

UNITED STATES PATENT OFFICE

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TREATMENT OF BITUMINOUS BINDER MATERIAL

No Drawing.

Application filed December 4, 1928. Serial No. 323,787.

This invention relates to improvements in mixtures for treating tar, and other bituminous and asphaltic substances and like road-binder materials for the purpose of so modifying the natural condition or state of such a substance as to render it workable and susceptible of being readily handled (e. g., loaded, unloaded) and employed for the purpose intended; to improvements in processes of treating such substances; and to the improved product resulting from such treatment. An object of this invention is to save expense in the treatment as heretofore practised and to improve the condition of the substance treated. In order to handle and work with heavy bituminous materials cold, it has been common practice to mix such a substance with a certain amount of lighter oils (e. g., kerosene, naphtha, gasoline); but it has been found that, after using such a lighter oil (or oils) for cutting back the heavy bituminous material and after allowing the mixture of the latter and the lighter oil (or lighter oils) to stand for even only a short time, the components of the mixture separate, the relatively heavy bituminous material sinking to the bottom, while the lighter oil (or oils) are found on top. This separation of the components of the mixture results in the necessity of going to the expense, inconvenience and loss of time required to reheat the mixture and to agitate it properly before the material can be satisfactorily handled cold.

In carrying out this invention, there are used: (a) Quicklime pulverized to pass a #20 sieve, and (b) Glauber's salt (sodium sulphate) pulverized to pass a #20 sieve. In the form of a mixture of these two substances, the preferred proportions are ninety per cent (90%) of quicklime to ten per cent (10%) of Glauber's salt.

As an illustrative example or specimen mix, the following will suffice for the purposes of the person skilled in the art, to-wit:

(a) Eighty-four pounds (84 lbs.) of natural lake asphalt (or petroleum asphalt) of 85 to 100 penetration; (b) fifteen pounds (15 lbs.) of heavy naphtha, the flash-point of which lies above 175° F., and (c) one pound (1 lb.) of the mixture of quicklime and Glauber's salt in the state and proportions just mentioned hereinabove. A mix of this character (that is, without mineral aggregates) permits handling and use in surface treatment and penetration types of roads. The mixing may be done by hand or in mechanical mixers. By adding the mixture of pulverized quicklime and sodium sulfate to the lighter oil (or oils), in proper proportion, at the time of cutting-back, the quantity of cut-back material needed is only about a quarter as much as is required in the practice heretofore followed. The action of the quicklime-Glauber's salt mixture is to bring about the thorough cutting-back of all particles of the relatively heavy tarry or bituminous or asphaltic binder-material, so that the latter is enabled to mix perfectly with the lighter oil (or oils) present. Moreover, this quicklime-Glauber's salt mixture acts to maintain the stability and completeness of mixture of the binder-material and the lighter oil (or oils) and serves to prevent the separation of these substances, whereby the binder-material is kept in mobile liquid form and is susceptible of being readily and easily handled (as in loading and in unloading) and employed without having to be reheated, for example, by steam to its melting-point, as has commonly occurred in the practice pursued heretofore. Binder-material of the kind or type hereinbefore mentioned (that is, tar, bitumen, asphalt), when treated as described in the foregoing, has its condition or state so changed and modified that it is enabled to coat most fully and to adhere most closely to the mineral aggregates now employed in pavements, roofs and the like.

Cold-mix bituminous binder-material has

heretofore proven generally unsatisfactory owing to the fact that, if enough light oil (or oils) is employed to cut-back the bituminous component thereof and also, at the same time, to confer stability and prevent the latter's settling down and separating out as soon as the mixture cools, the bonding and cementing properties of the bituminous binder-material that are depended upon to hold the mineral aggregates together are affected adversely and are weakened to such an extent that the road constructed from the mix of mineral aggregates and such binder-material will be found to be too soft to permit traffic over it until there has taken place an evaporation of a large proportion of the light oil (or oils); and, after such evaporation, it will be found that the bituminous material remaining is of such slight proportion that it will not serve adequately to bind and cement the mineral aggregates; therefore, the road fails. By the use of the quicklime-Glauber's salt mixture described in the foregoing, it is found practicable to reduce the proportion of light oil employed to one-fourth of the quantity heretofore employed. The action of this quicklime-Glauber's salt mixture is to cut up completely all the particles of the tar or bitumen or asphalt and so to change the state of this bituminous material that it thoroughly and entirely and evenly coats the mineral aggregates and is freed of any tendency to slough or loosen therefrom. Due to the enhanced bonding and cementing properties conferred by the action of the quicklime-Glauber's salt mixture on the bituminous binder-material, the mineral aggregates do not need to be so well graded either as to size or density, from which it follows that it is frequently practicable to employ local materials the use of which would otherwise be excluded. Heretofore the mineral aggregates have had to be well graded so as to avoid the formation of voids; and this necessity has generally required that part of the mineral aggregates be brought to the place where the work was to be done from points remote therefrom. The coat of construction has thus been increased due, for example, to charges for freight and handling of that part of the mineral aggregates; and this expense is now eliminated by the use of the quicklime-Glauber's salt mixture, as hereinbefore described. Furthermore, the quicklime-Glauber's salt mixture reacts with the bituminous binder-material in such a way that the latter, while retaining its resiliency, is freed from any tendency to be affected by change in atmospheric temperature, or in other weather or climatic conditions.

As is more fully described in my co-pending application, Serial No. 323,788, filed concurrently herewith, in large-quantity production of paving material or roofing or the like, in which mineral aggregates enter into the

mix, the quicklime-Glauber's salt mixture is generally added to the mineral aggregates with the other components of the mix (e. g., naphtha, tarry or other bituminous or asphaltic binder); and such a method of mixing is practised generally in those cases in which the finished end-product is prepared and shipped to the point where it is to be used (e. g., laid). The coarse mineral aggregates may be sprayed with the light oil, or oils, after which the bituminous material (e. g., tar, bitumen, asphalt), fine mineral aggregate (e. g., sand, stone dust, slag dust), the quicklime-Glauber's salt mixture and hot water are put into the mixer with the naphtha-sprayed coarse mineral aggregates. But the quicklime-Glauber's salt mixture and the light oil (or oils) may be added to the bituminous material at the refinery, or at any other suitable and convenient point, after which the bituminous material so treated and now ready to be mixed with the mineral aggregates may be shipped to the point where the mineral aggregates are and the work is to be done (e. g., highway construction or repair.) Or the quicklime-Glauber's salt mixture may be mingled with the bituminous material at a point away from where the work is to be done, after which the bituminous material thus treated is shipped to the point where the work is to be done and where the mineral aggregates are first sprayed with light oil (or oils) before they are mixed with the treated bituminous material, and hot water.

Due to the action of the water on the quicklime-Glauber's salt mixture, its volume is increased and voids in the paving mixture are filled; and, when the latter mixture is compressed, there results a pavement that is more dense than heretofore made: Furthermore, such a pavement will not crank or become soft and will, therefore, offer greater resistance to wear.

The Glauber's salt counteracts the burning effect that the quicklime would have upon the heavy bituminous material and the tendency of the quicklime to drive off the volatile oils thereof. The Glauber's salt assists in setting or retaining these oils in the heavy bituminous material.

The quicklime-Glauber's salt mixture assists the light oil in cutting-back the heavy bituminous material and in reducing the particles thereof so that they will remain intimately mixed with the light oil, whereby the resulting bituminous binder material is reduced to and maintained in a mobile liquid condition.

In accordance with the patent statutes, I have described the preferred form of this invention; but I desire it to be distinctly understood that I fully realize that changes may be made therein and that I intend to include within the scope of the claims that follow

hereinafter all modifications of the preferred form of this invention that do not depart substantially from the spirit thereof. For example, while I prefer to use a quicklime-Glauber's salt mixture of nine parts of quicklime to one part of Glauber's salt, yet other proportions of the quicklime and Glauber's salt that vary slightly from the preferred proportions just given may be used but, so far as I have been able to discover, always with lessened efficiency in the production of the results sought to be obtained. Again, while I have, in the illustrative example or specimen mix hereinbefore given, specified the use of asphalt of 85 to 100 penetration, yet it is to be understood that any grade of bituminous binder material may be used without departing from the spirit of this invention.

I claim:

rial to the action of the mixture of light oil, quicklime and Glauber's salt so obtained.

8. A mobile liquid bituminous binder for road-construction material comprising a mixture of bituminous material of the character described with cut-back substances including quicklime and Glauber's salt in the proportions of substantially nine parts of quicklime to one part of Glauber's salt.

Signed at Birmingham, Alabama, this thirtieth day of November, 1928.

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1. A composition of matter for cutting back bituminous material of the character described, said composition including a mixture of quicklime and Glauber's salt in the proportions of substantially nine parts of quicklime to one part of Glauber's salt.

2. A composition of matter for cutting back bituminous material of the character described, said composition including a mixture of light oil, quicklime and Glauber's salt.

3. A composition of matter for cutting back bituminous material of the character described, said composition comprising light oil and a mixture of quicklime and Glauber's salt in the proportions of substantially nine parts of quicklime to one part of Glauber's salt.

4. A mobile liquid bituminous binder for road-construction material comprising a mixture of bituminous material of the character described with cut-back substances including light oil and a mixture of quicklime and Glauber's salt.

5. A mobile liquid bituminous binder for road-construction material comprising a mixture of bituminous material of the character described with cut-back substances including light oil and a mixture of quicklime and Glauber's salt in the proportions of substantially nine parts of quicklime to one part of Glauber's salt.

6. Manufacture of a mobile liquid bituminous binder material comprising adding a mixture of quicklime and Glauber's salt to a light oil; and then subjecting heavy bituminous material to the action of the mixture of light oil, quicklime and Glauber's salt so obtained.

7. Manufacture of a mobile liquid bituminous binder material comprising adding to a light oil a mixture of quicklime and Glauber's salt in the proportions of nine parts of quicklime to one part of Glauber's salt; and then subjecting heavy bituminous mate-

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