactions arranged by Gustav Griot. Translated from the German by Harold G. Lorshh.**
38. **Rigid Frame Formulas** By Prof. Dr. Ing. A. Kleinlogel.
39. **VDA, TATSACHEN UN ZAHLEN, 1951 (Facts and Figures, 1951)** 16th edition. (VERBAND DER AUTOMOBIL INDUSTRIE, E. V., 16, Folge, Frankfurt, A.M., 1952).
40. **Commonwealth Engineer, Vol. 38, No. 5, dated 1st Dec. 1950** containing an article "Concrete Quality Control—Fallacious Application of Statistical Analysis" by L. Boyd Mercer. (Australian Trade Press Agency, 15, Red Lion Square, London, W.C.I.).

41. **ANNLES DE L'INSTITUT TECHNIQUE DU BATIMENT ET DES TRAVAUX PUBLICS, New Series, No. 122, February, 1950,** containing an article "Crushing and Fragmentation of Rocks III" (LE CONCASSAGE ET LA FRAGMENTATION DES ROCHES III, LE ROLE DE LA DENTURE DES CONCASSEURS) by M. Albert Joisel. (Annales de L'Institut Technique du Batiment Et Des Travaux Publics, 28, Boulevard Paspail, Paris-VII).
42. **Bihar 1951-52** (Director of Public Relations, Bihar).
43. **Bombay Marches on—Fisheries.**
44. **Bombay Marches on—Rehabilitation.**
45. **Bombay Marches on—Prohibition.**
46. **Bombay Marches on—Agrarian Reforms.**
47. **About India.**
48. **Hyderabad—A Guide to art and Architecture.**
49. **Kashmir Calling—A Tourists' Guide.**
50. **The Panorama of India.**
51. **Travancore and Cochin—Regional Guide.**
52. **The Handbook of India.**
53. **Where to stay in India—A Hotel Guide.**
54. **Passenger Origin Destination Survey—Preliminary Statistical Report.** (The Port of New York Authority, Department of Aviation Planning Bureau, 111 Eighth Avenue, at 15th Street, New York 11, N. Y., 1951).
55. **Traffic Tests of Soil Cement Lanes—Technical Bulletin No. 187** by James H. Reynolds, Jr.
56. **Practical Utilization of Aerial Photography in Highway Location—Report of Technical Committee on Highway Location, Surveying and Mapping—Tech. Bulletin. No. 189.** by R. Getty Browning.
57. **Design Construction and Maintenance of Secondary Roads—a panel discussion—Technical Bulletin No. 190** by A. J. Thelen.
58. **Transit Modernization and Street Traffic Control—A Program of Municipal Responsibility and Administration** by John Bauer and Peter Costello. (Public Administration Service, Chicago, 1950).
59. **Manual of Standard Practice for Detailing Reinforced Concrete Structures (ACI 315-51).** (American Concrete Institute, 1263, West McNichols Road, Detroit 19, Michigan).
60. **Better Highways Awards—Facts Book.** (General Motors, General Motors Building, Detroit 2, Michigan).
61. **The Changing Picture in Highway Traffic (Reprinted from the September 1952 issue of Civil Engineering)** by D. Grant Mickle. (American Society of Civil Engineers, U.S.A.).
62. **Roads and Road Construction Year Book and Directory, 1952.** (The Carriers Publishing Company Ltd., 66, Victoria Street, London, S.W.I.).
63. **Statistics with applications to Highway Traffic Analyses** by Bruce Douglas Greenshields and Frank Mark Weida (The Eno Foundation for Highway Traffic Control, Saugatuck, Connecticut, 1952).

FOR BETTER MAINTENANCE OF YOUR DIESEL ENGINES



ATOMISER TESTING PUMP:

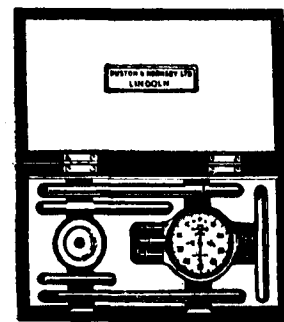
The satisfactory running of an oil engine is largely dependent upon the condition of the Atomiser or Atomisers.

We strongly recommend every user of Ruston or other makes of oil engines to invest in a Ruston Atomiser Testing Pump.

CRANKSHAFT ALIGNMENT INDICATOR:

For use in fixing new engines and periodical checking of existing installations.

Applicable to any size or make of engine, whether Horizontal or Vertical, which has three or more crankshaft bearings and webs as small as 2 1/2" apart.



HOT-WATER THERMOMETERS:

Made by Messrs. Heath Hicks & Perken (Thermometers), Ltd., England.

To measure the temperature of Jacket water accurately.



EXHAUST DIAL THERMOMETERS:

Made by Messrs. Coley Thermometers Ltd., England.

To measure the temperature of Exhaust. Indispensable for use with multi-cylinder engines to check proper load on each cylinder.

Supplied with Co-Axial Stem, if required.

GREAVES COTTON & CO. LTD.

1-FORBES STREET, FORT, BOMBAY.

Branches:

AMMEDABAD • KANPUR • MADRAS • CALCUTTA

G 930

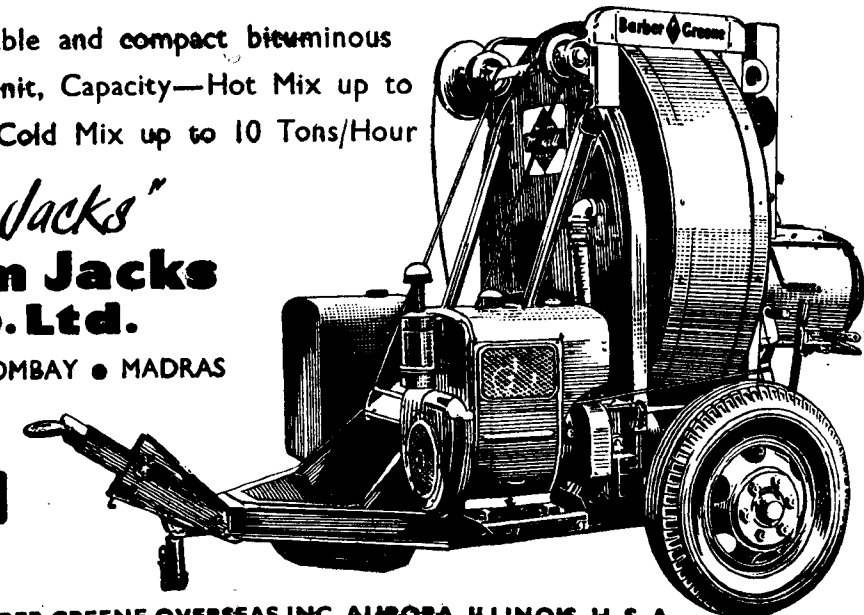
Please mention this journal when replying to advertisements.

The NEW Barber-Greene Mixall

The new portable and compact bituminous Dryer-Mixer Unit, Capacity—Hot Mix up to 5 Tons/Hour—Cold Mix up to 10 Tons/Hour

"Ask Jacks"
William Jacks & Co. Ltd.

CALCUTTA • BOMBAY • MADRAS



BARBER-GREENE OVERSEAS INC. AURORA, ILLINOIS, U. S. A.

BARBER-GREENE OLDING & CO. LTD., HATFIELD, HERTS, ENGLAND

WJX 114

THE HINDUSTAN CONSTRUCTION CO., LTD.

We operate on an extensive scale as Civil Engineering Contractors.

And Specialize in the following:

ROADS,
RAILWAYS,
ROAD AND RAIL BRIDGES,
EARTHWORKS,
RAILWAY AND HYDRO TUNNELS
ETC.

CAISSON AND MONOLITH SINK-
ING BY DREDGING AND UNDER
COMPRESSED AIR,
FOUNDATION WORKS,
PRECAST PILING,
BUILDINGS,
DOCKS AND JETTIES ETC.-

WE ARE ALSO SPECIALISTS IN:

GUNITING, CORE DRILLING, GROUTING AND SEWAGE PURIFICATION.

THE HINDUSTAN CONSTRUCTION CO., LTD.

Head Office:

CONSTRUCTION HOUSE, BALLARD ESTATE,
BOMBAY.

Please mention this journal when replying to advertisements.

“ COLFIX ”—Bitumen Emulsion Manufactured at Colfix Factory, Titaghur.

The premier manufacturer of Emulsion in India

Used

For Double Surface Painting,
Premixing & Patch Repairs
under

D.G.S. & D. Contract Rate

For particulars please write to

McLEOD & CO. LTD.,

3, NETAJI SUBHAS ROAD,
CALCUTTA.

GANNON, DUNKERLEY & CO., (MADRAS) LTD.

CIVIL, SANITARY & CONSTRUCTIONAL ENGINEERS



Specialists in Design and Construction of R. C. C.
Structures, Bridges, Buildings, Water Supply and
Drainage Schemes, Sanitary Installations etc. . . .

Sole Licensee in South India for the
Italian ‘R’ System of Prestressed Concrete.

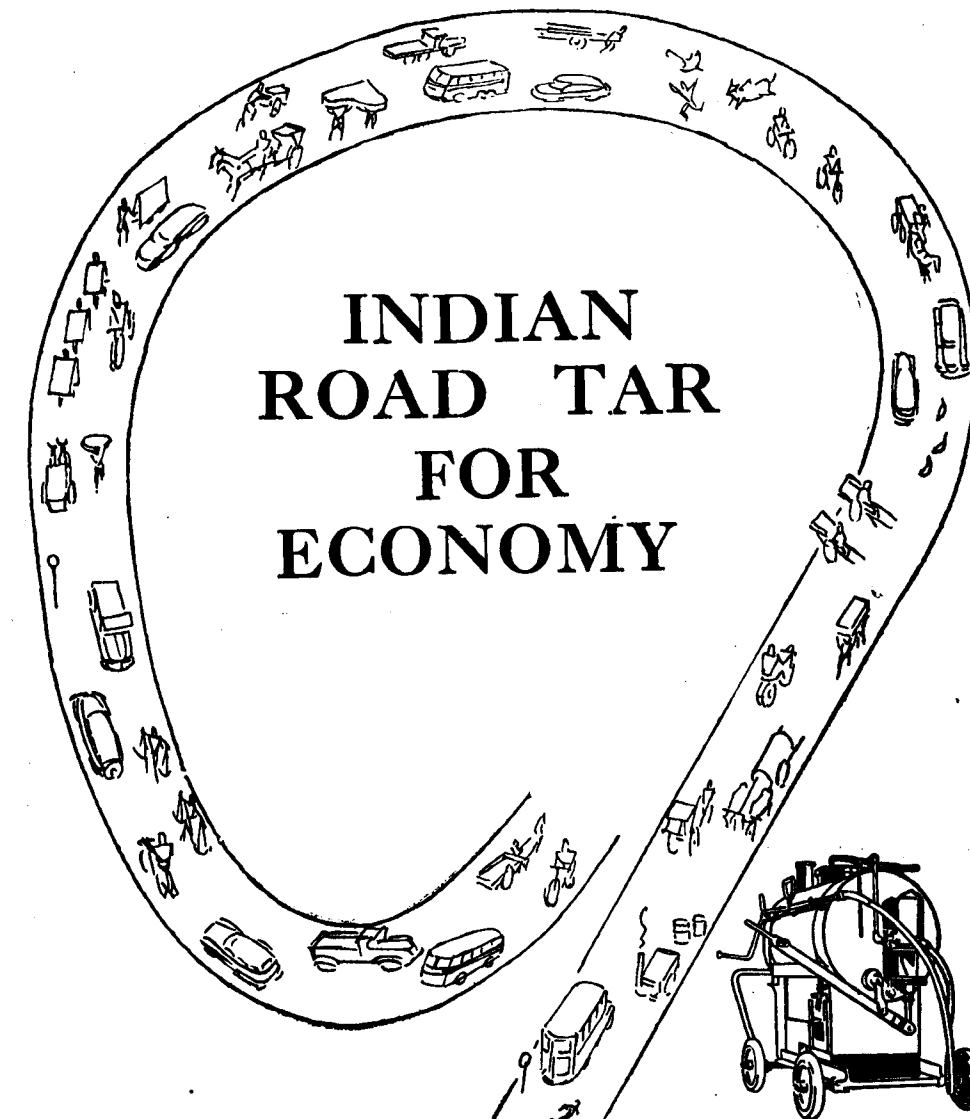


Registered Office: 14, BOAG ROAD, MADRAS-17.

Telephone: 88316 & 88549.

Telegrams: “VITOPUS”, Madras.

Please mention this journal when replying to advertisements.



MANUFACTURED AND
SERVICED BY

THE SHALIMAR TAR SPRAYER
This light, hand operated
Sprayer has been specially
designed for Road work
under Indian conditions.
It is very efficient, easy to
operate and maintain and is
sturdily built for long service.

SHALIMAR TAR PRODUCTS
(1935) LTD.

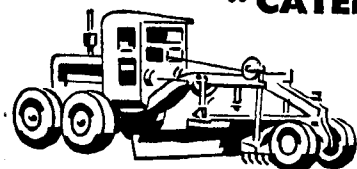
6, Lyons Range, Calcutta.

STG/S

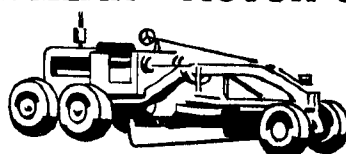
Please mention this journal when replying to advertisements.

SAVING **TAX** RUPEES SERVING **TAX** PAYERS WITH

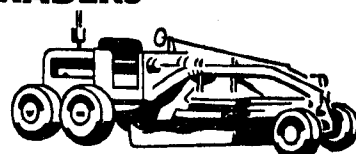
"CATERPILLAR" MOTOR GRADERS



NO. 12 (100 H.P.)



NO. 112 (75 H.P.)



NO. 212 (50 H.P.)



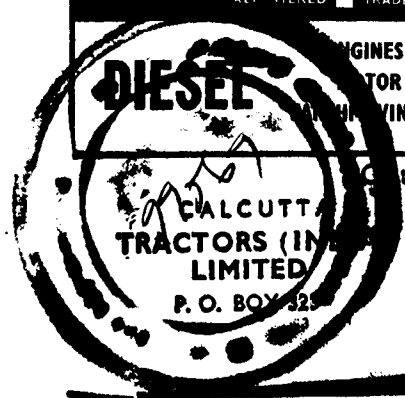
Saving tax rupees is important to every official in a state, city, town or village. He has to in order to do his job well. But as important as saving the tax rupee is the job of making it

serve the taxpayer. Service to the taxpayer means useful work and that is the speciality of "CATERPILLAR" Diesel Motor Graders. They do high-quality work at low cost. "CATERPILLAR" Diesel Motor Graders build roads and streets, widen and maintain existing roads. You will be serving your community and getting the maximum out of every tax rupee invested.

Caterpillar

REGISTERED TRADEMARK

ENGINES-TRACTORS
MOTOR GRADERS
HAULING EQUIPMENT



CALCUTTA
TRACTORS (INDIA)
LIMITED
P. O. BOX 32

BOMBAY
LARSEN & TOUBRO
LIMITED
P. O. BOX 278

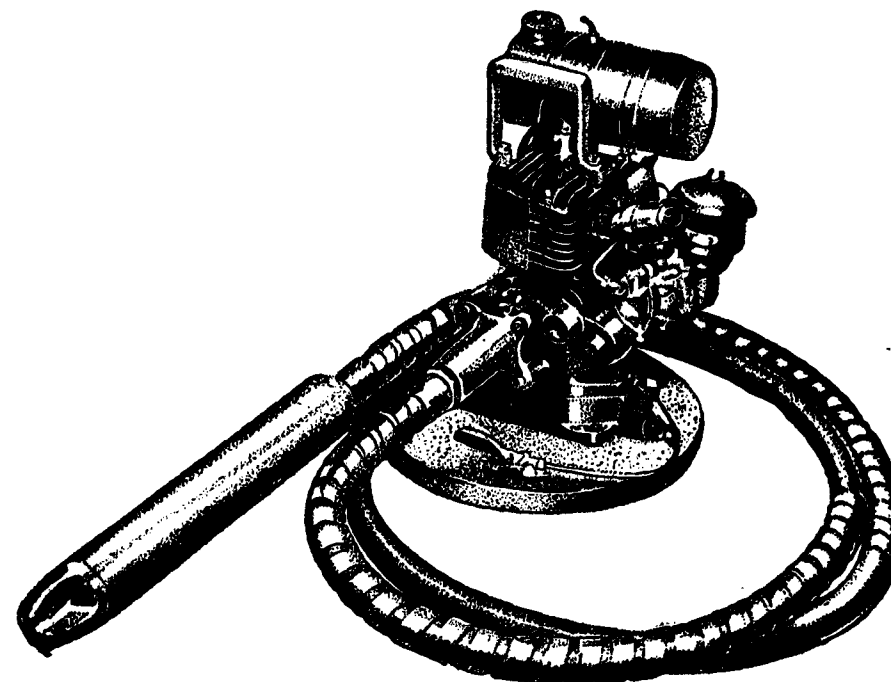
DELHI
WILLCOX (BUCKWELL-
INDIA) LIMITED
P. O. BOX 1408

Sales and Service

CAT67

Please mention this journal when replying to advertisements.

MASTER GASOLINE OR ELECTRIC CONCRETE VIBRATORS for ALL Concrete jobs



CONCRETE VIBRATOR

FOR USE ON HIGHWAY AND BRIDGE WORK, PAVEMENTS, REINFORCED CONCRETE BRIDGE PILES, MASS CONCRETE, BRIDGE DECKS, CONCRETE ARCHES, FOOTINGS, GIRDERS OR BEAMS, COLUMNS AND FLOOR SLABS ETC. ETC.

AVAILABLE FROM INCOMING CONSIGNMENT:—

Sole Agents:—INDO-AMERICAN COMMERCE LTD

15, PARK STREET,
CALCUTTA-16

PHONE: CITY 5292
GRAMS: WESTDAX

Please mention this journal when replying to advertisements.

**PUBLICATIONS
OF THE
INDIAN ROADS CONGRESS**

A limited number of copies of the following publications are available for sale.

Publications.		Price inclusive of postage, etc.	
		Rs	A. P.
1.	Volume IX—Part 4—October 1945	3	0 0
2.	Volume IX—Bound—Madras 1945	10	0 0
3.	Volume X—Part 4—August 1946	3	0 0
4.	Volume XI—Part 4—May 1947	3	0 0
5.	Volume XI—Bound—1947	12	0 0
6.	Volume XII—Part 1—September 1947	3	0 0
7.	Volume XII—Part 2—January 1948	3	0 0
8.	Volume XII—Part 3—April 1948	3	0 0
9.	Volume XII—Part 4—March 1948	3	0 0
10.	Volume XII—Part 5—September 1948	3	0 0
11.	Volume XII—Bound—1947-48	12	0 0
12.	Volume XIII—Part 1—December 1948	3	0 0
13.	Volume XIII—Part 2—January 1949	3	0 0
14.	Volume XIII—Part 3—January 1949	3	0 0
15.	Volume XIII—Bound—1948-49	11	0 0
16.	Volume XIV—Part 1—September 1949	3	0 0
17.	Volume XIV—Part 2—December 1949	3	0 0
18.	Volume XIV—Part 3—December 1949	3	0 0
19.	Volume XIV—Part 4—July 1950	3	0 0
20.	Volume XIV—Bound—1949-50	8	0 0
21.	Volume XV—Part 1—August 1950	3	0 0
22.	Volume XV—Part 2—November 1950	3	0 0
23.	Volume XV—Part 3—January 1951	3	0 0
24.	Volume XV—Part 4—August 1951	3	0 0
25.	Volume XV—Bound—1950-51	9	0 0
26.	Volume XVI—Part 1—Nov. 1951	3	0 0
27.	Volume XVI—Part 2—March 1952	3	0 0
28.	Volume XVI—Part 3—April 1952	3	0 0
29.	Volume XVI—Part 4—October 1952	3	0 0
30.	Volume XVII—Part 1—December 1952	3	0 0
31.	Volume XVII—Part 2—January 1953	3	0 0
32.	Volume XVII—Part 3—January 1953	3	0 0
33.	Road Research Bulletin No. 1	5	0 0
34.	I. R. C. Standard Specifications and Code of Practice for Road Bridges in India (1937)	1	8 0
35.	Proceedings of the Chief Engineers' Conference at Nagpur on the Post-war Road Development in India	2	8 0

Copies can be had from the Secretary.

INDIAN ROADS CONGRESS,
JAMNAGAR HOUSE, SHAHJAHAN ROAD,
NEW DELHI-2.

தமிழ்நாடு ஆவணக்காப்பக நூலகம்,
எழும்பு, சிசுவை-600 000.

தவணைத்தாள்.

சே. எண் :

பு. எஸ். :

[illegible]

S.F. 259A-6-1,00,000-30-1-84.