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Editorial

THE OBVIOUS

MOST great truths, once they come to be formulated, appear quite simple. The teachings of the great religious leaders, the teachings of Mahatma Gandhi, are quite easily understood, even a child can understand them. Newton's laws of motion, the laws of physics, chemistry, and dynamics are essentially simple in their statement of broad principles.

The experts who drew up the Nagpur Road-Plan for India were careful first to get down to fundamentals and to formulate a statement of truths concerning roads. Once stated in the form of principles, these truths were immediately obvious to every one. Consider the following :—

1. Roads feed and are fed by other means of transport-communications and must be considered primarily as part of the transport-communications network.

   [In other words " One must not consider a road solely by itself but in relation to the traffic that is to come on it from or go on to other roads, railways, steamer ghats, airfields etc."]

2. All classes of roads are of importance to the national welfare and one class of road is not to be developed at the expense of another : development should be balanced as between classes and should proceed in a planned sequence.

   [This follows from the first principle]

3. Roads should not be built unless justified by traffic, defence, or other National or State needs.

4. The sole criterion for the specification of a road surface should be the traffic it is to carry. A national highway may have an earth surface and a village road a concrete surface if these surfaces are warranted by traffic requirements.

5. Road maintenance to proper standards should generally have priority over construction of new roads.

6. In construction, the filling in of physical gaps in the road system should generally have priority.

Many other simple and obvious truths were embodied in the Nagpur Plan in the form of principles that were to be adopted in giving effect to the

plan and the Central and State Governments readily accepted those principles as obviously suitable and reasonable.

When it came to executing the Plan, however, those obvious truths were not so readily admitted. Vested interests showed their power and even honest men sometimes found it easy to persuade themselves that those pet schemes of their own that did not conform with the principles enunciated in the plan, were exceptions. This is a very human failing. So long as discussion is carried out on the plane of what principles are to be applied and whether there are exceptional cases not governed by general principles and so long as the final decisions are taken on the basis of what is right in given circumstances, it can be safely assumed that the taxpayer's money will not be misapplied to benefit any particular interest.

Unfortunately, in the heat of debate on the execution of the road plan, fundamental principles are apt to be forgotten entirely so that final decisions occasionally indicate a yielding to pertinacious canvassing or to what the Americans call " log rolling." In such cases one seldom hears during the entire discussion any reference to the interests of the general taxpayer or to the interest of India as a whole or even the interests of a particular State. On the other hand plenty is heard of some particular local interest and appeals to sentiment and prejudice are common.

A great American road engineer said in a speech recently that it would never be possible to ensure good upkeep and development of roads unless a law was enacted that would ensure the observance of sound principles in the matter. Such laws have already been enacted in the United States of America to cover the main roads and the speaker now wanted similar laws to control local roads. He said :

> " A good law is one which fixes responsibility and accountability " establishes standards of performance, embraces broad guides for administrative bodies in determining procedures, provides for adequate financial support, and creates efficient administrative machinery.
>
> "The backbone of the State-local relations law should be a State-aid programme managed by the . . . . . local units with State assistance in planning, establishment of priorities.....and selecting road systems.
>
> " Mandatory and voluntary features should be embodied in the law ; the former to be confined largely to reporting and accountability of the local units for the funds received and expended,

> state approval of plans and programmes, and adequate provision to ensure a minimum standard of performance."

We have as yet no law in India comparable to the laws governing the Federal and State participation in road upkeep and development activities nor to the newly proposed American law (described in the previous paragraph) governing similar State and Local participation. The framers of the Nagpur Plan had, however, studied the existing American laws and the plan embodied the great truths or principles included in the American laws and quoted in the early parts of this Editorial.

The American Constitution did not provide for the enactment of any such laws as have already been enacted in America, still less for the further laws now proposed to be enacted, yet the Americans got over their Constitutional difficulties in the past by various devices (declaring nearly every road in the States as " a postal road " thus justifying Federal participation and control, and so on) and will no doubt get over their present difficulty. The Supreme Court has now accepted the validity of all the road laws so far enacted.

We are more fortunate in India because our Constitution provides for the enactment of a national highway law, for enunciating the principles that are to govern the taxation of motor vehicles, and for the making of grants for any public purpose notwithstanding that that purpose is not one with respect to which Parliament or the Legislature of the State, as the case may be, may make laws. We can by agreement between the Centre and States enact laws just as suitable and as sensible as the laws the Americans have enacted, after a long period spent in trial-and-error, to embody sound principles in legislation concerning roads and road transport.

We understand the Transport Advisory Council is going to consider this month some tentative drafts of the kind of laws we have been referring to. Let us hope the Council will purge their minds of prejudices, resist vested interests, and concentrate on consideration of the fundamental truths concerning roads and road transport and the principles that ought to be embodied in the laws on this subject. Let us hope also that in the heat of debate they will not forget THE OBVIOUS truths enunciated in the Nagpur Plan.

THE ENGINEER'S STATUS

* * *

MAY I, however, permit myself one concluding thought? Civil engineers of character and ability are probably more numerous today than at any time in the history of the Institution. Against great odds they are achieving wonders. But we must do our utmost to ensure that the engineer is given every opportunity to give of his best, in whatever capacity and in whatever part of the world he may be working. **At home, a watchful eye must be kept for those who would erect artificial boundaries of responsibility and, in doing so, would so circumscribe him that this advice is lightly treated.** It is of the greatest importance that technical advice should be given greater weight in formulating policies at a high level—the responsible engineer should always be in a position to play his full and personal part in the reaching of decisions.

His status should be such as to afford him a full opportunity of presenting the merits of his proposals—whether in private industry, in State industry, or in Government activities—to the body or person holding the ultimate responsibility. Any other course, in a world in which efficiency counts for so much, is the negation of common sense.

It has been truly said that the condition of liberty is eternal vigilance, and the engineer must beware lest in accepting the position of the technical slave he thereby becomes the enemy of technical progress and thus the enemy of everything for which the Institution stands. Abroad, in a highly competitive world, the influence of the Institution should always be in the direction of ensuring fair play for our civil engineers and the right atmosphere for them to plan and build their share of the great works of construction that are so desperately needed.

In adopting this attitude, however, the engineer must make quite sure, doubly sure, that by keeping abreast of modern developments, by fanning the spark of adventure in his outlook and practice, by the breadth of his learning, by his understanding of his fellow men, and above all by the quality and sincerity of his service, he deserves, and by doing so, preserves, his rightful position in the community.

[*From the Presidential address by Dr. W. H. Glanville C. B. E., D. Sc., Ph. D. to the Institution of Civil Engineers, Nov. 7, 1950*]

—o—

PRIVATE ENTERPRISE

A labour party politician speaking to a rather bored audience in a public park on all the good work the Labour Government had done since 1945, pointed at last to a group of small children playing nearby.

"*Look at those children,*" *he said,* "*all born since 1945 and how happy they are. What do you think that it is due to?*"

"*Private enterprise,*" *said a virile voice from the audience.*

—

INDIAN STYLE MANUAL FOR DRAFTING

* * *

7. NUMERALS

7.1. Numerals in Text. In technical writing, rules for the use of words or figures to designate numbers differ from the rules applying to other types of publications. The general rule in technical manuscripts is to use figures rather than to spell out the numbers.

7.1.1. **Application.** Numerals shall be used for dimensions, degrees, distances, weights, measures, sums of money, and like matter.

Examples : 2 feet 4 inches, or 2 ft. 4 in.,
8 x 16-mm camera.

7.1.2. **General Texts.** In general texts, numbers from one to ten may be spelt out, but figures shall be used for numbers above ten.

Example : ...used with 12 distinct types.

...whichever of these seven readings is largest.

7.1.3. **Connected Groups.** All similar numbers in connected groups shall be treated alike.

Example : Make 20 square bar-type button holes and 4 eyelet-and-taper button holes.

There were 5 men and 12 trucks.

7.1.4. **Ambiguity.** Numbers shall be spelt out where the use of numerals may be confusing and ambiguous.

Example : Twenty 110-volt transformers.

7.1.5. **Beginning a Paragraph and Sentence.** A paragraph shall not start with a numeral ; the number, if necessary in this position, shall always be spelt out.

Extracts from Indian Style Manual for Drafting.

7.1.5.1. Starting of a sentence with a numeral should be avoided as far as possible ; if unavoidable, it may be spelt out.

7.1.5.2. Where a number is spelt out, it is preferable that units which the number qualifies should also be spelt out.

Example : Ten grams of the residue are then incinerated in a muffle furnace.
And not :
Ten g of the residue.....

7.1.6. **Fractions.** Simple fractions should ordinarily be spelt out in general texts. The rules in 7.1.1., 7.1.3., 7.1.4. & 7.1.5. apply to fractions as well as other numerals.

7.1.7. **Numbers of more than Four Digits.** The Indian system of enumeration shall be used when writing numbers of more than four digits, the first group of three digits indicating hundreds, the next two digits, thousands, the next two, lacs, and so on. In texts, commas shall be used to separate these groups of digits; and in Tables, the groups shall be separated by a space.

7.2. Decimals. Decimals shall be used wherever possible ; common fractions shall be used only when necessary because of usage in an industry, as for example when describing bolts and nuts. Each document shall be consistent, whichever style is adopted. When using decimals, an "0" shall appear before the decimal point, if it is not preceded by a numeral. Common fractions and decimals less than one are treated as singular.

Example : ¼ inch
0.25 inch
1.5 inches

* * *

9. PUNCTUATION

9.1. References. The following references contain general rules for punctuation, which should serve as a guide when drafting Indian Standards :

(a) FOWLER, H. W. & FOWLER, F. G. King's English. 3rd ed. Oxford. Clarendon Press, 1947.

(b) Modern English Usage, Oxford. Clarendon Press.

9.2. Commas.

9.2.1. **General Principle**. The comma is used as a mark of separation to make clear the grouping of words, phrases, or clauses, with respect to the grammatical structure of the sentence.

9.2.2. **Clause or Phrase within a Sentence**. If a clause or phrase within a sentence is to be set apart from the rest of the sentence, one comma before the clause or phrase and one after it shall be used.

Example : The rule, as it was stated in the minutes, is tentative.
And not :
The rule as it was stated in the minutes, is tentative.

9.3. Semicolons.

9.3.1. **Complicated Phrases or Clauses**. Semicolons shall be used where an idea is complete, but is connected to a similar complete idea ; or to separate complicated phrases or clauses.

Example : The table, including the most recent additions ; the text, including the chapter on trade practices ; and the bibliography, were carefully studied by the Committee.

9.3.2. **Important Breaks in a Sentence**. A semicolon shall be used to mark a more important break in the flow of a sentence than that marked by a comma, or to separate complete statements whose force is dependent upon their remaining in the same sentence.

Example : This is as important for science as it is for practice; indeed, it may be said to be the only important consideration.

9.4. Colons.

9.4.1. **End of a Page or Column**. A colon shall never end a page or column. The last line or two shall always be carried over so that the colon immediately precedes the material which it introduces.

9.4.2. **Enumerations**. It is preferable to enumerate items in list form following a colon, not to run them along in sequence.

9.4.2.1. **Simple Enumerations.** In simple enumerations following a colon, as shown here, punctuation shall be omitted.

Example : The material recommended consists of :

(a) Poles or uprights
(b) Ledgers
(c) Braces

9.4.2.2. **Involved Enumerations**. Long and complicated enumerations following a colon are punctuated as they would be if they were given in sequence in paragraph form.

Example : Among such conditions are :

(a) exposure to damaging fumes or vapours, excessive or abrasive dust, explosive mixtures of dust or gases, steam, salt spray, excessive moisture, dripping water, etc;

(b) exposure to abnormal vibration, shocks or tilting ;

(c) exposure to unusual transport or storage conditions.

9.4.3. **Position of Colon**. Enumerations following the phrases like " as follows," " consists of," " conditions are," etc. shall be preceded by a colon at the end of the phrase.

9.5. Hyphen.

9.5.1. The hyphen shall be avoided at the end of a column or page, wherever possible.

9.5.2. A hyphen shall be used :

(a) where its insertion is necessary to avoid ambiguity, or where it is common practice to do so.

(b) to facilitate readings in words such as " co-operate " and " co-ordinate."

Continued on page 14

THE PRESENTATION OF TECHNICAL INFORMATION

(Extracted from ' Engineering ' — September 15, 1950)

ONE tends to think of a scientist as dividing the whole of his working time between experimental work in his laboratory and mathematical work in his study. The picture was approximately true in the past; it is far from true now. To-day, many scientists and most engineers spend only a part of their time in that way. A large and growing portion of it is concerned with the written and spoken word. When a scientist or engineer is not reading books, articles, reports, he may be writing them ; and when he is doing neither he may be attending conferences and committees. Reading, writing, listening and talking have come to be among the more important occupations in which the scientists and engineers of our day are engaged. The presentation of technical information was, at one time, of subordinate importance; now it dominates many of our activities.

A good worker must have good tools, tools that are well adapted to their purpose, tools that can be handled with economy of time and effort. The makers and users of laboratory apparatus appreciate this. With a view to saving the scientist's precious time galvanometers, for instance, are provided with adequate damping, so that the observed spot of light may come to rest quickly. With a view to avoiding pre-occupation with irritating and irrelevant details, control knobs and micrometer screws are conveniently situated and shaped; they are designed for easy adjustment, scales are calibrated wherever possible so as to avoid the use of conversion factors. With a view to reducing to a minimum any uncertainty in the interpretation of observations, nullmethods and other ingenious laboratory techniques have been developed. In fact, every device to be found in a modern laboratory is the product of much care and thought.

By comparison, the care and thought that are given to the art of exposition are only slight, and yet there is no justification for neglecting this substantial part of a scientist's work. His time is just as precious when he is reading a report as when he is reading a scientific instrument. If he cannot afford to wait while a spot of light, reflected by an inadequately damped galvanometer, is coming to rest, neither can he afford to wait while a verbose author is developing an argument at unnecessary length. If it is important to the research worker that the instruments with which he is working be so designed that every knob and handle is within easy reach, it is equally important for him to find the facts and conclusions in a report so arranged that he can easily grasp each one of them.

However, a scientist who will express his exasperation at badly-constructed laboratory apparatus in the most vigorous terms is surprisingly tolerant of badly-constructed reports and papers. ***Most of us almost seem to expect the bulk of the technical information that comes our way to be badly presented.*** Those who are well aware how important technique is in the discovery of technical information only too often fail to appreciate the importance of technique in its presentation.

I doubt if it has always been so. Among the writing of Eighteenth Century scientists one may find much that it is a pleasure to read. That was an extroverted century when men were vividly aware of other people; and good exposition depends, more than on anything else, just on such awareness. It went out of fashion later when, with the rise of romanticism at the beginning of the Nineteenth Century, men became more introverted, more pre-occupied with their own egos. Perhaps even scientists caught the new fashion; or perhaps it was only that they tended, as their fields of study became more and more narrowly specialised, to become unduly absorbed with impersonal facts. But whatever be the reason it remains true, unfortunately, that scientists of these times show an inadequate awareness of those who are to read or hear what they have to impart. Even those who command a polished style are not always good expositors; it would be more accurate to call them accomplished soliloquisers.

Training for Research

We cannot return to the Eighteenth Century and its methods. To the present day they must appear too intuitive. We tend nowadays to be more deliberate, more systematic, in our way of doing things. We are less individualistic. We believe more in the efficacy of instruction, and so we take groups of people and train them methodically for some common and specific task. In these times, for instance, one speaks of " training for research." To provide just this training is the main task of our numerous post-graduate teaching institutions. I doubt whether it would have occurred to an Eighteenth Century scientist that there could be such a thing as training for research. " Research workers," he would have said, if he had thought about the matter at all, " are born : they can never be made." Post-graduate institutions, in which one attempts to turn graduates into research workers by systematic training, would have been foreign to the spirit of the Eighteenth Century.

Whether it is wholly a good thing that we isolate research as much as we do and treat it as an independent intellectual discipline I do not know: and I do not propose to discuss that question here. What is relevant is that it accords with the spirit of the age to do so; and, in so far as there is a good case for making of research an independent intellectual discipline, there is as good a case for treating the art of exposition in the same way.

Training in the art of Exposition

If one can justify training for research one can justify training in the art of exposition. If it is apt to speak of research technique it is equally apt to speak of the technique of presenting technical information. To do so is to move with the times. So I venture to deprecate the suggestion, still made occasionally, that a good expositor is born and can never be made. Let us attempt, deliberately and systematically, to raise standards of exposition: let us take the technique of that art more seriously than we have done in the past: let us study that technique in all its aspects; let us attempt to perfect it, to teach it. Until that is done scientists must continue to be handicapped by the bad work of poor expositors.

Five main forms of Exposition

If the art of exposition is to become a recognised intellectual discipline, the field covered by it will first have to be surveyed. It is a wider field than one might suppose. I have already pointed out how much of a scientist's time is taken up while technical information is being conveyed from one mind to another. The vehicles that serve the purpose of conveying technical information are numerous and varied. Of these the spoken and written word are, I think, the most important. I should like to mention in particular five main uses of this vehicle.

Books and Papers

Scientific books and papers read before learned societies first come to mind. They are intended for perusal by a large number of people ; they represent a permanent store of knowledge; and their effect is long-range, for they are designed to have more effect on people's thoughts than on their immediate action. The technique of presentation must be adapted to this long-range purpose.

The Lecture

It is similar with the second use of words as vehicles of technical information, the lecture. This, too, is usually designed to influence people's thought more than their immediate action; but it presents different technical problems. A listener cannot turn at will to something that has gone before, as a reader can. He is not guided by the sight of a new chapter or a new paragraph to know when a new subject has arrived. He needs help in such matters; and a lecturer who can do no more than soliloquise does not give him that help.

Reports

Thirdly, I would mention the many reports that are produced daily in offices and laboratories all over the civilised world. Some of them are lengthy and some consist of no more than a short note ; some are in the form of letters sent through the post. They are all intended

for a limited circulation ; they are likely to be seen only by a few persons in a particular establishment; many are produced for only one individual ; and most of them are ephemeral. Once they have done their work they are not likely to be used again. So they can hardly be subjected to the same careful writing and repeated rewriting as is essential for a permanent and widely-distributed record of fundamental work ; but it is nevertheless necessary that such reports be so constructed that they may efficiently serve their purpose. If they serve less to influence men's thoughts, they serve more as a basis of immediate action; were it not so they would not have to be produced.

The person to whom a report or a letter is addressed reads it because he wants to know what to do, here and now. If the report is not adapted to its purpose, if it is confusing and difficult to follow, if its meaning is ambiguous, if its perusal is unnecessarily time-consuming, if it irritates or misleads, then one of two things may happen. It may be ignored, with the result that some desirable action is not taken ; or it may be misunderstood with the result that the wrong action is taken. Either result will be just as unfortunate as the consequences of a faulty piece of machinery. In fact, we ought to realise that the reports that pass within an organization are a part of its machinery.

Instruction Books

Fourthly, I would mention a very voluminous class of technical literature and one that we all tend to overlook, perhaps even, most unjustly, to disparage. I am referring to the material that every manufacturer has to publish in order to ensure that his customers shall make proper use of his products. This material includes descriptions of machines and apparatus, explanations of how they work, advice about the way they should be used, and maintenance instructions. Most of this material is anonymous ; it contains the manufacturer's name, but not the author's. For this reason, if for no other, it is not always taken as seriously as it should be; and yet it serves a most necessary purpose. It forms the basis of action, often of important action. It must not be ignored and it must not be misunderstood. So it must be both readable and clear.

The words spoken in conference and committee

* * *

Fifthly, and lastly, I would mention the words spoken in conference and committee. It is there, in these days, that very many important decisions are taken. The scientist who knows what the right decision is should also be able to ensure that those others who have to make or support the decision are properly informed. In these days of team work and joint deliberations there are few places where it is more important than in the committee room that technical information shall be effectively conveyed from mind to mind ; and it cannot be conveyed effectively without a good technique.

The person who would be helpful in a committee must be able to judge the proper moment at which to make a specific statement and the proper moment at which to keep silent ; he must judge the best length at which to develop his theme, the best form in which to develop it, the best amount of emphasis to employ ; he must know whether what he has to say will be welcome or unwelcome ; he must be aware of any misapprehensions that others sitting round the table may entertain ; he must, in short, be very much aware of other people. The mere soliloquiser is a bad committee man.

It is in committee more than anywhere else that one may observe with sadness how often a first class scientist remains unappreciated, ignored, ineffectual, and all this for the one reason that he lacks the technique of exposition.

(To be continued)

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THE ECONOMIC VALUE OF A FREEWAY

[From "the Economic Evaluation of the Gulf Freeway"]

OWING to the lack of economic analyses of freeway operations it has been difficult and in most cases impossible to obtain public support and necessary funds for the acquisition of rights-of-way and for the construction of freeways which are urgently needed in many large cities throughout the country.

The Department of Traffic and Transportation of the City of Houston has assembled statistical data relating to the economic values which have resulted from the construction and use of the Gulf Freeway. This report has been prepared in order to demonstrate that the expenditure of millions of dollars for construction of a freeway is warranted. If the public in general and motorists in particular can be informed regarding the value of the time savings which are produced through use of a freeway, public officials will have less difficulty in obtaining financial support for freeway development work.

An economic evaluation of a freeway must necessarily include reference to a number of intangible values as well as to the tangible ones. Although it is possible to assign monetary values to the savings in time which may be effected through use of a freeway, it is more difficult to measure the appreciation in land values and in business operations adjacent to a freeway, and especially in other areas which are made more accessible through use of a freeway. Values of this kind would have to be offset to some extent by decrease in property values and adverse effects on business along routes of travel which were used prior to the construction of a freeway. There is no way to assign definite values to the added stability of land and business in central business district of a city where accessibility has been produced through construction of a freeway even though it is obvious that favourable effects result from development of roadways which facilitate vehicle movements to and from business centres.

The statistical data in this report pertain primarily to an evaluation of the savings in travel time which have resulted from use of the Gulf Freeway although there is some reference to increases in the value of land adjacent to the Freeway.

DEVELOPMENT OF THE FREEWAY

Location & Design

* * *

In designing the Gulf Freeway, engineers provided for the type of construction that would expedite traffic flow and minimize accidents. The throughway section consists of six, 12-foot traffic lanes, three in each direction, with a 4-foot raised divider island. All intersecting streets and railroad lines are overpassed. Two service roadways parallel the throughway section but are separated from it with grass-covered parkways. These roadways, which are thirty-two feet wide, are designed for one-way traffic movements. Parking is not permitted on the two service roads and access driveways are limited. Access to the Freeway is limited because the route is a new one which the City purchased and to which abutting property owners have no rights of ingress and egress other than at locations approved by the City.

* * *

Construction and Right-of-way Costs

Approximately 11,000,000 dollars have been expended on the Gulf Freeway to date. Of that amount, 8,500,000 dollars were for construction and 2,500,000 dollars for right-of-way acquisition. * * *

Construction costs are defrayed jointly by the Texas Highway Department and the Federal Government. The City of Houston provides necessary right-of-way with funds obtained through bond issues.

* * *

Time Savings

Time savings resulting from use of the Gulf Freeway have been calculated and results based upon current traffic volumes are indicated in the accompanying Table.

Motorists who travel by way of the Gulf Freeway to and from Main Street may now complete trips in less than half the time formerly required when they followed old routes. The annual time saving for vehicles operating on the Gulf Freeway has been calculated at 100,684,240 vehicle minutes.

In addition to the time saved by motorists who now use the Gulf Freeway, the reduction in traffic on the old routes has relieved traffic congestion so that delays have been appreciably lessened and vehicles move more freely on those streets. Survey results indicate that the average time required for a trip between Main Street and the intersection of Telephone Road and the Freeway by way of the old routes has been reduced by about one and one-half minutes. The total annual time savings for vehicles operating on old routes amount to approximately 5,550,000 vehicle minutes.

Value of Time Saved

Economists have been attempting for many years to assign monetary values to time savings which may be effected in the transport of persons and goods by motor vehicles. The problem of developing acceptable values has been a difficult one because of the various types of vehicles in use, variations in operating expenses of automobiles, trucks and buses, and the actual value of time savings to persons who travel in motor vehicles and those who transport goods in trucks. * * *

It is obvious that any measure of time savings in terms of monetary values may be acceptable to some persons and not to others.

A conservative value which may be used for passenger vehicle time savings appears to be two cents per minute whereas a similar value for commercial vehicles would be five cents per minute. These values apply not only to the savings in operating costs, produced by reductions in delays and in " stop and go " driving at railroad crossings and street intersections, but also to the man-minute savings which accrue to motorists and operators of commercial vehicles.

An application of the values of time savings to vehicles now operating on the Gulf Freeway and on old routes results in the following total annual savings:

Time savings by passenger vehicles 87,434,240 minutes @ 2 cent per minute 1,748,684. dollars

Time savings by commercial vehicles 18,800,000 minutes @ 5 cent per minute 940,000 dollars

TOTAL ANNUAL TIME SAVINGS: 106,234,240 min. 2,688,684 dollars

Time is Money

Savings in motor vehicle travel time are of particular interest to the operators of commercial vehicles because in the transportation of goods and in the mass transporation of persons " time is money ". The conservative figures which have been applied to time savings in the operation of passenger and commercial vehicles are by no means a measure of the unusually high values which many truck and bus operators attribute to time saved through use of the Gulf Freeway. These time savings will continue to increase as more traffic uses the Gulf Freeway in the future.

Summary of Time Savings.

[Figures based upon results of speed and delay survey test runs between telephone road and main street.]

TIME SAVED BY USING GULF FREEWAY.

Av. running time on old routes (prior to opening of Freeway.) *14 min. 49 sec.*

Av. running time on Freeway *7 min. 06 sec*

Av. time saving per vehicle *7 min. 43 sec.*

Av. annual vol. of traffic on Freeway (Av. daily vol. 38,000 vehicles.) *13,042,000 vehicles.*

ANNUAL TIME SAVED BY USING FREEWAY *100,684,240 Vehicles. Min.*

TIME SAVED ON OLD ROUTES.

Av. running time on old routes:

Prior to opening of Freeway. *14 min. 49 sec.*

After opening of Freeway. *13 min. 19 sec.*

Av. time saving per vehicle *1 min. 30 sec.*

Av. annual vol. of traffic on old routes *3,700,000 vehicles.*

ANNUAL TIME SAVED ON OLD ROUTES *5,550,000 Vehicles. Min.*

TOTAL ANNUAL TIME SAVED *106,234,240 Vehicles Min.*

SAMPLE TRAFFIC CENSUS AUGUST 1949

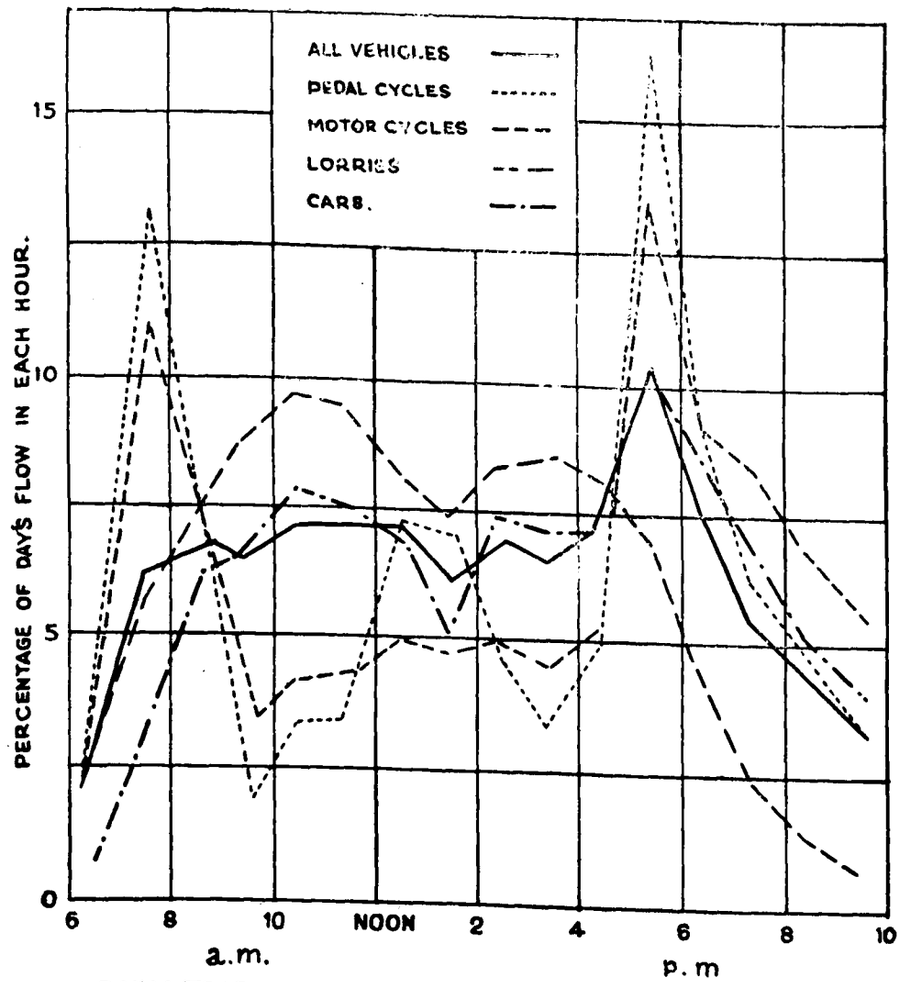
Great Britain

(Summarised from "The Surveyor," — July 7, 1950)

A sample traffic census was conducted in Great Britain at 21 points over a period of seven 16-hour days, starting from the 15th August, 1949. The points were intended to be as representative as possible of the whole country (Great Britain) excluding London. The main object of the investigation was to compare the results with those of a similar survey conducted before the war in 1938 and obtain an idea of the changes in traffic flow.

A punched card system was used to analyse the results obtained.

It was found that the general daily traffic pattern remained fairly uniform from Monday to Friday but there were considerable changes during the week-end.



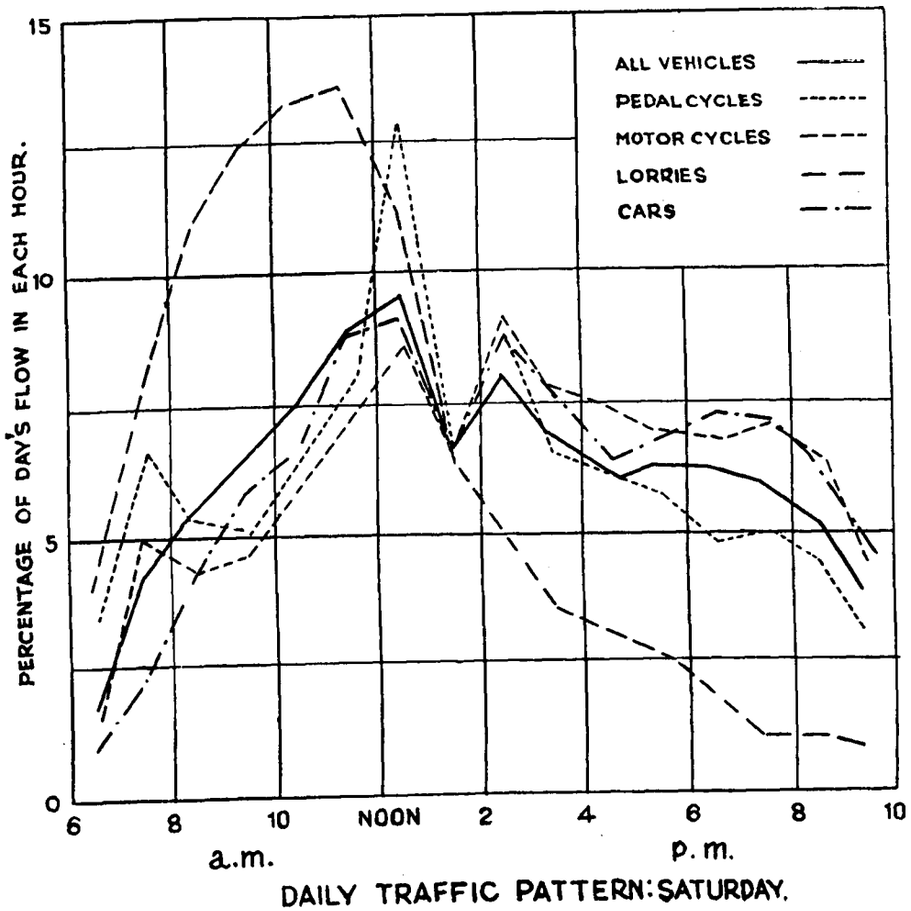
DAILY TRAFFIC PATTERN: AVERAGE FOR MONDAY TO FRIDAY

Fig. 1

Figures 1 and 2 show how the number of various types of vehicles varied through an average week-day and Saturday respectively. It is clear that on week-days motor cycles and pedal cycles show sharp peaks in the mornings and evenings*. Pedal cycles also show a mid-day peak.

All vehicles other than pedal and motor cycles show depressions during lunch time on week-days.

Again, the total traffic on a week-day remains remarkably constant from 8 a.m. to 5 p.m. The peak hours for all vehicles taken together are 5 to 6 p.m. on a week-day; 12 to 1 p.m. on Saturday and 7 to 8 p.m. on Sunday.



DAILY TRAFFIC PATTERN: SATURDAY.

Fig 2

* An exactly similar feature was observed in regard to bicycle traffic in New Delhi. The results are published in the I. R. C. Journal for September 1949, I. R. C. Paper No, 143 "Small-scale Traffic Survey in New Delhi".....Ed,

A comparison of the data with those for a few earlier years reveals some features of the overall changes in traffic between 1931 and 1949. There is a large increase in the number of goods vehicles from 1931 to 1949. The average annual increase between 1931 and 1938 is very nearly the same as that between 1938 and 1949. Public service vehicles increased by 56 per cent. Private vehicles recorded a fairly small decrease while there was a heavy fall in the number of horse-drawn vehicles.

An attempt has been also made in the original article to investigate the changes in the weight of traffic by assigning approximate average weights to different classes of vehicles.

The article concludes with a comparison of the accident data of 1938 and 1949 with respect to traffic flow. It is found that casualties per unit traffic in 1949 were much less than those in 1938.

(*Continued from page 6*)

9.5.3. **Compound Adjectives**. To avoid ambiguity, hyphens shall be used between two or more words that make up a compound adjective.

Example: noise-measuring instrument.

* * *

12. BIBLIOGRAPHICAL FORMS

12.1. **Bibliographical Reference to Published Articles**. Bibliographical reference to published articles shall be given in the following order and manner:

Example: SAHANA, D.B. Some problems of mica trade in India. **Journal of Scientific and Industrial Research**. Vol. 7, **No. 10**, p. 452-454 (1948).

12.2 **Bibliographical Reference to Books**. Bibliographical reference to books shall be given in the following order and manner:

Example: MITRA, S. K. Upper Atmosphere. Calcutta. Royal Asiatic Society of Bengal, 1947.

12.3. **Bibliographical Reference to Reference Books**. Reference to these shall be given in the same order as indicated in 12.2., except the name(s) of editor(s) or compiler(s) shall be given, if considered necessary in place of the author. The name, if given, shall be followed by the abbreviation (Ed.) or (Comp.) as the case may be.

Example: Heating, Ventilating, Air-Conditioning Guide. New York. American Society of Heating and Ventilating Engineers, 1943.

PERRY, J. H. (Ed.) Chemical Engineers' Hand book, 2nd Ed., New York. McGraw Hill, 1941.

* * *

POLITICS

Politics is the only profession for which no preparation is thought necessary.

(*R. L. S.*)

HERE AND THERE

1. DO WE REALLY WANT ROADS?

* * *

IN its wisdom or its folly, the Government believes that the nation cannot afford the necessary expenditure under present economic circumstances. Here we enter upon grounds for argument that have little to do with engineering. But fortunately we can quote from Dr. Glanville's address to illustrate the very point we wish to make: "I will not digress," he said, "into an argument as to whether or not good roads can be afforded, for what can be afforded is a matter of outlook and habit. We have all known men with incomes of thousands a year who seriously say they cannot afford a packet of cigarettes, and we have known other men who earn £5 a week who smoke their daily twenty. **It is solely a question of decision as to how income is spent. The Nation can have good roads if its desire to have them is strong enough**".

* * *

It is not at all widely realised that expenditure upon road improvement could be economically as well justified in present national circumstances as expenditure upon much else which is accepted with little or no argument.

* * *

Though engineers know that they can make the roads of this country better and very much safer, it is with laymen that the decision lies as to when the work shall be begun.

(*Extracted from 'The Engineer'— Nov. 17, 1950.*)

2. ORIGINS OF STANDARDISATION

IN one of the reading rooms of the Institution of Civil Engineers there is a brass plate engraved with the tolerances as well as the dimensions of howitzers and carronades that were in use before Whitworth's time: and it may be added that the present-day building brick of 9 by 4½ by 3 in. was standardised by Statute in the reign of Charles I, more than three centuries ago.

Some forms of standardisation are almost as inevitable as life itself. The Roman chariot made ruts in various countries, and the traces of them may still be seen in Pompeii and in the gateways of Roman stations in Britain. The wainwrights and cartwrights of Saxon and Norman times made their wheel tracks to suit these ruts, so that, when the Pilgrim Fathers and the Dutch **voortrekkers** emigrated, they took their covered wagons and made more ruts in North America and South Africa. When the automobile became of general importance, the farmers in the United States preferred cars to fit their ruts, and the same cars fitted the ruts in other countries.

In short, a good deal of standardisation is merely getting into a rut, and the initiator of the rut may have been a very remote innocent. It may be, indeed, that the original track of the Roman vehicle was imposed by the aggregate width of adjacent human posteriors, or one equine.

(*Extracted from 'Engineering'— Nov. 10, 1950.*)

3. TOLL ROADS

TOLL roads have always been a source of grievance to the British public, ever since their institution under the first Turnpike Act of 1663. When the turnpike system was becoming well established in the 18th century it was still not unusual for local rioters to pull them down or burn them down and effect grievous bodily harm on the unfortunate tollkeepers. An infuriated traveller wrote in 1799 that from

Grimsthorpe, Lincs., to Colsterworth on the Great North Road there were eight miles "called, by the courtesy of the neighbourhood, a turnpike, but in which we were every moment either buried in quagmires of mud or racked to dislocation by pieces of rock which they term mending." Despite the buying out of toll roads in the Victorian era there are still 32 toll roads and 51 toll bridges in Britain today. There are no toll roads in Scotland, but three toll bridges; but in the north-west of England there are eight toll roads and 15 toll bridges. The longest individual toll road is at Porlock, 4.19 miles.

(Extracted from 'Modern Transport'—November 25, 1950)

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4. SLUMP IN ENGINEER ENROLMENTS IN COLLEGES

THERE has been a decided drop in enrolment in the engineering schools of the Nation, according to a nationwide survey sponsored by the American Society for Engineering Education. S. C. Hollister, Dean of the College of Engineering at Cornell University and Chairman of the Survey Committee, said that, at its peak in 1948, engineering school enrolment was 226,000, and in 1949, it had dropped to 181,000. While the 1950 enrolment of 130,000 is greater than the 1940 figure of 108,000, enrolment in 1951 will probably be no larger than the 1940 enrolment, and a year later it can drop below 90,000. This drop in enrolment threatens a serious shortage of engineers. Last year every one of the 50,000 graduates was absorbed in professional activities.

The study indicates that, under normal peacetime conditions and if Selective Service permits engineering students to complete their courses, the engineering schools can be expected to graduate 32,500 in 1951; 21,900 in 1952; 17,000 in 1953, and 12,400 in 1954.

Under civilian peacetime conditions, the profession will absorb 20,000 engineering graduates every year. Industrial and military needs, added to normal peacetime demands, will require a minimum of 30,000 graduates. This indicates a need for 10,000 to 20,000 more engineering graduates annually. **To graduate 30,000 a year means that no fewer than 60,000 freshmen enter engineering schools each year**. In 1950 only 26,000 freshmen enrolled in engineering courses.

(Extracted from 'Civil Engineering'—December 1950)

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5. SECURITY OF SERVICE

NEARLY half of all civil engineers work for some public agency—federal, state, regional or municipal. Advancement in a public organization is seldom spectacularly rapid but, for a good man will be steady. Some employees in large public organisations tend to become highly specialized, which may be very satisfactory for a life-long career but a handicap in shifting to another organization. The civil service system cannot respond as quickly as a private firm to outstanding performance by an employee but the civil service employee is more likely to be kept on the payroll during slack times, although he can legally be dropped any time his job is abolished.

Some public agencies feel that the relative security of their jobs justifies lower salaries than are usually paid by private firms. **The young engineer should remember that the only real security is within himself in his own ability and confidence that he can make good.**

* * *

(Extracted from 'Civil Engineering'—December, 1950).

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6. THE THREE "Es" OF TRAFFIC SAFETY, ENFORCEMENT, EDUCATION, AND ENGINEERING

BUT what of the third "E"—Engineering—with which we are most intimately concerned? It is not often that a road accident, or at least the aftermath, hits the headlines of the national press. That one should have done so recently was in no way due to any unusual features of the accident but rather that one of the persons involved was a well-known radio star. That fact is of no particular interest to our readers but during the course of legal proceeding arising out of the accident the chairman of the bench is reported to have said: "This court has its own unhappy collection of gruesome photographs from Ackworth cross-roads. Reported recommendations for a round-about have gone from the court. We repeat those recommendations".

Brigadier Hughes has pointed out in **The Times** that the experience of most of the members of the County Surveyors' Society is that no grant can be obtained from the Ministry of Transport towards a road improvement unless one or more bad accidents, usually fatal, have taken place. In the majority of cases, without a grant no work can be done however willing the local authority may be to find its share of the cost. In these circumstances we cannot believe that the fact that a well-known radio star and his manager had to spend ten days in hospital will weigh very heavily on the Minister of Transport, with the result that the recommendations regarding Ackworth cross-roads will once again go unheeded.

Prior to the last war, Col. Bennett investigated the circumstances of every fatal road accident which had taken place in Oxfordshire over a period of four years. He calculated that 75 per cent of these could probably have been avoided by suitable road improvement. **Improvements were made at 60 separate road junctions and a reduction of 76 per cent in fatal and a two-thirds reduction in serious injuries were secured at these sites.** Other engineers who have also studied the "Engineering" aspect of road accidents are equally convinced of its value. The Minister and his senior advisers* on the other hand remain blind—but there is a possible glimmer of light, a Ministerial statement on zebra marked pedestrian crossings can, according to the Parliamentary Secretary, be expected shortly.

(From "Roads and Road Construction," —November, 1950.)

** Why blame the advisers unless this refers to financial advisers.—Ed.*

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7. URBAN AND RURAL ROADS

REFERRING to the complaint of Mr.O.P. Ramaswami Reddiar that there had been greater attention to urban roads rather than to village roads, the Public Works Minister, the Hon'ble Shri Bhaktavatsalam, wondered what exactly the critic meant by "urban roads". Purely urban roads existed only in the Municipal areas and most of them were being maintained by the Municipalities themselves.

So far as the City of Madras was concerned, the beautiful roads that were existing, were being maintained by the Corporation of Madras and the Government did not give any grant at all except that, in respect of some trunk roads passing **through** Municipal areas, the Government incurred some expenditure.

The Government had now accepted the policy enunciated by the Government of India and were insisting on the Municipalities bearing a portion of the cost of the improvement even of these roads. He asked whether those roads were not necessary even in the interests of the poor people and the ryots in the villages. It was the agriculturists who needed these roads for marketing their goods.

* * *

The Minister wanted the members to realise that the cost of maintenance and improvement of the roads had gone up more than thrice the pre-war cost. The traffic on these roads had gone up thrice, and unless the Government could find six times the money that was spent on these roads before the war, it was not possible to maintain them to satisfaction.

* * *

(Extracted from 'The Indian Express' Madras, 9-3-51).

8. MOTOR VEHICLE TAXATION IN MADRAS

REFERRING to the level of taxation on motor vehicles, the Madras Public Works Minister pointed out that the President of the Indian Roads Congress had observed at the last session of the Congress at Calcutta that not all the money realised from motor vehicles taxation was spent on the maintenance of roads. So far as the Madras State was concerned, more than double the yield from taxation on Motor vehicles was being spent on roads and even that was not found adequate. The improvement of the roads neglected during the war became the responsibility of the Government who had just finished the job and they had reached a stage at which the roads were now kept in a fairly good condition and he hoped to improve the standard of these roads still further in the near future.

Mr. Bakthavatsalam added that if the District Boards, who were maintaining these roads before the war, should be entrusted with the job again the condition of the roads would not be half as good as it was today.

(*Extracted from 'The Indian Express'– Madras, 9-3-51*).

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9. AN IMPROVED PROCESS OF ROAD-BUILDING

ROAD construction at very low cost by the process of soil stabilisation, using the most modern mechanical equipment, has proved successful in the laying of a road from Ramnad toMandapam in South India, a distance of about 22 miles. A special machine is used in this work for pulverising and mixing the soil, as well as for adding water, all in one operation. The sand and clay which are available very near the road are mixed in suitable proportions and then compacted by rollers. The resulting surface is such that even in rainy weather it remains strong and durable and one could comfortably ride in a jeep at a speed of over 45 miles per hour.

The Soil Research Committee of the Indian Roads Congress met at Ramnad on the 2nd February, 1951 and considered various problems of soil research and reviewed the work in progress on the Mandapam-Ramnad road.

[*Extracted from "The Hindu, Madras" dated the 12th February, 1951.*]

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10. RAILCAR LIFE

A feature of the long reports and discussion on railcars at the recent International Railway Congress was the lack of uniformity in regard to the actuarial life of diesel railcars. Some railways consider the life of a car as a whole to be 12 to 20 years; others allow 12 to 25 years as the life of the oil engine, 20 to 30 years the life of electrical transmission, and 25 to 35 years as the life of the mechanical portion, with the exception that the Swedish State Railways take the life of wooden bodies as only 10 years. On the other hand the Italian State Railways and the Belgian Vicinaux consider the life of all constituents to be almost indefinite because of repair and renewal methods. Such reasoning might well be applied to the railcar practice of other important systems, for example, the French National; and its truth has been more or less proved by railcars on certain European lines which have had a working life of at least 27 years. This principle is in accord with longstanding steam locomotive practice, and is perfectly feasible.

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Obsolescence the Drawback

THE principle became evident first on the Canadian National Railways years ago, when techniques were being evolved for overhauls and renewals of the old Beardmore-engined railcars. There is no reason why the life of railcars should not be 50 years, as with steam locomotives. Instead of two new boilers, four fireboxes and sets of tubes, new valves, axlebox brasses and the like, the oil engine would have several sets of cylinder liners, pistons, valves and shaft bearings, and a new crankshaft. An important result of this is that cars would not be withdrawn because they were worn out, but only because of obsolescence in comparison with continual technical advances. Whether they **would** be withdrawn for that reason is another matter. Few steam locomotives in Great Britain, Europe or the Colonies have ever been withdrawn because they were obsolete. Is there justification for assuming different methods would prevail with diesels?

(*Extracted from 'Modern Transport'— Oct. 21, 1950*)

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11. QUAINT?

OBSERVANT visitors from other countries, says the Kansas City Star, will be struck by some quaint things about the attitude of the American public towards its highways and some of the problems that have grown up with the highway system.

Towards traffic fatalities, for example, "A few hundred "polio" deaths in one year," it observes, " arouse the public and spread a national state of fear. But more than 30,000 traffic deaths are accepted with the indifference shown a Chinese famine."

Or towards highway damage caused by trucks. We have been aware for years that heavy loads are breaking our highways up, but we are only starting out to get the facts.

And in the attitude of the public toward taxes, of course, of which Missouri provides the most striking manifestation, "Within recent months," the **Star** notes "the people of Missouri turned down a progressive highway plan and a tax that would have cost the average motorist only $ 10 or $ 12 a year. People who will stick $ 100 worth of gadgets on a $ 2,000 car would not spend ten bucks to give it a modern trafficway or highway."

Quaint? Queer? Quite!

[*Extracted from "BETTER ROADS"– October 1950*

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LADIES AND GENTLEMEN

The tall, dignified man joined the crowd in front of a bargain counter, in an attempt to get a very special pair of hose for his wife. He inched his way patiently, but was buffeted here and there by the women, and made no progress.

Suddenly he lowered his head, stretched out his arms, and barged through the crowd.

"Can't you act like a gentleman?" inquired a cold feminine voice at his elbow.

"I've been acting like a gentleman for the past hour," replied the man, still charging forward. "From now on I'm going to act like a lady".

The International Road Congress, Lisbon

September 1951

Provisional Programme of Meetings & Excursions

(Extracted from 'Roads and Road Construction' Nov. 1950).

Monday, September 24.

Morning. The offices of the International Touring Association, Lisbon, will be open for distribution of documents, badges, etc., in connection with the Congress.

Preliminary meetings of the Permanent International Commission.

Afternoon. State meeting of Inauguration in the Palace of the National Assembly. The President of the Republic is expected to be present.

Evening. Opening of Exhibition Reception to Congress members

Tuesday, September 25.

The Congress will split up into groups or sections each of which will discuss the papers allocated to them.

Morning. Section 1-Question I
Section 2-Question III

Afternoon. Sections 1 and 2 (Joint meeting) - Question V

Wednesday, September 26.

Morning. Section 1 - Question II
Section 2 - Question IV

Afternoon. Sections 1 and 2.

Evening Reception

Thursday, September 27.

Morning. Sections 1 and 2

Afternoon. Joint Meeting

Evening. Reception

Friday, September 28.

Morning and Afternoon. Meeting of Editorial Committee.

Afternoon. Visit to the Lisbon Airport and to the bridge under construction at Vila Francade Nira.

Saturday, September 29.

Morning. Open

Afternoon. General meeting in Assembly Room: statement of conclusions.

Evening. The Permanent Council of the International Association and the chief delegates of the respective countries and of member organisations, with their ladies, will be the guests of the Minister of Public works at an official banquet. This will be followed by a reception, to which all Congress members are invited.

AFTER THE TERMINATION OF THE CONGRESS

Excursions A (north)

Sunday, September 30

Lisbon-Oporto (by rail, distance 340 km. =218 miles), Reception, dine and spend night at Oporto.

Monday, October 1

Visit road works on the Oporto-Viana do castelo-Braga-Oporto route. Distance 270 km. (170 miles). Dine and spend night at Oporto.

Tuesday, October 2

Visit to the Entre os Rios-Oporto bridge and road (100 kms. = 62½ miles), lunch at Oporto. Oporto to Lisbon by rail (349 km. or 218 miles).

Spend night in Lisbon.

Excursion B (south)

Sunday, September 30. Open.

Monday, October 1

Visit road works on the Lisbon-Arrabida-Setubal-Vila Franca de Xira-Lisbon route (180 km. or 112½ miles). Dine and spend night in Lisbon.

Tuesday, October 2

Visit road works on the Lisbon-Santarem-Castelodo Bode (Zezera Dam)-Vale da Orsa bridge-Tomar Fatima- Batalha-Lisbon (200 km. or 125 miles). Dine and spend night in Lisbon.

FREE EXCURSION

Wednesday, October 3.

Visit to road system in neighbourhood of Lisbon (100 km. or 62½ miles), with luncheon.

Excursion C.

Wednesday, October 3.

Evening. Leave for Madeira (dine on board).

Thursday, October 4. At sea.

Friday and Saturday, October 5 and 6 Trips and visits at Madeira.

Saturday, October, 6.

Evening. Leave for Lisbon.

Sunday, October 7. At sea.

Monday, October 8.

Arrive in Lisbon about 7 a.m. in time for the Sud Express at 11.45 a.m.

The trip to Madeira will give members an opportunity to see one of the loveliest of the Atlantic islands, and to visit some important and interesting road works and dams during the trip.

MEMBERSHIP

The following may take part in the Congress :—

Official delegates appointed by their respective Governments.

Permanent members of the Permanent International Association of Road Congresses.

Temporary members of the P.I.A.R.C.

Persons (ladies, and young people over 18) who accompany Congress members and who wish to take part must be enrolled as permanent or temporary members of the Association.

It has been agreed that Governments subscribing to the Association may send one delegate for every £5 subscribed by them. Collective Members who pay £5 subscription—2 delegates and for each additional delegate £2 10s. while commercial undertakings who pay £2 10s. subscription may send 2 delegates plus £1 for each additional delegate.

Private members may, of course, attend and any person accompanying them should be enrolled as a temporary member at £2 for the Congress year.

Permanent Membership. Permanent membership of the Association is granted under the conditions laid down in Articles III and XI of the Statutes of the Association. Applications should be addressed to the Joint Honorary Secretary, British Organizing Committee P.I.A.R.C., Berkeley Square House, London, W. 1.

Temporary Membership. Persons or organizations who, not being already members of the Association, wish to take part in the 9th Congress only, can be admitted as temporary members of the Association. Subscription rates for temporary members are double those of permanent members.

Applications for temporary membership should be made to the Joint Honorary Secretary, British Organizing Committee.

Rights of Congress Members. Members of all the above classes are entitled to be present at all Congress meetings and to attend the official excursions and receptions which take place during the Congress. They may take advantage of the travel facilities or reduced fares arranged in connection with the Congress. Before the Congress meets, they will receive official reports on the various subjects figuring in the programme, and after it has closed, the General Report on the work of the Congress will be forwarded to them. The Executive Council, however, cannot guarantee that reports will be dispatched to members before the Congress meets unless their subscription has been received at least a month before the Congress opens.

—(o)—

MILES AND MILESTONES

[*Extracted from MAIN ROADS - June 1950*]

* * * *

THE word "milestone," with its essential association with roads an travel, seems to exude an aura of old-world romanticism. In early times, when foot, horse-back and horse-drawn carriage were the modes of travel, the milestone was an eagerly awaited record and friendly guide to the traveller. Today, route maps, adequate sign posts, and the speedometer have rendered the traveller by motor vehicle more or less independent of milestones in their original role. However, the need for maintaining and improving the roads has given milestones a new and important part to play. Though they still serve the traveller, they also provide clearly defined reference points along the roads, and are used to indicate readily the precise position and extent of any work that is to be done on the roads. * * *

Origin in Europe

The custom of placing milestones on the roads in Europe was begun by Caius Gracchus (154-120 B.C). Plutarch tells us "he divided all the road into miles of near eight furlongs each, and set up pillars of stone to mark the divisions. He likewise erected other stones, at proper distances on each side of the way, to assist travellers who rode without servants, to mount their horses."

A typical Roman milestone was of cylindrical form, standing above the ground 6 or 7 feet, and having a diameter of nearly two feet. It was generally inscribed with the name of the Emperor in whose reign it was erected, and the mileage. * * The initials "M.P."(mille passus) placed on the posts stood for "mile."

Roads in general received little attention after Caius Gracchus until Augustus Caesar (63 B.C.—14 A.D.) undertook a thorough repair of the road system. **He paid from his own purse the cost of reconstructing the via Flaminia,** the great North Road from Rome to Arminium (modern Rimini) on the Adriatic Sea. Great roads—"viae Augustae"—were laid everywhere.

To ensure more timely repairs in future, Augustus in 20 B.C. created a permanent board of "curatores viarum," who were made responsible for the maintenance of the main highways. He commemorated his formal appointment as head commissioner of all roads by placing a pillar covered with gilded bronze in the Forum near the temple of Saturn, with the distances of all the chief places along the great roads measured from the thirty-seven city gates from which these roads branch out.

Used to Fill pot-holes

Milestones were erected in nearly every province of the Roman Empire. There are not many extant in England, as in later times they were often broken up to fill pot-holes in the road. Central pillars, in imitation of the "milliarium aureum" in the Forum at Rome, were often set up in the large provincial cities.

The oldest Roman milestone known in England was found on the Foss Way two miles from Leicester in 1771. It was of cylindrical form resting on a quadrangular base. Still decipherable on the stone was the fact that it was erected in A.D. 120 in the reign of Hadrian.

A milestone found near Aber, in North Wales, was 6 feet 7 inches high and 19 inches in diameter. On it was inscribed: "The Emperor Caesar Trajanus Hadrianus Augustus, high priest, possessed of the tribunition power, father of his country, consul for the third time. From Kanovium eight thousand paces."

The practice of placing milestones died out in Britain after the Romans. Although signposts were erected in the Middle Ages, milestones were only re-introduced about 1720. They were later made compulsory by various turnpike Acts, including those of 1744, 1766, and 1773. Milestones and the penalties imposed upon persons injuring them are mentioned in the reign of George III (1760-1820).

Donations for Milestones

The credit for the making of the first milestones in the colony (New South Wales)

belongs to Edward Cureton. In the Police Fund Quarterly Account, ending 30th September, 1814, stands the entry, "Edward Cureton for Fifty-four milestones. £40 10s. Od." * *

On the square part of the obelisk is engraved the distance between Campbeltown and Liverpool and on the top:—

"To the Memory of Captain James Cook, R.N., the discoverer of New South Wales born at Marton, Yorkshire, 27th October, 1728, and killed at the Sandwich Island, 14th February, A.D. 1779." * *

In addition some of the old milestones were being used by the Department of lands as survey marks and could not be removed to new locations. * *

MATHEMATICAL SECTION

Solution of Problem published in Feb .'51

Since in the order B C D A two are in their correct place, the other two interchanged should give the correct list. Taking all possible pairs and interchanging we get the following:

	Pair interchanged:
1. C B D A ...	B C
2. D C B A ...	B D
3. A C D B ...	B A
4. B D C A ...	C D
5. B A D C ...	C A
6. B C A D ...	D A

Since A & C should not be next to each other, (3), (4) & (6) go. Since the correct list must have one common with the order A B C D, obviously (1) is the answer.

NEW PROBLEM

There are three circular wells A, B, and C of *diametres 12 ft., 11 ft and 10 ft.* respectively, with their centres forming a triangle ABC with sides AB=35 ft., BC= 26 ft. and CA=30 ft. Across each well is placed a beam passing through the centre of the well for carrying a pulley. The extremities of all the beams lie on a circle of radius R. Find the value of R and give a geometrical construction for finding the centre of that circle.

—o—

QUITE DEAD

A mental patient was obsessed with the idea that he was dead. The psychiatrist told him to stand in front of a mirror and repeat, "Dead men don't bleed". Then the doctor stuck a pin in the patient's finger and made it bleed a little. "Now, do you see?" said the doctor triumphantly.

"Oh-ho, yes, I see now," said the patient. "Dead men Do bleed".

TECHNICAL INFORMATION

BRITISH INVESTIGATIONS OF THE SOIL AS PART OF A ROAD STRUCTURE

(Extracted from 'Roads & Engineering Construction'-Sept. '50.')

The pre-war practice of the Road Research Laboratory of the British Department of Scientific and Industrial Research of publishing an annual report was discontinued during the war, but has recently been resumed. Since the war two reports have been issued, and from these the following excerpts relating to soil studies have been taken. The British Road Research Laboratory is one of the world's leading research organizations in the highway field, comparable in its achievements to the U. S. Bureau of Public Roads, and its findings are receiving acceptance by an increasing number of road engineers.

AN important part of the British Road Research Laboratory's studies is concerned with the behaviour of the soil as a part of the road structure, and therefore, with methods of strengthening the soil by compaction and stabilization.

The soil foundation of a road can be considered as being composed of two zones. The upper zone immediately beneath the road crust is relatively highly stressed by traffic, and is subject to climatic effects such as frost and drought. The lower zone is relatively unaffected by traffic and weather and its function is to support the road crust and the higher soil layers.

The stability of the soil is increased by compacting it and, during the period under review, the performance of compaction equipment, including rollers and various types of vibrators, has been studied.

Many soils may be improved by stabilizing them, that is, by making them less susceptible to the effects of moisture. One important practical problem is to develop methods of processing the soil under practical conditions that will produce a material of a quality approaching that obtainable in the laboratory.

Since the type and thickness of construction needed to provide a satisfactory road surfacing is related to the stability of the road foundation, allowance must be made for possible changes in the foundation due to climatic and other causes during the life of the road; this involves studies of the action of frost, of the effects of drought and of other general questions relating to the movement of moisture in soil and to soil drainage. Although changes in the condition of the soil in the upper zone are of more importance than changes in the lower zone, the soil in the lower zone must be carefully studied for changes which may lead to serious differential movements of the road surface. These movements are being studied on the road and in the laboratory, and the investigations are linked with studies of the physical properties of the soil appropriate to each particular problem.

Compaction Studies

As a part of the study of the compaction of soil, full-scale investigations have been made in the large road machine at the Laboratory, which was adapted specially for the purpose. In this machine, rollers in common use, such as smooth-wheel and pneumatic-tyred rollers, have been used to compact a range of typical soils under conditions similar to those obtaining in practice. The roof over the 110 ft. diameter circular track of the road machine helps to minimize changes in the moisture content of the soils.

It has been found that pneumatic tyred rollers, if sufficiently loaded, have a satisfactory performance on all types of soil; smooth-wheel rollers, however, are most effective on granular soils, such as gravel and sand. The moisture contents for best compaction with a 2¾-ton smooth-wheel roller and a 12-ton pneumatic-tyred roller were found to correspond more closely with the optimum moisture content given by the British Standard (B.S.) laboratory

compaction test than with the values given by other tests. When the soils, in a 9-in. loose layer, were compacted, dry densities approximating to, and in some cases exceeding, the dry densities given by the B. S. laboratory compaction tests were obtained with the two rollers. In general, not more than ten passes were required with either roller to give satisfactory compaction.

A comparative study has been made of the performance of a clubfoot sheepsfoot roller (ballasted to about 5 tons), a taper-foot sheepsfoot roller (ballasted to about 4½ tons), an 8-ton smooth-wheel roller, and a 1/2-ton frog-rammer. The soils tested were a sand a gravelly sand, clay and three types of clay.

Sheepsfoot Rollers

The results showed that the shape of the feet made little difference to the behaviour of the sheepsfoot rollers. Both types were ineffective in compacting the sand and were less satisfactory than the 8-ton smooth-wheel roller on the gravelly soil. On the clay soils they performed well at lower moisture contents than those normally found. **The investigation showed that sheepsfoot rollers are as a rule less effective than other types of plant for compacting soils in this country though they are useful for compacting clay soils in countries with an arid climate.**

Smooth-Wheel Rollers

The 8-ton smooth-wheel roller was particularly satisfactory for compacting the sand and the gravelly soil, and compacted the clay soils well when the moisture content was a little below the optimum obtained with the B.S. compaction test. Satisfactory compaction was usually obtained with from 4 to 8 passes of this roller.

When the moisture content of each soil was such as to ensure the greatest density for a given amount of rolling, the effective depth of compaction was never greater than 4 in. with any of the rollers, nor could it be increased beyond 6 in. when the soils were wetter. The decrease in soil density with depth for all the rollers was much the same; **no evidence was found for the widely held belief that sheepsfoot rollers compact from the bottom upwards.**

Frog-rammer Effectiveness

Greater depths of compaction were obtained with the frog-rammer. Two or three coverages gave 20 in. for the granular soils and 10 in. for the clay soils. As the area of ground covered per hour is relatively small, however, the frog-rammer is best suited for work in a restricted area such as a trench or the backfill behind a bridge abutment.

In an endeavour to find a simpler method of measuring the compaction of earthworks, a study has been made of the Proctor needle test in which a small circular area is depressed into the ground with a compression spring and its resistance to penetration measured. This apparatus showed promise and a modified form employing hydraulic means of applying the pressure is being studied.

Soil Stabilization

The stabilization of soil with cement, bitumen, and waterproofing chemicals, has been studied in the Laboratory and under field conditions.

Cement-Stabilization

The mechanical processes involved in cement stabilization have been specially studied, and it has become clear that success depends essentially on the availability of efficient plant. The main requirements for successful construction are:

1. The adequate pulverization of the soil.

2. The uniform spreading and thorough mixing of the cement into the soil.

3. The proper compaction of the processed soil.

In the past the soil in mix-in-place construction was broken up by cultivators —ploughs and disc-harrows. While these are satisfactory on coarse-grained soils they have a relatively poor performance on clay soils, which is one of the principal reasons for the poor results obtained in

stabilizing these soils with cement. Specially designed soil pulverizers are now being manufactured, and the Laboratory is studying their performance on works and in special field investigations.

The usual method of spreading the cement in mix-in-place construction is to place bags of cement at appropriate places on the ground, to slit the bags open and to spread the cement by hand. This is laborious and does not result in very uniform spreading. Attention has therefore been given to the design of a mechanical spreader, and the characteristics of lime spreaders for agricultural purposes are being studied. The investigations suggest that the main problems are first to obtain a fast enough flow of the cement from the hopper into the spreading device, and secondly to obtain a uniform spread transversely.

An experiment was carried out to study the effect of moisture content on the properties of soil-cement. A half mile length of road, 10 ft wide, was constructed in soil-cement at Hatchlands. A 4-in. compacted layer of a sandy loam soil mixed in place with rotary tillers with 10 per cent of cement was laid on an old waterbound flint road and surfaced with tar and chips. The road was divided into five equal sections, each of which was constructed with different moisture contents. One interesting result was that the crushing strength of cubes made from the mix-in-place soil-cement was approximately 80 per cent of that obtained with similar laboratory-mixed specimens. The road is being kept under close observation and it is hoped to relate its performance both to the results of the crushing test and to the results of laboratory durability tests involving wetting, drying, freezing and thawing.

Stabilization with Bituminous Materials

Laboratory investigations of the stabilization of soil with bituminous materials have shown that the action of the binder is to waterproof the soil rather than to increase its strength. To study this waterproofing action a capillary water absorption test has deen devised. The treated soil is made into cylindrical specimens, 2 in. in diameter and 3 in. high, which are stood in water 1/8 in. deep. To ensure that the soil is in a condition in which it can rapidly absorb water when containing no waterproofing agent, the treated soil is initially compacted so that it has an air voids content of 10 per cent. It has been found that the weight of water absorbed by the soil in the cylinder after 28 days does not usually exceed 6 gm. in effectively waterproofed soils

Stabilization with Resins

Resins have been found to be effective waterproofers of only those soils which have an acid reaction. When soil is alkaline it is thought that the resin is broken down to form alkaline resinates. For alkaline soils, laboratory investigations using the sodium salts of certain fatty acids as waterproofing agents have given promising results.

An investigation of the attack by bacteria on resinous soil stabilization agents has been made by the Rothamsted Experimental Station for the Laboratory; this showed that serious bacterial attack can occur on resins mixed with soil. The presence of cement in soils tends to reduce the activity of the bacteria, and mercuric chloride and sodium pentachlorophenate were found to be effective antiseptics.

(To be oontinned)

POOR FISH

It is said the male fish swims over the ova deposited by the female fish and releases sperm to fertilize the ova. Hence the expression "Poor Fish".

List of Approved Works on National Highways

S. No.	Job No.	Name of work.	Amount approved. Rs	Remarks.
		MADRAS		
1.	451 MD 5	Reconstruction of a bridge over Vagu at mile 243/5 of Madras-Calcutta Road.	81,600/-	
		BOMBAY		
2.	446 BM 8	Survey for the realignment of N. H. No. 8 North of Nadiad. (i) Survey of Ahmedabad-Pirojpur Section.	1,598/-	
	447 BM 8	(ii) Survey of Pirojpur-Ratanpur Section.	16,008/-	
3.	448 BM 8	Construction of a bridge across the shedi river at Ratanpur in mile 368 of Bombay - Ahmedabad Road.	7,88,300/-	
4.	449 BM 4	Cement concreting miles 23/1 to 24/0 of the Bombay-Poona Road.	93,900/	
5.	453 BM 4	Improvements to curves in miles 240,241 & 242 of the Poona-Bangalore Road.	66,600/-	
		WEST BENGAL		
6.	455 BG 31	Permanent restoration works to Sevoke-Bagrakot Section of N. H. No. 31 (under Darjeeling Division)	1,36,600/-	
7.	456 BG 31	Permanent restoration works to Bagrakote - Patlakhawa Section of N. H. No. 31 (under Jalpaiguri Division).	36,400/-	
8.	458 BG 31	Reconstruction of a 60′ R.C. slab bridge in the 9th mile of the Moynaguri - Chalsa Section of Bihar Assam National Highway No. 31.	20,000/-	
9.	459 BG 34	Construction ef N. H. No. 34, Section from Raiganj to the West Bank of Nagar river (Bengal border).	10,56,400/-	

		ASSAM	
10.	454 AS 40	Special protective works to Shillong-Dawki Road (mile 24/7) for 1950-51.	31,434/-
11.	457 AS 39	Land acquisition for Dimapur-Inphal Road(National Highway No. 39)to avoid land slips in miles 41-42 in Kohima Division.	1,150/-
		ORISSA	
12.	450 RS 6	Construction of culverts in miles 54.75 to 80.00 of N. H. No. 6 near village Tangebilla to the Eastern approach Road to Baitarni.	1,02, 300/-
13.	452 RS 5	Surface dressing on N. H. No. 5 from right approach of Kathjuri to 12-1/4 mile of Cuttack-Puri Road.	1,06, 000/-.

PRIVILEGES & OBLIGATIONS

It may be a shock for the new graduate to discover that the world doesn't owe him a thing. In fact he owes the world something, as expressed some years ago by Ernest Martin Hopkins, then president of Dartmouth College. Dr. Hopkins was dissatisfied with the final words with which degrees were awarded, "with all the rights and privileges thereto pertaining," and changed them to read, "with all the rights, privileges, and **signal obligations** *thereto pertaining".*

OBVIOUS

Judge, addressing lawyer sternly, "If you are going to call a witness to prove that a thing is obvious, it's obvious that it is'nt obvious.".

[This is not invented. The judge was Mr. Justice MacNaughton in the King's Bench Division.....Ed.]

Books added to the Roads Organization Library during February, 1951.

1. **Economic Evaluation of the Gulf Freeway**. (Department of traffic and Transporation, City of Houston, Texas, July 1949).
2. **International Standard Definitions for Transport Statistics–Statistical Papers...Series M. No. 8**. (Statistical Office of the United Nations, Lake Success, New York, N. Y., 15th July, 1950.)
3. **Declaration on the Construction of Main International Traffic Artieres signed at Geneva on 16th September, 1950**. (Economic Commission for Europe Inland Transport Committee–Sub-committee on Road Transport).
4. **Surveying and Mapping, Vol. 10, No. I. January–March, 1950**. (The American Congress on Surveying and Mapping, Box No. 470, Benjamin Franklin Station, Washington 4, D.C.).
5. **A Study of Engineering Drawing and Design Practice in Foreign Countries-Bull. No. 46** by T. C. Brown. (Department of Engineering Research, North Carolina State College, Releigh, Sept., 1949).
6. **Country Road Use and Finance in Maryland–Bull No. A 19** by W. M. Paul Walker. (The University of Maryland, Agriculture Experiment Station, College Park, Maryland, December, 1942).
7. **Engineering Properties of Soil** by C. A. Hogentogler (McGraw-Hill Book Co., Inc., New York). 2 copies.
8. **Twenty-Ninth Annual Report of the Commissioner of Main Roads for the year ended 30-6-1950.** (Queensland Main Roads Commission, Brisbane, 1950). 2 copies.
9. **Concrete Practice in Building Construction** (Cement and Concrete Association, 52, Grosvenor Gardens, London, SW I, 1950).
10. **Bestimmungen des Deutschen Ausschusses fur** Stahlbeton by B. Wedler [in German] (Verlag Von Wilhelm Ernst and Sohn, Berlin, 1949).

Prize-winning Papers presented at the Public Works and Municipal Services Congress and Exhibition held from 13—18 November, 1950 at London.

11. **The Backgrounds of Street Lighting–Paper No. 2** by E. J. Stewart.
12. **The Administration and Engineering of Rivers–Paper No. 3** by Peter Sutcliffe.
13. **Road Safety and the Highway Engineer–Paper No. 6** by Edward Ogden.
14. **The Materials Engineer and the Highway Authority–Paper No. 10.** by F. N. Sparkes.
15. **The Problem of Clay in Road Construction–Paper No. 11** by D. J. Maclean.
16. **Road Beautification–Paper No. 14** by L. E. Morgan.
17. **The Supervision of Public Works–Paper No. 15** by R. S. Offord.
18. **Mineral Ash as a Low Grade Aggregate–Paper No. 16** by H. E. Orr.
19. **Rainfall, Run-Off and Evaporation–Paper No. 19** by John Glasspoole.
20. **Public Services in a relation to Town and Country Planning–Paper No. 20** by John L. Beckett.
21. **Types of Roads for Town and Country–Paper No. 23** by Herbert

J. Manzon.

22. **Central Public Works Account Code with appendices**. (The Manager of Publications, Delhi) 2 copies.

23. **Book of Forms referred to in the C. P. W. A. Code** (The Manager of Publications, Delhi). 2 copies.

24. **Combined Finance and Revenue Accounts of the Central and Provincial Governments in India for the year 1946–47**. (The Manager of Publications, Delhi).

25. **A Manual of the Geology of India and Burma** by Sir Edwin H. Pascoe (3rd edition). (The Manager of Publications, Delhi).

26. **Indian Coal Statistics of India, 1946**. (The Manager of Publications, Delhi).

27. **Indian Boiler Regulations, 1950**. (Published in the Gazette of India Extraordinary dated 15-9-50) (The Manager of Publications, Delhi).

28. **Statistical Abstract of Madhya Bharat, 1950**. (The Department of Economic Intelligence & Statistics, Madhya Bharat Govt., Indore).

29. **Madhya Bharat in 1949–50–An Economic Review**. (The Department of Economic Intelligence & Statistics, Madhya Bharat Govt., Indore).

30. **Monthly Bulletin of Statistics, Vol. I, No. 6, June, 1950**. (The Department of Economic Intelligence & Statistics, Madhya Bharat Govt., Indore).

31. **The Bombay Civil List corrected up to 1st January, 1950**. (The Supdt., Govt. Printing and Stationery, Bombay).

32. **The Bombay Civil List Corrected up to 1st July, 1950**. (The Suptd., Govt., Printing and Stationery, Bombay).

33. **The Civil List of the Hyderabad Government corrected upto 1st April 1950**. (The Government Press, Hyderabad Dn., 1950).

34. **Agricultural Statistics of the Punjab 1939–49–Economic and Statistical Organisation Publication No. 2** (The Economic and Statistical Adviser to the Punjab Government).

35. **Madras State Highways**. (Chief Engineer (Highways), Madras, January 26, 1951).

36. **The Central Road Research Institute**. (The Council of Scientific and Industrial Research, Delhi).

37. **The Indian and Pakistan Year book and Who's Who 1950, Vol. XXXVI**. (Bennett, Coleman and Co., Ltd., The Times of India Office, Bombay).

38. **The Indian Penal Code (Act XLV of 1860.)** Ram Narain Lal, Law Publisher, Allahabad).

WHO IS TO BLAME FOR ACCIDENTS

A learned judge was recently reported as saying that there seemed nowadays to be an idea that if an accident happened somebody must be responsible in damages. That, according to the judge, was wholly mistaken. Life had not reached such a stage of refinement, and there was still room, in the ordinary course of dealing between man and man, for one to have an accident without liability to pay damages. This is a view which is so often forgotten when discussing road accidents.

—

AN ADMISSION

At a recent meeting our Assistant Editor alleges he overheard the following :—

Chairman (*sternly*), "*Certain* **ALLEGATIONS**" (*pause*) "*have been made against the Committee. We should like to know who the member is*".

Member (*standing up excitedly*). "*I'm the alligator*".

We could not persuade our Assistant Editor to give us any more particulars. He said he was afraid of alligators. —*Ed.*

—

COUGH

The man with a robust cough never misses a music recital.

—*Zulu Provest.*

—

DESIRABLE

When there is an accident, it is very desirable to have presence of mind. It is even more desirable to have absence of body.

—

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