

The Measure of Highway Accomplishment.

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Long ago - long before the organization of society had become so complex - Lord Bacon set forth the doctrine that there are three things which make a nation great and prosperous - a fertile soil, busy workshops and easy conveyance of men and commodities from place to place. Now, no less than in Bacon's time, these are the essentials of national greatness and prosperity; but the importance of transportation is greater in proportion to the increased complexity of the social organization.

For the prosperity of the nation it is not necessary that there shall be tillers of the soil in every community, nor that every section shall convert the products of its soil into forms suitable for use in its own workshops. If all communities are connected and each is well served by adequate transportation facilities, each may develop the kind of occupation and character of production for which its people, its soil and its climate are best adapted, depending upon transportation to bring to it that which it needs of the products of other communities. The highest level of national prosperity is reached when the means of transport and exchange are so highly developed that each individual may apply himself to the labor for which he is best fitted and at which his efforts yield the greatest return.

To make a great nation it is necessary that there shall be easy conveyance of men and ideas as well as interchange of commodities. Common understanding and good will - the best foundations on which to build broad, advanced measures for the public welfare - are encouraged by personal contacts and by the intermingling of individuals within and between communities. The wider such activities extend and the greater the number of people engaged, the more certain and rapid will be the advancement in all measures for the common good.

The degree to which such contacts are developed depends largely upon the relative availability and cost of transportation.

The function of the highways is to provide the channels along which the tide of traffic may flow. Their adequacy to accommodate the traffic of the present, the degree to which they encourage the development of new traffic and the economy of the transportation they afford are the measures of highway accomplishment.

Highways have no value in themselves. It will be well for road builders to bear that thought in mind. They are worthless except as they are used by traffic. Mere extension of mileage is no measure of highway accomplishment unless there exists an economic relation of mileage to demand. Money spent for road construction in excess of the requirements of the traffic is so much loss. On the other hand if the roads that are built fail to accommodate any part of the movement of men and commodities necessary to the development of the territory they serve they are to that extent economic liabilities rather than assets.

In this country it is not likely that we shall be able to build too many roads for a long time to come, but there is more than a possibility that the roads we select for improvement may not meet the most urgent requirements of the traffic. Priority of construction is a problem we must face, and if our decision be faulty our accomplishment, regardless of the technical excellence of our construction will fall short of the full measure of value.

It is more likely, however, that we shall err in the kind of the roads that we build than in the number or the location in which we build them. Type of surface affects so greatly the costs of road construction that the selection of a type stronger or weaker than the traffic requires may easily be the determining factor between economical and wasteful accomplishment. Let me reiterate that the criterion of successful highway accomplishment is economical transportation which is not by any means the same as cheap highway construction. Cost of construction is meaningless except as it is considered with the resulting cost of transportation, which involves the two factors of road cost and the cost of moving men and commodities over the road. It may be assumed that any improvement of the road surface will facilitate, and reduce the cost of vehicular operation. This reduction in cost is the income or return from the expenditure required to make the improvement. Whether the net income will be increased or diminished by constructing a cheaper or more expensive surface in any case is the question upon which hinges the economy of the construction. Mr. Micawber stated

the problem exactly in imparting the familiar advice to David Copperfield which, as you remember, was "Annual income 20 pounds, annual expenditure nineteen nineteen six, result happiness. Annual income twenty pounds, annual expenditure twenty pounds ought and six, result misery." The proper balance of expenditure and income which Mr. Micawber found essential to personal happiness is no less necessary to the success of highway accomplishment. Expenditure may be large or small, roads may be expensive or cheap, in any case economy depends upon equality of expenditure for the road and income from it in the form of reduced cost of vehicular operation. The amount by which income exceeds expenditure measures the degree of successful highway accomplishment.

I am sure that this conception of the problem has not been clearly developed in the popular mind. While highway engineers have waged their wordy battles with the manufacturers and owners of heavy motor trucks, the public has been an interested observer. From one side it has heard the charge that the motor vehicles are ruining the roads; and from the other, the answering demand for permanent roads that will not be ruined. The result, I fear, is that the people have been given the notion that permanence - I prefer to say, durability - is the true measure of highway accomplishment, and that the road that wears out is a failure. There is just enough truth in that conception to make a great deal of trouble for those of us who have the public to please.

It is this notion that has recently proved so troublesome

to the California highway commission, and I know of no better way to illustrate the errors there are in it than to call attention to some of the results of the study the Bureau of Public Roads made at the request of the commission. The trouble arose because of the failure of some of the roads the commission has built in the twelve years since it began operations. Some of the newspaper stories were calculated to give one the impression that the system was practically a complete failure. In order to ascertain how much failure had taken place we made a very close inspection of mile after mile of the entire 1300 miles of concrete highway and we found that the portion that had failed was only about 12 1/2 per cent of the total mileage. There are those who think that even that amount of failure should not have occurred, but let me tell you that the people of California would have, at this time, not more than three-quarters of the improved road mileage that has actually been built for them if the commission had attempted to forestall these failures by designing stronger surfaces. And the changes are that the higher cost of the roads and the slower progress in extension of mileage would have prevented the approval of the later bond issues.

The State's accomplishment in building its roads is not to be measured by the percentage of failure but by the return it has received in highway service. Examined on this basis it appears that the roads have more than paid for themselves.

We made traffic counts at 103 different points on the road

system, and on the basis of these counts we estimate that the system carried in one year something like 400,000,000 vehicle-miles. What is the value of this service to the State of California? If you estimate it at 5 cents per vehicle-mile it would be \$20,000,000 for one year; if you are not so liberal, but would be willing to allow 2 1/2 cents, you still have a value of \$10,000,000. Certainly the value of the 400,000,000 vehicle-miles has been from 10 to 20 million dollars a year. That sum is returned to the community; it is not wasted. Now consider that the total expenditure since 1910 for construction, maintenance and operation has been only \$42,000,000, and I think you will be ready to join me in my belief that if all the roads had been destroyed in five years the people of the State would not have lost a single penny. As it is, the facts that in ten years the value of the State's agricultural production increased 300 per cent and that the population on or adjacent to the State highways, exclusive of the two largest cities, increased 63 per cent while the average for the entire State increased only 44 per cent, seem sufficient to indicate the enormous returns the people have received from their 42 million dollar investment.

In reciting these facts by way of example, I do not wish to convey the impression that I undervalue durability as a quality in highway surfaces. The cost of the surface which must be balanced against the return from the traffic includes the cost of up-keep as well as the initial expenditure. Lack of durability means heavy replacement charges, which often make the road investment unprofitable. The point I am trying to make is that durability bought at a price

which is greater than the return from the use of the road is a poor investment, and a highway system built upon that principle can not be regarded as a great accomplishment.

Great accomplishment - the greatest possible - is continuous, economical highway service. To attain to that measure of success means that the roads built must meet the needs of the greatest number of people at the least possible cost; that the value of the service they render, as measured by the reduction in the total cost of transportation, must be as great as possible, and that interruptions to their continuous service must be as few and as brief as possible, consistent with the other requirements.

Continuity of service can be had only by constant, unremitting, careful attention to maintenance. If there is failure in this respect the most promising construction accomplishment soon goes for naught. Where there is wise concern for the preservation of the roads an inadequate beginning may in time be converted into a well-balanced system of highways by process of up-building. In those of our States which have been conspicuously successful in meeting their highway problems, a wise maintenance policy, it will be found, has contributed to their success; and certainly there can be no highway accomplishment worth while where maintenance of the roads is neglected.