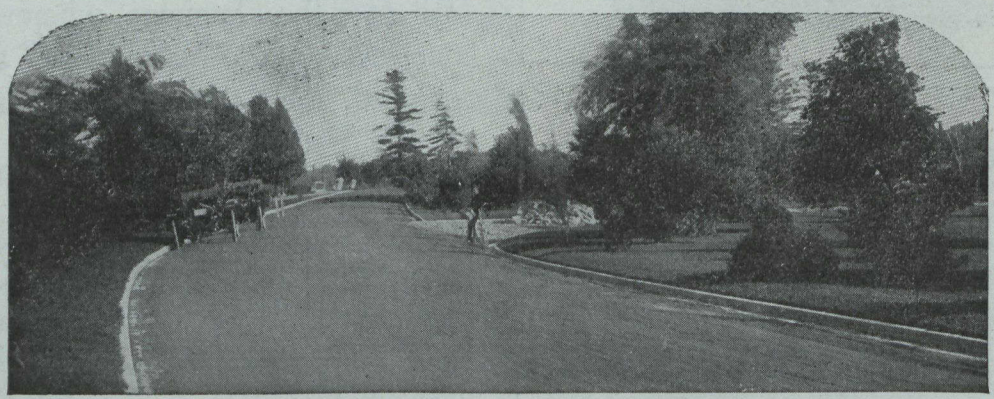
Use of Refined Tars in Road Construction and Maintenance

(By J. RANDALL ROBERTS, B.Sc.)

It is a well recognized fact among highway engineers that one great cause of the distintegration of waterbound macadam and gravel macadam roads is "internal attrition."

When a heavy motor truct or automobile is travelling up a grade or even along the level, there is a strong strust developed under the driving wheels, which, while propelling the vehicle forward, tends to push the upper part of the road backward. The same is also true in the case of horse-drawn vehicles, only here the "thrust" is under the horses feet. This "thrust" causes a slight rubbing of one stone on another in the wearing course of plain macadam roads, which in a comparatively short time causes internal wear, and results in the formation of depressions and hollows, even though the foundation may be still firm and unyielding.

To overcome this difficulty, dense, heavy, refined tars have been used as a "binder" for many years in England and France, and for about twelve years on this continent. Abroad, the method followed has been to mix the crushed stone or slag with the heavy refined tar (at boiling temperature) and place the mixture on the prepared foundation, consolidating the whole with a suitable roller. This method has been followed on this continent to some extent, but the greater percentage of "tar macadam" is built by the penetration method. In this case, the layer of stone is placed upon the prepared foundation to the desired thickness, and then "grouted" with the heavy refined tar, at approximately boiling temperature. The road is then finished by covering this course with smaller stone, sealing same with additional refined tar, and then covering with sand or screenings and rolling. There are several refined tars on the market, one of the best known being tarvia. A tarvia "X" macadam road corresponds very closely to the standard English practice in new construction.



GOVERNMENT PARKWAY, OTTAWA, ONT.
13 Miles, Maintained since 1910, with tarvia.

Tar macadam is an especially suitable type of road for trunk line highways, where the traffic is fast and heavy, on account of its durability and low cost of maintenance. In villages and towns, and in the residential sections of the larger cities, tar macadam is also very satisfactory, on account of its dustlessness, as well as durability and low maintenance cost. Under ordinary conditions, this type of road costs between sixteen hundred and twenty-five hundred dollars per mile more than the corresponding plain macadam, depending on length of haul of material, width of roadway, etc. In considering the question of road cost on a five-year basis, or longer, which is really the proper method, it has been proven many times that this extra initial outlay is more than justified.

The consideration of road costs over an extended period brings up the question of maintenance, the importance of which is only just beginning to be recognized by the average municipal official. Tar macadam should be watched closely during the first year of its life, as this is the most critical period. Any weaknesses which develop, such as formation of depressions, or buckets, due to poor foundation, or lack of sufficient "binder," should be repaired at once, so that the whole road will wear uniformly. From time to time, say every two or three years, oftener under heavy traffic, the whole road should be "painted" over with a light refined tar, and "blotted" with sharp sand or clean screenings, at a cost of from three to six cents per square yard. In this way, the surface is renewed as often as it wears out, so that, if the workmanship and materials used in construction were of the first class, the road may be made to give the greatest satisfaction and service indefinitely and under economic conditions.

This method of maintenance by surface treatments of refined tar is equally applicable to plain or water-bound macadam and "gravel" macadam roads, as well as tar macadam, and is, in fact, one of the very few successful methods of maintaining these types of road. A great deal of car must be taken, in all cases, in cleaning the surface, so that the new coating of light refined tar will stick and not peel off. It is needless to state that the road should be thoroughly dry at the time of application.

In general, it may be said that, under a comparatively heavy mixed traffic, composed of both horse-drawn and motor driven vehicles, light annual applications of light refined tar (cold application) with sand covering, give the most economical maintenance. In parks, cemeteries, private drives, etc., where application but once in two or three years is contemplated, a denser refined tar, applied hot, covered with clean, half inch stone, seems to give greater satisfaction, as by this method the light "stone color" of the roadway is preserved, a condition generally sought after in said locations.

Another very important consideration, which goes hand in hand with maintenance, is dust prevention. The use of refined tar in both construction and maintenance prevents in great measure the formation of dust from the road itself, which helps the maintenance thereby, owing to the retention of the road material in place, eliminates the cost of water sprinkling where such would otherwise be necessary, and also prevents the formation of mud in wet weather.

It might be thought to be more economical to build a plain macadam road and maintain it by surface treatments of refined tar, than to build the road as a tar bound macadam in the first place. This might be true under very light traffic conditions, but it is generally conceded, where the choice lies between the two, that for practically all locations where these types of road are warranted, it is cheaper and more economical in the long run to build the tar bound macadam. However, both tar bound and tar surfaced macadams are far superior to a plain water bound macadam road, no matter how well built this may be, as the well-known defects of ravelling, results of frost action, and of internal wear, also excessive dust, which are common to a water bound, are practically eliminated in a tar bound, and overcome, to a great extent, in a tar surfaced macadam road.