



Problems of Road Research.

AT the second session of the Indian Road Congress held recently in Bangalore, the delegates, mostly Engineers from the different parts of India, discussed more than thirty papers dealing with the various aspects of their departmental problems. Apart from this professional interest in the construction and maintenance of proper roads, the provision of increasing facilities for vehicular and pedestrian traffic must always be of the utmost importance to the general public. The introduction of motors which has initiated new Engineering problems, must produce even a more profound effect upon the social and economic life of the people than the Railways did before, and the greater range and mobility of these mechanically driven vehicles have brought about a transformation in rural India and in the general methods of transport. The basic facts and the elementary governing considerations of road problems are of such vital character as to necessitate the creation of a Ministry of Transport and a Road Research Board financed by the Road Development Account. The need for a Road Research Organisation is evident from two factors, *viz.*, the large amounts annually expended in India on the construction and upkeep of roads, and the large number of accidents associated with motor transport. The traffic problems are not confined to the technical and professional interests of the engineers alone, but they really belong to the domain of an applied science which includes not only Engineering but also Physiology, Psychology and Pedagogy.

The administration of the Road Development Account is vested in the Governor-General in Council in accordance with the advice of the Standing Committee for Roads. It ought to be the function of the Ministry of Transport to administer the Road Fund from which grants have to be made to the Provincial Governments for the maintenance and improvement of public roads, and the Ministry ought to be the responsible government department for initiating measures to promote the safety of road users. It ought to assume responsibility for the approval of all technical details regarding the lay-out and opening of new roads in all schemes for which grants are made from the Road Development Account. It ought to invite the local governments to submit research programmes with special reference to the traffic

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and climatic conditions of the provinces, and their practical applications which must be referred to the Road Research Board for investigation and advice. In such a scheme of co-ordination, the problems to be faced by the Ministry can be grouped broadly under two heads, *viz.*, physical and psychological. The former will include materials used in road-making, the processes of construction, road usage and testing apparatus for judging the durability of roads, and the latter must embrace the utilisation of the knowledge and training of applied psychologists in propaganda and instruction of road behaviour. In certain of its major aspects, the division of work in respect of road direction and control, the medical research worker will also find interesting problems. There is a serious responsibility, therefore, for systematising the information regarding all collateral problems upon which can be based the intelligent control and development of road transport in its engineering aspects.

Under the Constitutional Reforms of 1920, the construction and development of roads became a provincial subject. Though in detail the arrangements made by the provincial governments may vary, the general practice is that in some, the more important roads are under the charge of the provincial Public Works Departments, while in others the bulk of the responsibility devolves upon the District Boards or equivalent local bodies. In most provinces there are three authorities in charge of the roads which are classified under the "large trunk roads" and "feeder" roads. Of recent years, the rural problems have assumed a new character owing to the increase in motor transport, and the construction and maintenance of the most important roads have become an All-India concern which the provincial governments have not the financial resources to deal with adequately. The comparative backwardness of the road transport in India may be an advantage to the railways, as serious competition is eliminated, but it must retard the economic development of the country. The roads under the administration of the local bodies acting as affluents to the main arteries, are indescribably bad, and yet they are the main distributive channels of agricultural produce.

With the advent of bituminous and concrete binders, the dust problem may be considered as having been practically solved, but the main investigation is to enquire into the physical and mechanical properties of

the heterogeneous materials, subjected to the changing and the increasing intensity of loads and the influence of weather conditions. Strength and deformability as well as processes of attrition and progressive losses of strength, which occur under different conditions in use, must have a specific relation to the intrinsic properties of the various aggregates and to their distribution on the surface. This aspect of road engineering has a peculiar interest to the research worker, more especially in view of the roads being used by vehicles provided with iron and pneumatic rubber tyres.

Asphaltic bitumens, tar and pitch are all extensively used in road work, and our knowledge of the significant chemical properties of all these binders is still imperfect. During the hot weather when the temperature ranges between 100° F. and 120° F. in most districts, tar melts and rises from the surface in soft outcrops sticking to the heels of the bare-footed pedestrians and of the draught animals. The entire surface becomes corrugated on account of the rolling action of the vehicles, causing serious damage to the motor tyres, and when the tarred roads are hard, the ponies which are extensively used for dragging double-wheeled country coaches, slip and break their bones, besides endangering the safety of the occupants. The black surface of the tarred roads makes visibility poor at night, and must account for the numerous motor accidents on such roads at nights. The bulk of pedestrian traffic is bare-footed in India, and what are the effects on the human system of frequenting tarred roads during the greater part of business transactions. The position at present is that the road engineer is employing material brought frequently under trade names, but of whose chemical composition he has no definite knowledge, and whose effect on the users of the road there is no means of ascertaining.

Generally speaking, the Indian roads are a standing menace to public health, acting, as they do, as the great carriers of infectious diseases. It is the common experience in all the Indian towns that the tarred roads during summer emit intense radiation of heat, parching up the air passages of nose and throat, which is a prelude to the onset of influenza and all other manifestation of bronchial and lung trouble. When the hot winds blow over such roads, carrying the dust particles and other impurities, the eyes and mouth of the users of the road become

involuntarily filled with them. In using any new road binders the road engineers and the public health authorities have to co-operate and conduct experimental work before they are employed on a large scale. Roads have always acted as a source of danger to public health, and all attempts at improving its conditions must be supported by a definite knowledge of experimental investigations in the research laboratories.

The most frequent cause of road accidents arises from the skidding characteristics of the surface. We have at present no knowledge regarding the general influence of vehicle design on skidding, and formal investigation in this direction and in its relation to some conditions of road surfaces becoming slippery is desirable as a means of preventing those conditions from arising. Roads accumulate various types of debris on their surface, and behave differently under seasonal and atmospheric conditions and all these have to be linked with the texture and composition of binders. Another factor which produces road accidents is psychological. The statistical data of accidents have been collected in a more or less mechanical fashion, and few psychological tests have been devised to investigate the human factors in accidents. What is the psychological basis of the various traffic regulations? Has the effect of these regulations on the driver and on the pedestrian generally been determined? It must be remembered that the driver of a motor car has to use the eye, the hand and the leg almost simultaneously and does his selection include any examination of how far these organs co-operate in a given situation and how speedily and correctly does his mind form the right judgment? How far does the habitual use of alcohol and narcotics affect the alertness of mind and steadiness of the eye, hand and foot? Equally important with these factors is irritability and impatience, as well as night and colour blindness and defective sight. In such fields of enquiry the psychologists and doctors have

to co-operate in the design of traffic and car signals, in the framing of traffic regulations, in the illumination of roads and vehicles and in the selection and rejection of drivers.

Clearly the pedestrian and the cyclist cannot be selected. They are in the habit of picking up their own methods of using the road, and since the traffic regulation is becoming scientific, arbitrary modes of using the road must always produce accidents. It is obvious that they, above all others, should be instructed how to avoid accidents from motor traffic. Instruction in schools and colleges and propaganda by private and aided agencies with a view to impart systematic training may produce the desired results. On the roads it is not uncommon to find the physically deformed and defective people, blind and deaf, old men and unsophisticated children sorely trying the patience of motor drivers, the motor cyclists and bicyclists. We have, on the other hand, villagers carrying head-loads, bullock carts carrying steel girders and bamboo poles, and beggars crossing from foot path to foot path, on sighting a car to stop. The Indian traffic conditions are peculiar, and their control and direction must be based partly on research work and partly upon the education and enforcement of traffic regulations.

The importance of scientifically prepared and accident-free roads in India must become evident when it is remembered that more than fifty per cent. of her population uses the road bare-footed almost from infancy to old age, imbibing into the system the dust and pollution of the road accumulations. Will such an existence improve the physical efficiency of the people? It seems to us that the multiplicity of problems involved not only in the construction and maintenance of roads, but also in the reactions of such roads on public health, must be the chief argument in favour of instituting a Ministry of Transport and a Road Research Board.