UNITED STATES PATENT OFFICE.

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METHOD OF MAKING ROAD-BEDS AND PAVEMENTS.

1,102,927. Specification of Letters Patent. Patented July 7, 1914.

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To all whom it may concern:

Be it known that I, JOHN A. JOHNSTON, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Method of Making Road-Beds and Pavements, of which the following is a specification.

This invention relates to a method of making road-beds and pavements for the purpose of improving the wearing qualities and, at the same time providing a most durable and practicable construction at a minimum of expense.

It has been proposed heretofore to apply bitumen in a molten condition to a layer of broken stone in the manufacture of road-beds for the purpose of thoroughly binding the stone together and forming a compact and lasting foundation, but there has always been some difficulty owing to the fact that the bitumen might not always flow thoroughly into all the interstices between the stones, and after it has once set it is a difficult matter to force it farther in by rolling. Moreover, if it fails to flow into all the interstices, it leaves voids between the stone layer and foundation which sometimes results in large masses of material being loosened.

The principal object of this invention is to provide an improved method of uniting the bitumen with the entire layer of broken stone. It can be applied either to one or more layers in the road bed. This is done according to this method by reversing a portion of the usual process and yet using a part of it, that is, the layer of broken stone is not all put on the road-bed at the same time, nor is all the bitumen for a single layer applied at once, as has been the case heretofore, but a small portion of the stone is first spread on and, without being rolled at all, is treated with an excess of bitumen. This fills all the voids and runs down to the foundation below so as firmly to unite therewith and at the same time provides a material amount of bitumen above this portion of the layer of stone. Then the rest of the stone layer is applied on the top of the bitumen and rolled thoroughly in place, after which the remainder of the bitumen is added to it. This double treatment with bitumen results in providing a complete filling of all the voids in the entire layer of stone as the molten material coming down from above meets the bitumen previously applied and melts its surface so that the two bodies of bitumen are homogeneously united. Moreover, if there is any flaw in the application of the bitumen so that there are any voids not filled, these must occur at the middle or about half way between the upper and lower surfaces of the stone layer where they are entirely surrounded by the bitumen and broken stone conglomerate, instead of being at the bottom as heretofore, where there is no bitumen immediately below. This is an advantage because in the first place a void occurring at this point is only a short distance from the upper surface of bitumen, and consequently it cannot be of as great an extent as when it occurs at the bottom at a greater distance from the upper layer of molten material. Moreover, the old method permitted at times a comparatively wide space between the foundation and broken stone layer unfilled with bitumen, this providing an opportunity for a solid block of the broken stone and bitumen to crack away. It will be understood also that by applying the bitumen to the lower part of the layer of broken stone, and thereafter applying the rest of the layer of stone and rolling it in, the bitumen is forced up into the second layer of stone a material distance by the rolling process and that at this point the upper portion of the stone is thoroughly forced into the bitumen by the heavy pressure of the roller. Another advantage of this method is that the bitumen is prevented by the broken stone to which it is applied from flowing on the cambered surface or getting into an uneven condition so that the rest of the stone is applied on a uniform layer of bitumen.

Having described the invention broadly, I will now describe a specific practical way of carrying it out.

After all foundations are in place the sub-surface is brought to a grade 2″ below, and parallel to the proposed finished surface with a crown or camber not to exceed ½″ per ft. of cross section. This sub-surface is thoroughly rolled. All depressions which may appear are filled and again rolled, and the rolling continued until a firm, well compacted true surface is obtained. On the sub-grade, prepared as described, is placed broken stone, which should be not less than 1½″ in their longest dimensions. These are so spread, that, after thorough rolling, the

resultant surface will be 2″ below, and parallel to the proposed finished surface of the road; all depressions formed under the rolling are filled with stone of the same size as previously used for this layer, and the rolling continued until an unyielding surface is obtained, which must be true to line, grade, and cross section. On the surface so prepared, is spread a layer of broken stone, which vary in size from ¾″ to 1½″ in their longest dimensions. This layer of stone is so spread as entirely to cover the sub-surface, but in the thinnest possible way, (practically one stone deep). Thus it will be seen that it forms only a small part of the ultimate broken stone layer. Without rolling this last layer of stone, it is sprinkled with water and while still wet, there is sprayed over it a layer of bitumen heated to 250 degrees F. applied with a mechanical sprayer at the rate of ½ gal. per sq. yd. of surface and at a pressure of 70 to 80 pounds per sq. in. Over this bituminous is spread a layer of coarse, clean sand, using 0.02 cu. yds. of sand per sq. yd. of surface. On this bituminous matrix is then spread sufficient stone (¾″ to 1½″ size) to complete this stone layer and to bring the surface to a point ½″ below the proposed finished surface. The whole then is watered and rolled, until the stone surface is smooth, all depressions filled with stone of the same size as the rest of the layer, and again rolled. Only enough rolling is done to take out the depressions and true up the surface, but not enough to close the interstices of the stone. Care must be taken to keep this surface absolutely free from dirt. On the stone surface so prepared, water is sprinkled, and while still wet, there is sprayed over it a layer of bitumen, heated to about 250 degrees, F., applied at the rate of ¼ gal. per sq. yd. of surface, and at the pressure of 70 to 80 pounds per sq. in. Over this bitumen is spread grit, (preferably stone chips, all of which should pass through a mesh of ½″, and none through a mesh of $\frac{1}{16}$″). Only enough grit is used to prevent the bitumen from sticking to the wheels of the roller. This surface is again wet and another layer of bitumen applied and covered in the same manner as the previous one, except that more grit is used for covering. The whole road is then well watered and thoroughly rolled, using such additional grit as may be needed to cover any bitumen that appears on the surface, and the rolling is continued until there is no movement of the road material under the roller and whole becomes thoroughly compacted.

Although I have described in great detail a specific way of carrying out the invention, stating relative proportions and absolute measurements of the materials employed, this description is given simply for the purpose of enabling a practical man to carry out the method on a commercial scale, and I am aware that the invention is not limited to the particular proportions or even the precise order of steps specified in the example.

Therefore I do not wish to be limited to these features, but

What I do claim is:—

1. A method of making uniform road-ways and pavements which consists in providing a foundation, spreading thereon a thin layer of broken stone, applying to the broken stone a body of molten bitumen sufficient to fill the voids of the broken stone and to cover the same, then applying the remainder of the layer of broken stone of the same character on the top of the bitumen and rolling it in to force the upper parts of the bitumen up into the voids in the part of the stone layer latest applied, and finally applying molten bitumen on the top of the stone to permit it to flow down to fill the voids therein, and to come into contact with the first mentioned layer of bitumen.

2. A method of making road-ways and pavements which consists in providing a hard foundation having rolled broken stone at the top, spreading thereon a thin layer of unrolled broken stone, applying to the thin layer of broken stone a body of molten bitumen sufficient to fill the voids and to cover the same, then applying the remainder of the layer of broken stone on the top of the bitumen and rolling it in, applying molten bitumen on the top of the stone to permit it to flow down to fill the voids therein, and to come while molten into contact with the first mentioned layer of bitumen while still warm, whereby the two bodies of bitumen become homogeneously united and the entire mass becomes uniform from bottom to top, and spreading a thin layer of grit over the top thereof.

3. A method of making road-ways and pavements which consists in providing a foundation, spreading thereon a thin layer of broken stone, wetting it, applying to the broken stone a body of molten bitumen sufficient to fill the voids of broken stone and to cover the same, applying a layer of coarse clean sand, then applying the remainder of the layer of broken stone on the top of the bitumen and rolling it to smooth its surface but not sufficiently to close up the voids, wetting the stone, and finally applying molten bitumen on the top of the stone to permit it to flow down to fill the voids therein, and to come into contact with the first mentioned layer of bitumen and sand.

4. A method of making road-ways and pavements which consists in providing a foundation, spreading thereon a thin layer of broken stone, spraying on the broken stone a body of heated molten bitumen un-

der pressure, then applying the remainder of the layer of broken stone on the top of the bitumen and rolling it to form a smooth surface, and finally spraying molten bitumen under such pressure on the top of the stone so as to force it to flow down to fill the voids therein, and to come into contact with the first mentioned layer of bitumen.

In testimony whereof I have hereunto set my hand, in the presence of two subscribing witnesses.

JOHN A. JOHNSTON.

Witnesses:
ALBERT E. FAY,
C. FORREST WESSON.