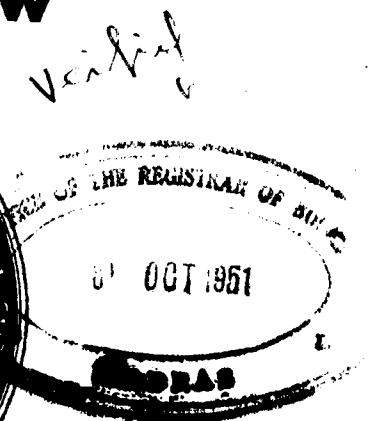


305 Transport-Communications

MONTHLY REVIEW

305
4.57



No. 54

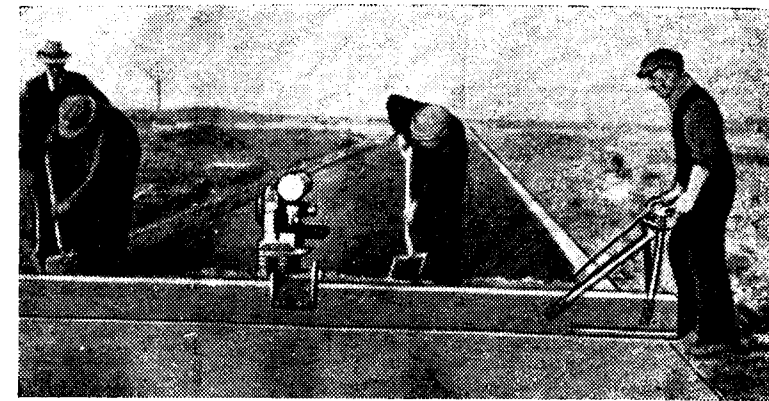
October 1951

In this issue	Page.
1. Preparation of Scientific Papers	1
2. Highway Planning in undeveloped Territories	2
3. Soil Mechanics Laboratories in India	4
4. Traffic Surveys in Australia	6
5. Analysis of Transport Economies in Himachal Pradesh	13
6. Economies in Small Bridge Construction	17
7. HERE AND THERE :—	
(i) Travlogue of an Official Commission	20
(ii) Taking Risks with Roads	20
(iii) Canadian Automobile Production	21
(iv) Analyses of Breakdowns	21
(v) Do you know ?	21
(vi) How We Pay for Roads We Do not Have	22
(vii) To Local Body Engineers	22
(viii) Yoga curbs U. S. Road Accidents	22
(ix) Sex and Accidents	23
(x) When a Pedestrian is not a Pedestrian	23
8. Correspondence	24
9. (i) Administration Report of the Punjab P.W.D., 1948-49	24
(ii) Orissa Budget for 1950-51	25
10. TECHNICAL INFORMATION:—	
(i) Quick Methods	27
(ii) Bond Between Concrete and Reinforcement	27
(iii) Are Expansion Joints Necessary ?	28
11. Book Review	30
12. List of Approved Works on National Highways	31
13. List of Books added to the Roads Organization during August 1951	32
Also:—Specialists—Very Responsible—Do our Politicians know this?—Procrastination—Guide to Guide—Book Writers—HeAndShe—Perfect understanding.—Thoughts after hearing a political speech.	

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



7L
D411m2, N48
NSI-54



FOR *Modern* *Roads...*

JOHNSONS' VIBRATING SCREED

Concrete Vibration needs no introduction to civil engineers, and the experienced engineer knows that Johnsons' Vibrating Machines make his work efficient, simple and economical.

Apart from the Vibrating Screed, illustrated here, Johnsons' make other machines for contractors engaged in road making.

C. H. JOHNSON (Machinery) LTD.

Sole Agents for India and Pakistan:

KILLICK, NIXON & CO., LTD.

(ENGINEERING DEPARTMENT)

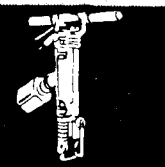
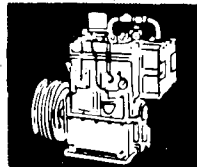
Killick Building, Home Street,
Fort, Bombay I.

Telegrams: "KILLICK"

Telephone: 30901

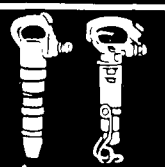
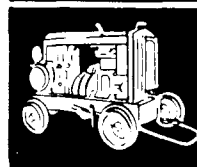
COMPRESSED AIR EQUIPMENT

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



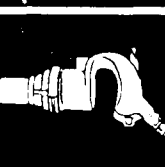
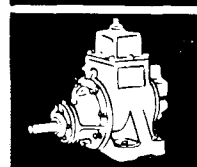
ROAD RIPPERS
Weights from 43 lbs. to 75 lbs.

PORTABLE COMPRESSORS
Two Stage. Displacements from 130 c. ft./min. to 360 c. ft./min.



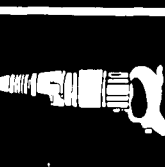
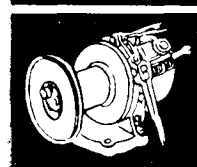
PICKS & SPADERS
Weights from 20 lbs. to 26½ lbs.

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



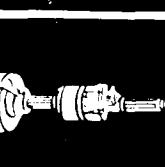
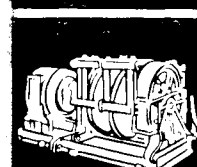
HAMMERS
Weights from 7½ lbs. to 13½ lbs.

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



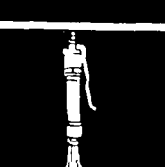
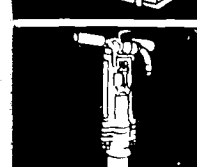
ROTODRILLS
Hand and screw-feed. Capacities to 1½ ins.

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



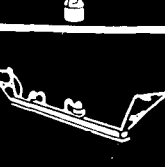
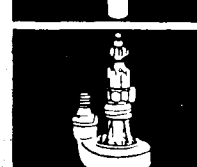
ROTOGRINDS
Radial and surface types. Taking 2" to 6" wheels.

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



RAMMERS
Weights from 9 lbs. to 40 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.



CONCRETE COMPACTORS
A new machine for Concrete Compaction.

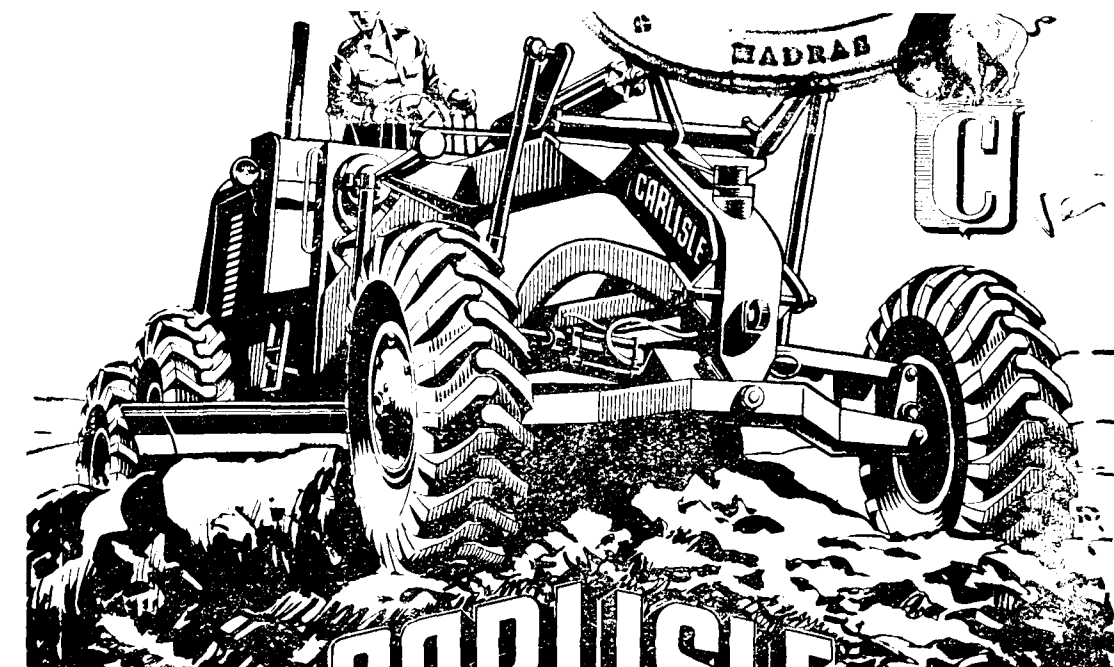
The machines and tools illustrated here are but an incomplete guide to the range of Holmans activities. Among others not mentioned Holmans Drifters Sinkers and Stoppers are world famous. And so in due course will be the latest Holman Development, the HOLBIT, the tungsten carbide tipped rock drill bit.

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.



CARLISLE
Grader

CARLISLE HEAVY-DUTY ROAD GRADERS are manufactured by Distington Engineering Co. Ltd. (Subsidiary of The United Steel Companies Ltd.)

Complete After Sales Service. Full details and illustrated literature from the world distributors.

WORLD DISTRIBUTION BY

BLACKWOOD HODGE

CALCUTTA
P. O. Box 8954
6/2 Madan St.,
Calcutta 13

DELHI
Speedbird House, Service Lane,
Connaught Circus,
New Delhi

MADRAS
150-B Mount Road,
Madras, 2

BOMBAY
Lotus House
Marine Lines,
Bombay, 1

U.K., U.S.A., EIRE, BELGIUM, PORTUGAL, SPAIN, ITALY, S. AFRICA, E. AFRICA, W. AFRICA, RHODESIAS & NYASALAND, BELGIAN CONGO, ANGOLA, MOZAMBIQUE, SUDAN, INDIA, PAKISTAN, CEYLON, BURMA, AUSTRALIA

Please mention this journal when replying to advertisements.

TOURNAROCKER

DRIVES AND STEERS ON FRONT WHEELS

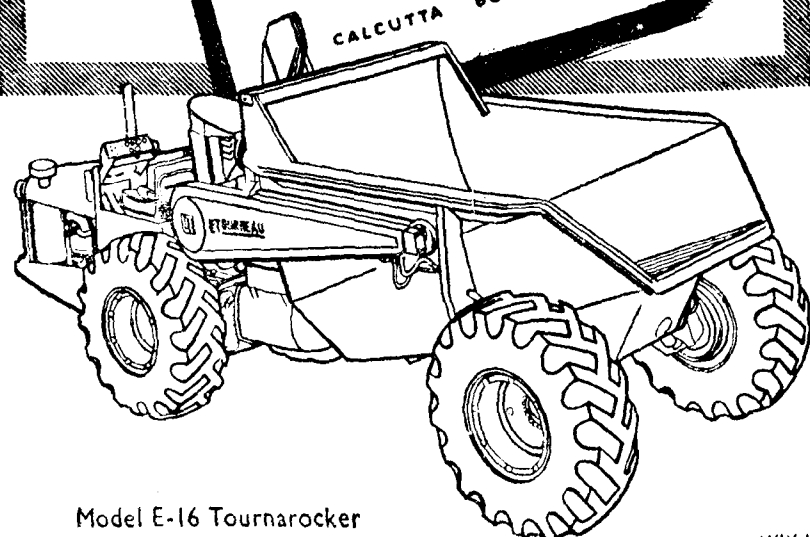


No rear-wheel drive truck can ensure safety under such conditions.

TOURNAROCKER has been designed from the drawing board for hauling rock, overburden, coal, etc.

"Ask Jacks"
William Jacks & Co. Ltd.

CALCUTTA BOMBAY MADRAI

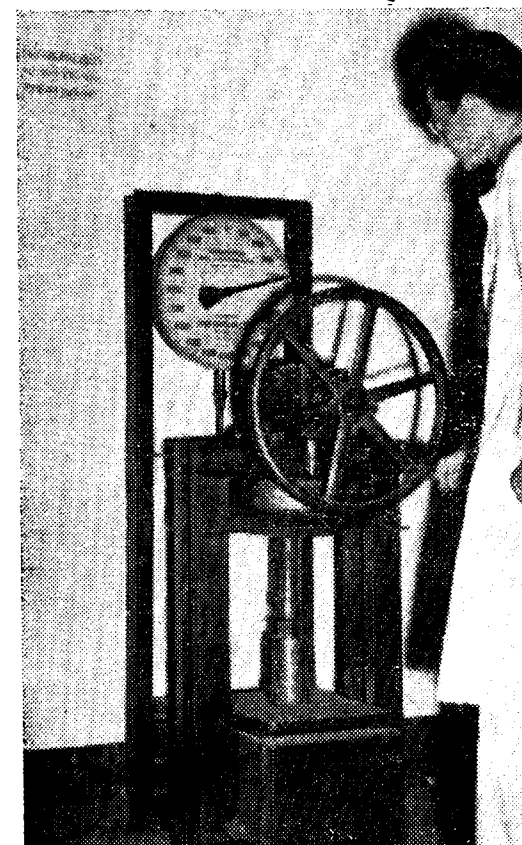


Model E-16 Tournarocker

WJX 12

Please mention this journal when replying to advertisements.

Make this your Laboratory!



A briquette of paving mix is tested on a Hubbard-Field Stability Testing Machine . . . to determine the shear strength of the compacted mix.

Standard - Vacuum's
FREE technical
service can help you
build better roads!

Fine equipment, expert technicians can help solve your roadmaking problems in the Standard - Vacuum test laboratories—maintained for your convenience. Please write or telephone for assistance or advice you may need — there is absolutely no cost or obligation.



Penetration test determines the hardness of asphalt.



STANDARD-VACUUM
Marketers of Quality Asphalt Products



Please mention this journal when replying to advertisements.



A complete range of GMI Batteries with complete Public Acceptance—

6 volt	15 plate	100 ampere hour
6 volt	17 plate	100 ampere hour
12 volt	9 plate	65 ampere hour

Also will be available soon a new 6 volt 19 plate 125 ampere hour Heavy Duty GMI Battery

GENERAL MOTORS INDIA LIMITED

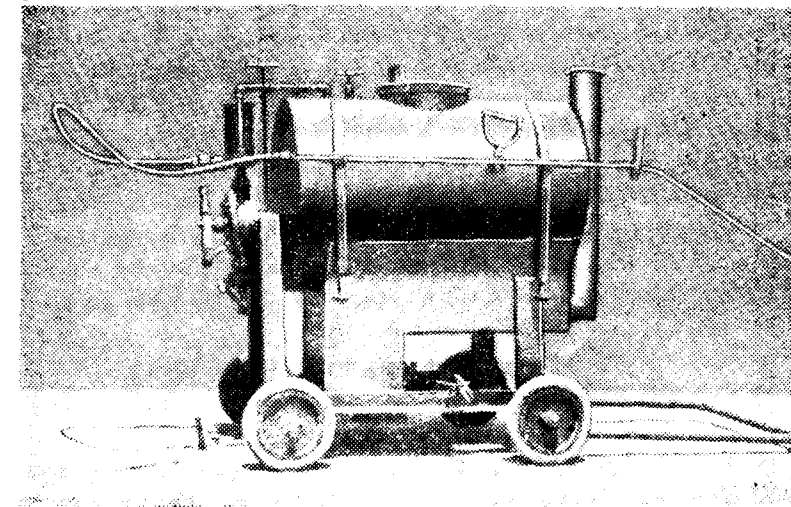
Fosbery Road, Sewree, Bombay.

Serving India's transport needs for over 23 years.

GMB. 5834.

Please mention this journal when replying to advertisements.

SHALIMAR TAR serves the Road Engineer



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

DETAILS SUPPLIED ON REQUEST

SHALIMAR TAR PRODUCTS (1935) LTD.
AMBALA - BOMBAY - CALCUTTA - DELHI - LUCKNOW

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.

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.

CORRIGENDUM

In the Review for September, 1951 the figure indicating the "Curvature in reciprocal centimeters" has been shown on page No. 25 whereas it should have been printed on page 26 with the article on "Graphical Methods of Curvature Measurement".

PREPARATION OF SCIENTIFIC PAPERS

(Extracted from 'Journal of Scientific & Industrial Research'—June 1951)

THE "Preparation of Scientific Communications" was one of the subjects discussed at the Royal Society Scientific Information Conference, London, 1948. The discussion led to the conclusion that:

"Many defects of scientific articles and delays in publication are due to inadequate preparation of manuscripts submitted to publishing bodies."

The conference invited learned bodies to initiate a vigorous and sustained programme to improve preparation of papers. The Conference further recommended that:

"All those handling papers in draft form, including heads of departments in universities and technical colleges, and directors of government laboratories, research associations, and industrial laboratories, might be urged, both through their scientific, academic and professional associations and by personal letter, to do their utmost to ensure that:

"manuscript submitted by authors under their direction is written in clear and concise English, and is prepared in accordance with the rules of the journal for which it is intended;

"to the best of their knowledge and belief any contribution passed through their hands, whether as communicator or referee, is worthy of publication on its merits as scientific information alone;

"they help their students and assistants in preparing such materials;

"special efforts are made to save time at all stages of preparation, from the completion of actual research work to

final printing, so as to avoid the psychological effect of dilatoriness on all those involved in the chain of publication."

Not only the methodology, but also the content of scientific communication has come in for discussion. It has been stated that "ninety per cent of the papers are only written to publicise their author's existence".* While the estimate of papers departing from the accepted aim of publication, viz., to add to the existing knowledge, may be open to question, the implication that the content of scientific communications has not received sufficient emphasis in determining publishability is worth noting. It is the responsibility of all those concerned in the chain of publication of scientific papers to see that only significant results are published, and that scientific literature is not burdened with printed papers unless some addition is made to help scientific advancement.

Drafting and shaping

The shaping of results of research into a concise, readable paper cannot be accomplished in one attempt. The research worker advisedly starts drafting his paper while the work is still in progress as this helps in discovering lacunae which need to be filled up by further work or in following up possible side lines suggested while preparing the draft. In the first draft, the author, who has before him tentatively tabulated statements of results, text illustrations and literature citations, has succeeded only in transferring his ideas to paper. The attention necessary for arranging the ideas and the results in their logical sequence and for giving precision and objectivity to expressions is possible only in the second or pos-

Continued on page 3

HIGHWAY PLANNING IN UNDEVELOPED TERRITORIES

ECONOMICAL CONSTRUCTION AND MAINTENANCE METHODS

(Extracted from 'Highways and Bridges'—July 11, 1951).

MR. John A. Swanson, U. S. Bureau of Public Roads, who acted as consultant in preparing a typical plan for Thailand, has made recommendations applicable to any undeveloped territory. They will doubtless be of interest to engineers and construction departments faced with planning and maintenance of highways.

Highway Finance Methods

Mr. J. A. Swanson says:

The highway funds provided for 1949 could be expected to accomplish but 40 per cent as much work as the amount made available for 1938.

Substantial increases in the motor fuel tax and motor vehicle registration fees are justified.

All receipts from taxes and custom duties on motor vehicles, motor fuel, parts, etc., should be deposited in a non-lapsing Highway Fund reserved for the exclusive use of the Highway Department for improving and maintaining national and provincial roads.

The highway user revenues deposited in the Highway Fund will finance the minimum essential maintenance needs, provided that the tax rates are increased as recommended.

The National Government should make substantial continuing annual appropriations to the Highway Fund if the needed highway improvements are to be accomplished in the foreseeable future.

Organization

It is recommended that the seven major divisions of the Highway Department be reduced and combined into four divisions, and a new division, the Highway Police, created.

The five new divisions of the Highway Department would be:—(1) Administra-

tion; (2) Design and Research; (3) Construction and Maintenance; (4) Provincial and Municipal; and (5) Highway Police.

The Highway Department should retain direct control over all provincial as well as national roads.

Key personnel should be sent abroad to specialise on various phases of highway engineering.

Planning and Programming

As a pre-requisite to modern long range highway planning, it is recommended that a current inventory be maintained of the physical condition of the principal and, if possible, of all rural roads.

The above data, coupled with information pertaining to traffic needs and the plans of other agencies of government, should be used in the development of a priorities improvement schedule.

The most urgently needed highway improvements are those which will provide transportation facilities between important cities and areas.

It is recommended that all national and provincial roads be divided into control sections to facilitate orderly programming of improvements and cost accounting.

Design Standards

All roads should be designed to accommodate fast-moving motorised traffic.

The most economical highway is the one which has been designed to standards which furnish safe, economical and rapid transportation at the lowest annual cost.

Construction

The current principal method of highway construction is by hand labour.

If the highway needs are to be met within the foreseeable future, it is imperative that highway construction operation be mechanised to the extent possible.

A programme of training technical personnel and labour in the utilisation, operation, maintenance and repair of the equipment should be inaugurated.

The most economical means of undertaking construction work thus far devised is by the contract method.

Mechanised equipment should be made available to contractors on a rental basis until such time as they are able to provide the necessary capital.

All work should be undertaken on the basis of prepared plans and specifications to assure that the design standards and construction methods used will result in an improvement with a long useful life.

Maintenance

An appreciable saving in maintenance costs could be effected by providing a bitu-

minous surface on mineral surfaced roads carrying substantial volumes of traffic.

The provision of funds for maintenance and betterment work should be considered to be of a higher priority than the provision of funds for capital improvements.

Materials

Maximum use should be made of locally available materials.

The materials section should be greatly expanded, and the section and sub-section chiefs be given about six months' training in a complete laboratory.

Accounting Control

It is recommended that the accounts used be reclassified so as to permit an evaluation of the economy of highway operations and practices.

(Continued from page 1)

sibly the third revision of the draft. The author should assure himself that the significance of his work has been fully brought out and placed in proper relation to what is already known. Except in seminal contributions which come out whole as an egg—perhaps from trans-intellectual levels—it is a good policy to write out a paper, leave it in cold storage, as it were, for some time, and take it up with a fresh mind for final shaping before it is sent for publication.

Facts or Opinions

Papers should be concise without prejudice to clarity. A concise account is

prized by scientists who have to peruse numerous periodicals to collect new data and acquaint themselves with new techniques to aid them in their work. Authors, who are themselves research workers, appreciate the value of brevity, objectivity, precision and logic in published papers, and they have the responsibility to see that their papers are models of these virtues. If facts are distinguished from opinions, and reasoning from wishful thinking, many defects in scientific communications can be eliminated. A properly prepared paper lessens the labour of editors, reduces the cost of printing, and eliminates delay in publication.

SOIL MECHANICS LABORATORIES IN INDIA

AT the first meeting of the Executive Committee of the Indian National Society on Soil Mechanics and Foundation Engineering held at New Delhi on 11-12-1948, it was decided to send out a questionnaire to all the states enquiring the nature of the laboratories that had been set up and the organization they had in connection with soil research and its application. The information received has been published in the annual report of the Society for 1949-50. Replies to the two main questions are tabulated below:—

Name of State or Department	Have you any soil research laboratories in your state, either functioning independently or attached to other research stations or Engineering Colleges? If you have not, have you any plans for setting up one in the near future? Kindly give details of the plan.	What sort of experiments and works can the present laboratories undertake? Please give short details of the existing equipment and the type of experiments that can be performed with them.
1. Engineer-in-Chief's Branch	Has a laboratory at Kirkee under S. M. E's control.	Has equipment to carry out almost all tests. Carries out soil tests for army and air force—also does research in soil stabilisation.
2. East Punjab (B & R)	A Research Laboratory at Karnal, also 30 field laboratories, under technical control of Karnal Laboratory.	Laboratory fully equipped. Research on soil stabilisation for roads and buildings.
East Punjab (Irrigation Branch)	One at Amritsar and two field laboratories at Dasuya and Rupar. Four more being equipped at Patiala, Anandpur, Nangal and Bhakra.	Fully equipped; experiments on stability of embankments, and dams, etc. and S. M. tests.
3. West Bengal (I. & W. Deptt.)	One attached to River Research Institute of the I. and W. Department.	Well equipped. Can undertake all experiments.
4. U. P. (Irrigation Branch)	One attached to the Irrigation Branch.	Well equipped. Can undertake most of the tests.
U. P. (B. & R. Branch)	A separate laboratory at Lucknow for B. & R. Branch.	Being developed; not yet well equipped.
5. Madras	One research laboratory under Irrigation Branch. Another small scale laboratory under Highways Department.	Has most of the equipment. Can undertake work to determine soil suitability for foundation and embankment, earthen dam and soil stabilisation.

(Continued)

6. Bombay	One at Dharwar in the Karnatak Irrigation Circle. One under Poona Irrigation and Research Division for tests in soil mechanics. One field laboratory at Nasik on the Gangapur earth dam project.	Laboratory at Dharwar equipped for soil tests for agronomical purposes. Laboratories at Poona, at Gangapur Dam and at Engineering College are all well equipped to carry out all soil mechanics tests.
7. Bihar	One recently started at Patna for Ganga Bridge investigation.	Routine tests proposed to be done.
8. C. P. & Berar	One laboratory attached to the Government Engineering College, Jubbulpore.	Many of the tests can be done.
9. Mysore	There is a laboratory maintained by Govt.	Well equipped to carry out all tests.
10. Hyderabad	A laboratory under the Director, Engineering Research Laboratories.	Well equipped.
11. Other States	Have no laboratories.	

Another question was: What type of soils are encountered in the different parts of your administration? If any soil surveys, soil maps, or soil profiles have been prepared please supply details. Most of the States intimated that no soil surveys had been carried out, and that they had no soil maps. Replies to another question showed that many of the leading Colleges of Engineering had introduced or were introducing soil mechanics in their courses of study.

SPECIALISTS

"I have a male canary and a female canary. How can I tell which canary is which?" asked the woman who had just entered the bird shop.

The proprietor suggested: Just put a male worm and a female worm into the cage. You will find that invariably the male canary will eat the female worm and the female canary will eat the male worm."

"But," said the lady in bewilderment, "how can I tell a male worm from a female worm?"

The man drew himself up haughtily. "Madam," he said, "this is a bird shop. Ask the man at the worm shop."

TRAFFIC SURVEYS IN AUSTRALIA

(From a Delegate's Diary)

THE Department of Main Roads (New South Wales) considers that if a road is of sufficient importance to be included in the main road system, it is also of sufficient importance to justify enumeration of the volume of traffic and the classes of vehicles using it. It has therefore been decided that the collection of these traffic data should be regarded as an essential part of the maintenance programme and should be carried out annually. The first systematic traffic survey was accordingly carried out in November 1949.

An Annual Feature

The form of representation of traffic volume most suitable for ready reference is considered to be a large scale map of the State with the roads drawn as bands, the widths of the bands being proportional to the volume of traffic on the roads represented by them. Such a map is constructed and reviewed each year.

The map is not an end in itself but it is an essential tool of administration. Traffic stations are of sufficient number and so located as to provide all the data required for preparation of the map.

The choice of census stations and the operational methods adopted are flexible and take into consideration differences in pavement, widths, maintenance methods, distance from maintenance control centres and density of population.

Counting stations are of three categories, e. g., primary, secondary and local. Each division is divided into zones similar in character as to percentage of various classes of vehicles and as to hourly, daily and seasonal variations in traffic volume. Within each zone one station is selected as a primary or secondary station at which traffic data will be assembled in greater details than at local stations, i. e. other than primary and secondary stations.

Single day counts at a station are considered an over-simplification. Such counts are misleading and give a wrong indication of the average daily traffic. On a primary station 24-hour counts are taken on a week

day on five occasions in the year at an interval of ten weeks and two week days, arranged so that each of the week days, Monday to Friday, is covered once. A 24-hour count is also taken on the second Saturday in May and another on the second Sunday in November.

On a secondary station counts are taken as on the primary stations but only for 12 hours, from 7 A. M. to 7 P. M.

At local stations also, which form 90 per cent of the total number of stations, the frequency of the counts is the same as on the primary and secondary stations but each count lasts only for 8 hours a day.

Most of the manual counting of traffic is done by men who normally work on the maintenance of the roads and at most of these stations the volume of traffic is such that men can tally traffic without serious interruption to their normal work. The personnel who make manual counts at primary stations are not, however, assigned any other duties.

Summarising Traffic Data

Divisional engineers arrange for traffic data recorded on the file sheets to be transferred to summary sheets and to diagrammatic summary sheets. One copy of each of these forms, duly filled in, is forwarded to the head office and one copy retained in the Divisional Engineer's Office for record.

At the head office the following procedure is adopted:—

- (a) A station number is allocated to each station.
- (b) Summary and Diagrammatic sheets for all counts at one station are assembled in one foolscap file enclosed within a folder bearing the station number.
- (c) Location of each station is shown on special maps reserved for that purpose.

(d) The following information is entered in a station and count register:—

- (i) reference to the map locating the station;
- (ii) a description of the location of each station;
- (iii) a chronological statement of the dates and duration of counts at each station;
- (iv) a statement of stations where counts are made in chronological order of dates.

(e) Traffic flow maps are prepared.

The schedules employed for the traffic counts are very interesting. Five out of twelve of them are reproduced here (pages 8-12).

Figure 1 gives the field sheet on which the counts are taken in the first instance. (A separate sheet is used for each half hour).

Figure 2 gives the summary of the counts for each station.

Similar forms are used for intersections and junctions.

Figure 3 shows the summary sheet for an intersection.

Figure 4 gives the diagrammatic summary form for an intersection.

Figure 5 is the form used for recording particulars of proposed stations.

Similar forms are used for other special cases, e.g., ferries and traffic not classified.

It is encouraging to find that States in India are now thinking in terms of traffic censuses as part of their annual road maintenance. In India there are no standard forms for traffic surveys and at some stage it would be necessary in the interests of uniformity and comparability to have standard forms. Readers would have already seen the booklet "Traffic surveys under Indian conditions" issued by the Ministry of Transport, Government of India, and it is hoped that the forms suggested in that manual will be utilized until authoritative standard forms are evolved.

VERY RESPONSIBLE

The rather "dim" blonde was being interviewed for a bookkeeping job at a business house. "You understand," said the personnel man, "that we need a responsible person."

"I am very responsible," she assured him earnestly. "Why, at my last post, whenever there was something called a discrepancy, they always said I was responsible."

SUMMARY OF TRAFFIC COUNT
TAKEN AT INTERSECTION

OF _____ AND _____
MILES FROM _____

DATE OF COUNT _____ DAY OF WEEK _____

DURATION OF COUNT _____ (AM TO _____ PM)

PERIOD OF COUNT COVERED BY THIS SHEET _____ (AM TO _____ PM)

STATION N° _____
MAIN ROAD N° _____
SHIRE OR MUNICIPALITY _____

PUBLIC HOLIDAY (State 'Yes' or 'No') _____
If any conditions in the district (such as a public holiday on preceding or succeeding day, market or sale day or temporary obstructions) tend to make traffic other than normal state 'Yes' or 'No'. On back of sheet give particulars.

WEATHER CONDITIONS _____

FIELD RECORD BY _____ (Name) _____
FIELD SUPERVISION BY _____ (Name) _____
SUMMARISED BY _____ (Name) _____

LOCALITY SKETCH

TO _____
FROM _____

CLASS OF VEHICLE	DIRECTION OF TRAFFIC								TOTAL VEHICLES	%
1. CARS (WITH OR WITHOUT TRAILER)										
2. TAXI CABS										
3. BUSES & PARLOUR COACHES										
4. MOTOR CYCLES (WITH OR WITHOUT SIDE-CAR OR BOX)										
5. TOTAL PASSENGER VEHICLES (TOTAL OF 1, 2, 3 & 4)										
6. UTILITIES & SIMILAR SIZED VANS & TRUCKS (NOT MORE THAN 4 AXLES, WITH OR WITHOUT TRAILER)										
7. TRUCKS & VANS (LARGER THAN UTILITIES)										
8. TOTAL (TOTAL OF 6 & 7)										
9. TRUCK-TRAILER OR SEMI-TRAILER COMBINATIONS										
10. TOTAL TRUCKS & COMBINATIONS (TOTAL OF 8 & 9)										
11. POWER VEHICLES NOT INCLUDED ELSEWHERE										
12. HORSE DRAWN VEHICLES										
13. TOTAL OF ALL VEHICLES (TOTAL OF 10, 11 & 12)										
14. PEDAL CYCLES (SEPARATELY)										
15. TRAMS										
										100%

JUNE 1948

DIAGRAMMATIC SUMMARY OF TRAFFIC COUNT
TAKEN AT INTERSECTION

OF _____ AND _____
MILES FROM _____

DATE OF COUNT _____ DAY OF WEEK _____

DURATION OF COUNT _____ (AM TO _____ PM)

PERIOD OF COUNT COVERED BY THIS SHEET _____ (AM TO _____ PM)

STATION N° _____
MAIN ROAD N° _____
SHIRE OR MUNICIPALITY _____

PUBLIC HOLIDAY (State 'Yes' or 'No') _____
If any conditions in the district (such as a public holiday on preceding or succeeding day, market or sale day or temporary obstructions) tend to make traffic other than normal state 'Yes' or 'No'. On back of sheet give particulars.

WEATHER CONDITIONS _____

CLASSES OF VEHICLES INCLUDED IN FIGURES IN DIAGRAM (MARKED THUS ✓)

CARS	
TAXI CABS	
BUSES & PARLOUR COACHES	
MOTOR CYCLES	
UTILITIES & SIMILAR SIZED VANS & TRUCKS	
TRUCKS & VANS (LARGER THAN UTILITIES)	
TRUCK-TRAILER OR SEMI-TRAILER COMBINATIONS	
POWER VEHICLES NOT INCLUDED ELSEWHERE	
HORSE DRAWN VEHICLES	
PEDAL CYCLES (SEPARATELY)	
TRAMS	

NOTE: THE PEAK HOUR
The total traffic moving through the intersection is at its morning and afternoon peak during the hours shown but in some cases individual movements may reach their peak at other hours.

JUNE 1948

M. R. FORM N° 204



TRAFFIC SURVEY ON MAIN ROADS SYSTEM OF N.S.W.
PARTICULARS OF PROPOSED TRAFFIC STATIONS

SHIRE OR MUNICIPALITY..... DIVISION..... SHEET N°..... MAIN ROAD N°.....

IF IT IS PROPOSED TO ABANDON AN EXISTING STATION ENTER 'NIL' IN (D) AND STATE REASON IN (P).
NO OTHER PARTICULARS REQUIRED

(A) STATION N°		H.O. TO INSERT IF NEW STATION
(B) TEMPORARY IDENTIFYING NUMBER		
(C) CLASS OF STATION		PRIMARY SECONDARY OR LOCAL
(D) LOCATION OF STATION	IN TOWN, ON OUTSKIRTS OF TOWN, REMOVED FROM TOWN DESCRIBE LOCATION STATE WHETHER AT A ROAD JUNCTION	
(E) OTHER STATIONS TO WHICH TRAFFIC VOLUME REGARDED AS TAPERING EVENLY		
(F) POINTS TO WHICH TRAFFIC VOLUMES REGARDED AS SAME AS AT STATION		
(G) WHAT IS PAVEMENT AT STATION		
(H) WHAT FREQUENCY OF FLOODING AT STATION		
(I) IS STATION WELL REMOVED FROM SCHOOLS, ETC.		
(J) IS VISIBILITY FOR RECORDER SATISFACTORY		
(K) IS DRIVER'S VISIBILITY OF TUBE ON PAVEMENT SATISFACTORY		
(L) ARE CONDITIONS FOR NIGHT RECORDING FAVOURABLE		
(M) OVER WHAT DISTANCE EACH SIDE OF NOMINAL STATION WOULD RECORDER WORK WHEN TAKING COUNTS		
(N) APPROXIMATE DATES, NUMBER, DURATION AND METHOD OF MANUAL COUNTS PROPOSED		
(O) NUMBER OF HOURS DURING YEAR RECORDER WOULD SUSPEND ORDINARY WORK OR WORK OVERTIME		
(P) COUNT TO BE CONTROLLED BY DIV. OFFICE, LOCAL OFFICE OR COUNCIL.		
(Q) IF PROPOSED TO ABANDON OLD STATION OR TO OPEN NEW STATION NEAR FERRY, STATE REASON		
(R) ARE ANY SPECIAL TRANSPORT ARRANGE- MENTS NECESSARY AND CAN THEY BE MADE AT REASONABLE COST		
(S) AT WHAT INTERVALS AND BY WHOM COULD AUTOMATIC COUNTERS BE CONVENIENTLY INSPECTED		
QUANTITIES OF FORMS REQUIRED	FIELD FORMS	457 *
		458 *
		459 *
	SUMMARY FORMS	457 *
		458 *
		459 *
	DIAGRAMATIC SUMMARY FORMS	458 *
		459 *
	SIMPLIFIED FIELD AND SUMMARY FORM	503
REMARKS		
SIGNATURE..... DATE.....		

JUNE 1949

ANALYSIS OF TRANSPORT ECONOMY IN
HIMACHAL PRADESH

BY ONE WHO KNOWS

A visit to any Himalayan valley will bring one face to face with the realities of the transport problem in the hills. Men and women carry their belongings and requirements on their backs. Mules and the altitudes, the climate, and the rainfall, all help to make these valleys attractive. Forests yield valuable timber. Fruit-bearing trees and plants supply abundant fruit and flowers. Fertile, terraced fields are



Yaks carry the commodities for the rich or for community use.

yaks carry commodities for the rich or for community use. Shepherds bring their requirements of grain, salt and other necessities of life on their sheep.

capable of yielding rich harvests. Herbs, spices, and a variety of beet-root, ginger, potatoes, etc., are all valuable products.

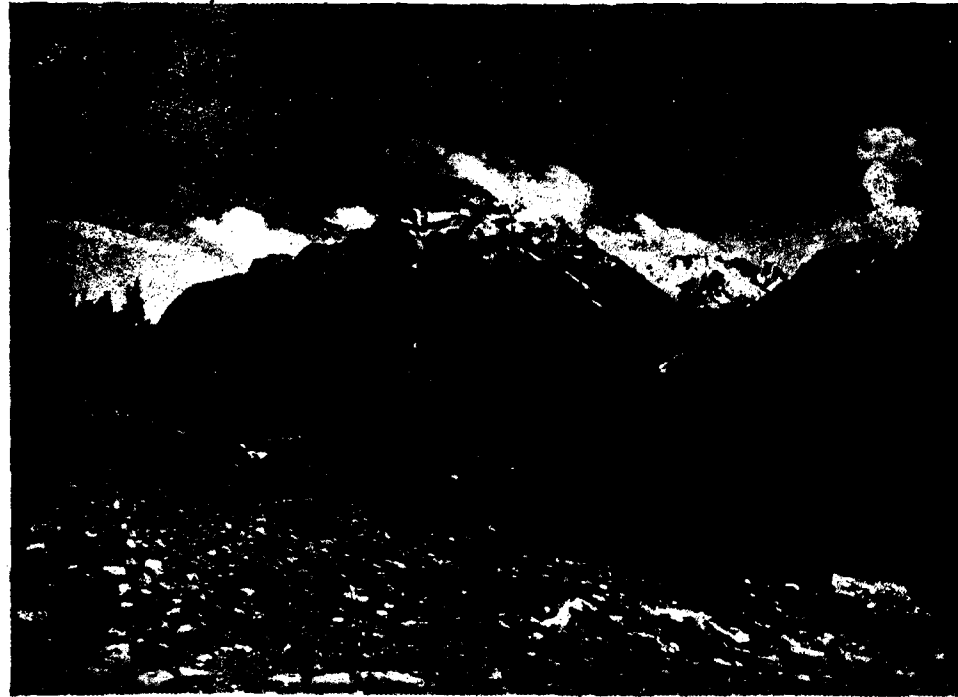
A man can carry 30 seers to a maund over about 10 miles during a day. As his average wage is Rs 2/-, transport costs annas 0-3-3 per maund per mile. A mule carries three maunds over 12 to 14 miles in a day. The average hire of a mule is Rs 6/- per day and carriage by mule works out to annas 0-2-4 per maund per mile. With the carriage rate of goods by rail in the plains at half a pie per maund per mile, how can hill economy survive in these days of fierce competition.

Nature's Bounty

In conspicuous contrast to the apparent adversity caused by a lack of transport facilities is Nature's bounty in these extremely fertile valleys. The diversity in

Though the general mineral wealth of the Himalayas is still unexplored and unsurveyed, salt mines, slate quarries and lime kilns are already appearing in different localities. Some day, if the transport handicaps are overcome, the din of commercial and industrial activity is sure to be heard in some of these valleys.

Few places can stand comparison with these Himalayan valleys in respect of their natural scenic beauty and the variety of entertainment they offer the tourists. If the difficulties of travel could be eliminated, holiday-makers are bound to discover the potentialities of this area and it may be that some day these hills will attract crowds of tourists, so far unknown in this area.



Scenic beauty in the second range of the Himalayas.

Lack of Communications

In distant Himalayan tracts the people live in great distress. At present they hardly grow enough food for their own requirements and whenever a crop fails they have to face a famine. The cost of carriage being extremely high they are forced to do with the minimum of imported food. Malnutrition is common and the health of the area and the man-power are gradually deteriorating.

In winter the snow-clad hills stop all inter-communication and time hangs heavy on the hands of the inhabitants who have no industry to keep them busy and no entertainment to make them happy.

Luckily, the misery created by the lack of the means of communication in these areas is partly relieved by the propitious climate excellently suited for growing cash crops like fruit, potatoes, ginger, etc. If the slow and costly transport by men and mules could be replaced by quicker and cheaper mechanised vehicular traffic, this valuable produce would not rot but would fetch good returns. By reducing the necessity of maintaining transport animals,

these scarcity areas would save some more cereals for human consumption. The breed of the sheep could also be improved if they were reared for wool rather than as beasts of burden. Once the hill community succeeds in building up its home economy it will be a great asset to the whole country.

First Necessity

"How cheaply can we move goods and how comfortably can we enable men to get to these places and work there with reasonable comfort" is the main test for creating the correct conditions for general development.

Railways are hardly practicable and economical above 7,000 ft altitudes. Cable cars on rail tracks and cable trollies would be useful for limited distances only. Road transport alone can serve the general economic need and is thus the first necessity.

This again focuses our attention on the fundamental figure of cost of carriage per maund per mile. "How to reduce the cost of carriage from 0-3-3 per maund per mile to as near half a pie per maund per mile

as we can achieve", is the crux of the whole matter. By constructing motor roads we immediately bring it down to 6 to 9 pies per maund per mile.

thus revolutionize all future transport in the Himalayan hills.

Future Hill Roads

Motor roads have to form the main arteries for building up the economy of Himachal Pradesh and other similar hill areas in India. Maximum grades and minimum radii of curves limit the utility of hill roads for heavy vehicles. If the roads have to meet the economic needs of the country they must conform to the proper specifications for hill roads for motor traffic.

To convert mule roads into motor roads means easing of grades and curves required for the heavy vehicular traffic and in most cases the existing alignments have to be scrapped. Thus all the money spent on the construction of a mule road goes to waste when the time comes to replace it with a motor road. It is, therefore, fundamentally important that all roads that have to become motorable in the next 25 years should be aligned as motor roads in the first instance.



Famous Trilokinath Shrine associated with the penance of the Pandavas (Chamba District, Himachal Pradesh.)

Suggested Policy

The old mule road was gradually developed from the footpath which connected individual villages and is very lengthy. Thus a new motor road connecting any two important points may, in spite of its easier grades and curves, have the same length as that of the mule road it replaces. If links, either bridle or motorable, were built to the intermediate valleys and villages, a motorable alignment, even though only four feet wide to start with might be nearly equally useful to those hamlets and villages. As a matter of fact actual experience has shown that villagers immediately leave the mule road as soon as a two to four feet wide track on a motorable alignment is available as such alignments avoid sudden and steep climbs and descents and are, therefore, less tiresome. Such new alignments have a long range value and they can be gradually widened and improved to motor roads when the traffic needs of the area demand it. This is thus one of the main considerations that should govern the future policy of planning roads in the hills.

Most of the existing mule tracks in Himachal Pradesh are wide enough for a jeep but bridge crossings and a few hair-pin bends always limit their utility. If in future all the mule roads and bridle paths are laid out so as to avoid hair-pin bends and provide enough roadway on the bridges, many of the remotest parts of the hills can become accessible by jeep. This will greatly help the correct appreciation by those in authority of the problems of this region and facilitate their early and satisfactory solution.

Himachal Road Development

With the above mentioned background, the Himachal Pradesh Government has formulated a 10-year road development

programme. The main roads that have ultimately to become motorable are to be gradually re-aligned as motor roads. Starting as a 2-ft wide 'trace' each road will be widened to serve as a bridle road and ultimately developed into a motor road capable of taking a 10-ton diesel or electrically driven vehicle.

The existing mule roads are being checked up and partly re-aligned to make them fit for a jeep.

Voluntary public help is being invited to hasten the pace of improvements to the roads provided in the programme. In addition, public contributions in the form of voluntary labour, cash, gifts of land, etc. for constructing small lengths of approach roads from the main roads to small villages are being encouraged.

A Bright Future

When transport is made easy and carriage costs in Himachal Pradesh are successfully brought down, the economic distress of the State will disappear to a large extent. This State will then occupy a proud position in the economy of the country by contributing large supplies of fruit and vegetables for food, and forest and mineral products for general industrial use. By her developed communications she may automatically become the home of the 'tourist industry'. Precision industries and other small scale industries similar to what is common-place in the hilly areas of Central Europe might help solve the unemployment problem during winter and bring activity, happiness and prosperity to the distant homes. But first must come the **ROADS**. The correct analysis of transport economy in the hills will thus help build a sound economy for the region and therefore for the country as a whole.

ECONOMIES IN SMALL BRIDGE CONSTRUCTION

(Extracted from 'The Surveyor'—November 17, 1950).

THE present-day situation is one which requires and exacts unrelenting economy not only in materials, but also in overall and detailed expenditure on all classes of constructional work which the authorities allow to be undertaken.

Some instances of the ways in which economies may be effected will be given in detail.

The Reinforced Concrete Box Culvert

This type of construction had a vogue of great popularity between the wars.

It possesses, of course, a decided advantage on soft ground since the load is distributed over a wide area of foundation, and its adoption obviates the need for piles. If well stiffened in the corners it is a very stable structure, and is a first class resister of earth pressure. In the writer's opinion this type of culvert was quite often wrongly adopted in so far as it was built on firm ground.

One particular direction where trouble has ensued is where the floor, the level of which is irrevocable, has been built at too high an elevation for the bed of the stream. The effect has been that flood water does not get away as fast as it ought to do, and scouring of the river bed at the downstream end has resulted.

In other cases the floor has been sunk deep below the normal gradient of the stream bed so as to anticipate any regrading which may ever be contemplated by the authority for the watercourse. This is no doubt a wise precaution, given that a box culvert has been chosen. The conclusion to be drawn is that the average culvert is better suited for its work without a floor than with one, in cases where there is little or no fall along its length and where the material of the stream bed is not easily erodable.

Much steel reinforcement, wrought shuttering and skilled labour go into the building of a box culvert.

Most official engineers realised very early in the war that all these factors militated against the continued use of these culverts.

A much cheaper and better solution would be to have brick or mass concrete side walls, no invert and a precast slab roof.

The Lure of The Portal Frame

The portal frame, like the box culvert, is a statically indeterminate structure and as such seems to exercise a fascinating influence over the mathematician. They may both be regarded in the light of cranked beams equal in overall length to their perimeters instead of only to their spans, as is the case of simple structures. From this consideration alone it is obvious that they require a great amount of steel reinforcement.

The portal frame in addition to being a doubly cranked beam, is also an inefficient arch, since vertical loads engender horizontal reactions as well as vertical ones at the supports. When this happens, the structure is by definition an arch.

The inefficiency of the portal frame as an arch is due to the fact that at the haunches the eccentricity of the line of thrust from the axis of the frame is considerable and a big bending moment is generated in consequence.

These are not merely academic issues, because, horizontal thrusts require much more expensive foundations to resist them than do purely vertical pressures and big bending moments require steel reinforcement in proportion to their magnitude.

At sites where the construction depth is very restricted and maximum headroom is required across the whole width of the span a portal frame meets the case admirably. There are many instances of this nature where roads cross over canals. There will doubtless be many other cases in the future where roads cross over roads.

Where the above conditions obtain, the desired clearance dimensions can be obtained with comparative economy by using a portal frame because the extra money required for the bridge is more than offset by savings in not having to lift the road, or it may be that physical considerations prohibit the raising of the road.

Temporary Bridges

Here there is much scope for the economic use of materials. The bridge may be temporary but its strength must be permanent, as although the intention may be for it to do duty for a limited number of years, at the end of that period it may be required to give extended service.

Whereas a permanent bridge is designed to give minimum maintenance, considerable relaxation in this respect is permissible with a temporary bridge and its approaches. In the latter case, the materials constituting the structure should be considered as being on loan to the bridge. If practicable it should be built as far as possible of components which otherwise might lie in the depot as emergency stock.

When the bridge is ultimately replaced by a permanent one, it is unlikely that any of the parts will be suitable for re-use at the site, and they will in consequence go into stock at the depot. An alternative would be for the contractor to make an allowance for taking over the material of the old bridge.

The aesthetics of a temporary bridge are not so important as those of a permanent one, since the former will of necessity have "temporariness" figuratively written all over it, and will be regarded as in this category by all and sundry.

Materials Commonly Used for Temporary Bridges

The ubiquitous rolled steel joist comes in very handy for spans ranging from 10 to 40 ft. It might be described as traditional practice to use a half-timber decking on top of the R. S. J. s. * * * Refrain from making holes in the flanges of the joists as this would depreciate them for further use, owing to reduction in strength. * * *

Fasten down the timbers by means of hook bolts engaging the edges of the

flanges. The hooks would probably be formed merely by bending the end of a round bar at right angles on to the slight taper of the flange. It is surprising how well these bolts hold in practice.

However, a specification for a road bridge would go into greater detail and stipulate the use of purpose-made cast iron or mild steel clips in conjunction with square-headed bolts, the assembly being devised so that neither clip nor bolt could turn if the nut on the top became slack. The said nut, also square, would be recessed in the top surface of the half-timber and if further timber were available, a paving of 2 in. by 6 in. boards would be nailed diagonally in position to take the wear. In order to prevent rocking the 6 in. by 12 in. timbers should be sawn die-square.

If each and every timber is secured even to one flange only of each and every joist crossed by it, a very large number of fastenings will be necessary. It should be sufficient to have a fastening at one-half or even one-third of the intersections, provided heavy kerb timbers are bolted at intervals to the ends of the cross timbers.

The foregoing remarks can only apply to cases where an adequate supply of timber is available, which can be assumed to be a rare event at the present time.

Temporary Bridges Without Timber

Assuming that the span justifies the use of joists having a minimum depth of 18 in. for the superstructure, a sound bridge can be made by using six of these joists giving an 18 ft roadway and a 5 ft footway. Instead of having a timber deck, precast and vibrated concrete arch segments, lightly reinforced with mesh, can be placed across the bottom flanges of the joists.

The troughs formed by the jack arches and the sides of the girders are filled with washed gravel, graded from 1½ in. gauge down to 1/8 in. sand, and this is consolidated in layers by flooding with water. Then a covering of hoggin, 4 in. thick, is added and consolidated to camber by a 2-ton roller. This layer covers the top flanges of the girders and provides the

foundation for a two-coat surfacing of bituminous macadam.

The girders should be inter-connected by substantial tie bolts passing through holes in the webs slightly staggered from bay to bay and having back nuts as well as end nuts to ensure the bolts being able to act as distance pieces as well as ties. In addition, in order to make provision for resisting horizontal thrust from the jack arches on the outer girders, it is advisable to fit ties with hooked ends engaging the lower flanges of the outer and adjacent girders. These ties should preferably incorporate a turn-buckle for making sure that they are taut. It will be noted that this form of construction entails no drilling of the girders with the exception of the holes in the webs at a level above the top of the jack arches.

It is recommended that the tie bars, nuts and washer plates should be dipped whilst warm in a good quality bituminous paint. The same sort of paint on a red lead primer put on before erection after thorough cleaning should be satisfactory for the girders. Strips of bituminised felt should be stuck with hot bitumen to the flanges which form the skewbacks for the jack arches.

Cast-in-situ concrete kerbs of 12 in. by 12 in. cross-section with slots at intervals for drainage are perhaps the most suitable, although not recoverable for further use when the bridge comes to be dismantled. The concrete of the kerbs can be rooted a short distance into the gravel fill. The parapet posts may well be constituted of angle-irons secured by hook bolts to the top and bottom flanges of the outer joists and 2 in. by 4 in. seasoned timber, if available, makes good hand rails enabling wire mesh to be stapled to it. The kerb is cast after the angle-iron posts are in position so that it comes tight up against them and is restrained by them in case of violent shocks.

The superstructure of this bridge is contrived on the "Meccano" principle and all parts are re-usable with the solitary exception of the kerbs. These could be broken up and used as hardcore.

Illogically the substructure has not so far been mentioned. Substructures of

temporary bridges, unless they must be piled, are usually devoid of interesting characteristics. This arises from the fact that the spans are normally made big enough to throw the bearings well back from the river bank, thus avoiding the necessity for abutments proper, and a bed of mass concrete often suffices as a seat for the bearings. If the bed and banks of a river are undisturbed, there is no necessity for making provision against scour or erosion as these troubles will not occur. Hence, wing walls, training walls or revetments are, like abutments, superfluous. It is the bigger span which makes such features redundant and there is much to be said in favour of a similar treatment in principle for permanent bridges. The channels of most rivers tend to remain unaltered so long as structures are kept clear of them.

Services over Temporary Bridges

Whereas permanent bridges should have pipe ducts provided under the footways with the object of avoiding the cutting of trenches in the carriageway, temporary bridges are absolved from this costly necessity and their design is correspondingly simplified. This does not mean that they are not called upon to accommodate services, but it means that all users of the road including the commodities conveyed in the pipes and ducts must adapt themselves to the temporary structure.

Aesthetic considerations preclude the festooning of permanent bridges with mains and cables, moreover these when permanently installed, are protected from frost and damage in the most convenient way by being buried in sand in pipe ducts. There is no objection to pipes and cables being attached to the outside or the underside of a temporary bridge. This can nearly always be done by means of brackets secured to some secondary part of the structure of the bridge, not by welding or burning holes, but by drilling them, or, better still, by means of clips which avoid cutting any part. If outside mains must be carried, the bays under the bridge between the girders will usually take them supported by transverse bearers which may need a depression in the centre.

(To be continued.)

HERE AND THERE

1. TRAVALOGUE OF AN OFFICIAL MISSION

THIS is how, in 1564, the mayor and the treasurer of the prosperous town of Oudewater travelled to Brussels on a mission for their city. The distance between Oudewater and Brussels is approximately 100 miles, but it is more than probable that the roads leading from one town on their journey to another were not direct roads but wound their course around swamps and other obstacles. On a Friday morning at eight o'clock, the flourmiller Gerrit Pietersz came with his open cart to the mayor's home and, for the price of six stuyvers (six times five cents) drove the two men to the nearest town of Schoonhoven. Dropping them at the gate of the town, Gerrit Pietersz returned to Oudewater. The two officials walked through Schoonhoven, followed by two porters carrying their luggage. At the other end of town, they took a boat across the Lek River. At the other bank they found a cart to drive them to Papendrecht. Again a walk across town and again a river crossing. Then they were in Dordrecht, a city of considerable size. The cross-town walk to the Meuse River was long and tiresome.

In Dordrecht they found seats on a sailboat to Oudenbosch. From there, a cart drove them over the sandy grounds of North-Brabant province to Antwerp. A last cart brought them to Brussels, where they arrived late on Sunday night. Says a Dutch historian, "They made the whole trip in three days. It was a fairly fast

journey and it is a mistake to believe that travelling in the sixteenth century went at snail's pace....." (The historian wrote this in 1871). "Travelling was not always a matter of lazy, rumbling and creaking carts on an uneven road, where three times each hour the cart tipped over, or the travellers had to help to remove obstacles from the roads or pull the horse and cart through a ditch." The historian observes that at the time he writes about, conditions had improved considerably, although in winter the roads still were under water. "Even if our travel wagons were but open carts and even if people sat on wooden benches, the journey was usually very fast....."

The total cost of the official journey, including porters, ferries, dike tolls and bridge tolls, was 71 stuyvers and four duyten (pennies). The return journey was even cheaper: 59 stuyvers and no duyten. Total expense for the mission: six guilders and 10½ duyten (approximately three dollars). However, the expense account for "hotel" accommodation was separate. For one night spent at the inn of Willebrord Vischers, they spent: dinner for two, six stuyvers; beer, two stuyvers; wine, five stuyvers; sleeping accommodation, two stuyvers; total 15 stuyvers (0.30 dollars).

(From "Paths to World Fellowship"
Communications in the Netherlands.)

2. TAKING RISKS WITH THE ROADS

The following statement is issued by Major H. E. Aldington, M. Inst. T., technical adviser of the British Road C. B., M. I. C. E., Federation. Until recently Major Aldington was chief engineer (highways)

at the Ministry of Transport.

THE totally inadequate funds available at the present time for the proper maintenance of the roads raise the question of the grave risks the Government is taking in allowing the capital investment in the roads to depreciate so alarmingly.

The roads are an industrial set-up, and in the economic interests of the community this publicly-owned asset should be pro-

perly maintained and improved. It would seem that Government financial circles still do not fully appreciate the money loss which the country incurs by not properly maintaining the roads. It has become a political expedient to divert money from the roads whenever funds are required for other less essential but popular purposes, on a hand-to-mouth basis, and with no regard to future reper-

cussions in the way of increased costs — a thoroughly bad business.

It has been said with a considerable amount of truth that the state of a society can be gauged by looking at its roads, and that where there is activity, the roads, which are the symbol of movement, will indicate the fact.

The surfaces and foundations of our roads are undoubtedly deteriorating rapidly with the passage of time, and if adequate funds are not provided this deterioration will accelerate. The ultimate cost to the country will then be far heavier than it need be if sensible financial provision were made now.

At the present time, it is only possible to resurface the Trunk, Class 1, and Class 2 roads at an average rate of once in every 42 years as compared with one in 19

before the war. The roads are thus bound to worsen, for no surfacing material can possibly stand up to the wear and tear of traffic for this length of time.

The country has again reached a stage where it has to re-arm, and this at a time when the roads are starved of adequate financial provision and when the arrears of maintenance due to the late war have not been made good, consequently they are not so capable of carrying heavy military traffic as they were in 1939.

In the interests of the defence of the country it is essential that adequate financial provision should be made for the roads now, as part of the rearmament programme.

(Extracted from 'The Surveyor'—
September 22, 1950).

3. CANADIAN AUTOMOBILE PRODUCTION

THE Canadian automobile industry produced in 1950 a record number of 391,000 vehicles (of which 285,000 were passenger cars and 106,000 trucks), 100,000 units more than in 1949. In addition to absorbing more than 90 per cent of her own production, Canada imported 89,000 vehi-

cles, mainly from U. K. Canada now has more than 2.5 million registered cars and trucks, an increase of nearly 250,000 over the total a year ago. There are now 13.1 cars per 100 persons in Canada.

(From 'The Eastern Economist'—
June 22, 1951).

4. ANALYSIS OF BREAKDOWNS

AN analysis made by the Automobile Association (U. K.) of a number of car breakdowns shows that the most frequent causes of trouble were flat batteries (18.7 per cent) and punctures (14.9 per cent). Electrical faults totalled 45.7 per cent; in addition to flat batteries they included ignition (6.3 per cent) and lights, wiring, and fuses (5.5 per cent). Under the general heading of fuel troubles were running out of petrol (6.5 per cent), blocked petrol feed

(3.1 per cent), carburettor (2.6 per cent) and petrol pump (2.4 per cent). Among mechanical breakdowns the most common were jammed starters (3.7 per cent). Clutch and gearbox failures accounted for 3.5 and 3.3 per cent respectively. Transmission troubles numbered 3.4 per cent and included broken back axle half-shafts (2.4 per cent).

(Extracted from 'The Engineer'—July 13, 1951).

5. DO YOU KNOW?

1. THE oldest long-distance highway on record was the Royal Road, which extended between the Persian Gulf and the Mediterranean Sea across southwest Asia and Asia Minor. Do you know how long the road was?

2. How many adults in the United States ride in an automobile every day? Is the number 65,000,000; 15,000,000; 59,000,000; 78,000,000?

(Answers on page 29)

6. HOW WE PAY FOR ROADS WE DO NOT HAVE.

AFTER a seventeen-year connection with the Indian Roads and Transport Development Association (he had until recent retirement been a member of Council since 1940), Mr. V. F. Noel Paton has traced the fate of India's road system since the beginning of this century. After saying that expenditure on roads in the 1920s dropped while road taxation revenue had increased, Mr. Paton observed that that process continued even after the introduction of the Road Development Fund in 1929. The war of 1939-1945 focused attention on the progressive deterioration of the roads and a conference was called at Nagpur in 1943 to devise a plan for road development. It was there decided that India and Pakistan together should

have their road mileage increased by 160,000 in 20 years; India now accounts for 70 per cent of this total. Progress, however, had been disappointing, owing to shortage, not of funds, but of materials and transport facilities; later, Government loans were curtailed and administrative arrangements in the provinces were unsatisfactory. The colossal loss to India through lack of an adequate road system could not be easily expressed, but the state road transport undertaking in Bombay had estimated that it would save Rs 2 crores annually on bus operations if it had good metalled roads.

(From 'Modern Transport'—July 7, 1951).

7. TO LOCAL BODY ENGINEERS

WHEN you have gained experience of the workings of several local authorities, you will no doubt be struck by the different reactions of committees to their officials; not always depending upon the measure of confidence the official has warranted, some will regard them as employees to carry out their instructions, whether they be good or bad. The more enlightened authorities will look upon them as their advisers, welcome their criticisms and advise and, having reached a decision, will leave them to put into operation, without interference, the designs and

constructional works and matters of normal day-to-day administration. Have the courage of your convictions and make all your reports in writing; be brief; discriminate between policy and technical advice; in the former case, give the different points of view which occur to you; in the latter case, be decisive.

(From the Presidential Address by Harold Cliffe, B.Sc. (Eng.), M.I.C.E., M.I.Mun. E., M.T.P.I., at the annual conference of the Institution at Margate, June 20th, 1951).

8. YOGA CURBS U. S. ROAD ACCIDENTS

YOGA breathing exercises and a black spot on a small white card are helping to solve one of America's most serious road accident problems—falling asleep at the wheel.

Originator of the scheme is a 57 year old naturalised Briton, Frederick Marion, a leading metaphysician, and experimenter in the occult. Marion has worked for the University of London's Psychological Council, and is also well known broadcaster and writer.

He now spends most of his time lecturing in the United States. He contends that he can cure all problems of the mind

—of which "road hypnosis" is one. Over 8 per cent of the accidents on America's long, straight highways are caused by this form of hypnosis.

Marion's cure is simple—but has been so successful that a booklet on it has been published throughout America. The U. S. Army has also adopted the method.

The first step is a simple exercise which develops the "supersensory" centres of the mind so that they are "above and beyond the every-day range of the normal five senses, and are not subject to time and space." It consists of a few minutes concentration each day on a black dot one

inch in diameter framed on a white card. The method is to fix the card at eye-level, and to observe the dot for a few seconds, and then by closing the eyes trying to "see" it in the mind's eye. With daily exercises for about a month this can be accomplished.

The test is allied with yoga breathing exercises—about five minutes per day—which has a "cleansing" effect on the nervous system. A condition of mind

"vigilance" is brought about by these two tests which eliminates the hypnotic effect on vehicle drivers of long hours' driving on a straight road.

(From the 'Indian Nation', Patna—Aug. 9, 1951).

[Other Simpler and more mundane methods are given at page 14 of our Issue for August 1951...Ed.]

9. SEX AND ACCIDENTS

MR. Llewellyn asked the Minister of Transport what evidence was given by statistics as to the proportion of road accidents which occurred when men were driving and when women were driving, respectively. Mr. Barnes replied that of the number of drivers of motor vehicles, including motorcycles, involved in road

accidents during the month of April (the latest period for which figures were available), 95.2 per cent were men and 4.8 per cent women. These figures afforded, of course, no indication as to the relative safety of men and women drivers.

(Hansard 25—6—51).

10. WHEN A PEDESTRIAN IS NOT A PEDESTRIAN

A London magistrate, taking a dictionary definition that a vehicle includes "that in or on which any person or thing is or may be carried", recently found that a pair of roller skates, i.e., one on each foot, constituted a vehicle and that a boy on skates was accordingly not a pedestrian. His ruling arose in a case in which a motorist was charged with dangerous

driving when he knocked down a boy on roller skates going over a pedestrian crossing at Camden Town. The dangerous driving charge was dismissed, the motorist being fined for driving without due care.

(From 'British Road Federation' Monthly Bulletin—August 1st, 1951).

DO OUR POLITICIANS KNOW THIS?

"The next step to a Welfare State is a tyranny.

If the Welfare State breaks down, the country does not step back into a laissez faire state, it steps on to some kind of tyranny.

The Archbishop of Canterbury.

CORRESPONDENCE

Sir,

Enclosed is an extract from "An account of a Journey from Calcutta via Cuttack and Pooree to Sambulpur, and from thence to Medinipur through the forests of Orissa" by Lieut. M. KITTOE published in the May 1839 issue of the Journal of the Asiatic Society of Bengal.

"During my stay here (Sambulpur) I had searched for a good spot for erecting a bridge over the Mahanadi, (if such a great work were ever undertaken) which I found very near the present ford and

ferry; the river is there 4,500 feet broad in the rains, and there are huge masses of rock at convenient intervals right across, which would afford excellent foundations for either wooden frames or masonry to support a wire or an iron suspension bridge; I found the highest flood water mark to be about 47 feet above the level of the shallow stream flowing during dry seasons in the centre of the bed."

The bridge was opened to traffic in 1950.

Yours faithfully,
A. B. C.

Administration Report of The Punjab Public Works
Department, 1948-49.

ROADS

THE total length of roads lying in the Punjab at the end of the year under review was as below :—

2,126 miles metalled and tarred.

121 miles soil stabilised and water bound macadam

1,197 miles unmetalled.

The total cost of maintenance of these roads was Rs 69,58,341, as against Rs 30,57,000 for 7½ months of the previous year. Thus the maintenance expenditure per mile for metalled roads varies from Rs 2,350 to Rs 1,900 for G. T. Road and other roads respectively. The average expenditure per mile of unmetalled roads comes to Rs 600.

The floods of 1947-48 had caused vast damage to roads and bridges but these were completely restored during the year. The partition and the consequent mass migration had put an extraordinary strain on all the roads in the State and it meant a great effort to restore them to their normal condition on account of scarcity of labour, shortage of materials and difficulties of transport. A length of 327 miles

of roads was treated with tar or bitumen during this year.

Of the several road-works undertaken during the year the following deserve special mention :—

- (1) Widening metalled portion of Grand Trunk Road (National Highway No. 1) from 12 ft to 22 ft between Karnal and Ambala and Jullundur and Amritsar.
- (2) Preliminary investigations and designs of the bridge over the Beas at Mirthal on National Highway No. 1-A, Jullundur to Pathankot.
- (3) Construction of Rupar-Guzar Nangal Road in Ambala and Hoshiarpur Districts.

Work was also commenced on the construction of a large number of roads in accordance with the Post War Development Programme, but owing to the financial stringency in the later part of the year construction had to be suspended in most cases, though in some cases materials had already been collected and good progress had already been made in spite of the transport difficulties.

ORISSA BUDGET FOR 1951-52.

The following extracts have been taken from the Government of Orissa, Civil Budget Estimates and Budget Estimates of the Provincial Civil Works for the year 1951-52 in respect of revenue from and expenditure on Civil Works :—

(In Lakhs of Rs)			
	Actuals 1949-50	Revised Estimates 1950-51	Budget Estimates 1951-52
I. Revenue (Civil Works)			
1. Receipts	2.43	2.69	2.46
2. Ferry Receipts	0.17	0.01	0.01
3. Tolls on Roads	0.22	0.63	0.63
4. Recoveries of expenditure	20.90	0.13	0.07
5. Transfers from the Central Road Fund—			
(i) Ordinary	0.04	0.55	1.54
(ii) Reserve	—	1.02	3.90
6. Transfers from the Fund for Orissa Buildings	15.00	20.00	43.71
7. Miscellaneous	4.88	3.60	1.33
8. Khondmals Road Fund	—	0.05	0.05
9. Deduct—Refunds	- 0.20	- 0.01	- 0.02
Total	43.44	28.67	53.68
II. Expenditure (Civil Works)			
1. Original Works		60.47	48.74
2. Original Works, P. W. Development		27.96	13.61
3. Repairs		40.54	21.34
4. Grants-in-Aid		12.65	8.26
5. Suspense		1.50	2.00
6. Lump deduction for probable savings		—	- 2.33
7. Expenditure on Electrical Works		5.11	4.22
8. Expenditure in connection with Capital Construction		93.24	63.20
9. Establishment & Tools & Plants		26.35	22.50
Total		367.82	181.54
III. Revenue (Communications only)			
1. Ferry Receipts	0.17	0.01	0.01
2. Tolls on Roads	0.22	0.63	0.63
3. Receipts under the M. V. Act	8.03	7.08	7.25
4. Taxes on Sales of Motor Spirit and Lubricants	8.65	13.10	13.10
Total	17.07	20.82	20.99
IV. Expenditure (Communication only)			
1. Original Works	5.00	9.89	11.60
2. Original Works P. W. Development	n.a.*	16.55	9.45
3. Repairs	n.a.	28.35	12.80
Total		54.79	33.85

* n. a. = "not available"

A BRIEF REVIEW OF THE ORISSA BUDGET

(With special reference to Civil Works)

THE total revenue receipts for 1951-52 are estimated at Rs 10,56.32 lakhs and revenue expenditure at Rs 11,50.81 lakhs revealing a deficit (on revenue heads) of Rs 94.49 lakhs. The revised estimates for 1950-51 indicate a deficit of Rs 194.29 lakhs with revenue receipts amounting to Rs 11,31.99 lakhs and revenue expenditure to Rs 13,26.28 lakhs. The accounts of 1949-50 reveal a deficit of Rs 64.06 lakhs.

Revenue expenditure of civil works for 1951-52 estimated at Rs 181.55 lakhs

form about 16 per cent of total State revenue expenditure in the same year as against 20 per cent in 1950-51 (revised).

Expenditure on Communications (Original Works and Repairs) in 1951-52 is estimated to be Rs 33.85 lakhs, as against Rs 54.79 lakhs in 1950-51 (revised). The expenditure on communications forms 4.1 and 2.9 per cent of State revenue expenditure in 1950-51 (revised) and 1951-52 (budget) respectively or 20.4 and 18.7 per cent of expenditure on Civil Works in the two years.

PROCRASTINATION

Road works can be postponed—not so excessive transport costs, wastage of time, inconvenience and all the other penalties of procrastination.

GUIDE TO GUIDE-BOOK WRITERS

There even appeared in those days (about 1600 A.D.) the first predecessor of the modern travel guide. It was the "Travelbook through the United Netherlands Provinces and the bordering Realms and Kingdoms thereof; Comprising, beside a detailed description of the Cities, a list of the Barge and Coach Routes—Compiled with extreme effort by Jan ten Hoorn, Bookseller..." The book begins with a lengthy prayer for the travellers in which God's protection is asked against "murderers and Robbers, poisoned air and evil sickness, against battle and accident." With the help of this book the traveller knew exactly when to change from barge to coach, where for certain stages of the journey he would be able to rent a cart, where he would have to hitch a ride from a miller or peddler, or cover the section on foot.

[From "Paths to World Fellowship", issued by the Netherlands Information Bureau.]

INFORMATION SERVICE

1. QUICK METHODS

(a) Blob Methods for Approximate Determination of Clay Content

(Hirakud Research Station).

AN experimental technique has been evolved to determine quickly the volume of soil absorbing a known volume of water. It consists of preparing an air-dried specimen of soil passing No. 40 sieve and adding water to it in drops by means of an apparatus which delivers them in equal volumes. The soil particles get absorbed round the water drops, thus forming soil blobs, and the sizes of the latter are found to vary with the differences of soils, being larger for coarser soils and smaller for fine grained soils. The volume of the soil particles is then determined by simple displacement of water in a small glass measuring tube after removal of all inter-locked air from the suspension.

It is hoped that the method may prove useful for a quick determination of the percentage clay content of soils.

(b) Cohesion Method for quick Determination of Optimum Moisture Content and Maximum dry Density of Soils

(Hirakud Research Station).

A quick, simple, but fairly accurate method has been evolved which depends

upon making small-sized soil pellets by adding a definite quantity of water to yield a prescribed consistency.

The method consists of increasingly moistening a requisite quantity of soil passing 1/4" mesh sieve and moulding the moist soil lump to a prescribed shape and consistency, which, by experiment, has been found to be attained only at the optimum moisture requirement of any soil. At that stage, the moist soil lump is tamped into a specially devised mould of known volume to obtain homogeneity and a compact soil pellet. The volume of the pellet, corresponding to the volume of the mould, being known, its wet weight and moisture content are determined from which the dry density is computed. The values attained for moisture content and dry density compare reasonably well with A.S.T.M. compaction.

[Extract from the Annual Report of the Indian National Society of Soil Mechanics and Foundation Engineering—1949-50.]

2. BOND BETWEEN CONCRETE AND REINFORCEMENT

A study of the bond between concrete and steel reinforcement was recently made by Mr. L. P. Price for the Institut Technique du Batiment et des Travaux Publics, France.

The bond, says Mr. Price, is only elastic for very small relative deformations. For larger deformations, which nearly always occur near cracks, this bond has all the properties of friction in opposing motion. The deformation of the steel relative to the concrete is, therefore, neither proportional nor reversible.

The hypothesis has been experimentally checked by determinations of the stresses along bars cast into concrete. The theory

resulting from it has cleared up the following points:—

(1) The elongation of a long reinforced concrete prism is explained by the cracking of the concrete and the slipping of the steel. The phenomena can be explained by the assumption that under big deflections the concrete section absorbs a part of the tension equal to about 0.4 times the tensile strength of the concrete.

(2) In a reinforced member under bending or direct tension the width of the cracks diminishes when the bond increases (through increasing the number of bars or the use of indented bars), but for a given

length of member the accumulated width of these cracks remains constant.

(3) The modular ratio m is Young's modulus for steel divided by Young's modulus for concrete. This ratio varies considerably with the ratio of the diameter D of the bars to their useful length l and with the percentage w of steel in the section. In the particular case of the characteristic factors being as follows:—

Tension in steel.....

1500 kg/cm² (21,300 p.s.i.)

Tensile strength

of concrete.....30 kg/cm² (430 p.s.i.)

Bond stress between

concrete and steel.....20 kg/cm² (280 p.s.i.)

Ratio of Young's modulus

of steel to that of concrete.....7

The formula becomes:—

$$m = \frac{7}{1 - \frac{1}{500w} + 19\frac{D}{l}}$$

In practice m can have values between 5 and 20, whereas the theoretical value is 7.

(Extracted from 'Highways and Bridges —' May 23, 1951)

3. ARE EXPANSION JOINTS NECESSARY?

CONCRETE is strong in compression. It is unnecessary to provide expansion joints to relieve compressive stresses to the extent that contraction joints or hinged joints relieve tensile and flexural stresses. In fact, laboratory and field data show that under normal conditions no expansion space or very little expansion space is required to protect concrete pavements from actual stresses due to restraint when inert, if non-compressible matter is prevented from entering contraction joints or cracks. If contraction joints, properly spaced and maintained, are provided to control cracking and infiltration, and only normal construction materials are used, no expansion space is needed.

American Practice

In the United States of America concrete pavements are normally placed in warm weather with temperatures of 70 deg. F. or more in the concrete at time of hardening. Subsequently, under brilliant summer sun the temperature may rise to 120 deg. F. The coefficient of thermal expansion of concrete being about 0.000055 per degree F., each inch of slab will attempt to expand 50 times 0.000055 inches, or 0.00275 inches with the 50-degree rise in temperature. If this expansion is not allowed to occur and if the modulus of elasticity of the concrete is 4,000,000 pounds per square inch, the compressive stress which will

develop would be 1,100 pounds per square inch. If this stress developed, it would be of little significance in pavement concrete having a compressive strength of 5000 pounds per square inch, but under good maintenance conditions it will not develop.

During hardening of the concrete and subsequent drying, the pavement slab shrinks, opening contraction joints and leaving space for a considerable amount of expansion before restraint is encountered. If this space is preserved, the compressive stress which would occur following a 50-degree rise in temperature will be much less than 1,100 pounds per square inch.

Stress not Harmful

The compressive stress which does develop is not harmful, but is distinctly beneficial to the pavement. It reduces the opening and assures satisfactory load transference at the contraction joints. It also tends to reduce tensile stress in the top or bottom of the slabs if either happens to be under tension due to flexure caused by loads. When covered pavements break in flexure under load, the break is due to the tension in either top or bottom of the slab. An all-over compressive stress due to restrained expansion will reduce the tension and increase the load-carrying capacity of the pavement. The compression will not always be present, but to the

extent that it is present, it will reduce the number of critical stress repetitions which may occur and thus increase the life span of the pavement.

Expansion joints can therefore be omitted or used at long spacing in pavements placed during the normal construction season and of materials having normal expansive properties. If it is known that the materials in use have high expansion coefficients, or if the pavement is placed at low temperatures, a limited amount of expansion space may be needed. Under these conditions, $\frac{3}{4}$ inch expansion joints at intervals ranging from 300 to 600 feet should provide the required relief, the spacing within this range depending upon the severity of the special conditions which are thought to make the use of expansion joints necessary. The filler used for expansion joints should be nonextrusive.

In unreinforced concrete pavement, contraction joints of the dummy-groove type should be used at intervals which will control cracking. Local experience is the best guide as to the spacing required, but it will usually be 15 to 20 feet. If the spacing is too great, intermediate cracks will form. These cracks are not serious structurally, but are more difficult to keep

sealed against infiltration of incompressible materials.

A Satisfactory Joint

Perfection in sealing of contraction joints is not practical or necessary, but the joints should be designed and constructed so as to facilitate their sealing in maintenance operations. The most satisfactory type of contraction joint is the open groove, $\frac{1}{4}$ to $\frac{3}{8}$ inch in width and of a depth equal to $\frac{1}{4}$ to $\frac{1}{3}$ the pavement thickness. This groove is sealed after the concrete hardens but before the road is opened to traffic, by pouring with a suitable plastic material. The groove should be edged with a radius not greater than $\frac{1}{4}$ inch and it should not be overfilled.

If contraction joints are used at spacings which will control cracking, the slab lengths will be so short that the amount of shrinkage or contraction in each slab will produce only a small opening of the joint. The interlocking of the aggregate particles across the face of the joint will provide a substantial amount of load transference which, under most conditions, will make unnecessary the use of dowels in the contraction joints.

[Extracted from "The American City"—June, 1951]

DO YOU KNOW ANSWERS

1. The road was 1,755 miles long. The overall travel time from end to end of the road was 3 months and 3 days, an average journey of nearly 19 miles a day, according to Herodotus, writing about 457 B. C.
2. The Automobile Manufacturers Association reports that 59,000,000 adults ride in a car every day.

HEANDSHE

A Davenport held the twain,
Fair damsel and her ardent swain;
Heandshe.
But then, a step upon the stair!
And father finds them sitting there:
He.....and.....she.

BOOK REVIEW

Annual Report of the Indian National Society of Soil Mechanics and Foundation Engineering for 1949-50; Secretary of the Society, Kennedy House, Simla; pages 58. Unpriced.

THE Report is a brief review of important problems in soil mechanics tackled at the various Research Laboratories in India during 1949-50. Besides this the report gives abstracts of the following Papers accepted by the Society for publication:

- The report is divided into sections on :

theory and hypotheses;

laboratory and field investigations ;

stability and deformation of earth constructions like embankments and dams ;

foundation pressure and settlement of buildings on footings and rafts ;

pile foundations and pile loading tests;

problems of road and runway construction ;

improvement of the mechanical properties of soil ;

ground-water problems ;

and many other subjects of a general character.
1. The Scientific exploitation of soil by S. R. Mehra (a popular leaflet). This has since been published.

2. Specifications for the use of rammed cement-soil in building construction. B & R Research Laboratory, Karnal, Punjab, (In the press).

3. Soil exploration—power house No. 1 on Nangal Hydel Canal by A. S. Kalha and R. S. Shrikant.

4. Investigations, design, and construction of earth dams—general review by K. L. Rao.
- In the end are appended replies to the questionnaire on “Soil Mechanics in India ” issued by the Society.

The report is interesting and informative.

PERFECT UNDERSTANDING

Once a French husband told a Chinese friend: “ My marriage is perfect. My wife and I have a perfect understanding. She defers to me on all the important matters. And I defer to her on all the unimportant matters.”

“ How does it work out?”

“ Well, in ten years of marriage no important matters have come up.”

“ I”, said the Chinese, “ have an even better arrangement with my wife. All matters, important or unimportant, are subject to my decision, all except one.”

“ What is that one?” asked the Frenchman.

“ Me.”

THOUGHTS AFTER HEARING A POLITICAL SPEECH

To be good is noble; but to tell others how to be good is nobler—and no trouble.

Mark Twain.

List of Approved Works on National Highways

S. No.	Job No.	Name of work	Amount approved Rs	Remarks
ORISSA.				
1.	492 RS 6	Survey for short route from Keonjhargarh to Pallahara via Kuanr and Govindpur on National Highway No. 6.	13,900/-	
BOMBAY.				
2.	493 BM 4	Improvement of bad kink in mile 222/3 of Bombay-Poona-Bangalore-Madras Road.	18,800/-	
3.	494 BM 3	Cement-concreting miles 56/5 to 57/4 of Bombay-Agra Road.	1,03,979/-	
4.	496 BM 8	Strengthening of the bridge over the river Narmada at Broach on National Highway No. 8, Providing 6" thict timber decking.	47,600/-	
PUNJAB				
5.	495 PB 1	Construction of byepass on the Grand-Trunk Road near Karnal.	4,64,800/-	
6.	498 PB 1A	Construction of a bridge in mile 13/4 of Jullundur-Mukerian-Pathankot National Highway No. 1A.	66,880/-	
UTTAR PRADESH				
7.	497 UP 2	Painting miles 472-487 of National Highway No. 2 (miles 467-452 of G. T. Road).	5,47,500 -	

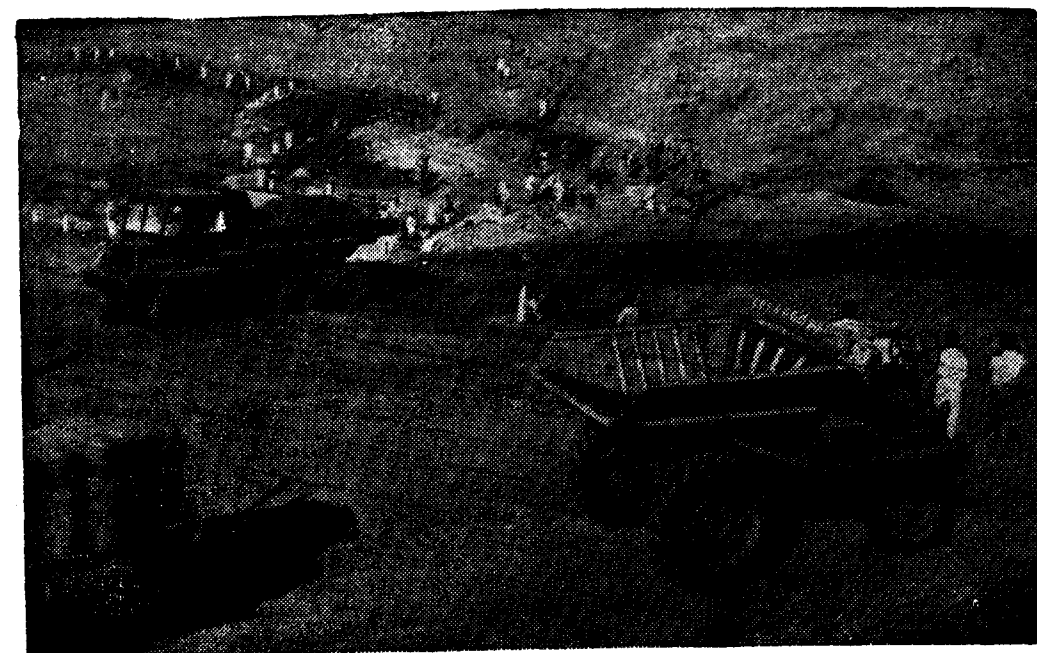
List of Books added to the Roads Organization Library during August, 1951

Publications of the British Standards Institutions, 24/28, Victoria Street, London, S.W. 1.

1. B.S. 1121: Part 17, 1951: Methods for the Analysis of Iron and Steel. Part 17: Titanium in Permanent alloys.
2. B.S. 1121: Part 18: Chromium in Ferro-chromium.
3. Quarterly Bulletin of European Inland Transport Statistics, Vol. II, No. 4. (4th Quarter 1950), (United Nations Economic Commission for Europe, Transport Division). Papers read at the last meeting of C.B.I. held from 2nd to 7th July 1951, Simla.
4. Hydrometeorology of Koyna Catchment (cyclostyled) by S. K. Pramanik and K. N. Rao.
5. Maximum Run-off Discharges for cross-drainage Works on Hirakud Canals by H.L. Vadera and M. G. Hiranandani.
6. Theory of flow of water—Further amplifications and applications by Ishar Das.
7. A Note dated 6-3-51 on the Chambal River Multipurpose Project by Shri M.D. Mithal.
8. Soil Survey and Rapid Tests by S.P. Ray Chaudhuri and B.V. Subhia.
9. A Note on Soil Conservation Survey by S. P. Chaudhuri.
10. Theory of Flow of Water and Universal Hydraulics Diagrams by Ishwar Das.
11. Design for Canals Falls by Shri H.L. Vadera and B.S. Talwani.
12. Note for the Central Board of Irrigation—Soil Chemistry by Dr. Dalip Singh and Dr. S. D. Nijhawan.
13. Annual Report 1950 of the Indian Institute of Science, Bangalore by Prof. M.S. Thacker.
14. Planning Malaria Control in Multi-purpose Projects by Dr. Dakshinamurthy etc.
15. Waterlogged Land on Bombay-Deccan Canals and Their Drainage and Improvement by Shri I. M. Magdum.
16. Central Board of Irrigation—Classification of Soils by Dr. R. V. Thamhani.
17. Sewage Irrigation in India by Dr. R. P. Talati.
18. Theory of Flow of Water and Determination of Depth of Sheet-piling in Design of Weirs, Bridges, and Barrages by Ishwar Das.
19. Report of Irrigation and Navigation Research Institute at Poona with a Summary of the Report.
20. Annual Report No. 16—Irrigation and Allied Research. Irrigation Development Division (1950—51) Poona.
21. Annual Report of Hirakud Research Station 1950 by Dr. R. C. Hoom.
22. Annual Report (Technical) of the Hyderabad Engineering Research Laboratories for 1950 by Dr. S. P. Raju.
23. Hyderabad Research Station, Krishnarajasagara (Mysore) 1950—Research Publication No. 5 by V. Ganeshia Iyer. (2 copies)
24. Annual Report of the River Research Institute, West Bengal, 1950—Publication No. 6, by Dr. K. N. Bose.
25. Determination Allowance Pressure of Soils—Field Experiments for the note by M. G. Hiranandani.
26. Report of the Irrigation Research Institute Amritsar for the year ending December 1950—Research Publication No. 5 by C. L. Handa. (Irrigation Research Institute, Amritsar, 1951).

27. Important Bridges on Indian Railways—Statement showing the Cost and particulars of bridges either of over 1,000 feet in length or costing not less than Rs 6,00,000 each: 30th June, 1948. (Central Standards Office, Ministry of Railways, New Delhi). (3 copies)
28. Large Organic Cations as Soil Stabilisation Agents—Bulletin No 168 by Donald T. Davidson. (The Iowa State College of Agriculture and Mechanic Arts, Ames, Iowa.) (2 copies)
29. Technical Bulletin No. 137—Report of Committee on Calcium Chloride Soil Stabilization. (1948).
30. Technical Bulletin No. 154—Report of Committee on Calcium Chloride Soil Stabilisation. (1949)
31. Technical Bulletin No. 157—Base Stabilisation on the Blue Ridge Parkway. (1949).
32. Manual of Transit and Traffic Studies, 1947 (American Transit Association, 202, Madison Avenue, New York 17 N. Y.)
33. The Nature and Testing of Asphalt and Asphaltic Mixtures—University of California Syllabus Series No. 318. by B. A. Vallegre (The Institute of Transportation and Traffic Engineering, University of California Press, Berkeley and Los Angeles, 1950.)
34. Gazetteer of India and Pakistan (Published under the direction of the Director of Military Survey, Army Headquarters, India. (8 copies).
35. Economic Geology No. 4—Cement—Series A of Bulletins of the Geological Survey of India by J. B. Auden. (Office of the Geological Survey of India, Calcutta).

Publications of the American Road Builders' Association, 1319 Street Northwest, Washington 4, D. C.



AVELING-BARFORD DUMPERS

Aveling-Barford Dumpers of 4½ and 9 cu. yd. capacities are employed on the vast Damodar Valley Project. At the Konar Dam site, illustrated above, they are doing a big job helping to move 6,400,000 cu. yds of earth.

4½ cu. yd. capacity: Ample power provided by 54 B.H.P. Diesel engine; Patent Reversible driving position gives full driving vision; 4 speeds both forward and reverse; instantaneous, gravity or power-assisted tipping.

9/10 cu. yd. capacity: 135 B.H.P. Diesel engine; Patent Reversible driving position; Hydraulically-controlled gear box giving 4 speeds both forward and reverse; controlled mechanical tip, full tipping angle reached in under 10 seconds.

chosen for the big jobs

Distributors:

Western Region including U.P. & Hyderabad (Dn.)

**GREAVES COTTON
& CO., LTD.**

No. 1-Forbes Street, Fort, Bombay.

Distributors:

Eastern & Southern Regions

JESSOP & CO., LTD.

63-Netaji Subash Road,
Calcutta.

Surface your Roads with **BITUMULS**

Cold Bitumen Emulsions require no heating
"DIRECT FROM DRUM TO ROAD"

Full particulars and Technical Advice from:—
BITUMEN EMULSIONS (INDIA) LTD.

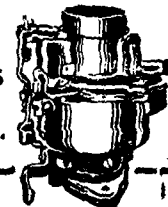
Head Office, Factory and Laboratory,
7/1, Hide Road, Kidderpore,
CALCUTTA 23.

TELEGRAMS: "BITUMULS".

Rochester
Products
Carburetor

- No fuel loss on any incline
- Smooth acceleration while turning
- Easy starting in hot weather
- Continuous fuel flow
- Power Mixture readily available
- Acceleration hot or cold
- 40% fewer parts to service
- All metering parts in cover

ROCHESTER PRODUCTS
DIVISION OF GENERAL MOTORS.



Available for 1932 to 1951
models of Chevrolet Cars
and Trucks.

GENERAL MOTORS INDIA LIMITED.

Fosbery Road, Sewree, Bombay.

Serving India's Transport Needs for over 23 years from our factory in Bombay.

Please mention this journal when replying to advertisements.

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. . . .

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

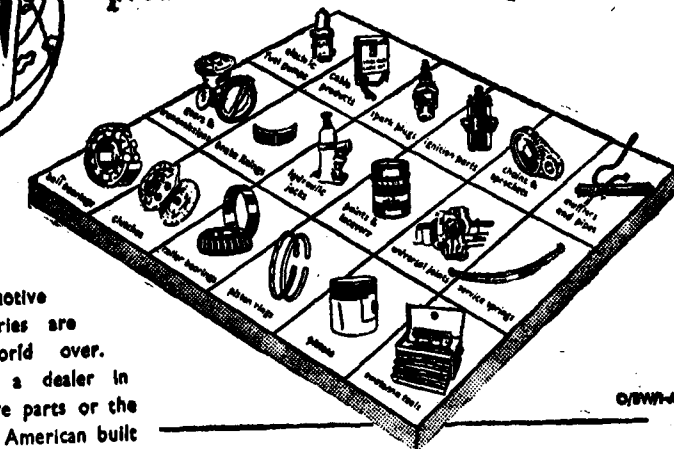
Telephone: 88316.

Telegrams: "VITOPUS", Madras.

BORG - WARNER INTERNATIONAL



Genuine American Automotive parts
and accessories . . . each Borg-Warner
product is dominant in its field



Borg-Warner automotive
parts and accessories are
renowned the world over.
Whether you are a dealer in
American Automotive parts or the
owner of a fleet of American built
trucks—you need not worry about
your spare parts and accessories. Each
Borg-Warner product is dominant in
its field; and there is a Borg-Warner
product to meet your every need . . .

Write for further details to:

F. & C. OSLER (INDIA) LTD.

Head Office: 12, Old Court House Street, Calcutta.

Branches:

New Queens Road, Bombay Scindia House, Queenway, New Delhi

Please mention this journal when replying to advertisements.

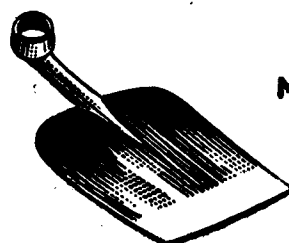


TATA AGRICO IMPLEMENTS

help him to
GROW MORE FOOD

Strong, durable, easy-to-handle Agrico implements are the first choice of farmers all over the country—first essentials to successful farming.

THERE'S AN AGRICO
IMPLEMENT FOR
EVERY FARMING JOB



MAMMOOTIES:

In three patterns including the popular Swan-necked Design. Sharp cutting edges ensure efficient working. Balanced construction enables easy handling.



POWRAHS:

In five patterns to suit varying work conditions. Made from high-carbon, heat-treated steel like all other Agrico Implements.



PICKS & BEATERS:

In four basic patterns designed to do various types of work. Cutting points are specially strengthened to retain sharpness. Extremely sturdy and long lasting.

TATA AGRICO *Implements*

THE TATA IRON & STEEL COMPANY LIMITED
Sales Office: 23-B, Netaji Subhas Road, Calcutta
Branches at: Bombay, Madras, Nagpur, Ahmedabad, Kanpur, Secunderabad, Vizianagram Coa and Jullunder Crntt.

Please mention this journal when replying to advertisements.

EQUIPMENT FOR EFFICIENT ROADMAKING



1 RUSTON-BUCYRUS & BUCYRUS ERIE EXCAVATORS

The most versatile machine for shallow digging on roads, road grading and widening and culvert or bridge excavations.



2 AVELING - BARFORD DIESEL SHUTTLE DUMPERS

The 4½ cubic yard model, capable of operating under the most adverse off-the-road conditions, it is an ideal machine for all short-haul transport with its patent reversible steering and power assisted tipping for speedy operation.



3 The heavy duty type S.C. designed to meet the need for a specialist unit, more heavily constructed than the lorry for the longer transport of rock and other materials. It is built to work continuously under the most difficult conditions of surface and gradient and to withstand the heavy impact of rock directly discharged from excavators. Like the 4½ cubic yard Shuttle Dumper it is fitted with patent reversible steering and quick tipping gear.



4 AVELING - BARFORD VIBRATORY CONCRETE FINISHERS

The ideal machine for speedy construction of modern concrete roads. It is designed to compact and finish concrete mixes of low water and sand content giving maximum strength and economy in cement.

Please write to us for descriptive literature,

Sold and serviced by

GREAVES COTTON & CO., LTD.
1, FORBES STREET, P. O. BOX NO. 91, BOMBAY 1.

MAS. 480

Please mention this journal when replying to advertisements.

**HERE IS
LOW-COST DRAINAGE
under limited headroom.**

Problems of limited headroom can be solved quickly and economically with Nestable ARMCO PIPE-ARCHES:

These low-wide structures provide adequate drainage without the expense and trouble of raising grades or installing several smaller openings.

Nestable ARMCO PIPE-ARCHES have ample strength to withstand the impact and vibration of traffic. They assure many years of satisfactory service. Installation is a simple matter for a small unskilled crew. ARMCO PIPE-ARCH can be nested into convenient bundles to simplify handling and transportation.

Where severe erosion is a problem ARMCO PIPE-ARCHES can be supplied with a PAVED-INVERT. Or an ASBESTOS-BONDED PIPE-ARCH will check corrosion. Write for complete information.



ARMCO INDIA LTD.
21, ESPLANADE MANSIONS
CALCUTTA.



ARMCO MULTI-PLATE PIPE ARCHES.
"Sankosh Allpur-Duars,
Assam Rail Link."

Please mention this journal when replying to advertisements.

Motorists' QUIZ...do you know?



How FAR WOULD THE PISTONS TRAVEL IN THE CYLINDERS OF A SIX-CYLINDER CAR DRIVEN AT 40 M.P.H FOR ONE HOUR?

- 1 25,000 FEET?
- 2 ABOUT 15 MILES?
- 3 OVER 80 MILES?



ANSWER: OVER 80 MILES IS THE CORRECT ANSWER—SHOWING YOU THE TREMENDOUS AMOUNT OF WORK THIS PART OF YOUR CAR DOES IN AN HOUR'S DRIVING! PROOF, TOO, OF THE NECESSITY FOR ALWAYS REPLACING WITH GENERAL MOTORS GENUINE AND APPROVED SPARE PARTS—BUILT FOR THE JOB!

INSIST ON GM GENUINE AND APPROVED SPARE PARTS—*Packard* RINGS AND TOLEDO PISTONS

INSIST ON GM GENUINE AND APPROVED SPARE PARTS
DISTRIBUTED IN INDIA BY
GENERAL MOTORS INDIA LIMITED
SERVING INDIA'S TRANSPORT NEEDS FOR OVER 23 YEARS

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

TIMBER

HARDWOODS - SOFTWOODS - PLYWOODS

MILLAR'S 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.

ROAD CONSTRUCTION

IS

AN INVESTMENT TO GOVTS.

"Every additional vehicle on the road represents
an average income of more than Rs. 1000/-
annually to the public Exchequer."

MORE ROAD CONSTRUCTION—MORE MONEY
FOR ROADS

APPLY 'HOTFIX'—ASPHALT

OR

'COLFIX'—EMULSION

Messrs. McLEOD & CO., LTD.,
CALCUTTA.

Please mention this journal when replying to advertisements.

CONCRETE

The Easy way

BY THE

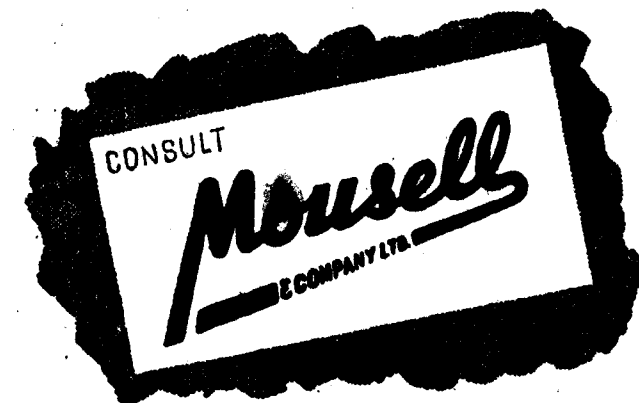
"CHEECOL"

(REG. TRADE MARK)

Grouting Process

(PATENTED)

FOR ROADS, FLOORS, RUNWAYS ETC.



41A, FREE SCHOOL STREET, CALCUTTA • LOTUS HOUSE, MARINE LINES, BOMBAY

R.P.S.

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 post
			Rs.
1.	Volume III—Lucknow 1937	...	4 0
2.	Volume IX—Part 4—October 1945	...	3 0
3.	Volume IX—Bound—Madras 1945	...	10 0
4.	Volume X—Part 1—December 1945	...	3 0
5.	Volume X—Part 4—August 1946	...	3 0
6.	Volume XI—Part 4—May 1947	...	3 0
7.	Volume XI—Bound	...	12 0
8.	Volume XII—Part 1—September 1947	...	3 0
9.	Volume XII—Part 2—January 1948	...	3 0
10.	Volume XII—Part 3—April 1948	...	3 0
11.	Volume XII—Part 4—March 1948	...	3 0
12.	Volume XII—Part 5—September 1948	...	3 0
13.	Volume XIII—Part 1—December 1948	...	3 0
14.	Volume XIII—Part 2—January 1949	...	3 0
15.	Volume XIII—Part 3—January 1949	...	3 0
16.	Volume XIII—Part 4—July 1949	...	3 0
17.	Volume XIV—Part 1—September 1949	...	3 0
18.	Volume XIV—Part 2—December 1949	...	3 0
19.	Volume XIV—Part 3—December 1949	...	3 0
20.	Volume XIV—Part 4—July 1950	...	3 0
21.	Volume XIV—Bound	...	8 0
22.	Volume XV—Part 1—August 1950	...	3 0
23.	Volume XV—Part 2—November 1950	...	3 0
24.	Volume XV—Part 3—January 1951	...	3 0
25.	Volume XV—Part 4—August 1951	...	3 0
26.	Road Research Bulletin No. 1	...	5 0
27.	I. R. C. Standard Specifications and Code of Practice for Road Bridges in India (1937)	...	1 0

Copies can be had from the Secretary,

INDIAN ROADS CONGRESS,

JAMNAGAR HOUSE, SHAHJAHAN ROAD,

NEW DELHI-2.