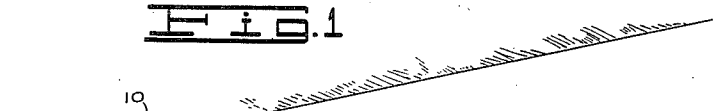
Jan. 2, 1940. M. H. IRVINE 2,185,341

PAVING

Filed Dec. 28, 1936

Fig. 1



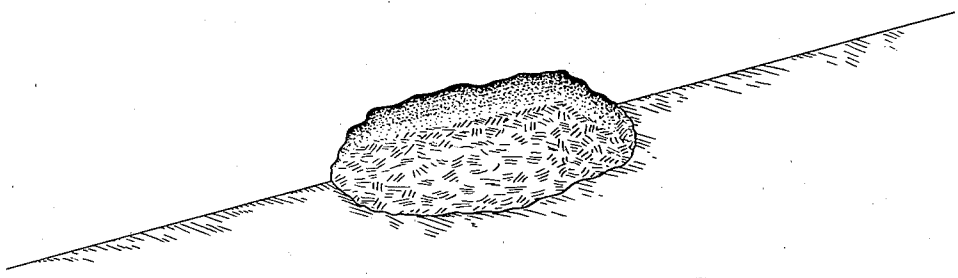


Fig. 2

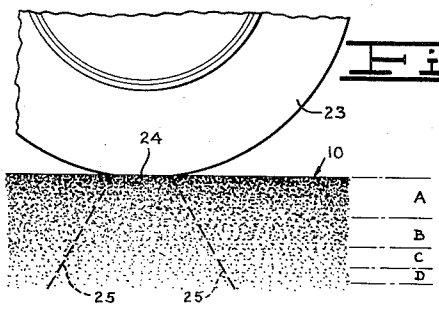


Fig. 3

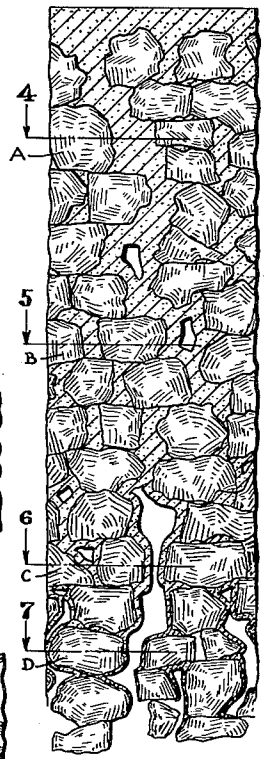


Fig. 4

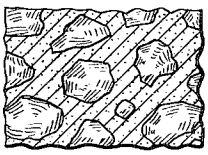


Fig. 5

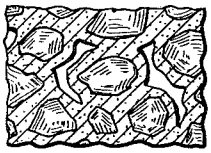


Fig. 6



Fig. 8

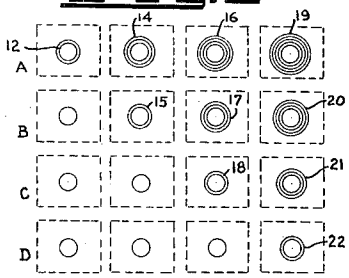


Fig. 7

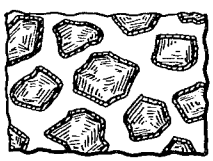


Fig. 9



BY

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2,185,341

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PAVING

Milton H. Irvine, Los Angeles, Calif., assignor of one-third to Frederick R. Paulsen, Los Angeles, Calif., and one-third to Stanley D. March, San Pedro, Calif.

Application December 28, 1936, Serial No. 117,785

1 Claim. (Cl. 94—23)

This invention relates to paving.

The general object of the invention is to provide a paving which includes roadbed material united with a bituminous binder in a novel manner.

Another object of the invention is to provide a pavement including roadbed material treated with successive applications of bituminous material to produce a structure wherein the relative amount of the binder decreases as the distance from the wearing surface increases.

A specific object of my invention is to provide a roadbed material which is treated with a plurality of applications of asphalt, oil, tar, etc., which penetrates, during the different applications, to different depths into the roadbed material.

Another object of the invention is to provide a road built up of a plurality of homogeneous zones with the densest zone nearest the surface and with a gradually diminishing density below the surface.

Another object of the invention is to provide a novel method of making a road.

Other objects and the advantages of my invention will be apparent from the following description taken in connection with the accompanying drawing, wherein:

Fig. 1 is a perspective view with parts broken away showing a road embodying the features of my invention;

Fig. 2 is a diagrammatic section showing my invention;

Fig. 3 is an enlarged sectional detail showing the various zones;

Figs. 4, 5, 6 and 7 are diagrammatic sections taken on lines 4—4, 5—5, 6—6 and 7—7 respectively Fig. 3;

Fig. 8 is a diagram showing the manner in which successive coatings are applied; and

Fig. 9 is an enlarged section through a piece of road making material showing successive coatings thereon.

Referring to the drawing by reference characters I have shown my invention as embodied in a road which is indicated generally at 10.

In the following specification I will refer to my invention as used in connection with roads or pavements but it will be understood that my invention may be used in general roadway, railway, dam, ditch or other constructions and may be used on horizontal surface, slopes, burms, etc., without departing from the spirit of my invention.

In the practice of my invention I may employ natural gravel or other aggregate which is already in the roadway and this material may be left undisturbed or may be loosened before being treated according to my invention. If desired, the aggregate may be transported to the roadway.

The binder preferably consists of hard asphaltum, liquid asphaltic road oils, or tar in various forms which is cut back with a light volatile solvent in sufficient amount to produce a mixture having a desired predetermined viscosity.

The solvents employed are preferably those which readily dissolve asphalts and tars and which have low viscosity at temperatures ranging from 60° to 120° Fahrenheit. Such solvents may be kerosene, cleaning solvent, gasoline, etc. These solvents have varying distillation ranges most of which have an initial and end point between 175° and 550° Fahrenheit.

If according to my invention a slow curing cut back is desired, I may employ a straight residuum road oil having an asphalt content of approximately 70% mixed with kerosene in the proportions of 25% to 35% kerosene to 75% to 65% road oil. For medium curing cut back a liquid asphalt having a normal penetration of 100 to 400 is mixed with kerosene in the proportions of 40 to 60 kerosene to 60 to 40 asphalt. For rapid curing cut back I may employ a steam refined asphalt having a normal penetration of 30 to 100 mixed with cleaner solvent in the proportion of 40% to 60% cleaner solvent to 60% to 40% asphalt.

The above types of cut back illustrate the range of materials which may be employed but it will be understood that in its broad aspect my invention is not limited to the use of the specific materials mentioned.

In order to satisfy the requirements of various localities and materials the types of road oil, asphalt or tar and the percentages of solvent are varied to produce cut backs having different viscosities and different curing properties. The desirability of using cut backs of different viscosities is occasioned principally by the variation in density of different road materials which are to be penetrated (as will be hereinafter described) with the cut back.

If the road material is quite dense a cut back having a Saybolt furol viscosity at 77° Fahrenheit of 30 to 60 may be used. If the road material is medium in density the viscosity may

range from 50 to 80 and if the road material is somewhat porous the viscosity may be as from 70 to 130 or even higher.

In the manufacture of my improved paving according to my improved method the cut back material is applied to the surface of either loose or compacted road material while the latter is in situ and the material is applied in separate applications which may approximate ⅛ to ¼ gallon per square yard and the material may be applied in any manner which will insure a uniform distribution. It is not necessary that the material be applied under pressure or be heated. The cut back penetrates or flows into the roadway completely coating with cut back each particle of aggregate to the full depth of penetration.

As soon as one coating is applied evaporation of the solvent starts. In this application the material will be deposited through the road material down to the limit of a first zone which has been indicated at A in Fig. 3 and which is shown diagrammatically in the particle at 12 in Fig. 8. After the solvent has partially passed from the binder a second application is made. This second application will penetrate to the bottom of zone B in Fig. 3 and will cause a second coating as indicated at 14 in Fig. 8 to be applied to the upper aggregates and will apply an initial coating 15 to the aggregate in the second zone.

After a suitable interval the third application is made. In this application the cut back passes down and coats the third zone C applying a triple coating to the upper aggregates as at 16, double coating 17 to the aggregates in the second zone and an initial coating 18 to the aggregates in the third zone. A fourth treatment may be then applied which will penetrate to the fourth zone D thus causing a fourth coating 19 on the upper aggregates, a third coating 20 on the aggregates in the second zone, a double coating 21 on the aggregates in the third zone and a single coating 22 on the aggregates in the lower zone.

The number of applications will vary from two to ten or more according to the content of the road material and the total amount of cut back applied. In the application of the material as above described the first coating is uniformly distributed throughout the aggregates for a small distance below the surface in zone A. The second application penetrates through the aggregates in zone A treated with the first application leaving a second film of cut back on the material treated in zone A with the first application and causing a portion of the second application to penetrate through zone A to zone B which receives its first application.

Each succeeding application results in an additional coating on the upper zones and an initial coating in the lowermost zone. This process of building up layer upon layer has the effect of leaving a heavier deposit and more binder in the road material nearest the surface and a gradually diminishing amount of binder in the zones below the surface. The binder finally deposited in the upper zone is preferably of such amount as to fill all the voids and to provide a wearing surface.

In Fig. 2 the roadway 10 is indicated with a truck wheel 23 shown as in engagement with the roadway as at 24. It is well known that the lines of pressure of a load which is supported on an appreciable depth of stable road material will diverge from the point of contact in all directions at an angle as indicated at 25 in Fig. 2. If the wheel supports a load of 800 pounds and has a surface of contact longitudinally of one inch and a tire width of four inches, the area of contact 24 is four square inches and the road material at the surface is subjected to a stress of 200 pounds per square inch.

This load before reaching the sub-grade below the paving is distributed over an increased area depending on the depth of the paving. With the figures just quoted if the depth of material treated is three inches and if the line 25 of divergence of pressure is at 30° to the horizontal, the area over which the load would be distributed would be approximately 33.3 square inches and the road material would be under a stress of approximately 24 pounds per square inch.

Thus it will be seen that with my invention the strength of the road decreases from the surface downwardly so that where great strength is required this is amply provided for while at the same time there is no waste of material in providing a binder in an area where the load stresses are light.

From the foregoing it will be apparent that by applying the binder to the surface as described this binder is disposed in the roadbed in various amounts and in locations which will produce uniform stability in the roadbed under stress by diminishing from the surface down. With the arrangement satisfactory treatment of a roadbed for any desired depth with a less amount of binder is secured or if the same amount of binder is employed the latter is employed to a greater depth so that in either case a superior paving results.

Having thus described my invention, I claim:

The method of making a road in situ from granular road forming material comprising applying successive applications of approximately ¼ to ⅛ gallon per square yard of an asphaltic cut back which has a Saybolt furol viscosity at 77° F. of from 30 to 130 and allowing each application to cure partially before making the next application whereby successive applications will penetrate deeper until the upper stratum is completely saturated.

MILTON H. IRVINE.