

community, and in the carrying out of the work to leave them with as free and unhampered control as is possible under the laws of the state in which they are working.

The sums of money which are now being expended in this country for the construction of highways are of considerable magnitude, aggregating, I am informed, for the year 1911 about \$150,000,000; out of this amount probably \$50,000,000 will be obtained by a direct bond issue, and in many cases, the means taken for the redemption of these bonds are not altogether apparent. Further than this the experience in this state shows that from 10 to 15 per cent. of the amount expended in the roads needs to be expended annually to maintain the roads as they have been built up to the present time.

Careful Study Necessary.—It may readily be seen, therefore, that it will not be necessary to go far before it may become apparent that any state may be bankrupted by carrying out all desires for new and improved highways in sparsely settled communities. Careful study should therefore be made of each section of the state and the road construction adapted to the needs of the inhabitants, with such changes as may be necessary in order that through routes may also be provided along the lines of maximum travel from the main centers of population, and after this is done it still remains to have some proper administration of highway officials to devise a road which in its maintenance will not take all of the good from the people which the construction of the road in the first instance seemed to imply.

Mr. Bensei was followed by George W. Cooley, State Engineer of Minnesota, who spoke on conditions in Minnesota, and said that road patrols were a necessity to good maintenance. Minnesota uses convicts as road patrols with good success. President Parker also spoke in the discussion, and said that maintenance of roads was of equal importance to their construction. R. A. Meeker, State Supervisor of Roads for New Jersey, was the last speaker, and explained the road administrative system adopted in New Jersey.

Problems of Construction.—By Major W. W. Crosby, Chief Engineer of Maryland State Roads Commission.

The speaker called attention to proper grading and installing of underground structures, drainage, subgrade and surfacing. He also spoke of the reconstruction of old roads. Regarding underground structures, he said they should be installed as early in the proceedings as possible, especially those which cross the road. He said that such procedure not only insures their being out of the way, but also allows more careful construction and better results in the back-fill.

Major Crosby thought the matter of subgrading one of the most important of all construction problems. In his judgment more failures in surfacing have had their rise in defective subgrades than any other source.

Best Highway Commissioner.—The discussion was led by R. A. Meeker, State Supervisor of Roads of New Jersey, and Charles W. Ross, Street Commissioner of Newton, Mass. For his description of what a good road should be in a general way, Mr. Meeker quoted from Isaiah the following passage:

"Every valley shall be exalted and every hill brought low. The crooked shall be made straight and the rough places smooth." What better description could you want of a main highway?" asked Mr. Meeker.

In regard to adding bituminous substances to road surfaces, he said he was convinced that a return must be made to rolling and puddling roads thoroughly before placing the bituminous matter. Referring to the statement made at the morning session that engineers were not always essential, he said that civil engineering was condensed common sense and

experience. He said that too often when county or city officials had decided what they wanted they required engineers to do in five minutes what had taken the officials two years.

Charles W. Ross, Street Commissioner of Newton, Mass., was introduced by President Parker as the best street commissioner in Massachusetts. Mr. Ross said that in his opinion the most necessary thing was first to look after the surface water. He said that sewer, gas and water mains should be made to connect with the back of sidewalks. Too often, according to the speaker, corporations came along to tear up the streets after they had been made, and in resurfacing them an inferior material was used. He advocated the resurfacing of a torn up road by the city instead of the corporation for whom it was torn up.

Congressman Danforth Speaks.—Congressman Henry G. Danforth gave an interesting talk, in which he advocated following the line of the least resistance. He outlined the philosophy and history of road making, beginning with the Indian, who made a trail on the highest ground and forded rivers at their shallowest points, down to present times, and concluded with a statement relative to the cost of construction. He said:

"If you are going to build roads at the cost of \$13,000 a mile, when the total value of farms along the highway may not be worth that, the cost is excessive." Another interesting talk on water-bound macadam roads was made by George C. Hoyer, of Rochester, a State Highway Inspector.

"Problems of the Contractor," by C. A. Crane, Secretary of the General Contractors' Association, and an informal discussion on bonds and deposits, delayed payments, labor laws, percentage bidding and lump-sum and unit-price bids.

The organization of which Mr. Crane is secretary has a membership in New York city of eighty-seven companies and he addressed the convention at length on contracting problems. Harold Parker, the president, yielded the chair for the day to the third vice-president, James Owen, of Montclair, N. J. Mr. Owen was particularly earnest in his support of the proposal to have a committee named to draw up a contract that would cover the various demands that have to be considered in the building of roads.

Barge Canal Contracts Scored.—Mr. Crane criticized the barge canal contracts. He said that the specifications are too one sided and make the contractor responsible for the engineer's mistakes. Unsatisfactory and unreliable information is furnished to the contractors, Mr. Crane said, and the strict requirements prevent the contractors from making the money that is their just due. In part he said:

"It is unfortunate that there is a more or less prevalent tendency to associate contractors on public work with politics and graft. You men who plan and supervise the work know that, in the main, the contractor gives full value for money received. The exceptions are no more frequent in the contracting than in any other business."

Two provisions of the labor law were severely rapped by Mr. Crane. He said these impose hardships on contractors and there is no reason for the prohibition that none except citizens of the United States shall be employed on state work. Mr. Crane also opposed the provision that compels contractors to pay the prevailing wage. He declared that if the courts should uphold the clause barring alien labor, the state work would have to come to an end, as there are not enough citizen laborers to perform it.

Incompetent Engineers.—The speaker held that it was impossible to establish a prevailing wage. He said that if the state imposed fewer statutory restrictions in its contracts there would be less trouble between contractors and en-