

He referred also to the experience of New York State with respect to highway bonds, and criticized the method of issuing 30 to 50-year bonds at 4 or 4½%, in that the road wears out long before the bonds have expired. It was stated that, roughly speaking, grading involved about one-third the cost; foundation another one-third, and the surface the balance. But the surface wears out from year to year and an annual appropriation, not connected with the bond, should be applied to it.

Mr. Diehl thought that the city should be required to pay a fair proportion of the cost of construction and maintenance of surrounding roads. The benefit to the city is great. Buffalo contributed several millions in this respect to adjacent counties. The speaker cautioned against frequent change of heads of a highway department. He felt it to be a serious mistake. He referred to one instance where there had been twelve different heads in fifteen years. A lot of money had been lost through inexperience and changes of organization. Another point upon which the speaker dwelt was the inadvisability of improving highways in patches. One frequently came across several miles of good roads interspersed with occasional stretches of mud. The best policy was to commence road construction at the centre of population and work outwards along the principal thoroughfares. A careful keeping of records is indispensable to economic work. It was owing to this that the changes of organization above referred to involved waste of money. Some cost data were given respecting expenditure and reconstruction.

In the discussion which followed the presentation of Mr. Diehl's paper, the importance was brought out of a careful predetermination of financial conditions, traffic, soil conditions and probable future use of the road to be improved. To a question relative to cost data of maintenance of bituminous surfacing in New York, it was replied that no good records were obtainable on account of frequent changes of officials. It was stated that best records obtainable were those in England. From \$800 to \$1,000 a mile for maintenance and reconstruction was a general reply respecting New York. The speaker suggested the use of the term "per ton of traffic" rather than "per mile" as more suitable. Respecting bond issues, it was emphasized that the term should be "short."

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Wearing Surfaces.

By George W. Tilson, Consulting Engineer, Borough of Brooklyn, New York City.

The author reviewed the history of surface improvement, including the systematic road building movement in England early in the nineteenth century under the direction of Telford and Macadam. It is stated that the importance of road building received but little attention in America prior to the advent of the bicycle in 1859. Later the development of the automobile caused the subject to be taken up with increased vigor. The movement has grown to such an extent that in the last six or eight years, for instance, New York State had issued bonds to the amount of \$1,000,000,000, the greater part of which had already been spent. A total of 34,000 miles of improved roads were constructed in 1913 and 1914.

Mr. Tilson analyzed roads into the usually accepted classes from the cheapest form, the earth road, upwards according to expensiveness. The essentials of good construction in roads of sand-clay, gravel, waterbound macadam, bituminous types, etc., were summarized in brief, and some notes respecting cost included.

Finance.

By S. L. Squire, Waterford, Ont.

While the need of good roads is obvious to everyone, of city and country alike, there is much educating to be done to overcome misconceptions and uncertainties respecting cost. The average farmer would rather have roads as they are than run the risk of paying too great a price for their improvement. The speaker emphasized the necessity of instilling into the minds of the rural population the willingness of the cities to pay their share of the cost.

He commented upon the recommendations of the Ontario Highway Commission respecting apportionment of suburban road costs.

An important feature of Mr. Squire's address was the emphatic manner in which he supported road development rather than delay under present conditions. The war had developed industries, made markets for more farm produce, and created better prices. Owing to the war, wheat was selling at \$1.60 per bushel rather than 80c., making a difference of some \$8,000,000 to the farmer. He should be in a position to pay his share as outlined in the Commission's recommendation.

Honest administration, claimed the speaker, would help more to bring the farmer into line on the good road movement, and it was very necessary before he could be convinced that road improvement is so decidedly to his advantage.

The paper closed with an admonition that the present is not any time to hesitate in the matter of road improvement, but rather that the government should advance it as materially as possible.

In the discussion which followed, it was suggested that in order to provide money for road improvements the war tax of 1 mill, about to be levied, should be continued after the war. It was the general impression, as advanced by Mr. H. J. Bowman, Berlin, Ont., that each county, having special conditions to meet, should devise its own scheme. He was strongly in favor of a pay-as-you-go system.

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In a few remarks of welcome made by Dr. R. A. Falconer, president of the University, it was pointed out that the enlargement of transportation by the construction of better roads would reduce considerably the high cost of living in cities. He emphasized the necessity of the engineer in Canadian development. Efficiency and thoroughness were vital. That experts must be employed to guide the communities in this great work was brought out by the European war.

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Road Laws.

By B. Michaud, Deputy Minister of Roads, Quebec.

The speaker dealt with conditions as found in Quebec province, with the classification of traffic and the mileages of rural roads. This was followed by an explanation of the road laws of Quebec and some observations respecting a comparison thereof with those of other provinces. The road department of the Quebec government does the work directly, with the exception of bridges and culverts, which are let by contract. The province is divided into twelve districts, each with an inspector who makes daily reports. Some interesting information respecting the government's equipment and machinery was given. The governmental grant for maintenance of earth and gravel