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# UNITED STATES PATENT OFFICE

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## PREPARATION OF TARRY AND BITUMINOUS SOLUTIONS

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This invention relates to the preparation of bituminous and tarry solutions for the purpose of road building and the like and aims to provide an improved compound and method of producing the same for such purposes.

It is generally recognized that bituminous compounds constitute one of the most important classes of basic materials for road-making purposes and consequently much attention has been devoted to their treatment to render them applicable to road surfacing. One of the problems has been to find a suitable diluent which would allow the use of bituminous compounds in a cold state, without retarding their drying or setting properties as occurs in the case of high-boiling distillates from mineral crude oils, which, being saturated hydrocarbons are very stable oils preventing quick setting. Low boiling diluents such as naphtha, white spirit or the like, have the disadvantage of rendering the diluted bituminous materials highly inflammable or else expulsive of fumes which may be objectionable or even unhealthy, like those of pyridine or nitrated hydrocarbons.

Among other proposed methods of liquefying bituminous materials, it has been suggested to add a small proportion of tar to a relatively large quantity of shale oil, the solution being rendered soluble by the addition of soft soap and soda for employment as a dust-laying composition to which hygroscopic substances are added in order to prevent the drying of the material which of course would be entirely unsuitable for road making. Another suggestion has been to use shale oil or other unsaturated hydrocarbons in combination with bituminous substances, but this has been done always in such proportions or with such admixtures that the compounds have been unsuited to fulfill the conditions forming the object of the present invention, namely, to prepare a fluid bituminous material capable of being used in the cold state and which, under the influence of catalysts, will rapidly alter its physical and chemical properties by polymerization or condensation and finally form a binder which will firmly bond the road aggregates together.

According to the present invention, to a preponderating mass of tar is added asphaltic bitumen or bituminous material which may already contain unsaturated compounds, and a flux medium or diluent in the form of oil or liquid containing unsaturated hydrocarbons, increasing the unsaturated compounds of the prepondering mass, which will polymerize or otherwise react with the air-oxygen, the process being accelerated, when desired, by an added catalyst. Such a mass can be applied directly in the cold state to any suitable aggregate.

Various oils or liquids containing unsaturated hydrocarbons may be employed as the flux media or diluents, as for example, solar oil, but it is preferred to employ crude shale oils, or better still, "topped oils" which in some instances contain sulphur or catalysts with alkaline reaction hastening the drying. As the low boiling fractions of shale oils are not required for the purpose of the invention and a better price moreover can be obtained for these fractions if used as motor spirit, the residues of crude shale oil which has been "topped" up to 190° C. may advantageously be used instead. Not only is this more economical, but the product is better suited for use as a flux. It is much less inflammable and at the same time richer in the required unsaturated compounds as also in asphaltic matter which will render ordinary tar, or even pitch, non-brittle and therefore may be used for the preparation of road tar from pitches. When a catalyst is to be added, various substances giving an alkaline reaction may be used, such as the oxides or hydroxides of the alkali metals or alkaline earth metals, or of magnesium, basic silicates, Portland or other anhydrous cements, carbides or calcium cyanamide. Thus, whereas it may take days to dry without the help of a catalyst, in the case of a mixture for example of tar with 20% of an admixture containing unsaturated or polymerizable substances, an addition of even less than 2% of powdered slaked lime will have the effect of reducing the drying process to as many

hours as days might otherwise be required, there being present in tar phenolic bodies which together with the unsaturated compounds may condensate, resinify or polymerize under catalytic influence similar to the condensation processes taking place between phenolic and carbonyl-compounds in the presence of catalyzers.

In applying the invention to road-making purposes, I may proceed in the following manner, viz: taking 100 parts of tar, I mix them with 20 parts of bituminous material such as asphaltum at a temperature of 50° C. and (in order to obtain a good flowing liquid) this mixture is then fluxed with 20 to 25 parts of shale oil which has been topped up to 190° C. The preparation thus obtained is ready for use at normal temperatures and can be applied in the cold state. It will properly cover 30 to 40 times its weight of stone splits or grit, which before being mixed in a mixer with the tarry liquid is shaken with say ½ to 1% of powdered slaked lime in a suitable mixing drum. The tarring of the grit and the depositing onto the road may be carried out in any weather, as neither rain nor cold will detrimentally affect the hardening of the surface. The treated road grit, after being spread onto the road is rolled in well, and very soon dries and hardens, so that the road can be opened to traffic in a few hours afterward.

Resiliency and other desirable properties may be imparted to the bituminous solutions by adding to the diluent, or to the bituminous materials themselves, colloidal solutions from oily or fatty pitches such as stearine pitch, which as I have discovered, can be obtained by heating such pitches for several hours under pressure to about 150 or 160° C. with suitable solvents such as aniline or its homologues, pyridine, phenols, vegetable oils like linseed-oil, mineral oils and turpentine. The following example will demonstrate how I may proceed to prepare liquefied bitumens containing fatty pitch, viz: taking 2 parts of stearine pitch, I heat them in an autoclave with 5 parts of shale oil up to 150° C. for 4 hours, whereby a solution is obtained similar to a rubber solution. This is diluted with 40 parts of shale oil and then stirred into 250 parts of warm tar of a temperature of about 50° C. After cooling, a liquid tar results which may be used in the cold state. I find that very good results are obtained by first mixing 200 parts of stone splits, which may be calcareous with 1 to 2 parts of powdered slaked lime and by adding thereto in the mixing drum 10 parts of the tar mixture. The term "asphaltic bitumen" is herein used according to the definition of the International Committee on Nomenclature, which is as follows: Natural or naturally occurring bitumen, or bitumen prepared from natural hydrocarbons, or from derivatives of natural hydrocarbons by distillation or oxidation or cracking, solid or viscous, containing a low percentage of volatile products, possessing characteristic agglomerating properties, and substantially soluble in carbon disulphide.

What I claim is:—

1. The process of manufacturing fluid bituminous masses employable in the unheated state and hardening thereafter, which consists in adding to a preponderate mass of tar and asphaltic bitumen which may contain unsaturated compounds, a flux medium or diluent of oil distilled in 190 degrees centigrade and containing unsaturated hydrocarbons which with the unsaturated compounds of said mass will resinify and/or polymerize therewith under the influence of air oxygen.

2. The process of manufacturing fluid bituminous masses employable in the unheated state, which consists in adding to a preponderate mass of tar and asphaltic bitumen containing unsaturated compounds, a flux medium or diluent of shale oil topped up to 190 degrees centigrade and containing unsaturated hydrocarbons which with the unsaturated compounds of the preponderate mass will resinify and polymerize therewith under the influence of air oxygen; such action being accelerated by adding a catalyst to the mixture.

3. The process of manufacturing fluid bituminous masses employable in the unheated state, which consists in adding to a preponderate mass of tar and asphaltic bitumen containing unsaturated compounds, a flux medium or diluent of shale oil topped up to 190 degrees centigrade and containing unsaturated hydrocarbons which with the unsaturated compounds of the preponderate mass will resinify and polymerize therewith under the influence of air oxygen; such action being accelerated by adding an alkaline catalyst to the mixture, together with a binder of stearine pitch workable in the cold state.

Signed at London, England, American Consulate General, this 16th day of January. 1931.

ROBERT ARNOT.