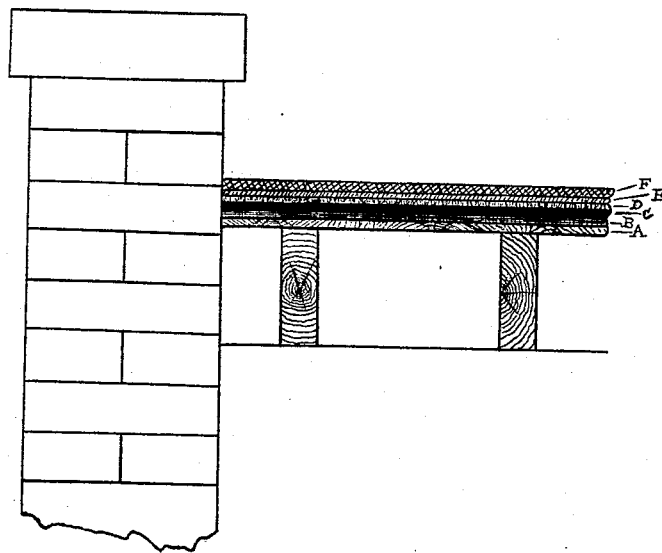


C. M. WARREN.  
Composite Roof.

No. 217,916.

Patented July 29, 1879.



Witnesses.

*Geo E. Long*  
*Fred L. Kane*

Inventor.

*Cyrus M. Warren*

# UNITED STATES PATENT OFFICE.

CYRUS M. WARREN, OF BROOKLINE, MASSACHUSETTS.

## IMPROVEMENT IN COMPOSITE ROOFS.

Specification forming part of Letters Patent No. **217,916**, dated July 29, 1879; application filed November 22, 1878.

*To all whom it may concern:*

Be it known that I, CYRUS M. WARREN, of Brookline, in the county of Norfolk and State of Massachusetts, have invented a new and useful Improvement in Composite Roofs, which invention is fully described in the following specification, reference being had to the accompanying drawing.

This invention is intended as an improvement upon the roof for which Letters Patent were granted to me March 28, 1876, numbered 175,131; and it consists in laying slate, tile, bricks, or equivalent rigid material in the layer of hydraulic-cement mortar, preferably of Portland cement, therein described.

In carrying out my invention, the roof is first constructed in the ordinary manner of laying a gravel roof, usually of three or more overlapping courses or layers of saturated paper or felt on the sheathing-boards A, with intermediate layers of hot bituminous or coal-tar cement, preferably the former, or equivalent material, and the surface of the felt foundation B thus formed spread over with a layer, C, of the hot bituminous cement, or equivalent material, and this, while still hot, immediately covered and filled with warm or dry gravel, broken stone, slag, sand, D, or equivalent material, brought to a firm bearing upon the felt. A fine mineral material may be substituted for the gravel; but the latter is far preferable. To the gravel roof thus constructed, or in any other suitable manner, and after the bituminous cement has well set by cooling, the loose gravel is swept off, and the firm gravel surface D remaining is covered with a layer of the hydraulic-cement mortar E, described in my patent above referred to, and this followed immediately with a layer of bricks, slate, or tile, F, or equivalent rigid material, which should be well embedded in the hydraulic-cement mortar before it has begun to set.

I am aware of the patent issued to Luke S. Mills and C. Hart Smith, No. 40,542, dated November 3, 1863, and also of the two patents issued to Tobias New, numbered and dated as follows, viz: No. 147,962, dated February 24, 1874; Reissue No. 8,414, dated September 10, 1878; and No. 209,131, dated October 22, 1878; and I disclaim any invention contained in either of these patents.

In the construction of a paved roof the pave-

ment of which is laid on bituminous or any kind of soft or fusible cementing material, or in a composition of which such a fusible material is one of the chief ingredients, it is important that such material should be intermixed with some firm, rigid, supporting substance on which the slates or other paving may rest, in order to protect the underlying soft material from the pressure, to which it would otherwise be subjected, of the superimposed paving material, and, more important still, from the greater pressure incident to its use for the various purposes for which such a paved roof is intended.

With no other support under the slate or tile than a material which is soft and plastic, in warm weather a continued pressure on one end or corner of a slate or tile, as in tilting back in chairs, or even standing for some time on one end or corner of a slate or tile, would press it downward and raise the other end, leaving it in a position to be easily broken by displacing the bituminous composition underneath.

In regard to the running or pressing out of the bituminous cement, the case would not be improved by laying the tile or bricks in hydraulic cement with the latter resting merely upon the soft or fusible bituminous cement.

The melted bituminous cement being poured over the felted roof and allowed to cool forms a smooth glistening surface, directly upon which is spread the wet hydraulic mortar to receive the bricks, slates, or tile. After setting, the under surface of the hydraulic cement is simply like that of a smooth slate or tile lying on the surface of the pitch, and the latter is as liable to be pressed or run out from underneath into the gutter as in Mills and Smith's roof, although the hydraulic cement will prevent its coming to the surface through the joints. There is no chemical union of the surfaces of the bituminous cement and slates or tile, as between hydraulic cement and gravel.

In my improved roof these objections are entirely obviated by having the slates or tile set in hydraulic cement, which is firmly united to and supported by the projecting pebbles, with which the bituminous cement is completely filled, and which prevent it from being pressed out and running, the whole forming one solid, immovable, and inseparable mass.

Other equivalent supports for the pressure of the hydraulic cement and tile may be substituted for the gravel, such as broken stone, strips of wood or metal, nails with thick heads, or buttons projecting above the felt equal to the desired thickness of the bituminous cement. The weight of the hydraulic cement and tiles or slate, resting upon such supports as these, would prevent the pressure from coming upon the bituminous cement; but the use of the gravel is simple, economical, and effective, and serves the double purpose of preventing the bituminous cement from running of itself in hot weather.

I do not claim, broadly, the laying of slates

or tile in hydraulic-cement mortar upon roofs, as I am aware that this has long been practiced.

I claim as my invention—

The combination of tile, or other equivalent rigid material, laid in hydraulic-cement mortar upon a foundation of gravel, or other equivalent supporting material, embedded in bituminous cement, or other equivalent material, in the construction of a roof, substantially as set forth.

CYRUS M. WARREN.

Witnesses:

GEO. E. CARY,  
FRED. L. KANE.