

concrete or the concrete road on top of it, for the main thing is to have a sub-base that will hold the traffic.

Value of a Solid Sub-Base

The great trouble we are having to-day is that we lay a six-inch concrete road on a new sub-base, where there has been no road before. Concrete will not crush under traffic. In New York city about two years ago they made an investigation at my request to find out if the concrete did crush under the heaviest traffic they had in the city, and they found that it never did crush or give under traffic. A great many say that six inches of concrete will not stand very heavy motor traffic. They miss the point. The concrete stands, but the sub-base under the concrete goes with the traffic and that breaks the concrete. If you build your road, and it is desirable to put a road in certain locations, build it up on materials that you have at hand, and let the traffic keep going over it for years and when the time comes to put on your concrete, you will have a perfectly firm and solid sub-base that will enable you to keep your road under the heaviest possible traffic, because four or five inches of concrete will stand up if the sub-base is sufficiently solid.

Basing Outlay on the Traffic

The building of roads is like any other business problem. When you start in business, you don't start in at the top. You organize the company, usually in a small way, and then gradually build up, until you get a big corporation. The same thing applies to the road. You have to creep before you walk, and it is the pioneer work that makes it possible to get the good road system later on. You must not be discouraged because you cannot lay one of the modern, more or less permanent, types of pavement. It would not be the thing to do; the financial outlay would be too great for the amount of traffic that these roads will require to carry. This whole thing must be viewed from the purely cold-blooded business standpoint. You must realize that the road that you are going to build here should be the one that you are justified in building in the locality for the amount of traffic existing there. Of course, once you build roads you are going to attract traffic, and it will gradually become heavier. Then, there will gradually be a change in the type of pavement, until you get to the more or less permanent type.

Segregation of Traffic

The time has come to my way of thinking, when, between the big cities we shall have to have two types of roads, one for ordinary passenger automobiles, and one for motor trucks. I do not believe that we as roadbuilders should strive for legislation limiting the weight of trucks, but we should have legislation limiting the weight of trucks per inch of width of tire. The trucks carry our produce, and no matter how we try to limit their weight, they are going to grow in size as big as they can grow, for two to pass, one going in one direction and the other in the opposite direction. So our problem is to build roads, where the motor truck traffic is heavy between cities, that will carry the greatest amount of weight that there can be put on a truck of reasonable size, keeping in mind always that the width of tire must conform to the weight on the truck. I was asked by the Manufacturers' Association of Baltimore, several months ago, to say something on that subject, and I told them that the time was coming, and I firmly believe it is, when we shall have steel tracks for our heavy motor truck traffic, paved with granite block in between, and on the shoulder, to carry the large trucks between such cities as New York, Philadelphia, Baltimore and Washington. We cannot build a road to carry the kind of traffic that passes through a park that will also carry the kind of traffic expected over an inter-city freight motor truck road. It would be a waste of money to build a road for such heavy motor truck traffic, where probably 80% of the traffic is passenger automobile traffic. We should be building a very expensive type of

road to carry the 20% traffic, one that would be entirely unnecessary for the 80%. That problem is already confronting us, and it is not going to be long before it is going to confront you here in Canada, in Quebec, Montreal, Hamilton, Toronto and other thickly populated districts.

In Manitoba your problem is largely one of earth and gravel roads. Several years ago, I had the pleasure of attending the first convention of this association held in Montreal, and road-building at that time was very new in that part of the country. They were then building the King Edward highway, an ordinary water-bound macadam road, and had completed fifteen or twenty miles of it. They have made tremendous strides since that time, so that their problem is now the same as ours, and they are building more or less permanent types of road. In this part of the country you will make the strides they have made in the more populated centres, and will later be building more or less permanent types of road.

Macadam vs. Concrete Foundations

There are two ways of building asphalt roads, namely, on a macadam foundation or on a concrete foundation. If you build your roads now, on a proper location, and with proper drainage and plenty of outlets, and when gravel is required you put it on, then when the time comes to put on an asphaltic concrete, you will have a foundation that you can lay the road on, provided it is a travelled road. I believe that if you put the asphaltic concrete road on a broken stone foundation, or on a gravel foundation that has been travelled over, so that it is thoroughly compact, you really get better results than if you put it on concrete. Concrete will crack. We cannot stop it from cracking, and the pavement will crack right through to the surface. That of course does not injure the pavement seriously. You can bind up those cracks with a little bituminous material, but you are not likely to have that trouble on an old macadam or gravel road.

Kinds of Asphaltic Concrete Pavements

An asphaltic concrete that we have built successfully, is the one that is covered by the Warren patent, and that is about 7½% of asphalt, 8 to 10% of limestone or Portland cement dust, 50 to 55 or 60% of stone and 25 to 30% of sand, all properly graded. I have laid several hundred miles of that type of pavement, but laid it in the locations where the patent did not affect us, and we were not disturbed. That is the best asphaltic concrete pavement. The second is that known as the Topeka pavement. In that you put a moderate percentage of asphalt, about 8 or 9%, because you use a small-size stone, about a quarter of an inch, and you also use a different grade of sand. We have had very satisfactory results with it. In an inspection tour I made recently, I particularly noted the results of the wear of heavy motor truck travel over the various types of pavement. The asphaltic concrete has stood up as well as any one of the types of pavement I speak of, and has given the service that we expected it to give, and in my classification of pavements I put it ahead of concrete, that is if it is on an old broken stone road or on a concrete base.

Comparison with Concrete Pavement

This statement would probably be disputed by a great many people, because concrete seems to the layman better than anything else, because he does not know anything about it except in a superficial way. The simplest thing to a layman's mind is concrete. Concrete roads are good roads, but you cannot build them that they won't crack. If you can do that, there are untold millions waiting for you. A concrete road after it is laid must be maintained like any other road, and it is usually maintained by being patched and chequered with tar and asphalt poured into the joints, resulting in a very ugly looking pavement, to my mind not a fit one for a park or a city. The asphaltic concrete pavement on a firm base will give

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