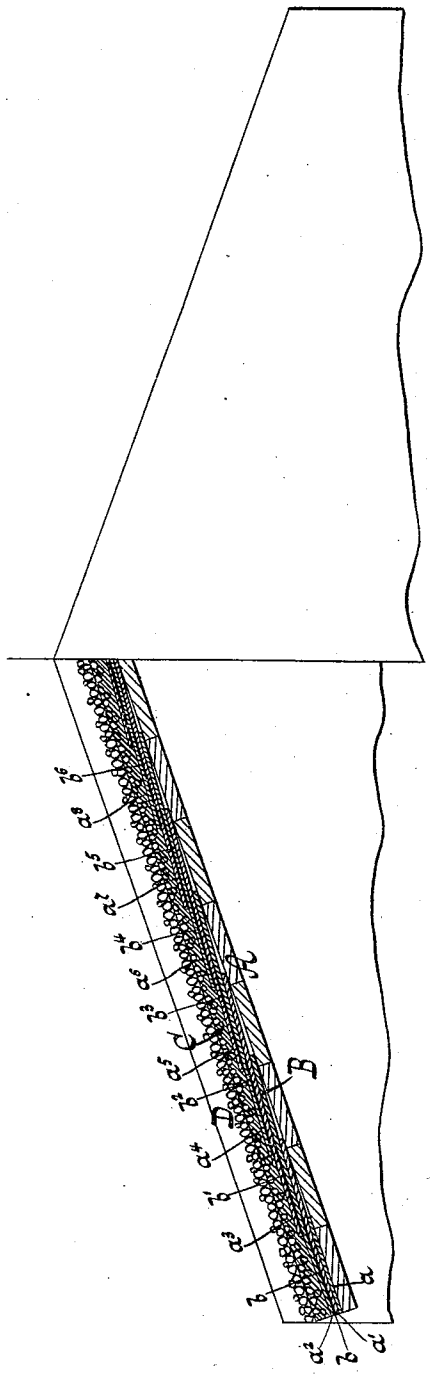
(No Model.)

C. M. WARREN.

Composite Roof.

No. 236,386. Patented Jan. 4. 1881.



Witnesses.
Chas. Wahlers.
William Miller

Inventor.
Cyrus M. Warren
by Van Santvoord & Hauff,
Attys.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CYRUS M. WARREN, OF BROOKLINE, MASSACHUSETTS.

COMPOSITE ROOF.

SPECIFICATION forming part of Letters Patent No. 236,386, dated January 4, 1881.

Application filed November 13, 1880. (No model.)

To all whom it may concern:

Be it known that I, CYRUS M. WARREN, a citizen of the United States, residing at Brookline, in the county of Norfolk and State of Massachusetts, have invented new and useful Improvements in Composite Roofs, of which the following is a specification.

This invention relates to roofs which are constructed of a bottom layer of paper or felt, a protecting layer of native bitumen, or equivalent material, and a top layer of gravel; my present invention being intended as an improvement of the patent granted to me May 22, 1877, and numbered 191,208.

This invention is illustrated in the accompanying drawing, which shows a sectional side view of my roof.

In this drawing the letter B designates a roof-foundation composed of paper or felt, preferably three or more thicknesses, saturated with coal-tar or other suitable adhesive water-proof material, (with or without an underlying layer of dry paper,) laid in successive overlapping courses *a a' a²*, &c., alternating with intermediate courses or layers *b b' b²*, &c., of coal-tar, pitch, or other suitable adhesive water-proof cement. This foundation is covered with a surface coating or layer, C, of bituminous cement, composed of natural asphaltum and petroleum-residuum or other suitable non-volatile material, and a layer, D, of gravel, sand, or other fire-proof material embedded or mixed with the cement.

The foundation B is placed on an even surface of tongued and grooved or matched sheathing, A, which is covered (commencing at the gutter, into which the first three courses, *a a' a²*, which should be well cemented together, are extended about one or two inches) with successive overlapping courses *a³ a⁴ a⁵*, &c., of the felt, each extending over the next preceding one, preferably about two-thirds of its width, so as to give at least three thicknesses over the entire roof when finished. As these courses are being laid each is secured to the sheathing-boards with nails and tin buttons, and cemented with the pitch under the top of the next course in the usual manner. Upon the surface of the felt-foundation thus constructed is then spread the layer C of the melted and hot bituminous cement above described, and upon this is immediately applied the layer D of warm or dry gravel or other suitable fire-proof material.

Instead of the cement made of natural asphaltum and petroleum-residuum above described, a compound of natural asphaltum and either wax-tailings, heavy petroleum-oil, or other equivalent non volatile softening material may be employed; and instead of natural asphaltum as an ingredient of such cement, rosin, or a residuum of the distillation of coal-tar, or of petroleum-residuum, or of wax-tailings, or of a mixture of coal-tar and petroleum-residuum, or of a mixture of coal-tar and wax-tailings, or any admixture of two or more of these residuums, or other equivalent material, may be wholly or in part substituted, the non-volatile softening material (which for coal-tar residuum should be wax-tailings) being retained; and instead of a felt saturated with coal-tar I may use a felt saturated with pine-tar or other equivalent material.

I do not claim, broadly, a roof-foundation composed of overlapping courses of saturated paper or felt alternating with layers or courses of adhesive water-proof cement.

I am aware of the patent granted to E. B. Warren, April 6, 1878, in which are shown overlapping layers of felt or paper saturated with asphaltic cement and held together thereby; but these layers do not alternate with intermediate layers of coal-tar, pitch, or other adhesive water-proof cement, as in my invention.

What I claim is—

In the construction of roofs, a roof-foundation composed of overlapping courses of paper or felt saturated with coal-tar or other equivalent material, alternating with intermediate courses or layers of coal-tar, pitch, or other equivalent adhesive water-proof cement, in combination with a surface coating or layer of a cement composed of natural asphaltum or other equivalent material, and petroleum-residuum or other equivalent non-volatile softening material, and gravel, sand, or other equivalent fire-proof material, substantially as set forth.

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

CYRUS M. WARREN. [L. S.]

Witnesses:
W. HAUFF,
E. F. KASTENHUBER.