

Cosmos Club
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Address before Organizing Conference of Engineers.

I trust none of you will be alarmed by the number of papers that I have in my hand. The only object in presenting any statistics is to give the engineers who are represented here an adequate idea of the extent to which the improvement of public highways has become one of our great public activities. Even so short a time ago as 1916, the total estimated expenditures for highway improvement in the United States was about \$272,000,000. In 1917 that figure was \$279,000,000. In 1916, the Federal aid road Act was passed, appropriating originally \$75,000,000 to be expended over a five year period, in the ratio of 50 cents of Federal money to 50 cents of local money. It was assumed that would be the rate at which the Federal aid program could normally develop, \$5,000,000 the first year, \$10,000,000 the second year, and so on. Then the war intervened almost before the States had an opportunity to pass the laws required to provide the funds and to form the organizations necessary to administer the Federal Aid Act. At the time of the original Federal aid act, July 1916, there were 16 States which had not a highway department of any adequate character, and a number of others who did not have any State appropriations for carrying on the work. Their duties were advisory or supervisory. During 1916, 1917, and 1918, all of the states formed highway organizations and passed revenue laws to provide the funds to meet the Federal appropriations; but very little work was done. During the year 1918, for instance, only a half a million dollars was paid out of the Federal aid funds, showing that the building of roads had come practically to a close. The figure, \$272,000,000, which was available for the year 1916, may be contrasted with the funds available for this year, which we estimate at about \$783,000,000, or more than three times as much.

The significance, however, of the highway engineer in this program is illustrated better by the fact that in 1916, we estimate that there was about \$74,000,000 spent under the control of the State highway department, and about \$198,000,000 spent under local control, and not under the State highway department. The percentage under highway department control was about 27 per cent of the total expenditure. This year, the amount available for expenditures under the State highway department and federal control, we estimate is \$633,000,000, and under local control is \$150,000,000, about 81 per cent of the total expenditures is to be spent under engineering control of the Federal and State Engineers. It is an extremely significant fact to me that we have advanced in the three year period since 1916, from the position where only about 27 per cent of the highway moneys were spent under the supervision of engineers to a point where about 81 per cent of the total funds available will be spent under engineering supervision.

I wish to emphasize the fact that I am talking about money available, and not the estimated expenditure for this year for it is problematic how soon the money now available will be expended.

There are in the United States somewhere near two and a half million miles of roads. The State and Federal laws have limited the expenditure of the State and Federal money to approximately two hundred thousand miles of the principal highways. The mileage built to 1916 under the State highway department was 59,000 miles. In 1918, that

total amount had advanced to 93,000 miles, or about 3.7 per cent of the total mileage of the country. This is not truly representative of the advance in control or in activity of the engineer in highway matters. The real advance is much better illustrated by the fact that in 1916 3 per cent of the total mileage of highways was maintained by the State departments under engineering control, while in 1918, about 8.1 per cent of the mileage was so maintained. In other words, at the present time we have advanced to the point where approximately the same mileage is maintained on State highways upon which we can legally expend the State and Federal money. I do not expect to see this mileage considerably increased immediately, but we are unquestionably advancing towards a more centralized form of control of all expenditures for highway building and maintenance.

If you recall the past history of the development of the highway departments, you will note that the first departments had only funds for State aid. Then they were given funds to build, as a State organization, certain roads. As the character of the results have become apparent, and as new laws have been passed, we find that more and more of the supervision, even of local expenditures, has been given over to the State highway departments. In speaking of the State highway departments I should include the Federal Bureau of Public Roads, because all of the Federal aid funds are expended under the joint supervision of each State highway department and the Federal Bureau.

The number of men who are at present engaged in the highway work is also significant. From a recent census we have the results from 36 States, who report approximately 7500 engineers employed by the State, or the State and County, organizations. This means that approximately 10,000 engineers are now employed in the road work, and the number would be increased at certain seasons of the year by men who might or might not be technical graduates, in the capacity of inspectors and field assistants.

To give you an idea of the requirements of the highway field in the future, we made an estimate that when the present freshman classes graduate from the engineering colleges there would be perhaps in the neighborhood of 5500 men finish engineering courses, and if the percentage which exists in some schools, of about 20 to 25 per cent in civil engineering, holds good, there would graduate not over 1,000 or 1200 potential highway engineers. That is three years from now, and our estimate of the number of men needed annually in the highway field will absorb the entire number of civil engineering graduates. Only a percentage of them will go into highway engineering. We must recognize this fact because there are so many other phases of civil engineering and allied branches that are calling these men, particularly in the industries.

From the figures that I have given you, and from this later statement, it is apparent that a responsibility has come to the engineers of the country and to any organization that may grow out of this Conference. Highway engineering and highway administration is, at the present time, in the hands of engineers. It is one of the big public activities in which engineers are directors as well as laborers. In the highway field we do not admit that the engineer is only capable of running a level or a transit, or superintending the actual construction work. We insist that he is capable of inaugurating policies, of acting

as the executive head and directing the affairs of the big, strong highway departments, and of the Federal Bureau itself. This fact points to the field that engineers must continue to occupy in the future, and also points the way towards the usefulness of an organization which may grow out of this Conference, in directing the attention of young engineers -- or men who are expecting to take an engineering course -- to the highway engineering field, and in helping, in every way possible, to prepare men to take the responsibilities of doing the actual engineering work itself, and of taking control in the executive and administrative capacities.

If you approach the highway executives in the state departments today you will find that their problems are not problems of design, although we have plenty of these with the advent of five, seven and ten ton motor trucks. The big problems are not those of the draughting room or of field construction. They are mainly those of administrative and economic character.

Our highway construction program for which we have available nearly a billion dollars today, will lag behind because of the economic limitations. During the period of the war, highway construction was placed in the same non-essential class as the making of pianos and musical instruments. We have a program agreed upon between the States and the Federal Government, of 27,000 miles of highway of all types. We have completed 4,000 miles, enough to reach across the Continent and more. We have 9,000 miles under contract, or one-third of the agreed program, and we are now being forced to curtail that still further. If all of the industries and all of the other activities which are no more essential than the building of improved highways, will limit their program to one-third, I believe there will be enough rail transportation, enough material, enough labor and contractors' equipment, to carry on. We have really come to the point where we must refuse longer to be placed in the non-essential class; particularly since a recent order of the Interstate Commerce Commissioner recognized the fact that in this day of insufficient transportation the highways must take their part. In one of their recent orders they advised that commodities which could be moved by motor truck, and passenger traffic should be so far as possible put on the highways. So this is another field in which an organization of engineers can be of immense value to the highway industry of the United States. We have come in the past two or three years to recognize the limitations of money as such. We did not expect to see the war last long because we felt that the people would run out of money. We actually found they ran out of material things. So it is with our present public road program. It is not so much a question of money as it is a question of the material things; and we believe that public highways are of sufficient value, of sufficient necessity, that we should have the fair pro rata of available transportation, materials, and labor.

Just one word further as to the classes of roads that are being built. Up to May 1st, the total estimated cost of all projects which have been agreed upon between the Federal and State Governments is about \$368,000,000. Of this, the expenditure for the earth, sand-clay and gravel types of roads, will take about 26 per cent. These types we may call the primary or first stage of road making. The intermediate miscellaneous types are limited to 9 per cent, while the bituminous and cement concrete, brick and miscellaneous high types will take 60 per cent of the expenditure. It seems to me that any national organization which may grow out of this conference will have the responsibility of helping the highway interests to obtain a sufficient

number of new engineers every year to take the place of those who drop out, and to fill the places opened by the rapidly expanding program; to fill engineering positions in the production of construction materials; to fill the places necessitated by the enlargement of contractors' organizations. It will be necessary also, and it seems to me that it should be accomplished by a great national organization of engineers, to create in the minds of the public a different attitude towards public service as a career for the young engineer. This is a matter that the State highway departments and the Federal Bureau are going to find more serious in years to come. The men who are in the work today will doubtless stay, but the young engineer is being attracted to other fields. The public service does not have a strong appeal, largely because of the attitude which has been taken by the public itself toward public service. A great national association of engineers could gradually develop a much more favorable attitude on the part of the public toward its public servants, and make public service as a career more desirable to the young man just entering his life work. The industries have quickly responded to the demand for increased compensation to meet the higher level of living costs, but the public has been much slower in its response. There is now proposed a re-classification plan for the Federal service, and should the recommendations which have been made by the Re-classification Commission be adopted by the Congress, a much more satisfactory condition will have been established in the Federal service. The same need of compensation adjustments exists in the State highway departments, although perhaps not to the same degree as in the Federal service, on account of the adjustments which many of the States have already made. From the standpoint of the future development of the highway work, the public cannot afford to have less capable or less efficient men in its employ than can the industries. Generally speaking, the administrative and executive positions in the State highway departments are held by technically trained men. This is as it should be. But the highway program is still in its infancy. We will spend in the future for this purpose untold millions, and an organization of the character proposed here can do a great work in helping to direct the attention of the public to the necessity for building up highway organizations to which can safely be entrusted the expenditures of these large funds.