

UNITED STATES PATENT OFFICE.

JOSEPH HAY AMIES, OF PHILADELPHIA, PENNSYLVANIA.

PITCH-CEMENT CONCRETE PAVEMENT.

SPECIFICATION forming part of Letters Patent No. 785,650, dated March 21, 1905.

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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 Pitch-Cement Concrete Pavements, &c., of which the following is a specification.

My invention relates to compositions for pavements composed of quicklime, bituminous and other pitch, and desired mineral materials.

A novel feature of the process is the way quicklime is employed to add to and supplement the heat that is necessary to be applied to the bituminous or other pitch cement in constructing pavements.

Quicklime used as herein described secures a perfect combination with the bituminous or pitch cement, and their mutual reactions produce desirable results. The lime has a viscous tendency when damp with water, but becomes hard and brittle when dry; but in combination with the bituminous or other pitch cement this tendency is modified, while in turn it will harden and toughen the cement. This permits the use of a very much higher proportion of fluxing elements with the bituminous or other pitch materials.

In constructing pavements of bituminous pitch, such as asphalt and the like, the difficulty is not to get sufficient viscosity at first, but to prevent what is known in the art as "aging." The viscosity and elasticity are lost by a process of crystallization, which in a few years leaves the pavement hard and brittle, hence subject to ready granulation from traffic. This result is called "aging," and it can be postponed for an indefinite period by the process herein described.

The quantity of quicklime I use by its actions and reactions in combination with the pitch permits the application of at least twenty per cent. of fluxing elements to the pitch, while the highest ordinary amount of fluxing elements applied by the art is ten to fifteen per cent. This increased amount of fluxing material, especially when a fixed oil is used therefor, will to a practical extent prevent aging, and it is the employment of the quicklime that permits

of the increased percentage of the said fluxing materials. The quicklime protects the composition from the effects of the summer temperature, and the said added quantity of fluxing materials makes the pavement tough and semi-elastic in the coldest winter weather. In short, the extremes of temperature are thus provided for and aging prevented. Moreover, the lime added in the manner described is very beneficial to the pitch elements.

One of the great difficulties in constructing pitch pavements is to rapidly and sufficiently heat the mineral matters employed in the large quantities demanded. If they are not sufficiently heated, the pitch cannot in due proportion be mixed therewith. If they are not hot enough, a too large amount of pitch will be demanded to coat them, and the greater the amount of pitch used the more surely will the pavement "break down" in the summer temperature, and the increased quantity of the pitch adds to the cost of the construction. Again, even in this case the pitch itself must be so hot that it will surely be damaged thereby. Further, when the pitch mastic is made at a local plant and hauled a long distance to the point where the work is being done the heat employed must allow for a loss of from 75° to 150° Fahrenheit in transit, and therefore the average usual heat infused into the mastic is 340° Fahrenheit for the pitch-cement and 480° Fahrenheit for the mineral matters, and at these high heats they are combined. It is known that these high heats are detrimental and materially aid in causing the early aging of the pavement.

The process herein described can be employed at a point in close proximity to the point where the streets or roads, &c., are being constructed, the elements being mixed by hand labor, although where convenient machinery can be employed for mixing the said materials.

I will now describe my process.

I make my compositions in batch quantities for immediate use, and to effect this I take eight parts, by weight, of finely-granulated quicklime and bring it to a slaked condition by mixing therewith a due quantity of water. To accomplish my purpose, I must add

to the lime about thirty-two parts, by measure, of water in one hundred parts of lime and water. I cannot effect my purpose if I vary much from eight parts, by weight, of lime in the batch quantity I am making. I have placed my fluxing element in a boiling-still and brought it to a desired heat. The fluxing element may consist of asphaltic oil or maltha or the like. I now add my asphalt therewith and incorporate the two well together by boiling and stirring. My asphalt is a natural article and in a crude condition. I now add to the said slaking quicklime ten parts, by weight, of the said heated asphaltic cement. The slaking lime has produced a high heat and is evolving hot vapors, and when the heated cement is stirred therein a violent fomentation takes place. I have duly heated my mineral matters, which are composed of broken stone of desired sizes and proportions. I now mix eighty-two parts, by weight, of these with the fomenting mass. I must take advantage of the said fomentation; otherwise it would be impossible to mix the eighty-two parts of the said broken stone therewith. The cause of the fomentations is the bringing of the asphaltic cement in contact with the slaking lime when it is rapidly and sufficiently evolving hot vapors. To secure this condition, about thirty-two parts of water, by measure, must be used in one hundred parts, by measure, of lime and water. If less is employed, the slaking lime will too quickly eliminate the water, and the said fomentations would not then occur. If a larger quantity were used, desired compression of the mass could not be secured. Thirty-two parts of water will be expelled, but not before a sufficient mixing by hand can be effected. The said fomentations enable easy and rapid hand-mixing, because the action of the cement, owing to the said hot vapors, is not unlike oil on a damp hot surface, and it can be freely and readily located with the mineral elements. It has been found that it is utterly impractical to mix hot mineral matters and hot asphaltic cement together by hand, owing to the tendency of the elements to draw together and ball and become too heavy to be mixed by hand. It is therefore seen that the production of the said fomentations is an essential part of the herein-described improvement. The fact that a very much larger amount of fluxing elements can be used with the asphalt, owing to the way I employ the quicklime, also contributes to easy hand-mixing of the elements. I may pour my fomenting mass upon the heated broken stone, but such a change would be

merely a matter of convenience. To carry out the process, exact proportions as nearly as possible should be adhered to. The broken stone should be duly heated and taken in nearly exact quantities, composing eighty-two parts, by weight, of the mass and eight parts, by weight, of the said quicklime and ten parts, by weight, of the asphaltic cement and a violent fomentation thereof induced. When this is done, a practically uniform mastic can be made by easy hand-mixing. If a larger quantity of lime is used, it will make the cement too thick to be mixed with the mineral matters, because it expands to three and one-half volumes by slaking. It is desirable that not more than ten parts, by weight, of the asphaltic cement should be used in order to secure a desired character in the pavement; but the problem consists in securing practical and commercial mixing by hand labor, and this is enabled principally by the benefit secured from the referred-to fomentation of the asphaltic cement.

I have not described the treatment of the subbase in making pavements, because the best method for this is old and well known.

I am aware bituminous and pitch elements have been mixed with lime, and this I do not broadly claim; but

What I do claim, and for which I desire Letters Patent of the United States, is—

The herein-described improvement in procuring compositions for pavements which consists in securing a practical method of combining desired elements in necessary proportions to secure needed results, viz: taking a due quantity of granulated quicklime and mixing it with a sufficient amount of water, then adding thereto and mixing therewith a required measure of the described asphaltic cement, thus producing the active fomentations desired, then immediately taking advantage thereof to make it possible to add thereto and mix therewith the necessary quantity of mineral matters, thereby enabling the practical mingling of the said ingredients, in batch quantities, and by hand-labor, if desired, then at once placing this mass upon a properly-prepared street or road bed, rolling and tamping it to secure desired compression as particularly and for the purpose set forth and specified.

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

JOSEPH HAY AMIES.

Witnesses:

HOWARD E. RANDALL,
MARY E. HAMER.