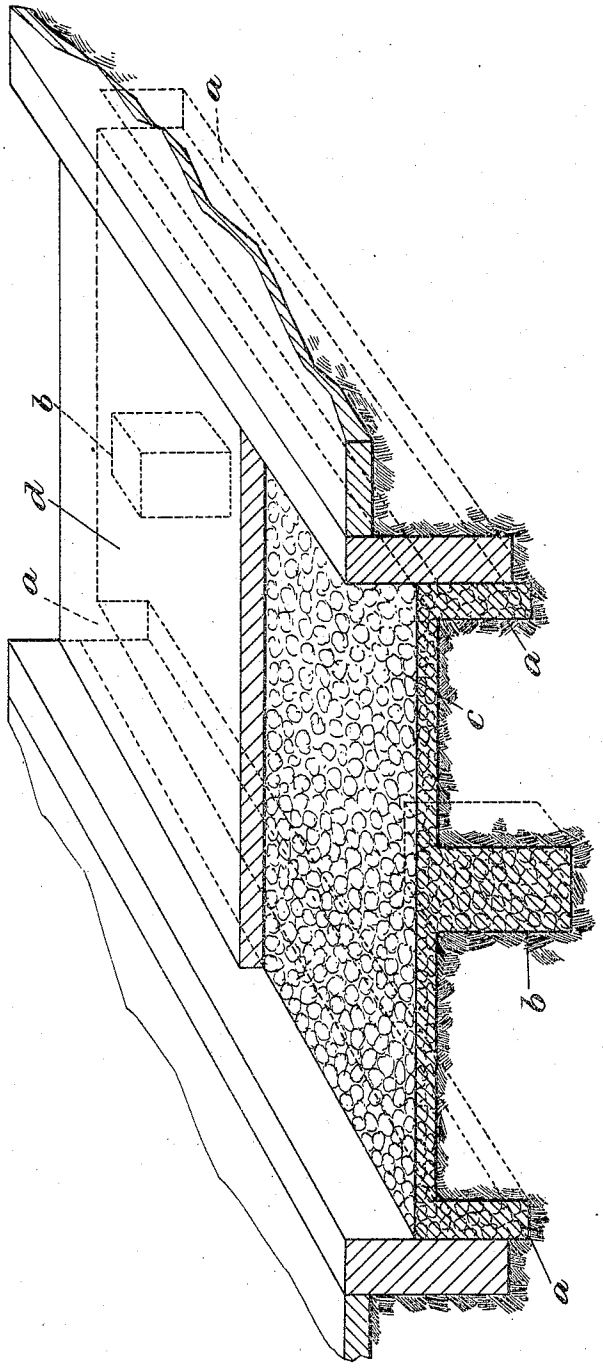
No. 792,873. PATENTED JUNE 20, 1905.

J. H. AMIES.

CONSTRUCTION OF BITUMINOUS MACADAM OR OTHER PITCH PAVEMENTS.

APPLICATION FILED OCT. 4, 1904.



Witnesses:
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No. 792,873. Patented June 20, 1905.

UNITED STATES PATENT OFFICE.

JOSEPH HAY AMIES, OF PHILADELPHIA, PENNSYLVANIA.

CONSTRUCTION OF BITUMINOUS MACADAM OR OTHER PITCH PAVEMENTS.

SPECIFICATION forming part of Letters Patent No. 792,873, dated June 20, 1905.

Application filed October 4, 1904. Serial No. 227,118.

To all whom it may concern:

Be it known that I, JOSEPH HAY AMIES, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in the Construction of Bituminous Macadam or other Pitch Pavements, of which the following is a specification.

My improvement has reference solely to bituminous macadam and other pitch pavements. It points particularly to the way the subgrade is prepared, and the mastic is manufactured and laid thereon without the arbitrary employment of artificial heat.

I will now describe my new roads construction and then explain the reasons that prove it to be practically perfect.

My process is as follows: I first establish my grade-lines and remove about three inches of the soil from the face-line of the grade. I now open on either side of the roads within the width-lines ditches or gutters from fifteen to thirty inches in depth and from three to twelve inches in width. These trenches I partly fill with large stones at the bottom to secure a perfect subgrade drainage. I may then fill the balance of the trench with smaller stones or with the soil previously removed. I then dig pockets or wells about fifteen feet apart in the center of the roads. These pockets may be a foot wide by fifteen inches deep. These are also filled at the bottom with large stones, as before described in the case of the trenches. I now roll or tamp the grade substantially until it is sufficiently firm. I now cobble the face of the grade with large stones. These stones must be forced down into the grade until almost level therewith. I now place thereon my topping, which is made as follows: I take the several sizes of stones with which I am provided and ascertain how I can proportion them to secure the greatest inherent stability. To do this, I take a metal measure and fill it in given proportions with the different sizes of stones and stone-dust. I then shake these well together and pour water thereon until the measure is completely filled therewith. I now pour off the water and ascertain by its measure just the percentage of voids the mixture gives. If I judge a lower percentage of voids can be secured by a different proportioning of the elements, I proceed as before described, and when I have thus secured the lowest possible percentage of voids I then add to the mixture the percentage of stone-dust which the water shows is necessary to secure the greatest inherent stability. This operation I perform each time new sizes of stones are provided. I now conclude if this mass can be properly rolled and tamped I will secure the greatest inherent stability. Thereafter I proportion my sizes of stones and stone-dust as thus ascertained. I now place my large sizes of stones down to the one-fourth-inch size in a separate pile and the grit and the stone-dust in another separate pile. Each of these piles I wet with water and stir them well until all the surfaces are dampened therewith. I then mix each pile with the relatively due amount of granulated quicklime. When the pile containing the large sizes of stones begins to throw off hot vapors caused by the slaking lime, I pour thereon in a cold state the fluxing-oil, which may consist of asphalt-oil or maltha or the like and mix it well therewith. Coming into contact with the escaping vapors the "flux" will foment violently, and during this effect the mixing will proceed with great ease and freedom, and while the fomentation is still continuing I sprinkle a due amount of dust of the hard asphalt thereon and mix it well therewith. The asphalt must be reduced to an impalpable dust. So far the mixing has been done rapidly and with ease. The asphalt-dust will now begin to stiffen the mass, because the flux will macerate it and take it up. In wetting the larger sizes of stones with the water I purposely use an excessive amount thereof. The quicklime will convert sufficient water to produce a chemical change that causes the lime to expand to three and one-half volumes, and I need to supply the stones with an amount of water greater than the lime will convert to secure easy mixing. If I had allowed the fine stone-dust to be mixed with the larger sizes at first, it would have been impossible to agitate the mass sufficiently to get a good hand mixture. In wetting the smaller sizes of stones and stone-dust I purposely use an insufficient amount of water. My design in

doing this will now become evident when I come to add the finer elements to the already-mixed mass of large stones and lime and asphalt. I now sprinkle the fine elements composed of grit and stone-dust, water, and lime upon the already-mixed mass above referred to. Owing to the fact that the lime is only partly slaked in the fine elements, it will withdraw and convert the surplus water from the previously-mixed mass of large stones, water, lime, and asphalt, and by sprinkling the finer elements thereon I will be able to work them in and thoroughly mix them with the said mass, which they will dry out and put in proper condition for the rakers hard by. I then submit the mass to heavy rolling and tamping to secure stability. It is, however, evident that I may mix my flux and asphalt together by boiling and while in a heated state pour them together upon the larger size stones and lime, and thus mix them, and then add the finer elements, as before described, should this way be found preferable.

The accompanying drawing is a sectional perspective view of my improved roadway.

a a are vertical views of the described side trenches filled with stone. *b* in the same way represents one of the center wells.

c represents the stone driven into the subgrade.

d represents facing layer of mastic.

a..... and *b*..... respectively represent the trenches and wells unfilled with stone, all as fully and clearly described above.

I will now explain the particular advantages of my process. In building a Macadam or Telford or stone road it is necessary to remove from seven to twelve inches of the face-grade of the roads and dispose of the soil thus removed in the cheapest manner and replace it with broken stones. The first will cost at least fifteen cents per square yard and the latter forty cents per square yard upon the average. The necessity of removing such a large mass of soil is to secure a depth for sufficient stone to make a wearing-surface. In my case I retain from seven to nine inches of the soil and make it serve as a part of the road-body. I only replace the three inches I remove with the composition I provide. In this way I save enough to make up the difference of the cost of the asphaltic cement and the extra labor in producing bituminous macadam road instead of the ordinary macadam road. This enables me to provide these roads at the actual cost of common stone roads. The way I prepare my subgrade by said ditching and by providing pockets or wells which I fill with stone completely drains off all expressed water, and therefore the subgrade remains stable. In cold climates there will be nothing to act upon to produce freezing, and in swampy or wet sections the road-bed is secured in this way. In the case of stone roads care is not taken against water, because the face of the stone roads admits enough water to offset any effect that might be secured by drainage. In my case I have a waterproof facing, and the subgrade can only become wet by the water having access from the sides or by being drawn up from the bottom; but my side trenches and center pockets effectually prevent this. I do not claim that inherent moisture of the soil of the subgrade will be prevented in this way; but inherent moisture will not soften the soil, nor will freezing act to expand nor thawing to contract, because there is sufficient elasticity in the soil to obviate these tendencies unless the water is expressed. The subgrade in either case can only be injuriously affected by expressed water.

In mixing my mastic I seek to secure a ready and easy hand mixing, because in the majority of cases roads-building work is located in remote sections and is often of such a limited extent as to make machine mixing inconvenient and expensive. In case, however, where machine mixing is convenient it is preferably employed; but to meet all demands for the work herein specified not only must easy and ready hand mixing be provided for, but the process must be of such an order and detail that poor and damaging mixing will be prevented, and to secure these results is one of the objects of my improvement.

Having now fully described my complete roads-building construction, what I desire to secure by Letters Patent of the United States is—

In the construction of bituminous macadam and other pitch pavements the process which consists of removing sufficient of the soil to secure a line about three inches below the face of the grade, then making side trenches and center wells, filling the same with stone, all being made firm by rolling and tamping, then cobbling the face of the grade with large stones, forcing the same within the surface thereof to about a level therewith, then placing thereon a facing composed of mineral matters made up and proportioned to secure the greatest inherent stability; then wetting them with water then mixing them with granulated quicklime, then mingling them with asphaltic cement; this composition being manufactured in a detailed manner to secure, when necessary, by easy and rapid hand mixing a thoroughly-prepared composition, the same being immediately placed upon the road-bed, the said road-bed being made as described, then rolling and tamping the whole to secure stability as substantially described and specified.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH HAY AMIES.

Witnesses:
EDWARD W. FARRELL,
JOSEPH LOFTUS.