left intact and unscarified, and the thickness of the new pitch-grouted coating increased as far as may be necessary.

If the crust is of sufficient thickness for the purpose, the regulation of the cross-fall should be carried out by scarifying the surface and removing material from the crown to the sides previous to the application of the new coating. Material loosened by scarifying should be screened and all material finer than $\frac{1}{2}$ in. should be thrown aside.

6. The aggregate of broken stone to form the new surface of pitch-grouted macadam should contain broken stone of approved quality, of which at least 60 per cent. must be broken to the size of $2\frac{1}{2}$ in., and 35 per cent. to sizes graded from $2\frac{1}{2}$ in. to $1\frac{1}{4}$ in. In addition to this 5 per cent. of chippings of the same stone, varying from $\frac{3}{4}$ in. down to $\frac{3}{6}$ in., should be used for closing after the grouting with melted pitch.

7. For making pitch-grouted macadam the pitch used should comply with the Road Board Speecification for Pitch, its viscosity being altered to suit climatic and local conditions by varying the quantity of the tar oils as specified therein.

8. It is important that the pitch should not be poured if the surface of the stone is wet. The stone may be protected by tarpaulins, or, if wet, may be dried in situ by portable blowers or other means.

9. The quantity of pitch required to grout a single coating is approximately, for a consolidated thickness of 2 in., 1½ gallons per yard super.; for $2\frac{1}{2}$ in., 1½ gallons per yard super.; but these quantities may vary with different materials, and care must always be taken to fill the voids adequately.

10. The aggregate after having been spread must be rolled down dry until the surface is formed, but without the addition of any small material.

11. The pitch, after being carefully melted, as described in Clause 18, must be raised to a temperature of 300 deg. Fahr. Clean, sharp sand must be heated on sand heaters to a temperature of 400 deg. Fahr. A dandy, or portable mixing vessel, is then to be filled with equal parts, by measurement, of the heated pitch and the hot sand, and the mixture, hereafter called the matrix, is to be kept well stirred while it is being emptied from the dandy or portable mixing vessel into pouring cans of from 2 to 3 gallons capacity, which are used for pouring matrix on to the roadway. Not only during the process of mixing, but afterwards, right up to the time of actual pouring, the matrix must be kept well stirred. The matrix prepared with pitch in the quantities specified in Clause 9 should be sufficient to fill the voids of the aggregate.

12. The final rolling should be commenced immediately after pouring the pitch matrix, and carried on rapidly before the matrix has time to set. The 5 per cent. of graded chippings should be spread over the grouted surface in part previously to and the remainder during the process of rolling. The traffic may be allowed on to the finished surface as soon as the surface has cooled to the normal temperature.

Double Pitch-Grouting

13. When the traffic is so heavy that a consolidated thickness of from 4 in. to $4\frac{1}{2}$ in. of pitch-grouted macadam is required, it is desirable, in order to obtain the best and most economical results, to divide the coating into two layers, the bottom layer to be the thicker one and to consist of large stones, the two layers being rolled down, and grouted separately. Any local stone which can be procured cheaply may, if suitable in quality for foundation work, be used for the

bottom layer graded from 3-in. gauge down to 2-in. gauge. No chippings are required for finishing the rolling of the bottom layer. The aggregate for the upper layer should consist of hard road stone of approved wearing quality, broken to $1\frac{1}{2}$ in. gauge, and 5 per cent. of chippings of the same stone used for the upper layer, graded from $\frac{1}{2}$ in. down to $\frac{1}{4}$ in., should be added before and during the process of rolling, and rolled down so as to form the finished surface of the road.

14. In pouring the pitch on the bottom layer the surface of the pitch should not be brought to the surface of the stone, but should lie about $\frac{1}{2}$ in. below such surface, with the object of providing a key for the upper layer.

15. The materials and the methods of grouting and laying down in the case of double pitch-grouting, except when otherwise expressly stated, conform to the provisions of Clauses 7, 8, 10, 11 and 12.

16. The quantity of pitch required for double pitchgrouting is approximately, for a considerable thickness of 4 in., 3¹/₄ gallons per yard super., and for 4¹/₂, 3¹/₂ gallons per yard super., but these quantities may vary with different materials, and care must always be taken to fill the voids in the surface coating adequately.

17. For the purpose of accurately ascertaining the proportions necessary for the matrix, it is essential that portable weights, scales and measures be provided, and all materials used in the preparation of the matrix should be accurately proportioned by weight or measurement.

Instructions for Melting the Pitch

18. The pitch boilers of from 2 to 3 tons capacity should be charged with pitch and about one-half of the proper proportion of tar oils. The fire should then be lighted, and thereafter a steady fire, with fire doors closed, should be maintained, when, in from four or five hours, the pitch should be thoroughly melted. A bright fire should be kept until the pitch reaches a temperature of 300 deg. Fahr., when the remainder of the oils should be added, and the mixture thoroughly stirred; the fire doors should then be opened and the temperature of the melted pitch permitted to fall to 250 deg. or 270 deg. Fahr. The pitch should then be ready for use, and in all cases should be thoroughly well stirred before being drawn off.

In the event of bad weather stopping the work of grouting, the fire door should be left open, the damper closed, and the temperature of the pitch allowed to fall to 200 deg. Fahr. It can be kept at this temperature for long periods with banked fires consuming 7 lb. of coke per hour.

It is recommended that a suitable Fahrenheit thermometer with metal protection should be at hand to indicate the temperature of the melted pitch. Whenever the weather is favorable for the recommencement of the work the pitch must be again raised to 270 deg. Fahr., by closing the doors and sharp firing.

It is desirable that the boiler should be kept air-tight when the pitch is being melted, by the use of airtight covers properly packed so as to make an airtight joint.

Note.—These general directions are not intended to displace or to discourage the use of proprietary articles, of which there are several of proved value.

ROAD BOARD SPECIFICATION, No. 4

Specification for Tar No. 1. General.

r. This tar is suitable for the surface tarring of roads. As to the use of this tar for making tar-macadam, see "Road Board's General Directions for Surfacing with Tarmacadam."