UNITED STATES PATENT OFFICE.

JOSHUA R. HAYES, OF NEW YORK, N. Y.

IMPROVEMENT IN COMPOSITIONS FOR PAVEMENTS.

Specification forming part of Letters Patent No. **107,489**, dated September 20, 1870.

To all whom it may concern:

Be it known that I, JOSHUA R. HAYES, M. D., of New York, in the county and State of New York, have invented certain new and useful Improvements in Making Asphalt Pavements; and do hereby declare that the following is a full, clear, and exact description thereof.

In making my improved asphaltic compound for paving streets, sidewalks, &c., I keep in view the chemical affinity that exists between bitumen and calcareous matter—a combination found in nature and known under the name of "mineral asphalt." Chemically, the native mineral asphalt is bitumen or pitch in combination with earthy material. Of the latter material, calcareous earth, by reason of its affinity for bitumen, gives to the asphalt mineral its valuable and durable characteristics for paving purposes. For this reason the mineral asphalt found in France and Switzerland are superior to those found elsewhere, as in Trinidad, &c. In the latter case the bitumen is found in combination with earthy material other than calcareous, and instead of being a mineral asphalt deposit it is simply a pitch or bituminous lake.

Where bitumen is found properly combined with calcareous earth we find true asphalt, which, in the language of Professor Ure, "forms a compact, semi-elastic solid, which is not liable to injury by the greatest alternation of frost and thaw, which often disintegrate in a few years the hardest stone; nor can it be ground to dust and worn away by the attrition of the feet of men and animals, as sandstones, flags, and even granite, are."

Bitumen or pitch, identical with the bitumen or pitch in mineral asphalt, exists largely in coal or gas tar. This is extracted by distillation from the coal-tar in the following manner: The vessel or retort in which is placed the coal-tar to be distilled off is wholly surrounded and embedded in both a water and sand bath, in order that no injury may occur by charring (through the direct contact of fire and heat) to the bitumen composing the solid part of tar.

When a moderate degree of heat—say about 225° Fahrenheit—is applied, so that the naphthas and other light volatile products are passing over in distillation, I add to every fifty gallons of tar one-half gallon fuming nitrous acid, previously heated to the boiling-point. This acid violently attacks the naphthas and all the lighter volatile elements in the tar, and, by decomposing and consuming them, facilitates the distillation, and at the same time tends to render inodorous (by thus destroying and decomposing the volatile elements) the remaining bitumen or pitch. The heat of distillation is then run up to a few degrees short of the point when the carbolic acid or creosote of coal-tar is eliminated—say 375° Fahrenheit—and no higher degree of heat applied, in order that the carbolic acid and other fixed elements in the tar may be retained in the bitumen. The bitumen thus prepared is then ready for admixture with the calcareous earth, to form an asphaltic compound for paving purposes. Any calcareous earth or calcareous sand may be used for the union with the bitumen. This union, in short, forms an artificial asphalt, which is durable for paving purposes, and is a compact, semi-elastic solid.

As bitumen, as I have shown, only requires a calcareous earth to unite chemically with it to render it durable and solid for paving purposes, the addition of extraneous substances, as sand, gravel, stones, ashes, cinders, crude lime, cement, &c., only tends to destroy the integrity and tenacity of the compound, while these materials themselves are capable of being ground into impalpable powders by attrition from the feet of men and animals, causing the destruction of the pavement and incalculable annoyance to all who travel upon it.

One of the best calcareous earths, if not the very best, to unite with the bitumen extracted from coal-tar is the deposit indigenous to many localities in the United States, and commonly termed "marl." This marl or calcareous earthy material, previously warmed over a gentle fire in a furnace adapted to the purpose, is thoroughly mixed with the bitumen or pitch, previously melted, in about the following proportions: Eighty parts marl; twenty parts bitumen. It is then laid down, when hot, the required thickness, and rolled smoothly with an iron or stone roller of the requisite size and weight. When cool, this union of the bitu-

men and marl forms a compact, semi-elastic solid, in physical appearance not unlike the native mineral asphalt, and certainly very near it in chemical constituents.

A pavement laid with these two materials—bitumen and marl—presents a smooth appearance, is not liable to abrasion by the attrition of feet passing over it, and, being in its nature a semi-elastic solid, friction from travel is avoided and durability is secured.

I do not here claim the process above described for preparing the bitumen, as that is the subject of another application; but

What I do claim as my invention, and desire to secure by Letters Patent, is—

Marl in combination with bitumen or pitch, prepared as described, to form an asphaltic compound for paving purposes, substantially as described.

J. R. HAYES, M. D.

Witnesses:
D. H. STONE,
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