UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN ASPHALTIC PAVEMENTS.

Specification forming part of Letters Patent No. **211,313**, dated January 14, 1879; application filed November 20, 1878.

To all whom it may concern:

Be it known that I, WILLIAM W. AVERELL, of the city, county, and State of New York, have invented new and useful Improvements in Asphaltic Pavements; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to understand and apply the same.

This invention relates to improvements in that class of pavements heretofore known as the "Grahamite asphalt pavement," or "Grahamite and Trinidad asphalt pavement;" and the invention consists, first, in the combination of a refined natural asphalt and the residuum of petroleum, forming an asphaltic cement; second, in the combination of such asphaltic cement and a silicious sand, forming an asphaltic concrete; third, in a pavement composed of a hydraulic concrete or other suitable base or foundation, a wearing or surface layer of such asphaltic concrete, and with or without an interposed cushion-coat of the same; and, fourth, in the manner of separately applying such parts so that the respective layers will merely rest in contact and not adhere to each other, and whereby an independent movement of either or both layers, caused by the expansion or contraction of the same, and a renewal of the wearing or surface layer, is secured.

The asphaltic concrete is preferably composed of about eighty (80) parts, by weight, of silicious sand or silicious stone-dust containing from six (6) to eight (8) per cent. of calcareous matter, three (3) to four (4) per cent. of aluminous matter, and about twenty (20) per cent. of asphaltic cement. The asphaltic cement is composed of four (4) parts of refined Trinidad or other asphalt and one (1) part of the residuum of petroleum.

In preparing this cement, I take the crude Trinidad or other asphalt, and refine it by the application of heat to such a degree as to resist a fire-test or prevent evaporation under two hundred (200) degrees Fahrenheit, and to give, by distillation, thirty-six (36) per cent. of hydrocarbon oil of twenty-two (22) degrees Baumé. This will preserve the cementing qualities, and eliminates all objectionable matter. The residuum of petroleum which is added to the refined asphalt should be a pure hydrocarbon liquid bitumen of a density from fourteen (14) to eighteen (18) degrees Baumé, and resist a fire-test of two hundred (200) degrees Fahrenheit.

In lieu of the residuum of petroleum, heavy petroleum-oil, wood or coal tar, or their products, may be used; but these substances are not desirable as substitutes for the residuum of petroleum when the latter is available, for the reason that they are more or less affected by natural causes.

The carbonate of lime and alumina, heretofore referred to as calcareous and aluminous matter, may be added to the cement in the proportion given; but when the cement is prepared where it is to be used, these ingredients should be mixed with the sand or stone-dust, if not found naturally therein.

This cement, when prepared substantially as specified, will possess the quality of pliability in summer and malleability in winter. It contains no water nor ingredient that is soluble in water or in the urine of animals, nor an ingredient that is oxidizable and remains unaffected by the elements. It withstands a fire-test of at least two hundred and twelve (212) degrees Fahrenheit, and therefore is not affected by solar heat.

The manner which I have found best in practice of mixing and applying the asphalt concrete is as follows: The sand or stone-dust is heated to about three hundred (300) degrees Fahrenheit, and thoroughly incorporated with the melted cement by means of any suitable heating or mixing apparatus, and transported to the street in heated carts, where it is carefully and rapidly spread to the required thickness, and preferably stamped with hot iron stampers weighing about twenty pounds until it is solid. It may then be smoothed or leveled with heavy hot irons, and subsequently rolled to remove the minor undulations from its surface.

The foundation upon which this concrete is laid should be firm and substantial, and may consist of dry concrete composed of broken stone, gravel, and sand, or one or all of such materials, cemented with the products of wood

or coal tar, or any kind of stone foundation firmly settled, or macadam. A foundation of hydraulic concrete well set is best adapted for this purpose.

The structure is composed of a firm foundation of any suitable material, and of sufficient thickness to suit the kind of traffic to which the street may be exposed, and upon such foundation a cushion-coat of asphalt concrete about one-half an inch in thickness is applied. This cushion-coat is composed of coarse sand, heated as already described, and mixed with from ten (10) to twenty (20) per cent. of the asphaltic cement.

The object of this coat or layer is to perfect the grade and act as an interposed cushion between the foundation and wearing-coat, to receive, transmit, and distribute all forces of impact or blows upon the wearing or surface coat. It serves to prevent the destructive action of the hydraulic cement (when said material is employed in the foundation) upon the asphaltic cement contained in the surface or wearing coat, and also arrests the rising moisture.

This cushion-coat may be laid without tamping, except in the gutters, the rolling and smoothing devices being sufficient, and in many situations—such, for example, as sidewalks and private roadways—this coating may be omitted from the structure.

The surface or wearing coat is composed of the asphaltic concrete, and may be from one and one-half ($1\frac{1}{2}$) to three (3) inches in thickness, and is applied in substantially the same manner as the cushion-coat, after the latter has become firmly set.

The tamping process is preferably resorted to in applying this surface-layer, but is not absolutely essential, the situation and requirements of the pavement governing the necessity.

The different layers composing the structure simply rest in contact, there being no adhesion of the same, and this feature is an important part of my invention. It permits an independent movement of either layer, that may be caused by a varying expansion or contraction, and whereby the cracking of one by the unequal expansion of the adjacent layer is prevented, and when once the foundation and cushion-coat are laid they may remain undisturbed for an indefinite period, it being only necessary, in repairing this pavement, to renew the surface layer, and which may be removed without in the least disturbing the permanent foundation.

The lasting benefit to be derived from this feature of my invention should in itself commend its use on the question of relative economy with other known and amalgamated concretes.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. An asphaltic cement composed of Trinidad or other natural asphalt, refined as described, and the residuum of petroleum, substantially as specified.

2. In a concrete pavement, the combination of an asphaltic cement, substantially such as described, and a silicious sand, in about the proportions specified.

3. An asphaltic pavement composed of a hydraulic concrete or other suitable foundation and a surface layer of asphaltic concrete, substantially such as described, and with or without an interposed cushion-coat, as set forth.

4. A pavement composed of any suitable base or foundation, a surface or wearing layer or coat of asphaltic concrete, and an interposed concrete layer or cushion-coat, said layers being separately applied and resting in contact without adhering, and whereby an independent movement of either or both layers, caused by the expansion or contraction of the same, and a renewal of the wearing or surface layer without disturbing the foundation or cushion-coat is secured.

WM. W. AVERELL.

Witnesses:
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