

## Road Repairs and Maintenance

**T**HAT highways constructed with borrowed money should be strictly maintained, is the keynote of a chapter in Department of Agriculture Bulletin No. 136, dealing with highway bonds. It has not been customary for officials to face frankly the cost of the maintenance and repair of bond-built highways at the time the bonds are issued and before construction begins. In fact, the authors of the bulletin point out, in the majority of cases where bonds have been issued by local authorities there has been no provision whatever for maintaining the roads when built. This is perhaps the greatest defect in the method of building highways by issuing bonds.

### Maintenance Necessary.

Maintenance, the highway experts of the Department point out, is necessary in order to insure to the community the maximum economic service by the road, and also to preserve the investment. The cost of maintenance and repairs must, therefore, be studied at the outset. In the absence of general data, the reports on maintenance from states which have highway departments should be of interest to county officers preparing to issue road building bonds.

The following opinions as to maintenance cost represent the results of careful analyses of state highway reports, as well as much first-hand information gathered by the Department's specialists:

### Gravel Roads That Last.

Well-constructed gravel roads will sometimes sustain several years of traffic without showing marked deterioration, even when there has been no maintenance. Such roads sometimes even improve during the second season; more frequently, however, they show ruts or the formation of chuck holes. It can not be expected that the average life of a gravel surface will be greater than that of a macadam surface.

The average interval for re-surfacing macadam roads is between six and seven years. If a sum equal to two-thirds of the original cost of the gravel surface itself is provided for renewals at six-year intervals, it should be estimated at from \$150 to \$250 per mile per year. If \$30 is then allowed for annual dragging and small repairs, the total annual cost of repair and maintenance of gravel roads would be from \$180 to \$280 per mile.

The annual cost of strict maintenance is sometimes below \$30. In Bennington County, Vermont, during 1912, 175 miles of gravel roads were maintained at a cost of \$20.70 per mile. The annual cost of maintenance and repair on sand-clay roads, including all necessary re-surfacing at periodic intervals, should not be fixed at less than 10 per cent of the original cost.

### Macadam Roads.

The cost of repair and maintenance of water-bound macadam roads has been determined with considerable exactness from Massachusetts figures and checked by re-surfacing charges in other states and in Germany. From \$100 to \$125 per year ordinarily pays for necessary small repairs, such as patching, cleaning culverts, etc., and from \$400 to \$425 per year is the necessary annual charge for re-surfacing at periods varying from six to seven years.

The sum of \$525 per mile, on an average, should therefore absolutely maintain macadam roads if changes and increases of traffic are not excessive. It must be understood, however, that in many instances where macadam sufficed for the volume and character of traffic prior to 1906, it will not withstand the action of the motor vehicle traffic, which has developed since that time.

Many miles of ordinary or water-bound macadam road have been re-surfaced with bituminous materials and many miles of new bituminous-macadam road have been constructed. The logical maintenance of such highways is a surface treatment with bituminous material and rock screenings, clean gravel, or sharp sand. The cost of such surface treatment is from 4 to 12 cents per square yard, and it may be expected to last from one to three years, according to the density of traffic and the success of the application.

Theoretically, perfect surface treatment would constitute absolute maintenance for a bituminous-macadam road. Such maintenance is seldom or never realized and bituminous-macadam roads doubtless require resurfacing at intervals. The

cost of such re-surfacing is not yet known.

### Cost of Repairs.

The average cost for repair and maintenance of 7300 miles of highway in Connecticut, Massachusetts, New York, New Jersey and Rhode Island for the year 1912 was about \$500 per mile. A large part of this money was expended for bituminous resurfacing and bituminous surface treatment. There is some question whether the expenditure correctly measures the average cost of repairing and maintaining bituminous-macadam roads.

In the State of New York, however, for the years 1911 and 1912 the average cost for repair and maintenance was \$724 per mile upon a total average of 2861 miles. The annual cost of repair and maintenance on Massachusetts State roads for the years 1910, 1911 and 1912 was, respectively, \$642, \$647 and \$676 per mile for about 850 miles. For the most part these figures for New York and Massachusetts represent the cost per mile of resurfacing with bituminous material and of maintaining bituminous-macadam and water-bound macadam roads by surface treatment with bituminous material.

It is clear, therefore, that \$700 per mile is not an excessive estimate at present for the annual cost of all repair and maintenance of bituminous-macadam roads.

### Kings and War.

A proud King dreamed in his gilded chair;  
He dreamed—and sighed, for the lands were fair!  
A King said "Yea!" It was but a breath!  
And a million men marched toward the gates of death.  
A million wives gasped as their husbands sped;  
A million babes starved as their fathers bled.  
A King sought gain in the north and south—  
And a million men marched toward the cannon's mouth.  
—Thomas Curtis Clark.



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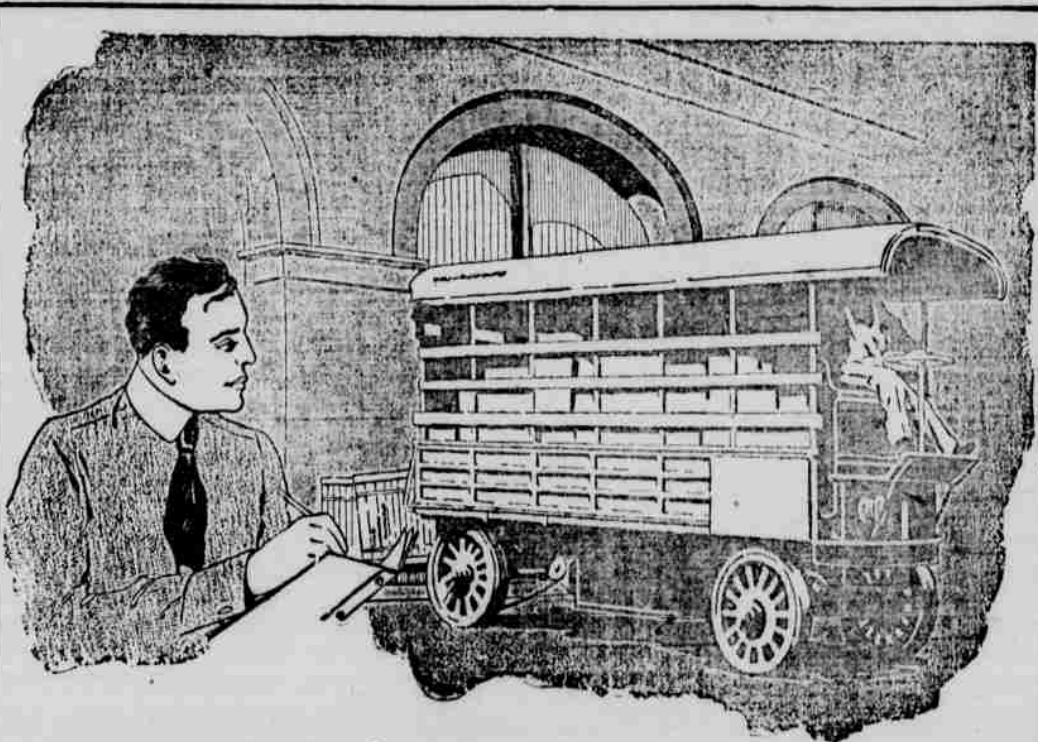
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