

University of Illinois  
February 21, 1921.

ADDRESS IN CONNECTION WITH THE HIGHWAY SHORT COURSE.

In May, 1920 a conference was called in Washington by the Commissioner of Education to ascertain the number of engineers that would be needed to carry on the great campaign of road building that had been planned. It was brought out that if we took all the civil engineering graduates of all the colleges in the United States each year we probably would not have enough engineers coming into road work to supply the trained force needed and take the place of those leaving the service. Of course we cannot hope to induce all the civil engineer graduates to enter highway work, or even a large proportion of them. The more attractive salaries offered by private industry will continue to draw large numbers of young men; and we shall not be able even to hold our own unless we make a decided effort to interest the young engineers in road work. Such an effort is to be made by a permanent committee, composed of a number of people interested in the promotion of highway and highway transport engineering education. The committee was formed as a result of the conference in Washington to which I have referred. Its purpose is to make highway engineering courses attractive to earnest young men who are willing to sacrifice mere financial gain to enter the public service. There are many young men who do not hesitate to make this sacrifice. There would be more were it not for the unfortunate attitude of the public toward government service. All of us are influenced to a great extent by public opinion, and so long as the public continues to look upon its service as a refuge for the inefficient it will be difficult to enlist the service of ambitious young men. In England the civil service position is regarded as a post of honor. It is the hope of the permanent committee that such a sentiment can be built up in this country, and that young men shall enter upon their college course with the fixed idea of going into the public service. In no other way can we hope to compete with the more than 6000 gainful occupations in the United States. We cannot conscientiously promise large salaries, but we can promise - what is better - the consciousness of fruitful work well performed. Certainly there are few employments that offer the opportunity to contribute so substantially to the advancement of our country.

I should like to leave with you some idea of the benefits which the people receive from the development of a highway system. It is impossible to go wrong in the building of highways if the work is well done. In the State of California a very considerable system has been developed. I am taking California as an example because we have recently completed a very thorough examination of the work which has been done under the State highway commission for the past ten years, and certain facts have been revealed that will serve as the foundation for some statements which I will make to you as to the economic returns from the roads which you are building. I also feel that the service has been in effect in California for a sufficient length of time and over a sufficient part of the State so that we are safe in assuming that what has happened there will happen in Illinois or any other State with minor modifications.

In 1909 the State of California voted its first bond issue of

eighteen million dollars. At that time even in a State so enthusiastic as California, where about 35 per cent of the people lived within the confines of the cities, the bond issue barely received a majority. The work was begun; and in 1915 a further bond issue of fifteen million dollars was approved by a vote of four to one. In 1919 a forty million dollar bond issue was approved by a vote of seven to one. Note the increase in five years - from a bare majority to a seven-to-one vote.

Within the State there are 46,000 miles of roads; in the State highway system that has been laid out there are in the neighborhood of 5500 miles. About 2500 miles have been improved with State and county funds so they are not quite half-way through with their program. To accomplish this result they have spent 42 millions of the State money provided.

Recently, in order to get the benefit of impartial judgment of its work the highway commission asked the Bureau of Public Roads to undertake a study of the conditions. We gladly accepted the commission and set to work, and this is what we found. The 1920 census figures show that at present 54 per cent of the population of the State, exclusive of San Francisco and Los Angeles live on the highways which have been built or proposed. They also show that while the increase in the population of the State as a whole from 1910 to 1920 was 44 per cent, the increase in population on the highways was 63 per cent, and this does not include the increase in San Francisco and Los Angeles. In other words the increase on the highways has been 20 per cent greater than the average increase. That is one of the effects of the highway construction that is worth thinking over.

We then turned our attention to the roads themselves and we found that of the 1734 miles of permanent types of highways constructed 1350 miles were concrete - practically all of it 4 inches thick and 15 feet wide. There had been a great deal of criticism of this type of construction, and we made a most careful examination of it to get at the facts. We classified nearly every mile of it by the cracks in it. Perhaps at first glance this may not seem to be a logical classification, but we found that we were able to make a thoroughly satisfactory classification into six classes, designated by the letters A to F, which fairly represent the relative condition of the various sections of the system constructed. Every tenth of a mile was examined and assigned to one of the six classes, and the classification thus made was checked and rechecked. In class "A", the first class, we placed all pavement which showed only the normal number of transverse cracks for a pavement built without expansion joints. Class "B" has more than a normal number of transverse cracks and perhaps some "crow foot" corner cracks; in class "C" we placed all pavement similar to the first two classes but with one longitudinal crack. Classes "D" and "E" are badly cracked pavement and class "F" is the disintegrated pavement. The pavements in the first three classes are useful and satisfactory roadways. Classes D, E and F are unsatisfactory; it does not necessarily follow that they should be rebuilt at once, but they will have to be re-built or strengthened, the thickness increased, and the pavement widened in the reasonably near future. Of the 1,262 miles of highways thus classified, only 157 miles, or 12 per cent, is included in the three lower classes. We found invariably that the bad pavement, or the pavement which was badly cracked, was on a bed of clay soil. This we could explain generally as being due to the failure of the soil as a support, but in many cases,

however, it was probably due to the materials used or the poor supervision of the construction and the workmanship. But the fact remains that only 12.5 per cent of the pavement classified had deteriorated to the point where it could be said to be poor pavement. It is a wonderful record for an engineering organization. From a length of over 800 miles throughout the State we took more than 600 concrete cores at intervals, here and there, and tested their strength. The average strength of all of them, including the 1:2½:5 concrete, which was first built presumably as a base for a bituminous covering, and the 1:2:4 concrete which was later built, was 3000 pounds. None of the concrete was as rich as you have used in this State. Everywhere we found the pavement to be as thick as or thicker than the specifications required. There is something for you to think about - six-hundred sample cores and not one less than the required thickness! Gentlemen, no delinquency on the part of the engineer can be covered up. Whatever he does must measure up to the inflexible standards of nature. In measuring up to that high standard lies the satisfaction and the delight of the work. The California engineers have met the test, and they have the satisfaction that comes with honest work well performed. By painstaking effort and honest care you can earn the same reward, and I am sure that none of you wants to come back to this meeting a year or ten years hence, and find a row of cores 5 inches high taken from pavement supposed to be 7 inches thick.

In California last year on those thirteen hundred miles of highways, according to the traffic census which we took this summer, the traffic amounted to over 400,000,000 vehicle-miles. There are over one hundred motor bus lines in operation on regular schedules and it is now possible, by transferring from one company to another, to take a continuous trip on the coast for a distance of twelve hundred miles. The amount of produce hauled was not, as you would expect, proportionately as large for the State of California as for Illinois.

California highways had paid back to the people every cent of money that they have invested the last ten years. Five cents a mile saved in the operation of each vehicle will more than repay the cost. It is your business to duplicate in Illinois what has been done in California. Remember that the need for highways has come suddenly upon us. The highway engineer has never been able to get into step with the program demanded. We have always been about one step behind the interests of the country; and the public, we think at least, are just a little behind us. So let us not be impatient when we hear it said that the engineer is worth no more than he gets. Rather, let us leave a better word, a little germ of educational thought in the mind of the man who criticises. Honest work and unselfish service have never failed of their reward, and you can be very sure that the highway engineer, if he remains true to his ideals will gain the public recognition of his value to the community.