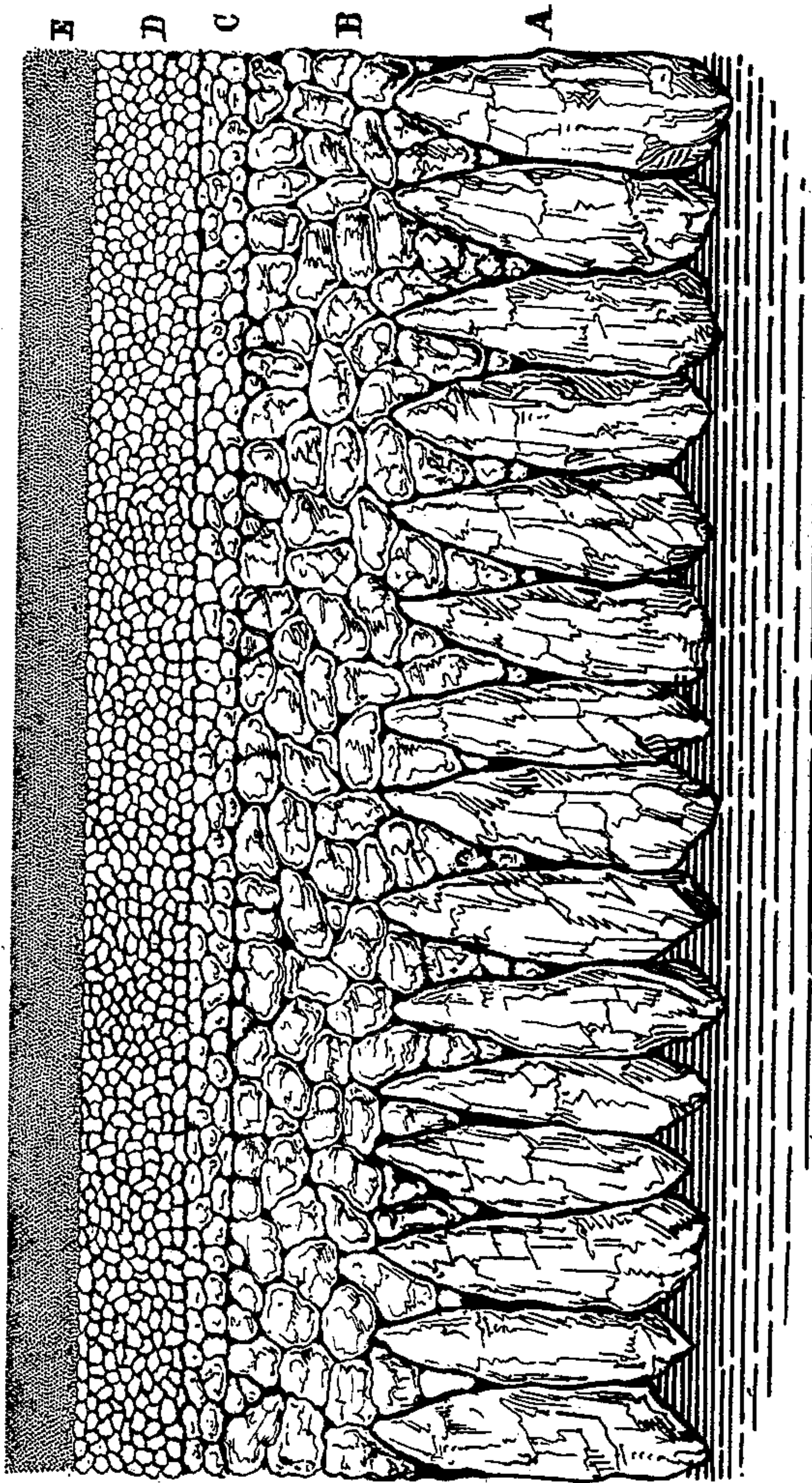


S. R. SCHARF.

ASPHALT CONCRETE PAVEMENT.

No. 176,360.

Patented April 18, 1876.



Attest:  
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# UNITED STATES PATENT OFFICE.

SAMUEL R. SCHARF, OF WASHINGTON, DISTRICT OF COLUMBIA.

## IMPROVEMENT IN ASPHALT CONCRETE PAVEMENTS.

Specification forming part of Letters Patent No. **176,360**, dated April 18, 1876; application filed March 20, 1876.

*To all whom it may concern:*

Be it known that I, SAMUEL R. SCHARF, of Washington, in the county of Washington and District of Columbia, have invented a new and Improved Concrete Asphalt Pavement; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The object I have in view is an improved asphaltic concrete pavement; and the novelty therein consists in the pavement itself, with its component parts and the various methods and processes connected with making and laying the same, all as more fully hereinafter explained.

In order that those skilled in the art may be enabled to make and lay my pavement, I proceed to describe the same, having reference to the drawings, which represent a vertical section of my pavement.

In the laying of my pavement the earth in the street should be excavated to a proper depth, and the surface thus exposed should be heavily rolled, the soft places developed being dug out and filled in with firm material.

Upon this road-bed, thus prepared, I place, by hand, a course of stone, A, for a sub-base. These stones are broken or quarried so as to be oblong, and preferably wedge-shaped, from five to eight inches in greatest length, and are placed side by side as closely as possible, with the largest ends down and sharpest ends up. The stones are not to be rammed, but the tops of those which project considerably above the general level should be knocked off with a hammer. Upon this sub-base, thus prepared, I place a layer of broken stone, B, about three or four inches in depth above the points of the sub-base A. These stones should be as nearly as possible of uniform size, and, for a fourteen or sixteen inch pavement, should preferably be cubes from one and one-half inch to two inches in diameter. The stone, after being broken, should preferably be riddled through sieves or screens with meshes of proper size to allow all material to pass through except the stone of the sizes indicated. Upon this stone, preferably before it is laid

upon the road-bed, there should be poured a mixture of distilled coal-tar and raw coal-tar, in the proportion of one part of distilled coal-tar to two, three, or four parts of the raw coal-tar.

This distilled coal-tar is coal-tar from which the lighter oils have been distilled, and from three to five gallons of heavy oils to a cask of forty gallons of coal-tar have been distilled. I distinguish as light oils those which are lighter than water, and heavy oils those which are heavier than water. The proportion of heavy oils thus distilled off differs with different qualities of coal-tar; but usually the quantity of heavy oils to be distilled off will be from three to five gallons to the cask, as above stated.

The residuum or distilled coal-tar thus produced will retain a solid form when exposed to an air temperature of about 60° Fahrenheit; but at an air temperature higher than indicated it takes a semi-fluid character, and slowly changes in form and settles toward a common level. Another test of proper distillation is, that the residuum may be bent, distended, or molded in the hands without sticking to them. If too much of the heavy oils is distilled off, the residuum is hard and brittle, and cracks in handling. If too little of the heavy oil is distilled off, the residuum sticks to the fingers.

The proportion of raw coal-tar to be added to this distilled coal-tar, as above stated, varies with the temperature of the air, in cold weather the quantity being greatest, and in warm weather the least.

The necessity of the use of the raw coal-tar arises from the fact that the distilled coal-tar is too stiff to properly coat the stones; but by the addition of the coal-tar, which has a certain proportion of water and light and heavy oils, the composition thus made is more fluid and readily coats the stones, and after a short exposure the water passes off by evaporation, and also the lighter oils, leaving the composition coating the stones quite hard, but not at all brittle. This distilled coal-tar and the raw coal-tar are heated in a suitable vessel until the composition reaches the boiling-point, when it is ready for use.



The stones, being coated with the composition described in any suitable manner, but preferably by being shoveled over in heaps while the composition is poured on, are hauled to the streets and placed thereon.

The stones thus laid upon the road-bed and coated are properly leveled, and then thoroughly rolled with a heavy roller until all the stones may, as far as possible, be embedded and fastened together.

Upon this stone base, thus prepared, I place a second course of stone, C, prepared and treated as follows: Preferably I take the stones which have passed through the riddle or screen when I prepared the base B, and pass the same through riddles or screens which will permit all stones under a half of an inch in diameter to pass through.

These stones, thus screened, of a diameter from one-half of an inch up to one and one-half inch, are heated by proper means to a point of heat about equal to the boiling-point of the composition hereinafter described, and while hot are mixed with this hot composition, prepared as follows: This composition is made of the distilled coal-tar before described, which preferably is heated in a proper vessel to about its boiling-point. Asphaltum is heated in a separate vessel to its boiling-point. The asphalt is then dipped out and mixed with the distilled coal-tar, in the vessel where it is heated, in the proportions of about ten per cent., in bulk, of the said distilled coal-tar, where Trinidad refined asphalt is used, or its equivalent in other natural asphalts, and thoroughly stirred. The asphalt must be a little hotter than the distilled coal-tar; otherwise it will not properly mix with it. If it is colder it goes to the bottom; if it is too hot it stays on top; but if of the proper temperature, it will mix intimately with the distilled coal-tar. This composition, thus mixed, is heated to its boiling-point, and kept at that degree of heat in the vessel while it is being taken out. This composition, thus prepared, is applied hot to the heated stones, most conveniently in a proper mixing vessel, wherein both the stones and the composition are poured, and intimately mixed by stirrers, until all the stones are thoroughly coated: or the stones may be placed upon platforms, or on the ground in heaps, and the composition poured over them, and the mass raked and turned over and over by suitable implements until the stones are thoroughly coated.

The composition described may be made with a less proportion of natural asphalt, or, indeed, with none at all; but I believe the best results are obtained when it is used in about the proportions I have described.

The stones thus coated with composition described are immediately carted to the street, and placed hot upon the prepared base before described and leveled off, with a minimum of thickness of about an inch or an inch and a half in depth, the low places or hollows being

thicker, it being one of the purposes of this course to bring the surface of the pavement to a uniform level or shape desired on all parts. This course is immediately and heavily rolled while hot, and rolled until it is cold.

Upon this course, thus prepared, is placed a third course, D, which is made as follows: This course should preferably be composed of screened clean broken stone, from one-quarter of an inch to three-quarters of an inch in diameter, heated as described, and mixed with the hot distilled coal-tar and asphalt composition before described, except that the proportion of asphalt is increased to twenty or thirty per cent. of the distilled coal-tar, and placed hot upon the course C, before described, to the depth of two or three inches, and thoroughly rolled.

Upon this course, thus prepared, I place an upper course, E, which is made as follows: I take the small stones which have passed through the riddles and screens, and all the stone-dust, and mix with the same about an equal bulk of clean, coarse sand or fine gravel, which should first be thoroughly screened. This proportion of sand or gravel varies with the quantity of stone-dust. If the stone-dust is abundant, as in gneiss, then there is required a larger proportion of the sand or fine gravel; but if the stone-dust is scanty, as in hard, blue limestone, then a less proportion of the sand or gravel is required, the office of the sand or gravel being to embed thoroughly the small stones mentioned, and to fill all the interstices. After the small stones and sand and gravel are mixed, they are placed in proper heaters and kept there until all the moisture is expelled, and until the mass is heated to a temperature a little higher than the boiling-point of the composition described. If there is no limestone in the mass, there should be added of air-slaked lime, or of hydraulic cement, from five to eight gallons to a cubic yard of the mixed small stones and sand or gravel, which lime or cement should be intimately mixed with the mass after the moisture is expelled and before the mass is heated to its highest point. If, as sometimes occurs in midsummer, the stones and sand or gravel are thoroughly dry, the cement or lime may be mixed with the same before heating the mass.

After the mass is heated, as described, it is mixed with a hot composition of distilled coal-tar and natural bitumen, prepared as follows: This distilled coal-tar, before described, is heated in a vessel to its boiling-point. Trinidad or other natural asphalt is heated in a separate vessel to its boiling-point. Then the boiling asphalt is dipped out and poured into the vessel which contains the distilled coal-tar, and the composition thoroughly mixed by stirring.

For use in the latitude of Washington, I prefer from fifteen to twenty-five per cent. of the natural asphalt, taking refined Trinidad asphalt as a standard.



For use in the latitude of New Orleans, I should require the largest proportion of asphalt, and at the same time should use coal-tar from which at least five gallons of heavy oil to the cask had been distilled off.

For the latitude of Chicago, where both intense heat and cold are to be guarded against, I should use the largest proportion of asphalt, and at the same time should use coal-tar from which not over three gallons of heavy oils to the cask had been distilled off.

This composition, thus prepared, is taken hot from the vessel and mixed with the heated mass of stones, sand or gravel, and lime or cement, in the proportions of from forty to sixty gallons to the cubic yard of the former, and thoroughly stirred in and mixed with the same. This mass, thus prepared, is taken hot to the street and spread upon the previous course, prepared and rolled for its reception, as above described, and spread evenly over the same to the depth of about two inches, and rolled with a light roller, moistened with water slightly, to smooth off the surface; then dust the same with hydraulic cement or finely-pulverized stone, and then roll the same thoroughly with a heavy roller until it is nearly or quite cold.

The foregoing description is of a perfect and complete five-course pavement, sufficient for all purposes of heavy travel or use.

In the pavement I have described, the advantage of the fine stone-dust used in the upper course is as follows: The liquid preparation which is mixed with that course penetrates the fine dust and becomes thoroughly incorporated with it, and this last-named mixture thoroughly permeates the mass of small stones and sand or gravel, fills all interstices between them, holds and binds all particles together, and, consequently, permits the whole to be rolled into a firm immovable body of great density, capable of sustaining heavy weights, and sufficient for any city traffic.

The advantage of distilling the coal-tar to a certain point, as before described, is, that upon trial tar thus distilled is found to have

the requisite proportion of heavy oils to retain its life and integrity, and to resist the variations in temperature to which it is subjected in various portions of this country.

If too much oil is distilled off the pavement will crack in winter, and if too little is distilled off the pavement will be soft in summer.

Having thus described my pavement, what I claim as new therein, and my own invention, is—

1. In a concrete asphalt pavement, the combination of the sub-base A with the base B, constructed, prepared, and laid substantially as described.

2. In a concrete asphalt pavement, the combination of the sub-base A, the base B, and the lower intermediate course C, constructed, prepared, and laid substantially as described.

3. In a concrete asphalt pavement, the combination of the sub-base A, the base B, the lower intermediate course C, and the upper intermediate course D, constructed, prepared, and laid substantially as described.

4. The composition described for the base of a concrete asphalt pavement, consisting of distilled coal-tar and raw coal-tar, prepared in the proportions and in the manner substantially as set forth.

5. The composition described for the lower intermediate course, consisting of distilled coal-tar and asphalt, prepared in the proportion and in the manner substantially as set forth.

6. The composition described for the upper course of a concrete asphalt pavement, consisting of distilled coal-tar and asphalt, prepared in the proportions and in the manner substantially as set forth.

7. The five-course concrete asphalt pavement, constructed substantially as described.

This specification signed and witnessed this 18th day of March, 1876.

SAMUEL R. SCHARF.

Witnesses:

M. M. ROHRER,

CHARLES THROMAN.