

all such patches are tightened up twice or three times daily with a brush. In ordinary wet weather, with proper attention, such patches will consolidate under the traffic and become an integral part of the road surface in about three days.

Tar-Macadam Roads, Etc.—A very large number of methods are in operation in the preparation of a tar-macadam or pitch-grouted surface, and the author, in submitting his remarks under this heading, wishes it to be understood that he in no way dogmatizes as to the best form of construction, but rather desires to convey the principles which have guided him in arriving at his present method.

In the manufacture of tar-macadam it is essential that all moisture should be expelled from the stone, and that after it has become absolutely dry the heated stone should be thoroughly mixed with the boiling tar preparation. The heat used for the drying of the stone should be duly regulated, and the proper proportion of boiling tar applied to thoroughly coat all the particles of stone.

In Belfast an entirely novel tar-macadam plant has been devised by the author by which the resources of a refuse destructor have been availed of for drying and heating the stone and boiling the tar mixture, which, if required, can deal with an output of 10,000 tons per annum, and has been working with entire satisfaction from June, 1910.

The general features are as follows: The stone supplied from the quarries is delivered at a high level to the drying towers. In its passage, by gravity, through the towers the stone is thoroughly dried and heated, and passes out at the lower end into a revolving mixer. Boiling tar, of sufficient quantity to thoroughly coat the stone, is also fed into the mixer, and the whole discharged at the outlet, thoroughly mixed, in the form of tar-macadam.

To obtain the heat from the furnace gases before passing up the destructor chimney a by-pass or loop has been built alongside the main flue, and two dampers or doors (one on the main flue and the other on the by-pass) have been built in at either end to regulate the passage of these gases. Into the by-pass a tubular air heater has been built through which, by means of a fan, fresh air is drawn and driven forward at a high temperature into the drying towers, where, after passing through the stone, it finds its way out at the top of the towers. The temperature of the hot air delivered to the drying towers is recorded by a pyrometer, and the heat required is regulated by the opening and closing of the dampers in the flues, and a cold-air inlet valve situated between the heater and the fan.

A cylindrical revolving mixer receives the stone from the outlets of the drying towers, and as the stone passes into the mixer it is treated with boiling tar delivered from one of a pair of tar-boilers on either side.

The power to drive the shafting and belting is derived from the destructor engine.

Twin towers are provided to secure a continuous supply of stone, the stone from one tower being drawn while the other is drying and heating. This arrangement also applies in the case of tar-boiling, and should it be required, there would be no difficulty in working continuously night and day.

Tar-macadam may be laid upon an existing roadway provided the levels of footpaths or abutting buildings will allow. If this is not the case, the surface of the existing roadway must be cut away to provide a sufficient depth for the new coating of tar-macadam, the formation being

left to correspond with the finished camber of the tar-macadam. The camber generally adopted on a level tar-macadam road is 1 in 30, while on an incline this may be reduced to 1 in 40, or even 1 in 45. In the case of a tar-macadam road the foundation must be sufficient to support the road traffic independent of the road crust for at least twelve months after the tar-macadam has been laid; there is, in warm weather, a certain amount of "give" in the crust, which, if the road is not to disintegrate as a consequence of the traffic, must be entirely supported by the foundation.

Difficulty has been found in securing uniformity in the distribution of the various sizes of stone in the mass where the aggregate is prepared with mixed sizes, with the result that the road surface wears unequally. It has therefore been found desirable to lay the material in three separate layers, the utmost care being taken that all material shall be uniformly spread and rolled. The bottom layer, being of 1 1/2-in. material, is first spread to a depth of 4 in. and compacted by light rolling, the intermediate coat of 1-in. material being then laid 2 in. in depth, and the two coats thoroughly combined by careful rolling. A top coat of 1/2-in. material is finally added and the surface rolled until the whole crust is thoroughly compacted. No advantage is obtained by an excessive amount of rolling. Only sufficient material is used in the top coat to thoroughly key the surface, and when finally consolidated the whole forms a tar-macadam crust 4 in. in thickness. After the road has been laid from six to nine months the surface is thoroughly cleansed, dressed with boiling tar, the surplus tar being absorbed and retained by covering off with a coating of fine stone dust. This tar painting may be repeated every two years, and greatly adds to the life of the surface crust.

In regard to repairs, it is of the utmost importance that any patching should be carried out as soon as the surface shows undue indications of wear, always providing that the work is done in dry weather. In executing such repairs the openings are carefully trimmed down plumb from the surface to an even depth, the whole is then thoroughly cleaned and given a light coating of a mixture of hot pitch and creosote oil and filled with 1-in. material, sufficient 1/2-in. being used to key the surface. The patch is then either rolled or well punned solid. In renewing surfaces it is well to deal with as long lengths as possible, the method adopted being the same as used in patching. In no case should the wear be allowed to extend below the finishing coats.

The life of a tar-macadam road varies in ratio to the intensity of the traffic, and has given best results in suburban roads. In the centre of the city, where subjected to heavy traffic, the results have not proved satisfactory. The author is, however, doubtful whether this is not due to defects in foundation rather than to failure in the wear of the tar-macadam surface crust.

Sett Paving on Existing Foundations.—The author has a considerable mileage of what may be termed second-class streets, through which a large amount of heavy traffic passes, paved with setts upon existing foundations. These setts are usually 6 in. deep, 3 in. broad, and from 5 in. to 7 in. in length, either of granite or whinstone. In most cases these streets were originally either ordinary macadam or boulder paving, and in consequence of the development of the district have been converted as indicated. In the case of a macadam road, sufficient depth is obtained for the new paving, and the old roadway trimmed off to the required contour. The setts are paved on a 3/4-