UNITED STATES PATENT OFFICE.

WILLIAM C. MURDOCK, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO THE NATIONAL VULCANITE COMPANY, OF NEW YORK, N. Y.

VULCANITE PAVING COMPOUND.

SPECIFICATION forming part of Letters Patent No. 394,126, dated December 4, 1888.

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To all whom it may concern:

Be it known that I, WILLIAM C. MURDOCK, of Washington, in the District of Columbia, have invented certain new and useful Improvements in Vulcanite Paving Compounds; and I do hereby declare the following to be a full, clear, and exact description of the same.

This invention relates to the preparation and combination of materials to form what is known as "vulcanite pavement"—a composition employed for paving streets, sidewalks, cellars, stables, &c.; and it consists in the novel and improved compositions and mode of treatment of the materials forming part thereof, as hereinafter described, and pointed out in the claims.

In the preparation of asphalt pavements it has heretofore been customary to prepare the asphalt by subjecting crude Trinidad asphalt in kettles or retorts to a fire heat of from 700° to 1,000° Fahrenheit, for the purpose of melting the mass to precipitate the earthy and other matters contained therein and driving off moisture. To the melted asphalt petroleum residuum is added in the proportion of about one part residuum to six parts asphalt, and the whole being subjected to heat and agitation produces what is known as "petroleum-asphalt cement." By reason of the high degree of heat heretofore deemed necessary in carrying out this process the heavier essential oils are driven off, to the detriment of the compound and injury of the pavement made therefrom, as the heavy hydrocarbons which are necessarily expelled, instead of being detrimental, are exceedingly valuable in maintaining the life and tenacity of the matrix, and their removal renders the residuum brittle, more liable to be injured by exposure to the atmospheric influences, as well as being more friable, and thus more readily destroyed and worn away when subjected to heavy or constant traffic, as in large cities. To counteract or in a measure compensate for the loss of the oils driven off in the preparation of the asphalt, petroleum residuum is added; but this again being subjected to the high heat is in turn deprived of a large portion of its more volatile oils; hence it sometimes becomes necessary or advisable to add in the subsequent treatment a certain proportion of petroleum residuum. As is well known, petroleum and petroleum residuum contain active solvents of bituminous matter, and its effect upon the asphalt, especially when the former contains the lighter oils, is of such a nature as to render it extremely difficult and practically impossible to thoroughly unite the asphalt cement with artificial asphalts made from coal-tar or such as contain these artificial asphalts in large proportions. As the result of much experience and many trials, I have discovered that it is possible to avoid or counteract these defects both as to the manufacture and product by substituting coal-tar residuum for petroleum residuum and subjecting the crude asphalt to a temperature not exceeding 500° Fahrenheit.

In practicing this part of my invention I place the crude natural asphalt in a retort or other vessel and add the coal-tar distillate—*i. e.*, coal-tar deprived of the lighter oils—in about the proportion of seven parts of the former to one of the latter, and heat the mixture to a temperature of 450° Fahrenheit, retaining it at or about this temperature, but never exceeding 500° Fahrenheit, until the asphalt has been completely melted or amalgamated with the coal-tar distillate. In this way I manage to preserve all the desirable qualities and constituents of both the asphalt and coal-tar, while eliminating the lighter oils, or such as in practice have been found deleterious or destructive to the life of the pavement, at the same time effecting a complete admixture of the two substances. The addition of the coal-tar distillate to the asphalt also assists materially in expediting the liquefaction and solution of the asphalt when subjected to the relatively low temperature employed.

The mixture is maintained at a practically uniform temperature of 450° Fahrenheit until evaporation ceases, and it is then in condition to readily and naturally combine with most, if not all, of the bituminous compounds, such as are employed for paving and similar purposes.

To form my improved paving compound or mixture, the asphalt thus produced is united

with distillate of coal-tar which has previously been subjected to a temperature not exceeding 450° Fahrenheit to drive off the more volatile oils, the proportions employed being approximately seventy parts of the distillate to thirty parts of the asphalt, forming an asphaltic cement possessing uniform properties and retaining all the heavier hydrocarbon oils and compounds not evaporating at the temperature to which the materials have been subjected—*i. e.*, 450° Fahrenheit.

Having thus produced my asphaltic cement, I proceed to prepare the ingredients which, when combined therewith in the manner and proportions specified, constitute the paving material. These materials or ingredients are clean, fine, and sharp sand, carbonate of lime, sulphur, sulphate of calcium, mineral wool or asbestus, hydraulic cement, calcareous gravel, and stone dust in proportions varying with the climate and service to which the pavement is to be subjected, the proportions also varying somewhat according to the relative coarseness or fineness of the materials used. Thus, to form the wearing-surface I may employ seventy parts sand, one part hydraulic cement, ten parts calcareous gravel, one part sulphur, six parts carbonate of lime, six parts sulphate of calcium, two parts mineral wool or asbestus, and six parts stone dust. These ingredients are thoroughly mixed and heated to a temperature not exceeding 250° Fahrenheit, but preferably at 230° Fahrenheit, and to this heated mixture I add at the same temperature a sufficient quantity of the asphaltic cement, prepared as described, to form the required wearing-surface.

The quantity of asphaltic cement will necessarily vary somewhat with the climate and thickness of the wearing-surface of the pavement; but it is usually within a margin of from five to eight per cent. of asphaltic cement to one hundred per cent. of the metal described. The materials—asphaltic cement and metal—are placed in an amalgamator and thoroughly mixed, after which, and while still hot and plastic, they are taken to the locality where the pavement is to be laid and spread upon a prepared surface, raked to the proper degree of thickness and tramped and rolled into a solid homogeneous mass or coating. The surface is then covered with hydraulic cement, or, preferably, a mixture of hydraulic cement and sulphate of calcium in about equal proportions, after which it is rolled again until cold and fit for use.

For street-work I prepare the base or substratum by first leveling off the surface to the proper grade and placing thereon a layer of broken stone, the larger stone being placed at the bottom and the smaller on top. This mass of stone is then covered and the interstices filled with coal-tar distillate and rolled into a solid mass or layer of the required thickness. Upon the base thus formed is spread the binder-course, consisting of small stone previously heated to about 150° Fahrenheit and mixed with the prepared asphaltic cement hereinbefore described, in the proportion of about one gallon of asphaltic cement to one cubic foot of metal. This mixture is laid evenly upon the prepared substratum and rolled to the required thickness, after which the wearing-surface is applied in the manner previously explained.

By preparing the binder-course with the asphaltic cement and interposing it between the coal-tar distillate of the substratum and the asphalt cement of the upper or wearing face a more perfect amalgamation of the several courses is effected and the life and endurance of the wearing-surface—the part most subject to decay—is increased and prolonged.

I do not claim herein the method of laying the pavement, nor the pavement itself, as contradistinguished from the method of preparing the ingredients as herein described and claimed, said subject-matter being reserved in a divisional application, No. 290,038, filed November 5, 1888.

Having thus described my invention, what I claim as new is—

1. The hereinbefore-described improvement in the art of manufacturing asphaltic cement for use in paving compounds, which consists in distilling coal-tar and asphalt together at a temperature of 450° Fahrenheit and not exceeding 500° Fahrenheit, and subsequently adding thereto coal-tar which has been heated to 450° Fahrenheit, substantially as described.

2. The hereinbefore-described improvement in the art of manufacturing asphaltic pavements, which consists in heating coal-tar and crude asphalt, in about the proportions named, to a temperature of about 450° Fahrenheit and not exceeding 500° Fahrenheit, until the vapors arising at said temperature are eliminated, adding to said mixture a further quantity of coal-tar which has been deprived of its lighter constituents by being subjected to a temperature of between 450° and 500° Fahrenheit, and subsequently adding to the asphaltic cement thus formed mineral substances at a temperature not exceeding 250° Fahrenheit, substantially as described.

3. The hereinbefore-described improved process of forming vulcanite paving compounds, which consists in mixing comminuted mineral substances, of which sulphur forms one ingredient, heated to a temperature not exceeding 250° Fahrenheit, with an asphaltic cement composed of coal-tar distillate and native asphalt refined at a temperature not exceeding 500° Fahrenheit, substantially as described.

4. The hereinbefore-described improvement in the art of manufacturing a vulcanite paving composition, which consists, essentially, in refining native asphalt by heating it, together with distillate of coal-tar, at a temperature of about 450° Fahrenheit and not

exceeding 500° Fahrenheit, adding, in about the proportions named, distillate of coal-tar which has been subjected to about the same temperature as the asphalt, and subsequently mixing with the asphaltic cement thus formed sand, hydraulic cement, calcareous gravel, sulphur, carbonate of lime, sulphate of calcium, stone dust, and mineral wool or asbestus, substantially as described.

WILLIAM C. MURDOCK.

Witnesses:
THOMAS DURANT,
MELVILLE CHURCH.