

UNITED STATES PATENT OFFICE.

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ASPHALTIC MATERIAL AND METHOD OF PREPARING SAME.

No Drawing.

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This invention relates to asphaltic materials and the novel methods by which the same are prepared, and has for its object to provide a material containing the required amounts of mineral aggregate, filler, and asphalt and which may be prepared in its entirety at a central plant and shipped to the road engineer, contractor, or the like for application to the roadway or street being surfaced, without "packing" in the freight car or other vehicle or when placed in piles at its destination and that simply requires heating at the time of laying in order to make a competent asphaltic pavement when rolled.

In order to more clearly set forth the objects and advantages of the present invention it may be well to point out some of the disadvantages of the present processes of constructing sheet asphalt pavements and asphaltic concrete pavements.

Sheet asphalt pavements consist of sand usually graded to meet certain specifications, to which is added a specified amount of limestone dust or other impalpable powder as a "filler", and a given percentage of asphalt cement meeting certain specifications as to penetration or hardness, loss by heating, paraffine content, etc. The mineral aggregate and the asphalt cement are heated separately and mixed together in the right proportion in a pug-mill. The material is then hauled to the point at which it is to be laid and must arrive there at a temperature well above 250° and be raked and rolled while hot. A disadvantage of this type of pavement is that any contractor who desires to bid on and construct such a pavement must have between \$30,000 and \$75,000 invested in a hot-mix plant. This necessary investment, of course, will keep out the small but equally efficient contractor and lessen the number of competitive bids. Furthermore, as the material must arrive at the place of laying in a hot condition, it is frequently overheated, if the haul be a long one, thus "killing" the asphalt cement and causing the pavement to crack.

Asphaltic concrete pavements differ from sheet asphalt pavements above referred to merely in the fact that the mineral aggregate employed is coarser, running from 1/2

inch down to "filler" and graded according to specifications; the asphalt cement employed is similar to that used in the previous type of pavement but is generally softer. Obviously the method of preparing and laying this type of pavement is open to the same objections as above indicated in connection with sheet asphalt pavements.

As hereinbefore stated it is the object of the present invention to prepare at a central plant, asphaltic materials containing all of the necessary ingredients for sheet asphalt pavements and asphaltic concrete pavements; such materials being prepared and combined in a manner which will prevent "packing" thereof during shipment or while standing in the contractor's stock pile and to which it is only necessary to apply heat by the local contractor at the time the material is spread on the subgrade.

In the preparation of material for the construction of sheet asphalt pavement I add to a dry, satisfactorily graded sand or combination of sands, with or without "filler" in accordance with the governing specifications, a dry pulverized asphalt, and the two thoroughly mixed; the amount added being controlled by factors which will be explained hereinafter. This pulverized asphalt may be a natural hard bitumen of the class known as asphaltites, such as gilsonite, grahamite, manjak, etc., or a residual asphalt produced from an asphaltic base or a mixed-base oil by the usual refinery methods of removing by volatilization the lighter portions until the residue is one that can be ground to a non-adherent powder, or a sulfonated residual asphalt, the hardness of which is obtained by the introduction of sulphur, or a combination of an asphaltite with a residual asphalt or natural asphalt made by melting the constituents together in such proportions that when cold the material may be ground to a non-adherent powder.

Of all of these natural, artificial or combined materials gilsonite gives the best results and I prefer it although I do not limit myself to using it only, as satisfactory pavements can be made with others. The hard asphalt may be ground to pass any mesh screen considered necessary, but I have

found that passing a 60 mesh screen is sufficiently fine.

The sand and filler (mineral aggregate) may be heated prior to the introduction of the powdered asphalt or the combined materials heated during the mixing operation, or after being mixed, as desired, but the temperature to which it is raised must not exceed that at which the pulverized hard asphalt will blend with the soft asphalt or "flux" used in the step to follow. This temperature cannot be given for all combinations as it will depend upon the kind of hard asphalt used; for example, gilsonite will blend with the "flux" at 250° to 300° Fahrenheit, while a residual asphalt of sufficient hardness to permit grinding to a non-adherent powder will require 325° to 375° Fahrenheit to cause it to blend with the "flux," while grahamite will require 400°. The maximum temperature at which the mixture of mineral aggregate and dry asphalt may be raised can best be defined as about 25° below the point at which the dry asphalt used blends with the "flux" and must be determined by experimentation with the materials to be employed. Obviously it is not essential to heat the dry mixture to this point as the flux can be incorporated at a lower one, but the higher the temperature the more thoroughly and easily can the flux be mixed with the dry materials. The heating and mixing of the dry materials may be performed in any type of machine suitable for the purpose, such as a revolving drum heater, a heated batch mixer or a heated spiral conveyor with special blades which I prefer.

To the heated mixture of the mineral aggregate and the dry asphalt is next added the semi-liquid asphaltic flux heated to approximately the same temperature and thoroughly mixed therewith; the amount added being controlled by factors which will be explained hereinafter. This flux may be a natural soft asphalt or the residue from an asphaltic or a mixed-base oil produced by any of the usual refinery methods. It should, however, have a flash-point above the temperature at which it is to be raised and its viscosity should not be so great as to render the finished product gummy or objectionably sticky for handling. For the purpose of identification the semi-liquid asphalt or flux may be described as having a specific gravity of 12 to 14 degrees Baumé; a flash point not under 300 degrees Fahrenheit; loss upon heating at 325 degrees Fahrenheit for 5 hours not over 5%; asphaltic content 80% or over and not under 98% soluble in carbon disulphide. Such a semi-liquid asphalt or flux is the one I prefer to use but as other semi-liquid asphalts or asphaltic fluxes of a similar composition and characteristics could be used I do not want to be considered as limiting myself to the use of this specific flux. The mixing of the flux

with the dry materials may be done in a suitable machine such as the usual pug-mill or a similar paddle or worm mixer, or a spiral conveyor equipped with special mixing blades.

The relative amounts of the powdered hard asphalt and the flux to be employed depend upon three factors; first, the desired or specified percentage of asphalt as asphalt cement in the finished pavement; second, the desired or specified penetration of the asphalt as asphalt cement in the finished pavement; and third, the relative proportions of the hard asphalt and flux employed that are required to produce asphalt cement of this penetration.

For example, is the specifications covering the finished pavement call for 10% of asphalt as asphalt cement having a penetration of 40-50 at 77° Fahrenheit and it is desired to use gilsonite as the hard asphalt and a certain asphaltic flux having the desired flash point and viscosity; it is found by experimentation that 30 parts of gilsonite and 70 parts of this flux will produce an asphalt cement having the penetration desired. If the specifications call for 10% of asphalt cement in the finished pavement the proportional mixture and the method of making a one ton batch of material to meet the specifications would be: 60 pounds of powdered gilsonite mixed with 1800 pounds of sand and filler, the mixture heated and 140 pounds of flux added and thoroughly incorporated.

If grahamite is used in place of gilsonite the proportions of the hard asphalt, i. e., the grahamite, to the flux would be less while with a residual asphalt it might be greater; any given combination being determined by the usual testing methods.

The composition just described constitutes the shipping product and upon leaving the mixer it is loaded directly into cars, trucks or wagons for transportation or deposited in a stock pile for future shipping.

As will readily be seen, this product contains the specified amount or percentage of asphalt, but as the hard asphalt remains inactive or unblended with the flux, and the flux remains unstiffened by the hard asphalt and will so remain until the material has been heated to the blending point of the two, it does not exist therein as an asphaltic cement. For this reason the material will not pack in the cars during shipment nor in the plant or contractor's stock pile. Nor will it be affected by atmospheric conditions to any appreciable or harmful extent in any reasonable length of time—in say two years—at which time a slight stiffening of the mass may be noticed due to a slight alteration of the flux constituent.

This product handles as easily as an oily sand and will not pack in a storage pile and the contractor therefore may carry as

large a stock at the railroad yard as he wishes and transport it to the point of application as rapidly as it is used.

Upon arrival at the place of use the material may be unloaded into small piles scattered along the side of the street or road to be surfaced or upon the subgrade itself. From these small piles the material may be shoveled into the bucket elevator of a simple heating machine. The heating machine may be of any suitable type but should consist in general of a bucket elevator which carries the material to a small hopper located above the heater proper and a suitable automatic feeder that regulates the flow of material from the hopper to the heater proper. The heater may be of the revolving drum type, the pan and rake type, a spiral conveyer type, or any type of concrete mixer equipped with a proper burner; in either case it should be preferably heated by an oil burner. The flow of the material through the heater and also the heat from the burner are regulated so that the material passing through is heated to at least 50° above the blending point of the hard asphalt used and the flux. This heating causes the hard asphalt and the flux to become blended into a true asphaltic cement meeting any specification necessary and of a superior quality. The machine should have a capacity equal to the maximum quantity it is desired to handle per day as the output of a large machine can be reduced by regulating the feeder and the oil burner.

Upon leaving the heater the hot material may fall upon a shoveling sheet or platform at the rear of the apparatus. From this platform it may be spread with shovels, raked and rolled in the usual manner.

My process of making asphaltic concrete pavement material is essentially the same as that just described, except that the mineral aggregate includes properly graded crushed stone in addition to the sand and filler and usually the asphalt cement employed will be slightly softer than that used in sheet asphalt pavements; this simply requires a different proportion of the hard asphalt and the flux. This asphaltic concrete material may also be shipped as a non-packing material containing all of the necessary ingredients of the finished pavement and may be heated at the point of application in the same type of heater and spread, raked and rolled hot in the usual manner.

From the foregoing description it will be apparent to those skilled in the art that I have devised a method of preparing paving material which applies equally well to sheet asphalt pavements and asphalt concrete pavements; that the materials produced by the process due to the presence of the unblended asphalt may be shipped or stored in stock piles without packing; that the ma-

terials are self contained, i. e., require no additions of material by the road engineer but simply that the material be heated to a point slightly above the blending point of the unblended asphalt contained therein, and then spread in the usual manner; and that by experimentation the percentages of asphaltic cement and unblended asphalt contained are such as will provide the specified percentage of true asphalt cement required in the finished pavement which meets the requirements as to penetration, etc.

It is to be expressly understood that in the foregoing description as well as in the appended claims the term mineral aggregate is intended to include materials such as sand, limestone dust or other filler, crushed stone, etc.

In accordance with the patent statutes I have described what I now believe to be the best embodiment of the invention, but I do not wish to be understood thereby as limiting myself or the scope of the invention, as many changes and modifications may be made without departing from the spirit of the invention; all such I aim to include in the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. The process of preparing asphaltic road material for storage and shipment the asphalts of which are adapted to be converted to an asphaltic cement on the job by blending, which comprises mixing mineral aggregate with hard asphalt in a powdered form in insufficient quantity to provide the required percentage of asphaltic cement, said mixing being carried out at a temperature below that at which the hard asphalt blends with a soft asphalt, and then adding semi-liquid asphalt or asphaltic flux to bind the powdered asphalt particles on the surface of the aggregate, the quantity of semi-liquid asphalt or asphaltic flux being sufficient to provide the desired percentage of asphaltic cement when blended with the hard asphalt by heating.

2. The process of preparing asphaltic road materials for storage and shipment the asphalts of which are adapted to be converted to an asphaltic cement on the job by blending, which comprises heating the mineral aggregate and powdered hard asphalt to a temperature below the point at which the hard asphalt will blend with a semi-liquid asphalt or asphaltic flux, mixing the same and adding the semi-liquid asphalt or asphaltic flux.

3. The process of preparing asphaltic road material for storage and shipment the asphalts of which are adapted to be converted to an asphaltic cement on the job by blending, which comprises heating the mineral aggregate and a powdered hard asphalt to a temperature below the point at

which the hard asphalt will blend with a semi-liquid asphalt or asphaltic flux, mixing the same, heating the desired amount of the semi-liquid asphalt or asphaltic flux to substantially the same temperature and mixing with the aggregate and hard asphalt. 5 powdered hard asphalt to the aggregate. 20

4. A composition of matter adapted for shipping, said composition comprising a loose, granular, non-compacted mass adapted for paving, the granules of said mass composed of mineral aggregate coated with hard, powdered asphalt particles and bound thereto by a coating of asphaltic flux. 10

5. A composition of matter adapted for shipping, said composition comprising a 15

6. A composition of matter adapted for shipping, said composition comprising a loose, granular, non-compacted mass of graded mineral aggregate, a coating of filler and powdered hard asphalt particles on the granules of said aggregate, and a coating of asphaltic flux binding said materials to the aggregate. 25

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