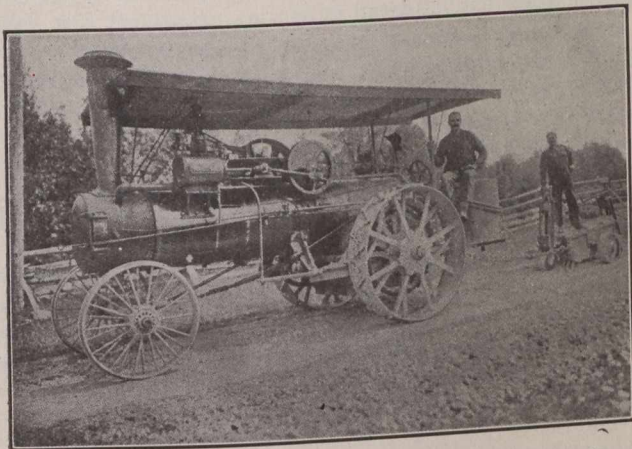


ROADS AND PAVEMENTS

THE SCARIFIER.*

The road scarifier is a machine almost unknown in Ontario, but is an extremely useful one for roadmaking purposes. A scarifier has been used by the County of Frontenac during 1909. This machine cost \$475, and is used in breaking up the surface of old stone roadbeds, in order that the roadbed may be properly shaped before putting on new material. It is of special use in a locality such as Fron-



A Road Scarifier operated by Traction Engine in Frontenac County.

tenac, where crushed stone has been largely used for years. By means of the scarifier, the grading of these old roads can be more cheaply and effectively done. When properly shaped, there is a considerable saving of new material, as less new crushed stone is required to crown the road and fill up inequalities. This work is at times done with a road grader, but is a severe strain on that machine and usually results in considerable outlay for repairs. Counties and townships having the treatment of old gravel and stone roadbeds to consider should study the results obtained by the use of a scarifier.

*From the Ontario Highway Improvement Report, 1910

WORK PRELIMINARY TO ROAD CONSTRUCTION AND STREET PAVEMENT MAINTENANCE.*

Geo. C. Warren, Boston, Mass.

I propose to show that the success or failure of a pavement is fully as likely to depend upon causes beyond the contractor's control, both preliminary to the construction of the pavement and subsequent to its completion, as to perfect or faulty workmanship or materials; although, when a pavement fails to sustain traffic, the public universally, and officials generally, attribute the result to a combination of inefficiency and poor material, for which the contractor is held responsible.

At the outset I believe we shall agree that water is the great enemy of pavements, and the most common cause of their undoing, even when blocks of sandstone or other com-

paratively soft stone are used. The only material that is not seriously injured by the destructive influence of excessive water is granite, and even that is injuriously affected.

The sources of deterioration from water may be summarized as follows:—

- (a) Improper sub-drainage.
- (b) Excessive sprinkling or flushing.
- (c) Lack of efficient cleaning.
- (d) Sub-drainage, due to the absence of pavements, or to their improper construction, between and around railroad tracks.
- (e) Too flat crown or grade to provide proper surface drainage.

All of these features are absolutely beyond the control of the contractor, yet they provide most fruitful sources of dispute between him and municipalities as to the responsibility for defects which develop subsequent to the expiration as well as during the maintenance periods of paving contracts.

A discussion of each of these features will be useful.

Sub-Drainage.—Perhaps there is no part of street pavement construction which is given so little intelligent consideration by engineers, or in which local custom is so blindly followed from decade to decade, as this matter of sub-drainage. And yet practically every writer on street pavement construction from John Macadam to the present day has referred to sub-drainage as the first essential to successful road or pavement construction. We find cities where the prevailing sub-soil is clay, which affords inadequate natural drainage, providing no artificial drainage for their pavements. We find other cities where the sub-soil is either sand or gravel, that affords the best possible natural drainage, providing for their pavements elaborate systems of sub-drainage that are, of course, wholly unnecessary. Again, we find cities adopting systems of sub-drainage in use in other cities where the sub-soil, and, consequently, the artificial drainage requirements, are radically different.

Several years ago I learned of a most glaring example of this copying process, which illustrated perfectly the lack of application of ordinary engineering, not to say "horse" sense, in pavement drainage. The municipal authorities of a lake city built on sand dunes, and having few manufacturing industries or railroads, evidently feared that the local engineers were not competent to prepare the plans and specifications for expensive paving work, so they engaged for the purpose a consulting engineer from Chicago. He practically copied the standard plans and specifications of the city of Chicago. It is well known that the prevailing soil in Chicago is clay, and that the railroads and factories of the city provide large quantities of cinders, which serve the purpose of an excellent cheap filling for sub-drainage purposes. In copying the Chicago specification in general, the engineer included the drainage specifications, which called for soft tile below the curb, and filling of cinders around the tile and to the bottom of the curb. The result was a very elaborate and expensive artificial drain system, wholly unadapted to the conditions that had to be met. The specifications provided for cinders, which had to be carried over two hundred miles by rail to be used in the place of the sand upon which the city stood, and which, at no expense, would supply the best possible natural drainage to be procured. Evidently the engineer in this case gave absolutely no consideration to local conditions, but blindly copied and adapted what had been found good for Chicago.

As a general rule, however, the fault with drainage is due to the fact that no artificial sub-drainage is provided

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