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SOME HIGHWAY QUESTIONS OF THE MOMENT.

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There are a number of questions which have been rather persistently placed before the members of the United States Delegation to the Second Pan-American Highway Congress, and of these I have been requested to select for reply at this time a few questions which seem to be at the moment uppermost in the minds of those who are interested in the movement for increased highway improvement, whether public officials or engineers.

The first question relates to the existing railway lines and the situation that would be created by the general building of improved highways. Thinking back to our own experience before the automobile came into existence, the railway executives generally were foremost in their advocacy of improved highways. They found there were periods of the year in the most productive districts when general business was almost at a standstill due to the mud embargo, resulting in a loss of potential business and a high cost for operation during this period. Such periods were followed at the time of crop movements by a demand upon the capacity of the rail lines that exceeded their facilities. At times of peak production, not only

were the rail facilities for movement of crops exceeded, but the storage at the rail stations was exceeded. It was not uncommon to find crops harvested and stored in the open, because of the lack of both storage and transportation facilities. The railway companies have always been one of the strongest influences for the upbuilding of the country on a permanent basis, and in the early period of agitation for better roads, the railways played a very prominent part. During the period of the war the rail facilities were exceeded to such an extent that a very large amount of traffic was forced to the public highways, and the use of the motor truck for freight hauling jumped almost over night from practically nothing to tremendous proportions. In the enthusiasm of the moment there was a great deal of talk about the supplanting of the railways by the highways, and much fallacious sentiment was created. This, of course, disturbed the minds of some of the rail executives and for a time they raised the questions which are probably in the minds of the executives of rail lines of this country, whether these are made public or not. It is not unnatural that those charged with large interests should look upon all potential changes in the transportation field with a questioning mind as to the effect of the new upon the older transportation agencies. This does not necessarily mean an unfriendly attitude. The experience of the United States has indicated that the highways when adequately developed do materially affect the business of the railways. It is not possible to dwell in long detail

upon the changes which have taken place, but the principal changes which have been shown by long studies of highway transportation as it has actually developed, and the changing of the rail business as shown by their reports, indicate in general about the following situation: As a whole the business of the railroads has very consistently increased. There has been a loss of the passenger business on the steam roads, and a very large increase in the freight business. There has been a large amount of the short haul freight business in less-than-carload lots taken upon the highways, and the passengers now carried in private and public motor vehicles upon the public highways constitute a very large proportion of the annual passenger mileage. The truck movements on the highways, however, have been largely limited to the "precious package" movement over distances less than 40 miles. Much of the movement is of food products which must be moved quickly from producer to consumer; that is, the truck is the best means of transportation for articles and products which are to be moved over short distances and which must be moved quickly. Such business has never been, on the whole, a source of profit to the railroads, although it is a very large source of profit to the producers, many of whom are dependent wholly upon such products as milk, butter and eggs, poultry, fruits and similar products for their livelihood. It is improbable that business of this type has been highly developed by the railroads in this country, or in the contiguous countries, and judging from the high prices of many such commodities

there is neither the production nor the consumption of such products that is desirable as a matter of diversity of crop production and a source of continuous income for the producer. The truck crop and dairy production are the source of employment and of profit for large numbers in the United States, and the transportation of these products is to a very large extent dependent upon adequate highways. The motor truck cannot supplant the steam railway for the hauling of mass production or over long distances, but rather it can supplement the rail facilities by bringing the crops to the rail stations over improved highways so as to reach a large territory and distribute the movements over a longer period of the year. The recognition of the supplementary character of both the motor truck and the motor bus to existing rail lines is now recognized to such an extent that more than seventy railroads use both motor trucks and motor busses. This combination is making possible the furnishing of more adequate transportation service by the rail companies than ever before, but the really important change that has taken place is the tremendous improvement in both the railway and the highway service, and our public knows that the competition of the highway service has brought about a changed condition in the adequacy, in the courtesy, and in the efficiency of the rail service which has been not only a tremendous gain to the public, but a source of profit to the railroads themselves. In my opinion there is not a responsible railway executive in the United States today

who does not recognize on the whole the beneficial effect of the improved highways upon the railways. There have been certain miles of steam railway abandoned. A careful investigation shows that these abandoned roads are almost wholly the result of depletion of some natural resource such as timber or mines which had been the original reason for the construction of such roads. There has been and still is some complaint by the railroads as to taxes paid by the railways for highway improvement, but a careful examination of the taxes paid by the whole rail properties indicates that taxes which they pay for highway improvement do not amount to more than about 2-1/2% of the highway income annually, and this tax is largely expended by the local communities for roads which lead from the rural districts to the rail stations. It is my judgment that as a business enterprise the railways of a country have more to fear from a lack of adequate highway improvement than from any honest and intelligent highway development.

A second question which has been asked many times is "What is the best type of highway to build?" Some surprise is manifest when the members of the delegation have no answer to this question, that is no answer as to some definite type or character of highway. This is not a reluctance to answer the question frankly. It is due to the fact that there is no single answer to the question. There is no single type of road as to physical character which is the best road to build. The best road to build is an economic fact. The best

road to build is that type which is smooth and free from objectionable dust and provides this traffic service at the lowest annual total cost. This means that in many sections of the Argentine the best type of road is the earth road, improved where possible with selected natural materials. Where the traffic justifies, the next step would be the improvement with one of the bituminous types. We are having real success in the improvement of long milesges of light traffic highway with the fine crushed rock surfaces placed on well-built earth or natural soil road and treated with some type of bituminous oil or bituminous emulsions. For the rural roads tributary to the city of Buenos Aires or either of the larger cities where soil conditions are comparable to the soil conditions of this area, and where the traffic of a city can reach a highway - that is within a 40 mile radius - and where the material for road building must be brought in from long distances, only roads of the standard pavement types such as Portland Cement concrete, or the asphalt or block surface on heavy Portland Cement concrete bases will prove economical or satisfactory. The amount of heavy traffic on the roads already developed, such as the Buenos Aires-La Plata or the Moron-Lujan roads, is a severe test of road construction, and only the highest class of materials and workmanship can be expected to produce a road that will stand such heavy usage and not then unless there is a most constant and painstaking maintenance. There are two observations worthy of mention. The wide right-of-way on the Moron road is an asset of unbelievable value for the future, and it will be desirable to have equal widths

of rights-of-way which are to go as primary arteries of the nation. The other is to compliment the roadside planting which is developing. Along with this the prohibition of the posting of advertising signs and billboards upon or contiguous to the public highways should be undertaken now before these have reached a large development, and before the business has been developed to a point that will afford funds to fight against legislation aimed to prevent or to regulate such advertising. The state of Massachusetts attempted to regulate billboard advertising along its highways, and the interested companies have succeeded in tying up in the courts the enforcement of such regulations for three years, and may possibly defeat the purposes of the regulations. The matters of adequate widths of lands for future uses and of roadside planning and beautification are matters that may well be considered of major importance at the very outset of a highway improvement program. They may be more easily provided for then than at any time later.

A third question is who should pay for roads. It may be possible to figure out a theoretical answer to this question, but it would be of little purpose since it must be answered not by any theoretical distribution of the benefits, but by the very practical fact of who is able to pay. Highway improvement is a matter of general benefit to the public, and this is particularly true of the major lines of highways connecting the trading centers of the country. Therefore, at the outset it is fair to make the major payment for such

highways a general tax upon general property, with such special taxes as are reasonable upon the road users in the form of motor vehicle and gasoline taxes. As the highways are built, a larger percentage of the whole expenditure will be taken over by the road users. To illustrate this point, in the United States the following changes in distribution of road revenues occurred in six years, from 1921 to 1927; The rural income increased from $1,149,000,000 in 1921 to $1,4[illegible],000,000 in 1927. The distribution and change in distribution was as follows: Federal aid, 1921, 6.9%; 1927, 5.5%. Bonds, 1921, 38.1 ; 1927, 18.6%. Motor taxes, 1921, 10.6%; 1927, 35.2%. General state and local taxes, 1929, 44.4%; 1927, 40.7%. The actual change in the source of revenue is greater than indicated since in 1921 many of the bonds voted were supported only from taxes upon property, while in 1927 the most of the bonds are based upon the income from the road user, that is, the gas or motor vehicle registration fees, listed in the above as motor taxes. An extensive study in many of the states of the United States during the course of which studies the individual movements of more than six million motor vehicles were analyzed after the information had been gathered from the vehicles themselves on the highway, indicated that on the major highways upwards of 90% of the traffic is city traffic. This proportion of course varies, but immediately surrounding any considerable population center a great percentage of the whole use of the highways is by the city traffic. Since the highways are necessary to the proper development of the

city. It is fair that urban property should contribute in general taxes as well as in specific taxes paid for the motor vehicles. A careful study of the effect upon farm lands of improved roads made in the agricultural districts indicated a considerable increase in the value of the farm lands, resulting from the building of a road of the lower cost types such as a well-graded earth road surfaced with gravel or some such material that would permit good service from the farm to the trading point throughout the year, but the value of farm land was not materially increased by changing the good gravel road to a paved roadway. In strictly agricultural districts, therefore, very little, if any, direct assessment should be made against the land unless a small percentage of the cost of an all year road of the cheaper type. This does not apply, however, to the lands in the immediate vicinity of the larger cities and population centers since the building of improved roads in such areas converts the lands to other uses than agricultural of the general type, such as sites for suburban homes and villas, or small farms for intensive crop production for such areas it is fair to assess a reasonable part of the cost of paved road construction to the land because its increased value. That is, the public thus shares in the unearned income of increase in value. It would never be possible, however, to build the long connections between cities, but remote from them, by relying upon any considerable percentage of the cost to be assessed against the property. There is no economic justification.

There is one other important point. This relates to the question of permanent roads versus permanent road service. The old Romans started road building on the basis of permanency, and thanks to this idea we are still able to dig up some examples of the types of construction which were in use at that time. Their idea called for roads from about three to four feet in thickness. This idea still prevails to some extent in European countries, and there are frequent echoes of this attitude toward highway improvement in these countries of the western continent. The policies pursued in the United States have been based upon an entirely different principle. We have built the lightest, cheapest roads we have found it possible to maintain under the traffic. We do not believe that time is the essential element in the life of a road, but we do believe it is the essential element in the use of the road, and we choose deliberately to get the maximum possible mileage with the funds available, and base our choice of construction types upon the cheapest road that can be built and satisfactorily maintained under the traffic. We believe that the building of long mileages of roads that can be maintained at a reasonable cost under the traffic is the problem of the western continent, and in all of our road construction continuous maintenance is essential. We believe it to be an engineering fallacy to attempt to build roads to last a certain length of time with little or no maintenance. Unless too large an expenditure is made in the original construction, it is

impossible to build roads that will stand up under heavy traffic without continuous maintenance. The changes due to expansion and contraction of the road material itself, the change in the dimensions of the sub-grade due to the absorption of moisture and subsequent drying and other causes produce changes in the roadway surface such as cracks or slight offsets which, if not constantly maintained, become a destroying cause due to the impact produced. A perfect cylindrical wheel rolling over a perfectly plain surface produces no impact, but once the smoothness of the surface is broken so that the wheel jumps, or rebounds, an impact is produced which, according to the tests which we have made of truck wheels on rough surfaces, may multiply the destructive force by from four to seven times. The impact of heavily loaded wheels is the great road-destroying force. As soon as the surface becomes rough in even a small degree, unless promptly maintained, the destruction proceeds at an accelerated rate. The experience of this city with stone block pavements ought to prove the soundness of this statement without argument. This whole question sums up in the thought that the number of miles of high type construction that can be built in any year is very limited in comparison with the mileage that is desirable. Therefore, as a first essential a road maintenance organization should be perfected, not only to keep in perfect condition new roads that are built, but to develop the best possible service out of the existing roads. There is no such thing as a permanent road.