32

32 Transport-Communications

MONTHLY REVIEW

No. 41 September 1950

In this issue

Also :—(1) The best research Engineer; (2) Research Welcomes change; (3) The Draughtsman; (4) Formerly; (5) Too much to bear? (6) Friends; (7) The first lesson.

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.

WASTED ASSETS

(Extracted from 'International Road Federation Bulletin No. 8'—March–April, 1950).

THROUGHOUT the centuries civilisation has followed the road and, despite the changed conditions of the modern world the highway still constitutes a vital link in every system of transportation. It is, then, a matter of serious moment, and one which affects the well-being of the entire community, if the fullest possible use is not made of so valuable an asset as road transportation. In this connection it is only fair to add that it is not the road transport undertakings that are at fault but rather the roads themselves. Since any weakness in one of the links in the chain of production (and transport *is* one of these links) may well adversely affect the success of any drive for increased output, this is a state of affairs that no country can today afford to tolerate.

The fact that, for one reason or another, the road systems of the world are inadequate is generally conceded. The recognition of this fact, however, implies no justifiable criticism of the road policy pursued in the past since it is plain that the present position has arisen, not so much through shortsightedness, as, in the main, through the unprecedented and, indeed, unpredictable rapidity of the advances made in the mechanical modes of locomotion, a progress which there has been little or no opportunity to parallel in the highway engineering field Once the essential inter-relationship between the roads, and the vehicles which ply on them, has been recognised, however, the case materially alters. A failure to adopt long term measures then becomes a blindness to the future trend of events that justifiably calls for criticism. *Nor, in the long run, can financial stringency be adduced as a sufficient reason for neglecting this aspect since it has been shown time and again, that good roads pay for themselves.*

There are, however, encouraging signs that the tide is turning. For example the United States, the first country to become motor-minded, is becoming road-minded also. There a re-orientation is taking place and it is increasingly recognised that highway construction must first and foremost be planned on a long-term basis. Before a road project is undertaken the future needs of the traffic in the area is estimated, up to a period of twenty years or more, and these factors are taken into account in drawing up plans. In all countries, even in those where major transport developments took place already in the last century, and where radical alteration of existing systems may be precluded on economic grounds the principle of designing the roads to meet the needs of present and future traffic can, and must, be applied if the road transport system is to operate efficiently and the full economic benefits to be derived therefrom are to be enjoyed.

That these economic and social benefits may be considerable and far reaching in their effects, has been proven repeatedly; no country can, therefore, afford to neglect its highways and thus diminish the possibilities of increasing the national income. Already in France, Belgium, the Netherlands and elsewhere great interest is being displayed in the science of traffic engineering, and in the technique generally of long-term highway surveys; it is to be hoped that this may prove to be the beginning of a sounder approach to the whole question

It is clear that, as matters stand, the road system, being an integral part of the life of every community, will, unless it is improved, continue seriously to hamper and frustrate economic development and rehabilitation; moreover the urgency of this problem becomes the more apparent when seen in relation to the present pressing need to remove bottlenecks to economic expansion wherever they may be found.

In the past a slogan which well expressed the keynote of the times was "trade follows the flag." Today it may equally well be said "trade follows the road" — nor should it be forgotton that the measure of ecohomic prosperity attained will inevitably be determined by the adequacy of that road. If there is one fact upon which there can be full agreement, it is that without the encouragement of all forms of transport, and, in particular, without increasing the efficiency of road systems everywhere, world progress towards a more secure future is certain to be slow indeed.

IDEAS ON ROAD ADMINISTRATION

[*Extracted from "Highways and Bridges," March 22, 1950.*]

AN efficient and economic system of road administration depends on a number of factors, but largely on there being a fixed road policy with some reasonable assurance as to the amount of money which will be available over a term of years for the purpose of maintenance and improvement of existing roads and construction of new roads.

The amount of money available annually determines, to a great extent, the volume of work which can be carried out, but not entirely so, as the volume of work is affected by the value of money at a particular time, and by economies which can be effected in design, specification and methods of carrying out the work. During the past years the development of construction machinery has made a great increase in the productivity of labour on road projects. The volume of work is, therefore, not entirely proportionate to the amount of money available, but for the purpose of this discussion the supposition that it is, will be near enough for our purpose.

We still lack a fixed road policy. Road expenditure is still a game of "Battledore and Shuttlecock." Works are started at one period and stopped at another. There is no continuity and half-completed works are left for years high and dry, all over the country, with no return on the sunk capital and with no advantage to road transport.

A brave effort was made a few years ago to lay down the main features of a 10-year programme for the development of the highway system, but on the first light breeze of the economic blizzard, which has now got us in its grip, the programme folded up overnight.

The objects of this programme were:

1. Promotion of safety on the highways.

2. Improvements to assist development areas in particular and industrial development generally, including better access to ports and markets.

5. Improved through communications.

4. Rehabilitation and improvements of towns and countryside, the re-development of devastated areas, the improvement of areas between the home and the workshop or office, and reduction of traffic congestion.

5. In the country, the promotion of the efficiency of agriculture.

In order to include major works of construction and reconstruction the programme was divided into three stages:

1. Two years – of renewed maintenance and beginning of works of first priority.

2. Three years – of increased activity of major works, including a limited number of motor roads for the development areas.

3. Five years – in which comprehensive reconstruction of the principal national routes will be undertaken, including a further number of motor roads.

In this way, the Minister said in the House of Commons on May 6, 1946, "movement on our highways will be made freer and safer for all classes of road users with corresponding advantages to the economy and well being of the country as a whole."

The Minister has since said that the progressive 10-year programme announced in 1946 has not been shelved, but owing to the economic crisis has been temporarily postponed.

The position is, however, that we lack the first fundamental requirement of an efficient and economic system of highway administration, and **we continue our erratic course, up one moment with maintenance activity in hand, and large, new works started, and down the next, with maintenance cut to the bone and all new works stopped.**

At the present we are in the down position, maintenance is on the danger list, new works have been stopped before completion, and the money expended lies fallow History repeats itself, storing up costs of arrears of maintenance work which the country will have to face up to in the future – that is, if the roads are to continue to handle the heavy industrial and passenger traffic now using them. It is well to remember that for every £1 not spent now on maintenance, £4 will probably be required in the future to make good the present neglect.

Reducing Export Prices

It may be that before long, due to circumstances quite outside the demands of road transportation, funds will again be made available for roads, and for a time there may be another boom, to be followed by the usual slump. It is submitted that this is no way for a manufacturing country such as Great Britain to run its road transportation responsibilities, dependent as we are on selling our finished products in overseas markets, modern and efficient highway tracks are essential to reduce transportation costs and our export prices.

The Commissioner for Roads (U. S A.), Thomas H. Macdonald, has truly said: "**The public pay for adequate highways whether they have them or not, and they pay less if they have them than if they have not.**"

The trouble is that public opinion does not yet appear fully to realise the importance of road transportation, requiring good, easy-running roads to be cared for and improved in the interests of the economic life of the country, and not just roads which somehow can be bumped over. The basic need is a truer appreciation by the State of the services performed by roads, and of the true economies to be effected by the provision of better roads.

Another important factor is that the civil engineer who has specialised on highways construction is not getting the opportunities to do the work for which he has been trained. This has resulted in many going on to planning, much of which will never get beyond the drawing-board stage.

My first point is, therefore, a plea for a realistic highway programme, however small or however large it may be, both for maintenance and new works to cover a moderate term of years, but sufficiently long to complete any new works started, with the assurance that during this term funds will be made available to carry the agreed programme to completion.

Roads are an industrial set-up which sell miles and services, and so long as this country continues its present erratic methods of dealing with the roads, it is not possible to have an economical and efficient road administration which will give satisfaction to industry and the travelling public.

Highway Authority

The public roads of Great Britain are in five classes, viz., trunk roads, Classes I, II and III, and unclassified, and the total milage is 183,658.

This large milage is the responsibility of 1,284 highway authorities, including the Ministry of Transport.

Under the present system of administration the extent and timing of work on the roads is not only governed by the amount of grant available from the State, but on classified roads is also governed by the willingness and ability of the local authorities to find the proportion of expenditure falling on them; but, **speaking generally, the local authorities are willing to find money for a volume of work larger than that for which State is willing to find its share by way of grant.** This may perhaps be regarded as an indication that locally there is a better appreciation of the importance of good roads than seems at present to obtain in Government circles

The present system of highway administration is an integral part of the local government system. That is, it is intimately related to the different types, sizes and functions of the various kinds of local government authorities, which, so far as highways are concerned, number 1,284 in Great Britain, increased to some extent by rural districts, where rural district councils still act as delegated authorities.

The present system of highway administration, therefore, reflects both the strength and weakness of the local government structure.

It may be contended that the right solution of the problem of highway administration, assuming that the first need as to a programme with financial backing has been met, is to dis-associate it wholly or more completely from the local government structure, as railway administration has always been dis-associated and as the administration of services such as electricity supply and gas supply is increasingly being dis-associated.

Dis-association of highway administration from the local government structure would, however, in all probability result in disadvantages greater than any resulting advantages. The reasons for this may be summarised. It would result in (a) a further weakening of the local government structure, (b) a tendency to give inadequate weight to the essentially local services which roads, including even trunk roads, perform and must perform, (c) a tendency towards centralisation in unduly large units with the resulting creation of local bureaucracies, and in this connection it has been said that "centralisation is the death blow of public freedom."

The true solution would appear to be (a) a re-organisation of the local government structure in a manner which will create the conditions in which highway services, in common with all other locally administered public services, can function with maximum efficiency and economy, together with (b) perhaps, the transfer to the State of responsibility for a limited additional milage of trunk roads.

The setting up of a central laboratory common to several counties is worthy of consideration.

* * *

Administrative Areas and Motorways

One final word about motor roads. Investigation has shown that there is a justification on economic grounds for the construction of some 1,000 miles of these special roads in this country. The motor road does not touch the community to the same intimate extent as the local "all-purpose" roads. Once construction has started, the whole of the 1 000 miles should be completed in the shortest time, say, 10 years.

The setting up of a quite separate body to handle this work is worthy of consideration. This separate body could be known as the "British Motor Road Construction Authority," designing and supervising the construction by contract of the motor road system, the cost of the work to be financed from motor taxation.

On the completion of the constructional work, the roads should be taken over for maintenance purposes by the large highway units, in order to economise in plant, supervision and general overheads.

—o—

THE BEST RESEARCH ENGINEER

The best research engineers I have known have been those whose minds are open to conviction and who are able to make their own decisions. Just because something is stated as a fact in the scientific literature is no positive proof that it is truth. Formulae, equations, and rules were made to be challenged and exist because someone challenged former rules.

—Dr. H. C. Rentschler—A. S. T. M. Bulletin 147.

A WORD FOR BRITISH RAILWAYS

[*From "Modern Transport"—April 1, 1950*]

ADDRESSING the Tees-side Chamber of Commerce Sir Cyril Hurcomb, chairman of the British Transport Commission, refuted charges that the railways had neither increased their efficiency nor realised economies. Considerable economies, he said, had already been made, and much larger economies would accrue when the Commission was able to bring the permanent way and rolling stock out of the state in which they had been left by the war. In spite of severe increases in the cost of their materials and wages — wage increases granted on the railways in 1949 alone amounted to £1½ million — the total of British Railways expenditure at £312 million in 1949 was only £1 million more than in 1948. The reorganization of the Scottish Region would save £1 million per annum; the compensation for damage and loss of goods had been cut by over £1 million in 1949; marshalling yards closed by merging would save £250,000 annually; little-used stations and branch lines closed to date would save another £200,000 per annum. By mechanisation and revised methods of working, the cost of maintaining and renewing railway track, bridges, buildings, etc., would eventually be reduced by some £3 million a year. These and other economies, not easily measured, were, however, eaten up by growths of expenditure outside the Commission's control, but the Commission accepted the need to effect economies, large or small, wherever that could be done.

As proof of greater operating efficiency on the railways, Sir Cyril Hurcomb quoted from the Commission's *Transport Statistics*. Net ton-miles per total engine hour, he said, had gone up from 461 in 1938 to 542 in 1948 and to 559 in 1949, an improvement of 21 per cent over pre-war. Net ton-miles had increased by 5,000 million, or 29 per cent, since 1938, although the railways were using less equipment. On the Commission's passenger services, they were carrying as many passenger services, a longer average distance, with 20 per cent less passenger miles. Further economies in freight haulage were limited by the custom of British traders to maintain relatively small stocks and to expect rapid delivery of relatively small consignments. Although this militated against holding wagons for ideal loads and against detaining wagons to make up full trains, the railways had met traders' requirements by giving one-day transit to 41 per cent of wagons, and two-to-three days transits to 45 per cent.

Having secured these substantial improvements in working efficiency, Sir Cyril Hurcomb went on, the railways' root difficulty lay in the fact that the level of their charges lags too far behind the general price level. They were paying on average two and a half times the pre-war price for a range of 56 commodities used in large quantities for building and maintenance work, whilst the cost of rolling stock was over twice that of pre-war, but fares and charges had risen by only 55 per cent.

It was sometimes asserted that the Commission's only aim was to increase road fares to existing rail levels. "There is no justification for that assertion," he said, "and it certainly does not represent the policy of the British Transport Commission." Existing discrepancies between road and rail fares were in certain cases excessive, and in the charges scheme recently submitted to the Tribunal the Commission proposed to reduce fares in the London area which are calculated on the standard main-line basis.

Indian figures

The principal features of the year 1948–49 from the point of view of Indian Railways were the maintenance of high levels of traffic, upward trends in earnings and reduction of transport shortages. The salient features of operation of Indian Government Railways were:—

(1) There was a drop in the operating ratio from 91.40 in 1947–48 to 78.98 during 1948–49, due to sustained efforts on the part of railways to attain efficiency in operation.

(2) The tonnage of goods carried increased by 6.2 million tons or about 8.69 per cent. Net ton-miles registered an increase of 1,712 millions or 8.52 per cent over last year.

(3) Passenger traffic, in terms of passenger-miles, also registered an increase of 2,902 millions or 8.9 per cent.

(4) The train-milage run during 1948–49 recorded an increase of 2.27 million or 1.69 per cent over the previous year. The figure for the year 1948–49 almost touched the figure for the year 1938–39.

(5) Goods services also showed greater efficiency in their performance. As compared with 1947–48, the net freight carried per goods train increased by 47 tons or by 11 per cent on the broad gauge. The net ton milage per wagon day was 6.3 per cent higher on broad gauge and 10.5 per cent higher on metre gauge.

(6) Measured in terms of engine-miles per day per engine on line (i.e., inclusive of time occupied under repairs, etc.) the daily milage on the broad gauge remained at the same level as in 1947–48 viz., 72 but on the metre gauge it increased from 71 to 73. Similarly the average number of engines in use daily during 1948–49 rose by 4 per cent on the broad gauge and by 5 per cent on the metre gauge as compared with 1947–48.

(7) The total number of staff of all grades (gazetted and non-gazetted) employed on the open lines of Indian Government Railways (including Assam and E. P. railways) registered an increase of 13,381 over the year 1947–48. The corresponding increase in the cost of staff was Rs 153 millions or 24.3 per cent over the preceding year. Such increase of staff and the cost was mainly due to the implementation of the recommendations of the Central Pay Commission with retrospective effect and other Awards—[Ed.]

Quiz Corner

ROAD MILAGE QUIZ

DO YOU KNOW?

1. The milage of extra-municipal concrete roads in India is

   (a) 700 (b) 1,000 (c) 1,500

2. The milage of extra-municipal bituminous roads is

   (a) 1,000 (b) 5,000 (c) 10,000

3. The ratio of bituminous roads to lower grade waterbound macadam roads is

   (a) 1 : 4 (b) 1 : 8 (c) 1 : 16

4. The ratio of metalled to unmetalled extra-municipal road milage is

   (a) 3 : 5 (b) 2 : 5 (c) 1 : 5

Answers:

1(a); 2(c); 3(b); 4(a).

GOVERNMENT SUPPORT OF RESEARCH

(Extracted from "Science" December, 30, 1949.

(Continued from August, 1950).

Objectionable Control

RESEARCH institutions generally are apprehensive of possible dictation or control over their research by a supporting agency. The independence of an institution is theatened if pressure can be applied toward the acceptance of undesired work. This may be minimised by the policy of basing support on proposals initiated from the institution, by the avoidance of permanent construction owned by the supporting agency, and by a co-operative programme of joint support. For a given institution, any danger of control may be balanced to some extent by internal adjustment and by the existence of a number of sources of support. Objectionable control with respect to progress on individual problems can certainly be avoided by intelligent management. Nevertheless, even though no pressure is intended, it is undeniably true that the mere selection of research for support by an outside agency is itself a form of control.

A subtle form of this influence may be expected to manifest itself in varying degrees by the tendency of an existing research group to perpetuate support from the same source, and the attempt of other groups to slant their programme in the direction of probable areas of support. This tendency should be recognised and any instances identified both by the institution and by the supporting agency.

A prospect may exist, especially among universities, which is of more fundamental concern to the cause of basic research. As already mentioned, the government quite properly invests its money in areas which will bring a return to the taxpayer—that is, in activities which promote the national welfare or security. This implies an emphasis upon short-term tangible and practical results, and this is foreign to the nature of pure or basic research. Will we therefore see in government support a verification of the truth first pointed out by Vannevar Bush in "Science—The Endless Frontier," that applied research tends to drive out basic? This would indeed be tragic.

All the elements that go to make up our high standard of living, in fact a very large part of the world's thought and progress, have come about through pure or basic research in the broad sense, that is, creative work in the arts and sciences. The great discoveries cannot in general be predicted nor can they be made to order. There is no need to give examples — history is eloquent on this score. This is admittedly a troublesome point. I believe it must be met by an insistence upon support of basic research in its own right. If a practical justification is required, let us call it a necessary investment for the future. It will be dangerous for basic research to compete for funds with applied research and development, which can cite probable practical accomplishments. This difficulty might be handled in the federal budget by general agreement that every agency should have a limited sum or a limited fraction of its budget set aside for research, and that this sum should not require detailed budget defense in advance. Instead, the results of the research programme should be subject to periodic review.

Administrative detail and the danger of having a strong administrative office

A quite different consequence of support of research by contract follows from the amount of administrative detail required of the institution and the supporting agency. Many academic institutions, not accustomed to this degree of administrative detail, have found it advisable to set up a special office and staff for research administration, particularly where there is a considerable volume of industry—and government—supported research. This is of course an advantage in that it takes many administrative details off the shoulders of the chief investigators and the scientific department concerned. It is

obviously important to centralise this function within the institution The growth and strengthening of these administrative offices is a consequence of support by contract.

However, there is an aspect of this development which may bear watching, namely, the possible tendency of a strong administrative office to dominate the research programme of the institution. In fact, an aggressive office is in position to exercise pressure upon the research staff of the institution itself. Or it may tend to insulate the scientists from his opposite number in the supporting agency.

Another investment, which may be related to the one just mentioned, is the establishment or the strengthening of research institutes or foundations, attached to a university but separated to a greater or less degree from the academic or educational plant. Such organizational units have advantages from the standpoint of handling externally supported contracts. They can accept support for applied research or development with less fear of upsetting the balance between education, basic research, and applied research. They can more readily go in for group research and more extensive programmes. To some extent they can protect the university from sudden fluctuations in financial support. They can more readily accommodate confidential work, either from industry or government.

* * *

These are some of the consequences which may be anticipated from government support of research. They are of course bound up with the mission of the sponsoring agency and also the policy and procedures established by this agency. These are to a certain extent dictated by governmental limitations, both as to allowable procedures and as to mission.

* * *

Practical Results

I have remarked earlier that the Government expects practical results from the support of research, and that in basic research the investigator should be as free as possible to work out his ideas. These ideas usually have nothing to do with possible application, and in fact any practical consequences are generally regarded as irrelevant to the investigation. How are we to reconcile these apparently opposing points of view? The answer is clear. In general, we must consider the practical application of ideas from basic research to be the responsibility of the supporting agency and not that of the investigator. This recognizes a well-known fact that many research men have no particular aptitude for applied research, or, if they have, do not make use of this aptitude except in solving their own research problems. Thus a research investigator may show a high degree of ingenuity in devising a piece of his apparatus to perform a special, practical function, but he regards this ability as important only to the accomplishment of his main purpose, the solution of his problem. If his attention to his chosen goal is deflected the probability of his making a creative contribution is considerably reduced. It is the integrated total of such accomplishments that form the backbone of true scientific progress.

On the other hand, the supporting agency should choose its staff to include scientists of a more practical turn of mind who by association with the needs of the agency are in the best possible position to spot possible applications and to carry them forward in the hands of the proper group in their Department. If this policy is followed, there should be minimum difficulty in insuring proper environment for the sponsored research and, at the same time, satisfactory output of practical suggestions. What is more, the tendency toward improper pressure on the research worker or his institution is eased thereby.

Safeguards

In order to arrive at adequate safeguards to insure reasonably effective operation of external research programmes supported by a government agency, it may be profitable, at least for purposes of discussion, to attempt to lay down a few guiding principles. I propose the following.

1. In selection of items for support, emphasis should be placed upon the field of interest of the agency and upon the caliber of the investigator, with final selection made from specific problems proposed by interested research scientists and accompanied by endorsement of their institutions.

2. Every effort should be made to insure that the working conditions are appropriate to research. These mean freedom in performance of research and freedom to publish and to exchange information with colleagues.

3. Administrative details should be handled as fully as possible by the respective administrative staffs of the institution and the supporting agency. However, the initial arrangement and any subsequent changes should be reviewed by the interested scientists on both sides.

4. The supporting agency should possess a scientific staff with full authority regarding approval of research projects and it should have committees of experts to guide it in formulation of its programme.

5. The scientific staff of the supporting agency should be composed of scientists with research experience who know from personal background the conditions that should be maintained. This staff should be competent to discuss the work intelligently and intimately with the working research groups. It should also be competent administratively and organisationwise to deal effectively with administrative and service units in the agency and also with other agencies with which the work should be co-ordinated

While the success of any plan for Government support of research obviously depends on the administration of the supporting agency, it must at all times be remembered that no charter, no administrative set up, and no staff can succeed in this relatively unchartered area without full co-operation from the institutions supported. It is impossible to solve many questions on a unilateral basis. A common misapprehension is that administrative questions arising in a research programme may be solved apart from scientific matters or vice versa. In point of fact, the two are apt to be inextricably mingled. In the negotiation and administration of supported research there are and should be four groups involved: the research group at the institution, the scientific staff of the agency, and the administrative offices of both the institution and the agency. It is also desirable that the policy of the supporting agency be flexible enough to adjust to the policy of the institution, within limits. Above all, I wish to emphasise the great importance of a co-operative interest on the part of the research investigators in the programme supported by the government policy. This co-operation should be kept extremely close, in order that the agency may meet or even anticipate the needs of the research group, and in order that it may plan effectively. A successfully organised programme should have the weight of approval of all its constituents. If this is achieved, government support of research will be abundantly justified.

—o—

RESEARCH WELCOMES CHANGE

Essentially Research is nothing but a state of mind—a friendly welcoming attitude towards a change Going out to look for a change instead of waiting for it to come.

—Chas Kettering, Ladies Home Journal.

PROGRESS OF THE FEDERAL-AID HIGHWAY PROGRAMME

By Thos. H. MacDonald

[*From "American Highways"—October 1949*]

* * *

IN this period — 1940 to 1949 — the overall increases and changes in the factors that reflect both the quantity and character of the services demanded from our highways are not only very large; they are also growing adverse in their relative proportions.

The number of registered motor vehicles increased from 32,452,861 in 1940, to 41,151,326 in 1948 — about 27 per cent as a total.

The number of busses increased from 62,582 in 1940, to 135,430 in 1948 — about 116 per cent.

The number of trucks, including tractor trucks, increased from 4,590,366 in 1940 to 7,227,380 — about 57 per cent.

The preliminary estimates for 1949 indicate a further increase of about 6.6 per cent in motor vehicles over 1948 — a total of 43 million plus.

The estimated vehicle-miles of service provided by our highways in 1940 was 302,143 millions, and in 1948 — 397,589 millions — an increase of above 30 per cent.

* * *

The 21,000 miles of Federal-aid highways opened to traffic during the fiscal year ended last June 30 included the construction or major reconstruction of almost 3,000 bridges over streams, railway-highway or highway-grade separations and combinations. A total of 149 railway-highway grade crossings were eliminated during the year, and protective devices were installed at an additional 466 grade crossings.

* * *

During the four years since the end of the war, there has been completed and opened to traffic a total of nearly 50,000 miles of Federal-aid highways. Another 19,000 miles are under construction or covered by approved plan, and an additional 15,000 miles are programmed for construction. These figures constitute an enviable record, particularly in view of the many difficulties that have confronted the highway construction industry in this postwar period.

The total cost of projects completed during the past year was almost $ 750,000,000, of which about $ 390,000,000 were Federal funds. In dollar volume the work completed last year set a new record high for the 33-year history of Federal-aid.

* * *

Again out of our usable past we know that it is the pattern of administration and organization at State and national levels that has produced the roads we now use and kept them in operation under adverse conditions. In a troubled world we need internal peace, and we cannot achieve this in our over-all road programme until the pattern of operations adjusted to the needs, that has been developed and proven satisfactory for State operations, is extended to the local roads. This problem will remain with us and will grow more acute until roads are provided adequate for the operation of motor vehicles to serve the rural districts.

Finally, the most important problem of all at State, Federal or local level, is a larger force of trained engineers and technicians who know they have a stable career in the highway improvement field. More adequate salaries, opportunities for advancement through in-training courses, retirement plans, are among the necessities to attract men to highway work.

—o—

PENALISING PROGRESS

British Road Policy Through the Centuries

[*Extracted from 'Highways and Bridges'—May 31, 1950.*]

ACCORDING to historians there was very little traffic on English roads in the interval between the departure of the Romans and the Elizabethan period. When transport began to run on wheels in real earnest the problem of road maintenance became a serious one and instead of tackling it in the right way by reviving the art of road-making so ably demonstrated by the Romans and neglected for 500 years, or more, the authorities regarded the wheeled vehicle as an objectionable intruder and an agent of destruction, to be discouraged, restricted, regulated and, if possible, eliminated altogether.

Wheeled transport has not only been hampered for centuries by restrictive legislation, but it was regarded as a ready source of profit by the turnpike trusts and, later on, by the Treasury. Nevertheless, being essential to the national existence, it has survived and increased in spite of every form of political persecution and unfair treatment.

Government Apathy to Road Building

No British Government has ever taken active steps to improve or extend the road system of their own country except spasmodically, under the stress of dire necessity. General Wade's roads in the Highlands were, frankly, military roads; Telford's roads, which supplemented them, were only built because of the scandal of Highland poverty and depopulation; the improvement of the Holyhead road by that same engineering genius was only carried out because of the open rebellion of the Irish M.P.s, headed by Parnell, after the Act of Union of 1801; the short-lived boom in by-passes of the nineteen-twenties was entirely due to the fact that there were two million unemployed in the country and the Government regarded road-making as a handy stand-by job for them.

Milch Cows and Gladiators

The competition between progress in road building and progress in vehicle building has gone on for half-a-century, with the vehicle builder always ahead, not because of any technical incompetence of the road builder, but because he has been compelled to take part in the race with his ankles tied. Thus we have arrived at the present age of mechanical perfection with our road traffic moving to the constant peril of the public at a fraction of its economic optimum speed and the users of mechanical vehicles regarded, perhaps no longer as intruders, but rather as uncomplaining milch cows, always willing to be milked by the Chancellor of the Exchequer.

In return for the hundred million, or so, per annum, which he has squeezed from them in recent years (a sum which will be considerably increased by the Crippsian ninepence), motor users are not given the freedom of magnificent highways on which they can drive at reasonable speeds with reasonable safety. Instead, they are granted admission to an arena, littered with victims, wherein they are compelled, willy nilly, to take part in perilous combats cheerfully tolerated by a Government which, without a shadow of doubt, would sternly refuse to sanction bull fights.

Restrictive Measures

Much of the restrictive legislation imposed with the idea of fitting the vehicle to the road, rather than the road to the vehicle, was futile and fatuous. Some measure of regulation regarding axle loads and over-all dimensions is, of course, as necessary on the road as on the railway. In the latter case there is usually a certain amount of friction between the civil engineering and the motive power departments, but there is, at the same time, close co-ordination. Tracks are re-aligned, superelevation adjusted and bridges strengthened to accommodate increases in speed and weight and thus the two indivisible components, the track and the train, remain suited to one another.

As wheeled transport developed, the first idea of the road authorities was to limit the load As far back as 1621 an Act of Parliament prohibited the use of any

four-wheeled wagon and limited the load on any vehicle to one ton. Thus, a two-wheeled cart with a ton load was legal, but a four-wheeled cart with a load of 30 cwt. was illegal. The difficulty of keeping a close check on the weights carried was probably insuperable, and the device of limiting horse-power was next adopted. In 1629 the above regulations were supplemented by an Act which made it illegal to use more than five horses in a team.

If five horses were necessary to pull a ton, as, no doubt, they often were, one can guess what the roads were like, but no one, at this period, appears to have been aware that a high tractive resistance must be accompanied, inevitably, by severe disintegration of the running surface under the stresses imposed by haulage.

"Red Flag Act"

Speed had not yet become a factor requiring control, but when steam traction engines began to appear many years later, the well-known "Red Flag Act" was passed, restricting the speed of these so-called "heavy locomotives" to four miles an hour in the country and two miles an hour in towns and requiring the presence of a man with a red flag or red lantern walking in advance. This Act remained in force until 1896 and applied to any form of mechanically propelled vehicle, thus hampering the development of the British motor industry and allowing our continental competitors to get the lead.

One or two pioneers defied the Act, however, by driving motor cars at speeds as high as 20 miles an hour, a proceeding which, of necessity, resulted in an infringement of the red flag rule, and as the number of these sturdy rebels began to increase the Act was brought into disrepute and ultimately repealed.

Although this event was hailed gleefully as "emancipation," it is a matter of some regret that the Government of the day was not far-sighted enough to insist that special roads should be built to accommodate the new form of traffic. **Politicians, however, with rare exceptions, seem remarkably myopic.**

"Twisting" the Road User.

Although it is accepted as a sound principle that those who use the roads should pay for their upkeep, there can be no valid reason why those who run mechanical vehicles on the roads for the more efficient carrying out of their business or profession should be subject to penal taxation entirely divorced from road expenditure.

The idea of "twisting" the road user is not new. The turnpike trusts were a notorious racket and did not spend anything like their full receipts on road maintenance, while the pike-keepers themselves retained as big a rake off from the takings as they dared. Some of the trusts even attempted to perpetuate the voluntary forced labour used on road repairs in the days before the turnpike system was introduced.

Gregory, in "The Story of the Road," records that the stage-coaches between London and Manchester paid £ 1,700 a year each in tolls, while eight miles of the Great North Road, near Whetstone, north of London, had in 1831, an annual income from tolls of £ 7,530, or over £ 900 per mile.

When, at the hey-day of the coaching period, enterprising inventors like Hancock and Gurney, put steam coaches on the roads, the turnpike trusts, eagerly supported, for a change, by the horse interests, increased the tolls on these vehicles to impossible heights. On one route, for instance, the charge at each gate was four shillings for a horse-drawn coach and £ 2-8s. for a steam coach.

Today, the owner of a 20-year-old Morris Cowley, worth about as many pounds—and there are still a good number on the road—pays a road tax of £ 15 per annum and a further £ 15 in petrol tax if his year's running amounts to a modest 5,000 miles. The ratio of the tax itself to the capital value of the article taxed is out of all reason, but that is by the way. These examples are quoted to show the manner in which road transport, whether commercial or personal, has been, and still continues to be, the subject of gross exploitation, with no benefits to the roads themselves. **Were such principles adopted in private trading they would be punishable by law as fraudulent.**

The story of British roads from the middle ages onwards is a tale of misguided policy, thwarted progress, and political dishonesty.

A FEW FUNDAMENTALS OF LOW COST ROAD DESIGN

[*From "Roads and Streets"—January 1950*]

Realised Only Now!

* * *

IN localities where the road-use pattern has become well established, it isn't necessary to anticipate the future very far ahead.

This point is emphasized because there has been a tendency toward *unnecessarily high design standards*, particularly on some lightly travelled sections in the state and federal arterial highway programmes. This tendency is believed to add markedly to cost without bringing commensurate return. Of course where low cost surfaces are placed on *primary* routes, the same attention to new right-of-way, surveys, and records is required as for high type pavements. For the distinctly local roads, however, a reasonable amount of right-of-way usually sufficied, and it is possible so to modify the alignment within these limits as to meet all real needs.

In view of the fact that many roads do not have now, or are unlikely to have, as much traffic as even 200 vehicles per mile per day, it can be seen readily that not only must the surfaces be built at low cost, but all the incidental items must be proportionately low, if a well rounded improvement is to be attained.

* * *

Low-Cost Materials

Low-cost roads of necessity must employ low-cost materials. That means materials from nearby points, particularly for foundations. Whatever they are, these aggregates should have a certain basic characteristic; namely, that when placed as foundations, bearing power shall be reduced little or none by *changing moisture conditions*. This is an easy matter to check, but one which is all too frequently neglected.

It is such a temptation to select an aggregate which will compact easily, that the damaging effect of too much clay binder is often overlooked, only to cause a lot of trouble later. By following standard methods of soil analysis, and using aggregate where the fine material does not show a Plasticity Index (P.I.) of more than 6, one can be quite sure that the foundation once compacted will remain that way. If the only abundant natural materials available have a P.I. higher than 6, they should be modified, at least in the surface, through appropriate treatment, such as the addition of fine granular aggregate, treatment with lime, or stabilization with liquid asphaltic materials, until the resulting mixture is definitely reduced in P.I. below the danger point. Much research is being carried out in this field, and specifications for appropriate procedures are widely available.

There will always be a large mileage of local roads where surfacing cannot be justified beyond placement of such aggregate as will assure all-year support. When traffic reaches around 50 motor vehicles per day, however, further improvement becomes practicable, as the cost of maintenance, plus the loss of aggregate through wind and water erosion, usually amount to a sum sufficient to capitalize a mudless, dustless surface.

Black-top Maintenance Costs

Residential streets paved with black-top are less expensive to maintain than are gravel roads, officials of Lansing, Michigan, have found. While maintenance costs for gravel streets in that city range from 600 to 1,000 per mile, black-top bituminous street upkeep costs average only 100 per mile. A low-cost surfacing is used only on streets carrying less than 4,000 vehicles per day.

—o—

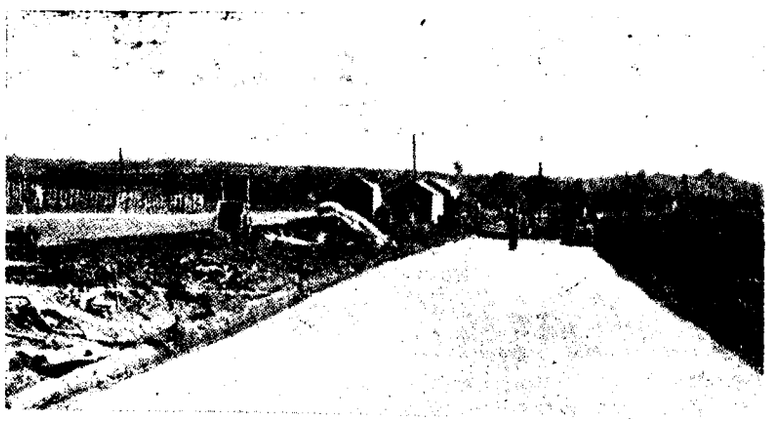
WATERPROOFING OF ROAD FORMATIONS

[*From the "Times Review of Industry"—June 1950*].

EXPERIMENTAL sections of waterproofed sub-base, applying the technique of soil stabilization, have been laid in the U.K. during May, 1950 on part of the A472 main road from Newport to Shrewsbury which the Ministry of Transport, in conjunction with the Monmouthshire County Council, is reconstructing as a dual carriageway route.

Most of the soil in cut and fill along this section is red marl (Old Red Sandstone series). It has a high bearing capacity when exposed in cuttings and when placed in fill but after even moderate rains it becomes unstable, and this characteristic is accentuated when foundation material such as broken stone is placed on the formation during road construction. To protect the formation and to enable it to retain its bearing capacity the top few inches of the soil have been mixed with small percentages of waterproofing material to provide a flexible cover which will not be damaged by the traffic during construction and by road making work. Varying thicknesses of treatment are being tried, ranging from 2 in. to 6 in. in depth. Two methods of applying the waterproofing agent are being employed. In one the stabilizing material is mixed with the formation soil in place by a rotary tiller; in the other the soil and the waterproofing material are put through a mixer of the paddle type and then spread on the formation. Smooth-wheel rollers are used to compact the treated formation after both treatments.

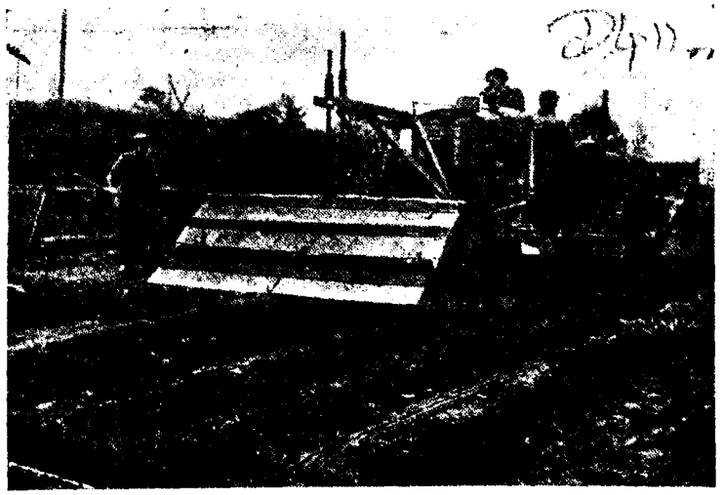
By permission of the Ministry of Transport the various operations involved in formation waterproofing by means of the rotary tiller were observed in action. In this method six short sections, each 68 ft. long, were being treated to depths of 3 in. and 6 in., two with the addition of 5 per cent of cement (to serve as controls) and four with the vegetable waste/cement stabilizer known as Pectosol, developed at the Bulstrode research laboratories. In two of the sections 2 per cent of the waterproofing agent was mixed with the formation soil to depths of 3 in. and 6 in. The remaining two sections were treated to the same depths with the addition of 5 per cent of the stabilizer. Various kinds of vegetable waste have been found to be suitable for this purpose, but in the present instance sunflower seed husks were the source of the vegetable material contained in the Pectosol, which consists of equal proportions of organic matter and cement.



The surface of the waterproofed section of the road has an excellent appearance after it has been compacted by the roller.

It is to be noted that with the stronger concentration of Pectosol, the quantity of cement incorporated in the mixture is only half the amount used in the all-cement control sections; in the sections with only 2 per cent of Pectosol, which must probably be regarded as tests touching the lower limit of effectiveness, the cement content is only one-fifth of the amount used in the control sections. The percentage required to give satisfactory results will doubtless vary to a small extent as between different types of soil, but laboratory experiments suggest that not more than 5 to 6 per cent of this stabilizing material is needed to waterproof the worst soils that are capable of being satisfactorily treated by this method. Consequently, if the field tests which are now being made give the results hoped for, the application of this technique will not only permit the preparation of stable sub-bases for roads in localities where it has been difficult to achieve this effect by compaction or by laying ashes, but will enable water proofing to be effected where desirable with a substantial saving in the amount of cement required.

When the waterproofing agent is applied by the rotary tiller after the formation has been graded the machine makes several passes along the length of the section to be treated, the number depending on the nature of the soil and the amount of moisture it contains at the time. The aim is to produce as fine a tilth as possible to ensure efficient mixing with the stabilizing material. In the present trials a Pulvimixer of American design, drawn by a bull-dozer tractor, was employed for this purpose. Sufficient water was then applied from a water-cart to bring the moisture content to the percentage at which the soil mixture has its maximum bearing capacity—it was found necessary on this occasion to add just over 1 per cent to raise the moisture content to the required proportion of 15 per cent. Rows of sacks containing the stabilizing material were then laid out and emptied. The stabilizer was evenly spread over the formation with rakes, and the rotary tiller again made several passes to mix the material thoroughly with the formation soil to the desired depth. The roller was finally used to compact the mixture, which in two or three days becomes hard enough to withstand the traffic of construction. Where cement alone is used for waterproofing it is mixed with the formation soil by the use of the rotary tiller before the required amount of water is added. If the present tests prove successful, this new technique of waterproofing the formation is likely to be extensively adopted in the construction of future roads.



Pulvimixer rotary tiller employed to produce a fine tilth and disperse the stabilizing agent through the soil formation.

HERE AND THERE

1. TURNING MUD TO "RUBBER"!

AN ocean beach, a soupy mud road, or a muddy pasture can be turned into a stable, rubbery surface suitable for landing operations, movement of heavy vehicles and landing of aircraft in less than five hours.

This is the word of a committee of engineers at the Massachussetts Institute of Technology who have reported on a study of a new chemical process for the stabilization of soils.

The process is based on calcium acrylate, which is absorbed by the soil particles. Then come two other compounds, sodium thiosulfate and ammonium persulfate, which cause the calcium acrylate molecules to lock themselves together. Thus the soil particles are joined in a simple, fast chemical reaction. The new treatment can be used even on soils which contain as much as 30 per cent water by weight.

The binding action begins two minutes or less after the mixing has taken place, and five hours after treatment the soil is an elastic mass with tensile strengths from 5 to 10 pounds per square inch.

If the stabilized soil is allowed to dry for a week it develops tensile strengths of 500 pounds per square inch or even more.

In the recent M. I. T. tests, a stabilized soil block three inches thick withstood the weight of a car moving over it 24 hours after treatment without noticeable indentation. A 16-pound steel ball dropped on to the test section from a height of seven feet rebounded about six inches without causing any damage to the section.

A similar blow, according to the report, on any of the known pavements such as concrete would probably have resulted in serious shattering.

In regard to costs the committee states, "The present cost of the necessary chemicals is still high, but there is reasonable hope that if the chemicals were made in mass production their cost would be substantially reduced."

(*Extracted from 'Science Digest'—May 1950*)

---

2. DOOM OF AN IRISH RAILWAY

SPEAKING at the recent annual general meeting of the Londonderry and Lough Swilly Railway, Sir Basil M'Farland, the chairman, said the board had now concluded there was no future for the railway portion of the undertaking and they would take steps to close it to avoid the heavy losses incurred. The position had been improved by reverting to buses on the Londonderry-Buncrana service. Their lorry services were at a disadvantage compared with those of private lorry owners, but he warned merchants that if they wanted cheap rates for picking up small lots in remote places they must give the company a reasonable share of the business.

The company's railway began as a 5 ft. 3 in. gauge line from Londonderry to Farland Point on Lough Swilly (opened 1863) and a branch (opened the following year) from Tooban Junction to Buncrana. The Letterkenny Railway was authorised in 1860 to St. Johnstown on the Londonderry and Enniskillen Railway, but in 1863 an amending Act enabled a diversion to join the L. and L. S. R. near Farland Point. The Lough Swilly Company took up the scheme which had been abandoned half completed, and opened the line on the 3-ft gauge in 1883, its own line being converted in 1885. The extension from Buncrana to Carndonagh was opened in 1901 and that from Letterkenny to Burtonport—worked by powerful 4-8-0 tender and 4-8-4 tank engines—in 1903.

A conversion to bus and lorry operation has been proceeding since 1929; the

Carndonagh line was closed in 1935, but some sections were reprieved at the instance of Donegal people owing to bad roads and fuel oil shortage during the recent war. With the delivery of double-deck buses and new lorries to the company's road undertaking the fate of the railway would appear to be sealed.

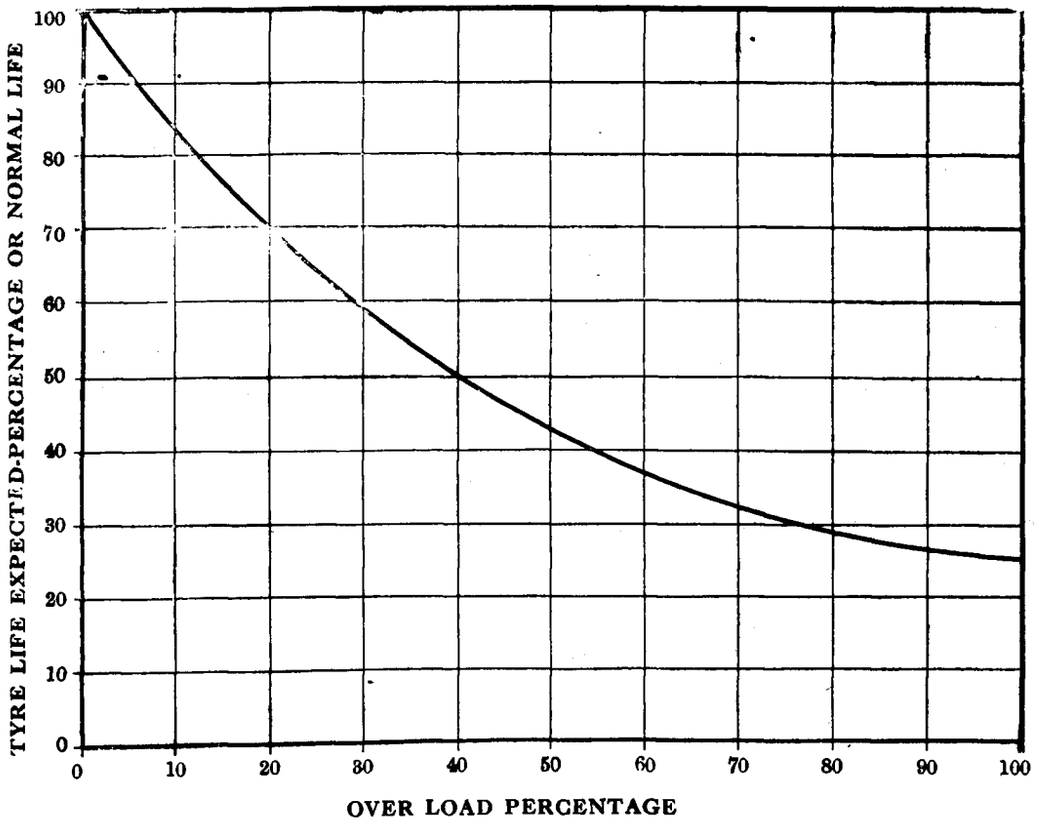
(*Extracted from 'Modern Transport'—March 18, 1950*).

---

3. OVERLOADING DESTROYS TYRE LIFE

IN any transport operation tyre loading and expectant tyre milage are definitely related. The following table and graph show the decrease in milage resulting from overloading a tyre:

1. Normal Load —Normal Milage
2. 20 per cent Overload—70 per cent of Normal Milage
3. 40 per cent Overload—50 per cent of Normal Milage
4. 60 per cent Overload—39 per cent of Normal Milage
5. 80 per cent Overload—31 per cent of Normal Milage
6. 100 per cent Overload—25 per cent of Normal Milage.



(*Extracted from 'Highway Research Abstracts'—Nov. 1947*).

4. ORIGINS OF COORDINATION

* * *

QUOTING from a report on international transport, the lecturer reminded us that **"national committees are unanimous in stating that the reason and origin of co-ordination measures are, in all countries, the unsatisfactory financial state of the railways."** The strategic value of the railways in a national emergency is not questioned, but Mr. Marsden rightly doubted the justice of compelling railway users to bear an expense which might fittingly fall upon the Exchequer. Just as the Exchequer has received over the years the credits of the Road Fund, so it might in future be debited with an assessment of the strategic value of the railways. The advantage of this proposal is that it would enable the Commission to develop on a proper economic basis the various elements of transport without requiring one to subsidise the other, and the principle might even be extended to coastwise shipping, which continues to benefit from the high rates on Government owned traffic. As was suggested, we are too prone to apply to railway finances the same considerations as applied during the halcyon days of the Victorian and Edwardian eras, instead of adjusting our methods and resources to the demands of a modern transport system and of an international situation which regrettably predicates preparedness for war.

[*Extracted from 'Modern Transport'—March* 12, 1949.]

5. STATE OF WELFARE OR WELFARE STATE?

HERE are some worthwhile thoughts. They come from a recent speech by Mr. W. Randolph Burgess, Chairman of the National City Bank of New York.

"The great political conflict which we, along with most other countries, are facing to-day is the conflict between the so-called welfare state and sound money. When a country makes the welfare state its objective it almost always starts spending government money faster than the production of the country justifiies. This means an unbalanced budget; credit expension; unsound wage and price policies; and, in the long run, a slowing down of production, because people are trying to get something for nothing instead of working for it. When this happens the "welfare state" may be an enemy of human welfare, for there can be no lasting human welfare when money is unstable. Simply calling a state a welfare state does not make it one. **What we need is a state of welfare and not a welfare state,** and to have welfare there must be sound money."

(*Extracted from 'Capital'—December* 15, 1949.)

6. TOLL ROADS

* * * *

THE Pennsylvania Turnpike and the Merritt Parkway are two examples of well patronised toll roads and tolls are also payable on some of the larger bridges, such as that at Oakland, California. The Merritt Parkway in Connecticut is 38 miles long, is available for private cars only and runs roughly parallel to an obsolete and overcrowded federal highway. The toll charge is only 10 cents irrespective of the size of car or the number of passengers, and this sum has probably been fixed at a sufficiently low level to attract customers while being sufficiently high to be remunerative. In addition, the State of Connecticut owns three filling stations on the Parkway which are released to petrol dealers who pay a rental plus a royalty on every gallon sold. Some idea of the amount of traffic using the road may be judged from the fact that 25,000,000 gallons were sold between the beginning of June, 1945, and the end of March, 1946, although traffic had not then reached pre-war volumes.

* * * *

(*Extracted from 'Highways, Bridges and Aerodromes'—January* 25, 1950).

7. ENFORCEMENT IN AUSTRALIA

* * * *

OF 57 loaded vehicles weighed, 39 exceeded the maximum allowed under the Board Traffic Act; 32 offenders were prosecuted and fined and seven owners or drivers who had slightly overloaded their vehicles were warned to reduce fheir loads in future. It is the practice to prosecute owners of vehicles who overload and since the penalty section has been altered to a minimum and maximum penalty, the fines have increased considerably and should influence owners of vehicles to refrain from overloading.

Several drivers of motor vehicles which were carrying loads in excess of 8 ft wide were prosecuted and fined.

Owners of agricultural implements which have caused slight damage to the bituminous surfaces of the roads have been warned to refrain from travelling their implements on this class of pavement, unless they take the necessary precautions against damaging the surface.

Quarry products being delivered under departmental contracts have been weighed peirodically for discrepancies and where deliveries have been made by cubic measurement the motor lorries carting these materials have been accurately measured and the loads inspected.

(*Extracted from 'Highways and local Government Department—South Australia'—Thirty-Second Annual Report*—1948–49.)

—o—

8. MEASUREMENT OF SOIL STRENGTH

AN easier, faster, and more accurate method for determining soil strength was described by Lee Schlesinger, graduate assistant in civil engineering at Illinois Institute of Technology, at the Highway Research Board's 29th annual meeting in Washington, D. C, on January last.

The new method, which uses rotating blades, provides accurate in-place measurement and eliminates the costly time-consuming, unsatisfactory laboratory testing method now used. By making spot measurements quickly available at any level, risks, costs and delays in the construction of buildings, roads and bridges can be reduced. Since most large construction is completely dependent upon the load the soil can stand and since compensation for soil weaknesses are costly, accurate measurement is a necessity.

The experimenters, Schlesinger and Dr. Eben Vey, assistant professor of civil engineering at Illinois Institute of Technology, fixed a four-faced blade to a shaft which turned at a constant rate in the soil. By relating the distribution of soil resistance on the surfaces of the blades to the measured surface force, they were able to determine the soil strength.

Heretofore soil strength has been measured by removing samples from the ground and testing them in laboratories. In these tests the results are regarded as incomplete because of the temporary removal of pressure from the sides and the consequent destruction of the original soil structure. Different laboratory tests have been used and the results often vary from one test to another, depending upon the nature of the soil and external conditions.

By on-the-spot, in-place measurement, true strength can be determined under all conditions. Schlsinger and Vey believe their test gives the true strength of the soil and will serve as a cross-check to determine which of the laboratory tests are valid.

* * * *

(*Extracted from 'Roads and Construction'—February*, 1950).

9. TENDERING PRACTICE REGARDING SUB-SOIL CONDITIONS

WHEREAS it is the practice of various federal and provincial government departments and some private owners, when calling for tenders on construction projects, to furnis certain information regarding sub-soil conditions,

And whereas the said departments and owners place in their specifications a clause stating that all tendering parties must examine the site and obtain for themselves all necessary information for the proper carrying out of the work, and further stating that the government will not guarantee any information furnished to the contractor regarding the nature, amount, and class of materials to be excavated,

And whereas the obtaining of accurate subsoil information before tendering is impracticable:

(*a*) because for each tenderer so to do would cause unnecessary expense, and

(*b*) because it is usually impossible to make the necessary tests and borings within the time allowed for preparation and submission of tenders,

Therefore, be it resolved that this association petition the government departments and owners concerned to amend their specifications and contract terms to provide:

(*a*) the furnishing of necessary subsoil information based on tests made at the direction of the department or owner, and

(*b*) that in the event of actual subsoil conditions varying from the conditions described in the specifications, an equitable adjustment will be made with the contractor.

* * *

(*From C. C. A. Convention, Montreal, Jan. 16—18, 1950 'Roads and Construction' —Feb. 1950.*)

---

10. RECORD TAXPAYERS

WITH an issued capital of £2,300,000, Mr. C. Basil Nixon, in his statement, as chairman to the shareholders of Leyland Motors, Limited, states that in twelve years the company has paid to the Government in taxation no less than £7,246,000. In addition it has paid not inconsiderable sums for social services and collected substantial amounts from the employees for the same services. Purchase tax and a large amount in oil duty has also been paid.

These vast sums, states Mr. Nixon, are passed on to the customers who have their own taxes to meet. When their fuel, registration and purchase taxes are added there is a heavy burden laid on road transport in this country, and it is essential in the interests of productive industry that the cost of transport should be kept as low as possible.

* * *

(*Extracted from 'Modern Transport'— London, April 8, 1950.*)

---

11. TAXING TRANSPORT

Some Observations on the British Budget

* * *

Cannot they see that bad roads which result in unnecessarily low running speeds, waste of time, waste of fuel and ever present risk of accident, are exactly equivalent in their economic effect to a high fuel tax?

The Chancellor is precariously and uncomfortably balanced on the horns, not of one, but of several dilemmas. In fact,

his position resembles that of an Indian fakir on his bed of nails. No sooner does he relieve a little pressure from one point than he gets a jab from another. He is desperately anxious to do something to rescue the railways from their impending bankruptcy but, if he discourages private motoring and independent road haulage too drastically, where will he get the revenue to offset the reductions in income-tax?

Again, by forcing traffic on to the railways and thereby increasing transport costs, he will inevitably increase the cost of living. What about wage-freezing when this happens? There is seething discontent already in many quarters

This anti-road budget bristles with inconsistencies and shows a complete lack of fair play and common sense where exemptions are concerned. Farm tractors, for example, will run on tax-free fuel—and rightly so. But what about the lorry which carries the farm produce to market or to the nearest railhead? Is the farmer's lorry a less important unit in agricultural production than his tractor?

* * *

The government, no doubt, is at its wit's end to find a way of saving the railways, but the railways can no more carry the present-day traffic volumes that are going by road, than the roads in the London area can carry the passenger traffic now being carried by the suburban railways and the Underground. What the nation needs – and needs very urgently – is a sane and unbiased approach to the whole transport problem by transport experts and engineers, not by party politicians.

We need both railways and roads, but to penalise and cripple road transport just because it has proved, by its cheapness and efficiency, to be a dangerous rival to the less flexible and more expensive system is sheer lunacy, as the country will find to its cost unless this policy is reversed.

* * *

(*Extracted from 'Highways and Bridges' – April 26, 1950*).

THE DRAUGHTSMAN

With clouding wits the Draughtsman sits
And pushes pens and pencils,
While day by day–years slide away
Among his inks and stencils.

He "works" and "works" and "never shirks"
(He couldn't do without it)
And if he stops, asleep *he drops,*
And then he dreams about *it.*

With head that sinks and frame that shrinks,
He does his toilsome duties
Without a glance for gay romance
Or a blink to all her beauties.

And when at last his life is past,
There comes no change to show it;
For engineers *are dead for* years
Before they ever know it.

[*Extracted from "Traffic Engineering" April, 1950*]

BATTERY—ELECTRICS FOR RETAIL DELIVERY

A Review of Their Capabilities and Limitations.

(Extracted from 'Motor Transport' — Jannary 15, 1949).

* * *

COMPARED with certain other type of transport, the battery-electric had definite limitations, but it also had a wide sphere of usefulness. There were two main limitations – maximum s eed and range.

A maximum speed of about 20 m.p.h on the level and a range of between 35 and 40 miles were the average figures, and, obtained by compromises in design, were quite sufficient for the type of service for which the electric was pre-eminent, namely retail delivery of bread, milk, groceries, and the like In this class of work the electric had the advantages of low running costs, little maintenance, long life, reliability, quiet running, cleanliness, ease of starting and driving, low insurance premiums, and advertising value. In addition to retail delivery, the electric vehicle was adaptable to a number of specialized duties, travelling shops and ice cream kiosks were two examples, and the author considered that there was a wide potential field both in the fighting services and in agriculture, where short haulage work played an important part. The R.A.F. introduced a few electrics during the war and with regard to aerodromes, both civil and service, there were many jobs where long range and high speed were not required and where the elimination of the fire risk was a factor of considerable importance.

Potential Field

* * *

In addition to the short haulage transport work of 35 to 40 miles for which the electric vehicle was suitable, there were many bread and milk delivery rounds in densely populated areas which were very much shorter. The development of the pedestrian-operated electric vehicle offered an ideal replacement to the man-pushed barrow, which, although a simple and cheap means of transport, imposed a severe strain on the operator, especially in hilly districts.

There were several different models available to-day ranging in payload capacity from 12 cwt to 1 ton, and although originally designed for milk and bread delivery, they were used for a number of purposes, both in retail delivery and in industry. The low taxation of the "pram" rendered it a most economical proposition.

* * *

In making a choice between the petrol or electric vehicle, the user would obviously desire to know something of the relative costs, but there were many factors influencing the cost of running electrics, and it might be that investigation of any particular case would reveal different figures. The author quoted figures compiled from information from electric vehicle manufacturers and trade journals and in relation to typical vehicles of 10 to 15 cwt payload capacity. The total of standard charges and running costs for a 200-mile week amounted to £3-18sh for the electric and £4-9sh for the petrol van. Factors common to both types, such as wages and garage costs, were omitted from these figures, and it was summed that the vehicles were operating on short-range delivery work with many stops in a flat district.

* * *

It was important to remember that in local delivery work a vehicle was stationary for a high percentage of the time during which it was on the road. In the electric vehicle the motor stopped when the vehicle stopped and there was therefore not the wastage of fuel or wear of working parts such as took place in the petrol van. The amount of electricity consumed during a day's work varied with payload, mileage, number of stops, nature of route, and to an appreciable extent the skill of the driver. Average figures were in the nature of half a unit per mile for a 10 to 12-cwt vehicle and three-quarters of a unit for a 1-tonner.

MADHYA PRADESH — P. W. D. BUDGET FOR THE YEAR 1950-51

THE following extracts have been taken from the Government of Madhya Pradesh, P. W. D. Budget for the year 1950-51 in respect of revenue from and expenditure on Civil Works.

Heads of Revenue		Actuals 1948-49. Rs	Revised Estimate 1949-50. Rs	Budget Estimate 1950-51. Rs
Ferry receipts	...	2,23,863	2,48,000	2,61,000
Tolls on roads	...	1,13,911	1,43,000	1,47,000
Transfer from the Central Road Fund	...	11,90,147	24,000	2,00,000
Other heads	...	7,65,084	6,86,000	6,08,000
Total	...	22,93,005	11,01,000	12,16,000
Expenditure :				
1. Original Works	...	35,59,945	51,41,900	42,98,300
2. Repairs	...	52,11,430	62,15,000	62,58,200
3. Reserve with Government	...	—	—	60,000
4. Suspense	...	7,32,356	7,64,000	35,000
5. Grants in aid*	...	3,684	7,100	19,500
6. Expenditure in merged State Areas	...	18,85,387	—	—
7. Post-war Development Schemes	...	51,98,848	62,53,000	61,13,000
Total	...	1,51,26,938	1,83,81,000	1,67,84,000
Expenditure over Establishment & Tools & Plants charges on Civil Works were as follows :—				
		Rs	Rs	Rs
8. Establishment	...	25,64,049	28,50,700	26,47,800
9. Tools & Plants	...	25,99,310	12,01,500	5,84,200
Expenditure on Communication only has been as follows:—				
		Rs	Rs	Rs
i. Original Works	...	1,60,192	19,82,200	25,78,000
ii. Repairs	...	40,25,081	48,36,400	48,23,100
iii. Post-war Development Schemes. (Original Works)	...	29,05,264	24,76,000	20,55,000

* From Provincial revenue.

DO YOU KNOW THE POPULATION OF INDIA?

The following statement showing the population of each State as determined by the Census Commissioner, has been recently notified for public information :—

Name of State.		Estimated population (in millions) as on 1st March 1950.
PART A—		
1. Assam	...	8.51
2. Bihar	...	39.42
3. Bombay	...	32.68
4. Madhya Pradesh	...	20.92
5. Madras	...	54.29
6. Orissa	...	14.41
7. Punjab	...	12.61
8. Uttar Pradesh	...	61.62
9. West Bengal	...	24.32
PART B—		
1. Hyderabad	...	17.69
2. Jammu and Kashmir	...	4.37
3. Madhya Bharat	...	7.87
4. Mysore	...	8.06
5. Patiala and East Punjab States Union	...	3.32
6. Rajasthan	...	14.69
7. Saurashtra	...	3.96
8. Travancore-Cochin	...	8.58
PART C—		
1. Ajmer	...	0.73
2. Bhopal	...	0.85
3. Bilaspur	...	0.13
4. Coorg	...	0.17
5. Delhi	...	1.51
6. Himachal Pradesh	...	1.08
7. Kutch	...	0.55
8. Manipur	...	0.54
9. Tripura	...	0.58
10. Vindhya Pradesh	...	3.88

BOOK REVIEW

Manual of Highway Engineering by P. A. Krishnaswami, (the Author, 3-Murugesa Mudaliar Road, T-Nagar, Madras 17) 1950, pp. viii+340, Rupees 6/8/-.

THIS handy volume should be welcomed by highway engineers, young and old, for it contains much useful information not readily found elsewhere about constructing roads under Indian conditions. The book deals with the main aspects of highway engineering in a comprehensive manner incorporating references to modern trends of development, both in theory and practice.

The Author has been engaged throughout his official career in road design, construction, and maintenance and has very advantageously used this experience in compiling this manual. He has presented the basic principles of design in detail. The technique of highway engineering, however, like that of all arts and sciences is changing from day to day as more data become available as a result of experience and research. Every highway engineer may not, therefore, be in total agreement with some of the Author's recommendations but this does not in any way detract from the value and usefulness of the manual as a handy book of reference for the practising engineer and as an exposition of principles of highway design for the student.

The book deals with planning and design, alignment, gradients, earthwork, drainage, materials, various surface types, footpaths, kerbs, traffic statistics and regulation, horizontal curves and superelevation, and highway administration and finance. It will enhance the usefulness of the book if, in the next edition, the Author could add a bibliography and an index.

The book is well got up and illustrated and is good value for its price.

—o—

FORMERLY

During World War II a British Admiral visited Moscow taking a Marine with him as batsman. The Russians provided a guide to show the marine round Moscow.

The guide pointed to a street and said "That is Roosevelt Street, formerly Hitler Street." A little later he said, "That is Churchill Hotel, formerly Mussolini Hotel; that is Montgomery Avenue, formerly Ribbentrop Avenue" and so on and so on.

The guide then offered the Marine a cigarette saying "Take a cigarette comrade." The Marine took it, murmuring "Thanks comrade, formerly bastard."

INFORMATION SERVICE

(i) STEAM CURING OF CONCRETE

(Extracted from "Magazine of Concrete Research"–June 1949)

IN the modern factory production of Cement Concrete products, it is frequently desirable to hasten the curing process. This necessity arises generally for two reasons: firstly to release moulds and pallets as quickly as possible and secondly to put the finished article on the market as soon as feasible to avoid having to provide extensive storage space. Although some acceleration of setting and hardening can be achieved by chemical means, steam curing is more effective and more susceptible to accurate control. Though known for the last few years, it is still in an experimental stage.

Different Processes

The main processes in use are conveniently divided into the following classes: High pressure, Low pressure continuous, and Low pressure intermittent.

High Pressure Process requires a specially constructed steel chamber or auto clave. Since the chamber has to be steam-tight, a continuous programme is not possible. Temperatures of 120 to 160 deg. C. are usual and the steaming period is short.

For high pressure steaming:

(i) a more rapid increase in strength occurs owing to the higher temperature,

(ii) with certain aggregates a lime-silica reaction may take place between the cement and aggregates, and strength, in excess of that predictable from the effect of increased hydration alone, may be developed,

(iii) a reduction in initial drying shrinkage and the reversible wetting and drying movements occur,

(iv) an increased resistance to sulphate attack is obtained.

Owing to the high capital cost of equipment and to the general inefficiency of an intermittent process, high pressure steam curing is only recommended where it is important to reduce shrinkage or to increase sulphate resistance or where the maximum strength is required.

In addition to the advantages enumerated above, a report published by the American Concrete Institute in 1944 claims that the high pressure steam process can produce products ready for use.

(1) within 24 hours,

(2) with compressive strength (which is permanent) at one day at least equal to that of moist cured units at 28 days, and

(3) with lower bond stress between steel and concrete.

The Low Pressure Continuous Process is most suited to mass production. In order to achieve maximum efficiency with this process, a day and night shift system is necessary; where this is not feasible, the work is so arranged that the tunnel is full at the end of the day, the doors are then closed and the charge left to cure overnight.

The Low Pressure Intermittent Process is carried out in batteries of curing chambers. The batteries are usually designed to take a day's output and steaming is commenced at the end of the day's work, the steam is often cut off during the night so that the kilns may be drawn immediately on starting the next day.

Other Processes in less general use are: electrical heating of the concrete, heating humidifying the entire preparation shed, and placing the units in piles with a steel or plywood cover and introducing steam by means of flexible hoses. The first process is more suited to cast in situ work, the other two are relatively inefficient and wasteful of heat.

Heating:—Heat may be conveyed to the units by radiation from the walls, ceiling, and roof, by convection of heated air and steam; and by condensation of steam on the surface of concrete and moulds. It is desirable that the method of heating employed should produce the acceleration of strength required for the least expenditure of energy and that all the units should be heated uniformly.

Inferences That May Be Drawn

Pending further investigations the following tentative inferences may be drawn:

(1) Low pressure steam curing has little effect on the moisture movement of the concrete. Provided that the curing cycle has been sufficient to develope full strength required, a dry heat cycle may follow the steam curing to reduce slightly drying shrinkage. If, however, steam curing is not sufficient to develope full strength, yard storage will be necessary in order to gain full strength and a drying cycle in this case is disadvantageous High pressure steam curing reduces both drying shrinkage and moisture movement in all cases.

(2) So far as low pressure intermittent process is concerned, no period need elapse before steaming is commenced. On the other hand, a waiting period of 2 to 5 hours, which may follow automatically in intermittent charging of kilns, is permissible. Even a short period might, however, seriously complicate the continuous process and in this case it can safely be omitted, especially if the initial heating rate is not too fast.

(3) Whether or not the concrete would attain the same final strength at long ages as similar concrete wholly air cured depends on the nature of the aggregates. Foamed slag and expanded day concretes showed permanent increases whereas clinker showed a drop in 28-days strength where initially steam cured.

(4) High pressure steam curing has harmful effect when the aggregate is composed wholly or in part of calcium carbonate. Some trouble may be encountered with heavy blast-furnace slag containing high proportions of sulphur.

On theoretical grounds, dense aggregates and concretes made therefrom will have the greatest heat capacity and, therefore, should take longer to heat up; on the other hand their thermal conductivity will be greater than that of light materials and this will probably offset any effects due to heat capacity.

(5) The mix proportions have little influence on the effectiveness of steam curing.

(6) With reactive aggregate a rapid hardening Portland cement may show an unusually great increase in strength on steam curing, presumably because the limesilica reaction is more pronounced.

(7) Addition of calcium chloride further accelerates the hardening (during steam curing), but the proportionate effect is less than is obtained without calcium chloride.

(8) Super-sulphated cement is adversely effected by temperatures above 40 deg. C. and presumably has a maximum rate of hardening between 20 deg. C. and 40 deg. C.

(9) It is probably unnecessary to safeguard against thermal shock except for very thick ware or complicated shapes or where the reinforcement is given a minimum of cover.

(10) Steel moulds may be used but are liable to fairly heavy corrosion. Aluminium may also be used provided the protective films that forms when first used is not polished off. In designing metal moulds the possibility of differential thermal expansion causing warping should be considered. Wooden moulds are of course subject to warping and binding but, after a cycle of two, become fairly stable, especially if well oiled. Composite moulds of wood braced with steel are very satisfactory.

(ii) DRAWING AN APPROXIMATION TO AN ELLIPSE

* * *

OUR drawing office uses the following method (brought to my notice by one of our Chinese draughtsman), which is forwarded to you in case it should be of interest, as it gives much the same result as is obtained by the other methods, but involves only the use of standard set-squares and compasses.

AOC, *BOD* are major and minor axis, respectively.

(1) At *A* erect *AL* so that angle $OAL = 60$ degrees.

(2) At *B* erect *BL* so that angle $OBL = 75$ degrees.

(3) Through *L* draw *LMN* so that angle $LMA = 60$ degrees intersecting *AO* in *M*, *OD* produced in *N*.

(4) Then *M* is the centre for scribing the arc *AL* and *N* is the centre for scribing the arc *BL*.

* * *

(*Extracted from The 'Engineer' March* 10, 1950).

—o—

TOO MUCH TO BEAR?

One of the dangers which appears to be inherent in nationalized undertakings is the big proportion of non-productive to productive work compared with private enterprise. There is nothing new in this idea, but I am reminded of it by the news that Mr. W. H. Bowker, of Blackburn, has relinquished his appointment as a unit manager with the Road Haulage Executive, because according to him, he has found that "form filling" leaves no time for the task of ensuring the movement of goods.

Mr. Bowker started in haulage after the first world war with a used lorry acquired with his gratuity, and he was a pioneer long-distance operator, specializing in fruit transport between Liverpool and London.

(*Extracted from 'Motor Transport'—March 25, 1950*)

—

FRIENDS

A candidate for sheriff in a western town got 55 votes out of a total 5,600 cast. The next day he walked down the main drag with two guns strapped to his belt.

Citizen: "You were not elected, and you have no right to carry guns."

Unsuccessful Candidate: "Listen, brother, a man who doesn't have any more friends than I do, needs to carry a gun."

—

List of Approved Works on National Highways and Other Roads

. No.	Job No.	Name of work.	Amount approved.
I. NATIONAL HIGHWAYS.			
		PUNJAB.	
1.	382 PB 1A	Preliminary work in connection with the Construction of a bridge over the Beas river on Jullundur-Pathankot Road.	56,204/-
		WEST BENGAL	
2.	381 Misc. 31	Borings on the beds of the Torsa, Kaljani, Gadadhar, Raidak and Nilkuthi rivers on Assam Access Road in the district of Cooch Behar, West Bengal.	8,500/-
II. OTHER COMMUNICATIONS.			
		KUTCH.	
3.	OC/KH/102	Purchase of a jeep car for the use of State P. W. D., Kutch.	6,000/-
4.	OC/KH/104	Purchase of a road roller by the State P. W. D., Kutch.	47,200/-
		HIMACHAL PRADESH,	
5.	OC/HP 105	Construction of Nahan-Poanta Section of Doon Road.	10,12,172/-

—

THE FIRST LESSON

They were on their honeymoon. He had bought a boat and had taken her out to show her how well he could handle it, putting her to tend the sheet. A puff of wind and he shouted in no uncertain tone: "Let go the sheet!"

No response.

Then again: "Let go that sheet, quick!"

Still no movement. A few minutes later, when both were clinging to the bottom of the overturned boat, he said: "Why didn't you let go that sheet when I told you to, dear?"

"I would have," said the bride, "if you had not been so rough about it. You ought to speak more kindly to your wife."

—

Books added to the Roads Organisation Library during July 1950

—o—

1. **The Technical Aspect of the Design of Roads** by Stweart Champion. (The Technical Press Ltd., London 1950).
2. **Highway Practice in the United States of America.** (Public Roads Administration, Washington, 1949).
3. **Highway Statistics, 1946.** U. S. Government Printing Office, Washington).
4. **Highway Statistics, 1947.** (U S. Government Printing Office, Washington).
5. **Highway Statistics, 1948.** U. S. Government Printing Office, Washington).
6. **Issues Involved in a unified and Coordinated Federal Program for Transportation.** (U. S. Government Printing Office, Washington, 1949).
7. **Substructure Analysis and Design** by Paul Anderson. (The Ronald Press Company, New York, 1948).
8. **A Method of Estimating Fees for Professional Civil Engineering Services–Revised Interim Report.** American Society of Civil Engineers, New York, 1949).
9. **Transport–Its History and Economics.** A. Dudley Evans. (Sir Issac Pitman & Sons, Ltd., London, 1946).
10. **Source of Engineering Information** by Blancho H. Dalton. (University of California Press, Los Angeles, 1949).
11. **Wood Work in Theory and Practice** by J. A. Walton. (George G. Harrap and Company Ltd., London & Sydney, 1947).
12. **Applied Hydrology** by Ray K. Linsley, and others (McGraw Hill Book Co., Inc., New york, 1949.)
13. **Tables of Random Sampling Numbers–Tracts for Computors XXIV** by M. G. Kendall and others (Cambridge University Press, London, 1949).
14. **Fundamentals of Statistics** by Truman Lee Kelley. (Harvard University Press, Cambridge, U.S A., 1947).
15. **Statistics for Economists** by R. G. D. Allen. (Hutchinsons University Library Press, London, 1949).
16. **Economics–An Introductory Analysis** by Paul A. Samuelson. (McGraw Hill Book Co., Inc., New York, 1948).
17. **Thermodynamics–Principles and Applications to Engineering** by Dr. Ing Ernst. Schmidt. (The Cala. rendon Press, Oxford, London, 1947).
18. **Manual of Accident Prevention in Construction.** The Associated General Contractors of America, Washington, 1949).
19. **The Story of Maps** by Lloyd A. Brown (Little Brown and Co., Boston, 1949).
20. **Report on Soil Stabilisation Experimental Works for Improving Tiruvottiyu–Ponueri Road** (In typescript) (Department of Highways, Madras, 1949).
21. **Report of the Scientific Manpower Committee.** The manager of Publications, Delhi, 1949).
22. **Thackers' Indian Directory of India and Pakistan 1949–50.** (Thackers' Press and Directories Ltd., Calcutta).

The times of India Directory, 1950. The Times of India Offices, Bombay).