5 A study of the underlying causes of accidents could be made in a state or portion of a state, not too large in area, including a careful case study of each accident or each serious accident from the medical, psychological, engineering and legal standpoints, resulting in statistical data on the relative importance of various causes or factors, and also including special attention to accident-proneness of individuals involved

As the whole subject is so definitely in the experimental stage, any of the studies mentioned would undoubtedly disclose the need for further research There can be little doubt that properly directed study along any of these lines would be of the very greatest public benefit and would point the way to material reduction of the national traffic accident toll

GENERAL DISCUSSION

ON

HIGHWAY TRAFFIC

MR E W JAMES, *U S Bureau of Public Roads* I have read with much interest the eight topics included in the report on highway traffic, and find that they indicate very fully the variety, scope, and in many cases, details of the major problems which are most urgent in connection with the subject

I was especially impressed with the various problems suggested in the first paper by Dr McClintock, and I venture to point out that practically all of them depend for their solution on the evaluation of delay It is to be noted that the determination of comparative delay is not sufficient if relief from any existing undesirable condition depends upon the installation and operation of signaling devices or on any form of reconstruction or construction of our street system Comparative delay will serve to demonstrate the relative merits of alternative conditions from the standpoint of traffic convenience and safety only If expenditure is involved in producing the desirable alternative condition, then we must have a determination of cost of delay in order to establish the economic soundness of the alternative Such determination of the cost of delay may be made—first, on the basis of all discoverable items involved, or second, on only the obvious and easily measured items

The first includes all expenses possibly attributable to operation under the conditions imposed, and will involve the cost of gasoline, oil and grease, all items of wear on brakes, tires, and moving parts, the effect of inertia, of manual operation of the controls, and all the details of car operation that may be affected by differences of speed and by frequent starting and stopping of the appropriate mechanisms. The second

group of items may reasonably be confined to gas consumption while idling and to the wear and tear on brake linings and on tires, incident to frequently stopping and starting the car

It is suggested that immediate and conservative results may be obtained by investigations pursued to the extent indicated by the simpler requirements of these three elements Exhaustive investigations covering the smaller items will inevitably consume considerable time, and any adjustments based on the less complete studies will always be on the safe side so far as the economics of the subject are concerned

Several of the matters discussed relate to traffic control, and it is to be noted that every impulse of modern highway development is towards centralization and specialization of such control To date it appears that so far as adopted, this kind of administration has disclosed its merits Counties are trying to shift the financial burden of providing modern highways to the States The tendency towards State traffic control is increasing State highway patrols, State constabulary, and otherwise named State police forces are developing, and are apparently rendering very satisfactory service Undoubtedly this tendency is a direct result of the freedom of personal movement made possible by the motor vehicle and improved highways The narrow lines of local administration are being physically crossed and the limits of local administration are, therefore, being removed and a wider jurisdiction substituted

This is a situation to be handled thoughtfully and with the greatest care The problem involved is to accept centralization without creating a sluggish bureaucracy, which is certain to create difficulties in highway administration

The questions of safety and of personal and property damages receive merited attention in the papers Emphasis is placed on individual responsibility The present trend indicates that property damages, unless substantially retarded, may reach a very serious figure in the not distant future This loss, like our annual fire loss, represents directly a reduction of national wealth, and it appears to be of the utmost importance that the question of general insurance of some kind be devised as promptly as possible in a form satisfactory to meet existing conditions Just what form compulsory insurance is to take remains a matter of considerable and serious doubt, but it appears that the right of some individuals to the free and equal use of the highways must be restricted in much the same way that individuals are restricted from maintaining fire hazards dangerous to the property of others In approaching questions of this kind, there is always an unconscious but mistaken premise that we must leave individual rights undisturbed, and still accomplish beneficial results With increase in motor vehicle density on our highways, we must frankly recognize that indivudal freedom is

subject to definition on narrower lines Such restrictions are occurring in very many ways as our modern life becomes more complex and if the traditional freedom of movement heretofore accorded to all American citizens has finally to be limited in the interests of safety and the preservation of property values, we should not in this day and time hesitate at the fact but proceed deliberately and promptly to devise suitable machinery for selecting and restricting those who deserve such treatment

The enforcement and observance of the traffic laws and regulations unquestionably constitute one of the most controversial and disturbing subjects discussed in the report The problem of enforcement reaches into the fundamentals of our court system, the selection of our magistrates and judges and the traditions of American jurisprudence In conversation recently with the Assistant Chief of Scotland Yard, in charge of traffic violations, and with the Chief of the North Irish Constabulary, those officials were very outspoken in their belief that we could never secure in this country adequate law enforcement until all of our enforcing officials down to police magistrates were appointed for life and became irremovable except for malfeasance or other adequate cause These two subjects of enforcement and observance are by no means separate activities They are closely related and would appear almost to be cause and effect Lack of adequate enforcement tends to create lack of observance of law

In a recent report by Dr McClintock on certain problems in Washington, D C , he discovered, for instance, 1,052 vehicles parking in excess of the curb capacity in a certain selected district of the city, and he found 7,212 vehicles (or 18 per cent of the total) illegally parked Apparently these conditions were so well known that they led to a study of the parking problem rather than to the enforcement of the existing parking regulations

The records of police and magistrate courts with traffic cases are such as to be rather notorious than laudable Irregular and unfair enforcement appear to produce a let-down in the observance of the law This same report indicates that where in certain cities a serious insistent effort has been made to correct a bad traffic condition, it has been successful principally through a corresponding effective, exact, and intensive application of law

It is interesting to note that in the Traffic Bureau in Washington there are approximately 160 men, of whom 50 are engaged full time in directing and expediting traffic, and for about one-sixth of the time the entire force is similarly engaged This represents approximately 43 per cent of all the time of the entire force

Roughly, this means that approximately half the effort of the enforcing agency is devoted to getting traffic disentangled and on its way, and assumably enforcement is 50 per cent efficient

The paper on traffic capacity is especially interesting in its conclusion that a 2-lane road is practically free from congestion when carrying up to 1,000 vehicles per hour In 1927, the Bureau of Public Roads in connection with the Cleveland, Ohio, survey reached practically the same conclusion by a very different method in investigation The paper referred to is also valuable in that it makes a definite attempt at an adequate definition of capacity Further studies along this line must more and more clearly distinguish between the normal or working capacity of a highway and conditions of over-load

With almost every large undertaking in the line of traffic surveys, new details are being developed and the studies are taking new directions

Any one attempting to organize a body for traffic study will realize how difficult it is to secure intelligently trained assistants There are two immediate needs, the first is an adequate manual of the methodology of the subject, and this should be prepared by a competent hand as early as possible The undertaking of a bibliography and analysis of traffic survey reports is a valuable step in this direction and should be pushed with vigor The outline of work proposed in the report appears adequate from the point of view of the collection of data, the suggestion of corrective measures, the drafting of regulatory material, and the enforcement thereof The outline should be expanded in my opinion to cover a large variety of the analytical methods used in handling the field data These are largely statistical in nature and while they follow well-known general principles, the applications are special, and it will facilitate the training of men in expediting and unifying methods if a discussion of analytical, statistical methods applicable to traffic problems can find a place in the proposed outline

MR J ROWLAND BIBBINS, *Consulting Engineer, Washington, D C*
I appreciate the opportunity of bringing before you two or three of the more important aspects of this very splendid report this year on traffic, namely, the important relationship between the design of the roadway and its costs, the operating costs, traffic control under which it is operated, and the immensely important subject of capacity In other words, it is a well rounded problem of economics I am glad to see this body gradually drifting into the study of what I call the transportation part of the problem In fact, I can define in my own mind that it is transportation first, last and always, and I am frank to say in my own view a good many failures are due to lack of comprehension of that fact For instance, in our cities which Mr Marsh has been discussing there are thirty million population, and the transportation agencies handle thirty-three million per day I have attended dozens of conferences in which the subject of mass transportation had hardly a paragraph of consideration, and yet that is really what we are talking about By

rail, by rubber, by bus, by the new express coach, by the trailer coach, by auto, and by taxi—it is all one and the same problem There happens to be on my desk a law suit covering one of the largest express boulevard projects in this country The law suit is over the design and capacity needs and there are two exactly diverging opinions It happens to be the North Shore Boulevard in Chicago, running from Grant Park north

We are confronted I think with an entirely new aspect with respect first, to single roadways, wide right-of-way, 100 feet of more, and second, twin roadways separated by a parkway, and third, a triple roadway—use Baltimore as an example, on North Charles Street—we note the parking flow lane through the middle and two roadways This whole law suit is about that very thing

PROFESSOR F H ENO I wish to make a suggestion with reference to super highways It seems to me we are going too far when we begin to put in highways that are 100 feet wide, or 80 feet wide with 8 or 10 parallel lanes I think the solution is rather, parallel ways with a parkway between, not parallel lanes, or, better still, highways that are one or two miles apart, are much safer than super highways

MR GEO F SCHLESINGER, *National Paving Brick Mfgr Assoc* One matter was referred to this morning which I think should have most serious consideration in dealing with traffic accidents It was brought to my mind recently because I was asked to investigate and report on a stretch of highway that had an unusually bad record in a short period There had been over 350 accidents on this 14-mile section resulting in 11 fatalities Some people were blaming it on the type of pavement—that is the way I got into the picture I was assisted by a fellow engineer in the investigation We found this Just beyond one section of this highway there were two roadhouses that were dispensing liquid refreshments and just beyond the other end of the highway were the chief patrons of these roadhouses From the testimony we got from the wrecking crews and others along the highway most of the people who had had accidents had been to these roadhouses and had either caused accidents to themselves or to their fellow motorists It is a serious matter and I do not know what can be done about it My fellow engineer in his report recommended that the road house be closed I admired his nerve as I thought that was a remote possibility and I never thought of it myself But the facts are that the drunken driver who has had a drink or two, is not in full possession of all his faculties He does not react, he wants to go, he will take chances, he will pass another car coming over a hill or around a curve He will do something where there is not enough room to pass a car coming the

other way, he will race a train to a crossing, and he will do any number of things that he would not do if he had not had the liquid inspiration. I think a man who is in this condition is a good illustration of the saying that the weakest part of the automobile is the nut that controls the steering wheel.