additional quantity of traffic, the widths of our roads must also be modified. Road-building is expensive anyway, and when you add a foot to a mile of road it costs considerable money, but we are adding to-day practically 3 ft. to the width of our standard roads.

Of 444 concrete pavements built under federal aid in the United States, 8% were 15 ft. wide, 36% were 16 ft., 42% were 18 ft. and 8% were 20 ft. In other words, we are building to-day just as many 20-ft. roads as 15-ft. roads, and almost half of the concrete work we do is 18 ft. wide. This is a serious problem to the engineer and to the men who finance the roads, whether the county or the state, and adds at least one-fifth to the normal construction of the surface.

Importance of Drainage

Then there is the question of drainage. This presents to us to-day some new thought. I wish someone would coin a new word for drainage, so that when the highway engineer talks about it someone will "sit up and take notice." We have talked and talked about it, yet we go right on building roads in such ways that one would think that we had never heard of drainage or that we don't believe in its efficacy.

The question of capillarity is one of the most interesting things that highway engineers are now thinking about, and I hope before the Bureau of Public Roads finishes experiments now being made, that it will have come to some definite opinions as to the effect of capillarity. We know now that capillarity, with a source of free water available, will soak a subgrade to the point of physical saturation, for a height of 18 ins. above the source of free water, in 24 hrs.; and that the same capillary action will bring water 5 ft. horizontally in 24 hrs. That is an interesting thing. We have lots of places in the United States where roads went to pieces a foot above the water. In New Jersey it has affected construction costs to the tune of $10,000 to $15,000 a mile, and in order to save our surfaces we have got to go to that expense.

This means that the modern highway engineer must get back to the teachings of Telford and Macadam. We are going to go back in construction to the large-interstices base.

We are studying and developing the so-called "black-top" or bituminous construction, which was the first step in meeting the problem of traffic ten years ago, and we are carrying it to a higher degree of usefulness. The tendency is to introduce bitumen of lower penetration. We are using bitumen with penetration as low as 60 to 80, and have automatic distributing machines for putting it down. We are introducing mixed bases for use in the west where water is not readily available for concrete making or water-bound macadam construction. We are laying two-course bituminous construction in order to give greater stability under certain conditions.

Exact Effect of Impact

We are now conducting a very valuable series of experiments in regard to impact. We are observing carefully and measuring the impact of a truck operating over obstacles of vairous sizes from ¼-in. to ½-in. high. We are conducting separate experiments on various kinds of pavements and with different bases; in some cases with saturated bases, and it is wonderful to observe what impact will destroy. We hope soon to know the exact effect of impact, and to know within very definite limits just what will cause failure of pavements. I may say that the whole future of auto-trucking depends upon the results of these experiments.

When we consider that big money is provided indiscriminately for an 18-ft. or 20-ft. track for a truck to roll over at the will of indiscreet and more or less irresponsible drivers, I think we can see that if the destruction by motor trucks cannot be successfully met, that the treasuries will draw their purse-strings rather tightly against the construction of roads for motor-trucking. This is a far-reaching problem, because the destruction by trucks is enormous.

We are also making investigations in regard to the resistance to abrasion. A number of years ago in Detroit, a machine was exhibited that reproduced the action of horses' hoofs, and so determined abrasion. That shows how recently the problem has changed. To-day to study abrasion we do not imitate hoof action, but we are using a machine with five 1,000-lb. cast-iron wheels, and by speeding it we soon determine the life of a pavement. We can put a brick pavement, for example, through its paces in the course of six weeks, simply by giving it such traffic as it would normally get in fifteen or twenty years in the ordinary manner of traffic on the open road.

That raises a most important point,—the question of road construction. We used to build roads by the mile; the time has now come when we have to build them by the square yard. We are purchasing tens of thousands of dollars of materials annually; we have got to know what we are purchasing and what we are paying for. That means laboratory control. We will have to be able to interpret laboratory results in a better manner than ever before.

There have come under my notice lately a number of cases where a laboratory man has thrown out materials which a skilled field man could use by mixing. That alone is a most important thing, and must receive attention to save waste at this time of material shortages.

The science of highway engineering is in its infancy, and it stands to-day on the threshold of a large development.

U.S. Government Does Not Enter Construction Field

In order that I may leave one more word of service with you, I will go back to the administrative side. I would say that in the States, in solving our problem, we have learned that with the state organizations, which is parallel to your provincial organizations, we should rely on the states to carry out the construction. The United States government does not enter into construction. We depend on the states for that, and for this reason: We must handle it at arm's length. Otherwise we would have to duplicate a large field organization, and so we are acting and finding it better to act, through the state departments.

This is an imporant subject to us all; the development that will follow the construction of a well-articulated system of roads is almost immeasurable. Certainly congress and the government of the United States would not appropriate hundreds of millions of dollars annually for road construction unless they felt that in so doing they were bettering the nation.

You have started on a federal program of about five mililons of dollars a year for four years. We also began on five million a year, but our impetus was so tremendous it has almost run away with the American congress, and that is some undertaking.

You will no doubt find it necessary, as we have found it necessary, to develop men particularly skilled in highway engineering and construction. You have excellent instrumentalities. Al that is needed is in your universities, and I am sure you have the engineerng talent among the young men of the provinces, and if they go into highway work and do their part in developing the highways and the highway system of the nation, they will be giving the greatest service to the nation that is possible, and that, I understand, is the goal which your society has set for itself.

Algoma Steel Corporation plan to erect a new structural steel mill to cost about $6,000,000.

Geo. G. Anderson, the Los Angeles irrigation expert retained by the Alberta government, stated at a conference with the provincial cabinet minsters that the proposed irrigation scheme in the northern Lethbridge district was entirely feasible, and that he had satisfied himself that an adequate water supply was available. He had found the survey work already done by the Dominion government to have been carried out with great carefulness and accuracy, but the estimate of cost that had been currently accepted, largely on local and unofficial authority, he believed to be considerably under the amount that would actually be required.