W. W. HUBBELL.

Improvement in Pavements.

No. 115,475. Patented May 30, 1871.

Figure 1.

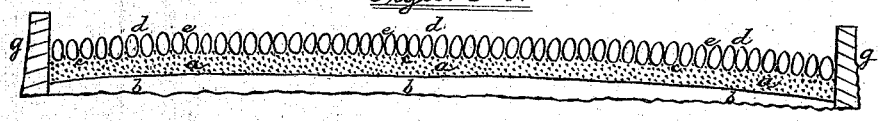


Figure 2.

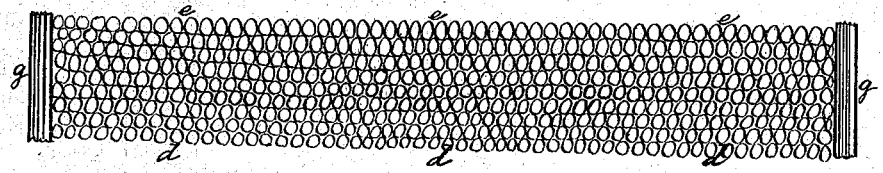


Figure 3.

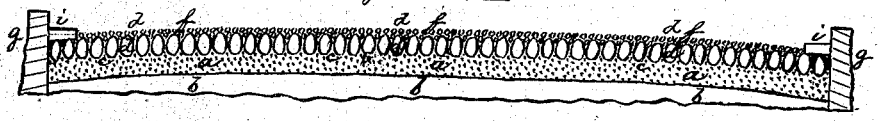
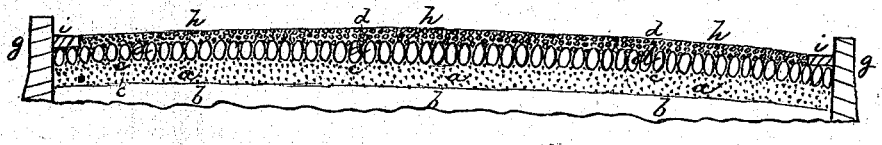


Figure 4.



Witnesses.

Walter Hubbell

E. A. Ramillie

Wm. W. Hubbell

Inventor

UNITED STATES PATENT OFFICE.

WILLIAM WHEELER HUBBELL, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN PAVEMENTS.

Specification forming part of Letters Patent No. 115,475, dated May 30, 1871.

Be it known that I, WILLIAM WHEELER HUBBELL, of the city of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Street Pavement, of which the following is a specification:

The nature of my invention consists in the manner of constructing a concrete and stone street pavement, with an under bed of large stone, cemented and interlocking with an upper surface of smaller cemented stone for a wearing-surface, with coal-ashes, cement, and lime, applied and constructed substantially as herein described; the object being to form a pavement which is not destructible by saturation and decomposition, which resists uric acid, wet, heat, and cold, is smooth and easy to the wheels of vehicles, yet gritty and pliant to horses' feet, and capable of great wear, and easy renewal of wearing-surface at small expense, and thus superior to any other pavement for the streets of cities.

Description of the Accompanying Drawing, which Represents the Street.

Figure 1 is the cross-section with the gravel-bed and the cobble-stone set in it ready to receive the solution of lime. Fig. 2 is the ground plan of the same as set in the gravel, showing the interstices between the stones for a foundation or bed. Fig. 3 is the cross-section of the stone bed with the layer of broken stone and concrete ready to be rolled for a surface. Fig. 4 is the cross-section of the pavement as finished for traveling-surface.

In constructing the pavement I first make a bed of gravel, *a*, about eight inches deep, and distributed on solid earth, *b*, the upper face *c* being shaped nearly to the configuration of the street in curvature and grade. Into this bed of gravel *a* I set cobble-stones *d*, or broken stones, so as to leave interstices *e* between them, they being set about half their depth into the gravel, to allow a solution of lime to settle down between them, and to allow smaller or surface stones to interlock with them. *g g* are the curb-stones. When these cobble or broken stones *d* are set or laid in the gravel bed *a*, I have a strong solution of lime slaked in water, and pour this solution onto the stones and between them, with water-pots, so that it shall be distributed evenly and shall run and settle down between the stones into the gravel bed in which the stones set, and convert this gravel bed into cement or concrete. About one bushel of lime slaked in about forty gallons of water should be used to saturate about six square yards of gravel bed; but I do not confine myself to these exact proportions, as it is manifest they may be varied. Before the solution of lime sets in the gravel bed drive the cobbles or stones down well into it. The saturated gravel will then be forced to near the top of the cobble-stones. Then set the gutter-stones *i* on the cobble-stones and concrete; and I now spread over these cobble or broken stones a thin layer of small broken stone, *f*, which have been prepared or selected for the purpose. These broken stone *f* should be durable in their texture, and of about one inch and a half, irregular or cubical in form—what is commonly known as turnpike broken stone. They will necessarily vary some in size and shape, some smaller and some larger. Some of these broken stone will settle down into the crevices or spaces between the cobble-stones or foundation-stones into the concrete, and interlock laterally with them, and, projecting up, will interlock with the larger broken stone, or those over the cobble-stones. When this thin layer of these broken stone is spread it should barely cover the cobble-stones, the object now being to get the interlocking and a firm cement or concrete bed, and connection between this upper and the lower stratum or bed of stone and concrete; and I now make and use a concrete of the following materials: Take about four bushels of dry sifted stone-coal ashes and sift or mix it thoroughly with one bushel of Rosendale or hydraulic cement, or similar cement. Now sift this dry ashes and cement over the bed of broken stone, and brush it about so that it shall settle down between the crevices. Spread it so that it shall cover about six square yards of the bed. Now water this with a solution of slaked lime, using about three bushels of lime in forty gallons of water. Now spread over this another slight layer of broken stone, and immediately roll them all down with heavy rollers, or ram them into the cement bed before it has set, so that they shall be pressed down solid into it and all interlocking together in a solid mass. Now sift more of this dry mixture of coal-ashes

and cement over this bed of stone, water it again with the solution of lime, and roll it all down to form a smooth surface, *h*, so that the upper surfaces of the broken stone will be at or close to the surface of the bed, and form substantially a part thereof to receive the concussions of wheels and horses' feet. A slight coat of fine clean stone gravel or pebble may be spread on it and rolled in, or it may be omitted.

By this described method of applying the dry ashes and cement and the solution of lime, they become equally diffused and saturated in their proper places to solidify, with the least possible labor and expense, which is necessary for this purpose of a street pavement.

This concrete bed of stone and this cement will become very solid, and I have found by experiment that such a concrete bed will resist the extreme changes of cold and heat, and the action of uric acid and of rains, to which it is exposed, better than any other cheap preparation, and make a superior pavement for the streets of cities.

When this pavement is worn into depressions, it is easily repaired and leveled up by loosening the surface with a pick, leveling it up with broken stone, sifting in the ashes and cement, watering it with the solution of lime, and rolling it down level with the old surface. A new surface dressing can also be put all over the old one in the same manner, at slight expense, and thus readily keep it in good order for many years, at small expense.

The coal-ashes being a calcined product of the city dwellings makes it conveniently at hand, and by experiment I find it is better for this purpose than sand or gravel, though they may be substituted in this process of making up the pavement; but applied in this manner would, I think, be within the scope of my invention. The cement may also be omitted, but it would make the concrete less solid and durable to use a solution of lime alone.

The advantage of making a cement of the lower bed of gravel is that it tends to prevent the stone bed from settling into cavities, and also tends to keep it more solid and drier, though cementing the lower bed may be dispensed with without changing the main principles of my invention.

I do not claim a bituminous composition, formed in layers, applied to and combined with a stone pavement; but

What I claim as my invention is—

The manner hereinbefore described of building up the concrete and stone pavement by the application of a solution of lime with dry coal-ashes or gravel, and Rosendale or hydraulic cement, mixed and sifted into the crevices of the broken stone so that the broken stone shall interlock between the bed and each other with this concrete between them, and form the stone and concrete surface described.

WM. W. HUBBELL.

Witnesses:

WALTER HUBBELL,

E. A. RAMILLIE.