(No Model.) 2 Sheets—Sheet 1.

A. W. COOPER.

TILE ROOFING.

No. 380,864. Patented Apr. 10, 1888.

Fig. 1.

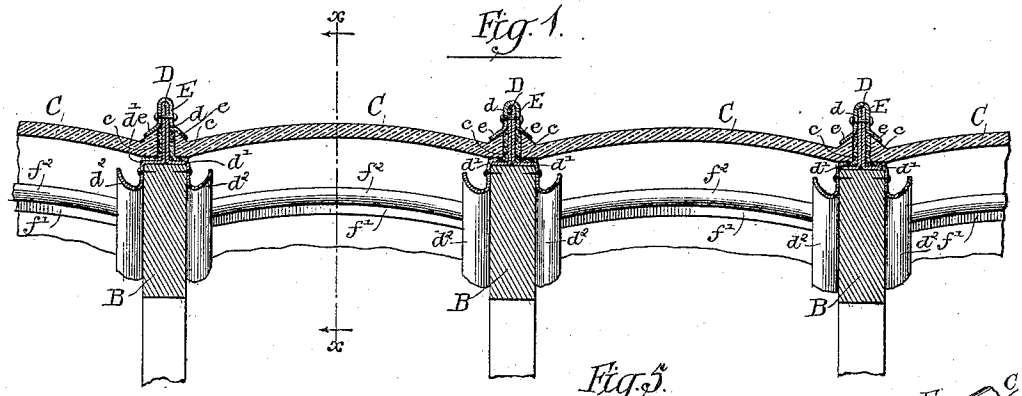


Fig. 4.

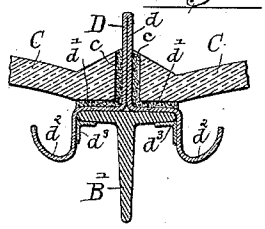


Fig. 5.

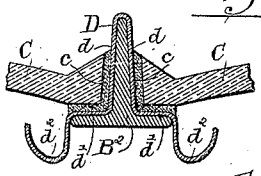


Fig. 2.

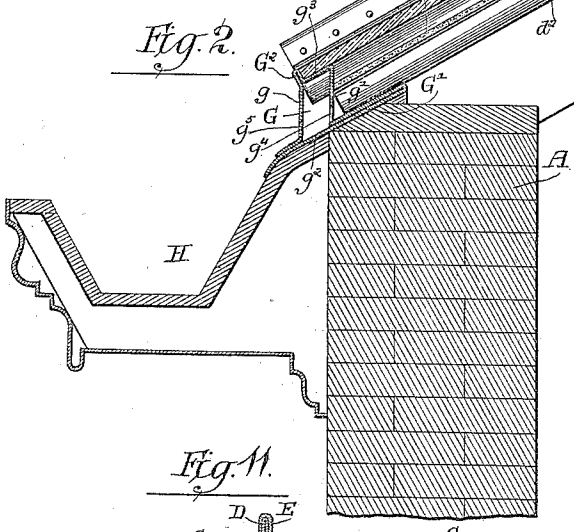


Fig. 3.

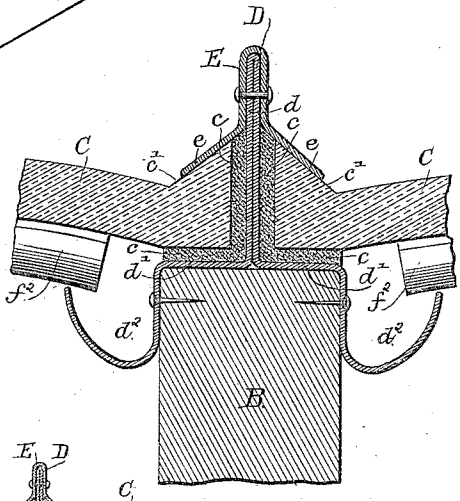
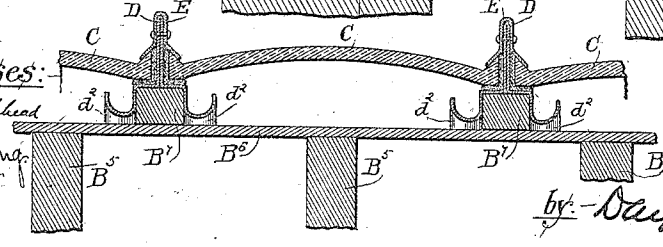


Fig. 11.



Witnesses:
Louis W. Whitehead
Wm. F. Fleming

Inventor:
Arthur W. Cooper

by Dayton & Poole
Attorneys.

N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.) 2 Sheets—Sheet 2.

A. W. COOPER.

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Fig. 6.

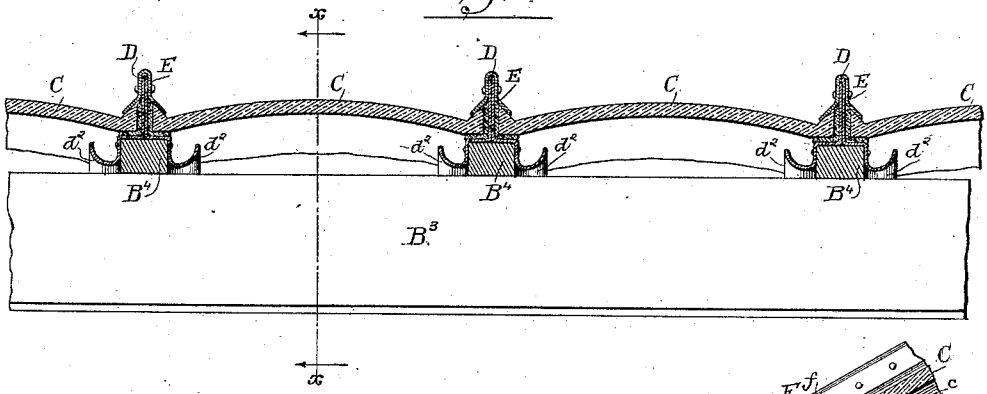


Fig. 9.

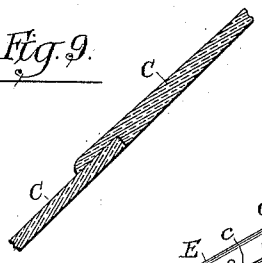
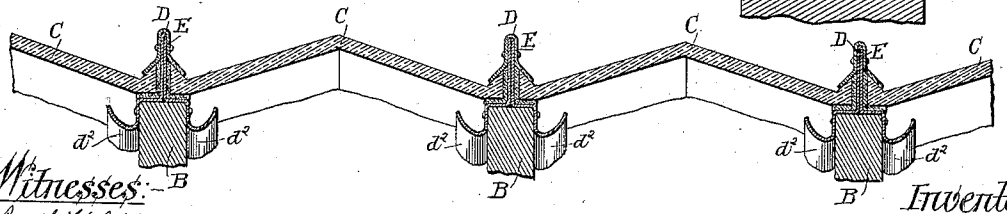


Fig. 7.

Fig. 10.

Fig. 8.



Witnesses:
Louis M. Hobbshead.
Wm. F. Fleming.

Inventor:
Arthur W. Cooper.
by Dayton & Poole.
Attorneys.

N. PETERS. Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

ARTHUR W. COOPER, OF CHICAGO, ILLINOIS.

TILE ROOFING.

SPECIFICATION forming part of Letters Patent No. 380,864, dated April 10, 1888.

Application filed December 20, 1887. Serial No. 258,456. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR W. COOPER, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Tile Roofing; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in the construction of tile roofs; and it consists in the matters hereinafter described, and pointed out in the appended claims.

In tile roofs as heretofore constructed the tiles have commonly been arranged to overlap each other in the same manner that shingles are applied. A construction of this kind is only applicable to steep roofs, and is necessarily very heavy and expensive, inasmuch as the tiles are overlapped in such manner as to give three thicknesses of the same over the entire surface of the roof.

A tile roof constructed in accordance with my invention embraces a single layer or thickness of arched tiles, which are supported at their edges upon rafters or other similar supports, the joints between the tiles being formed by means of rabbeted metal jointing-strips extending between and beneath the adjacent edges of the tiles, and provided at their lower margins with gutters to receive and carry to an interior or exterior drain-pipe or discharge-spout any water which may leak through the joints between the tiles. Said metal jointing-strips may be made of cast or wrought metal, and may rest directly upon the rafters or main supports of the roof, or may be otherwise sustained.

In the roof herein shown as embodying my invention the jointing-strips are made of sheet metal and are arranged longitudinally over and rest upon rafters or supporting strips or bars, as will hereinafter fully appear.

In the accompanying drawings, illustrating my invention, Figure 1 is a sectional elevation illustrating the construction of the roof embodying my invention, the section being taken upon a vertical plane parallel with the rafters. Fig. 2 is a transverse section taken upon line *x x* of Fig. 1. Fig. 3 is an enlarged detail section illustrating the joint between the tiles. Figs. 4 and 5 are sectional views illustrating metal supporting bars or rafters. Fig. 6 is a vertical section illustrating the roof embodying my invention, differing somewhat from that shown in Figs. 1 and 2. Fig. 7 is a transverse section taken upon line *x x* of Fig. 6. Fig. 8 is a sectional view illustrating a form of tile which may be employed for relatively flat roofs. Fig. 9 is a section showing one practical form of cross-joints between the tiles. Fig. 10 illustrates a form of roof differing slightly from that shown in Figs. 6 and 7. Fig. 11 illustrates in cross-section a roof provided with rafters and sheathing-boards as a support for the tiles.

As illustrated in Figs. 1 and 2, A is the wall, and B B the rafters, of a building.

C C are tiles, which are supported at their edges upon the rafters, and which are made of sufficient width to span the spaces between the said rafters. Said tiles are transversely curved or arched between the rafters, and are shown in said figures as made of somewhat greater length than width.

D D are metal jointing-strips, which are provided with a vertical part or flange, *d*, located between the adjacent edges of the tiles and extending somewhat above the same. Horizontal parts *d' d'* of said strips rest upon the upper surface of the rafters B beneath the marginal parts of the tiles, said horizontal parts being provided at their side margins with longitudinal gutters d^2 d^2, formed by giving a curved or concave form to the margins of the metal composing the strip. When this jointing-strip is made of sheet metal, as herein shown, the entire strip will commonly be composed of a single piece of sheet metal bent or folded at its middle, and having its folded part brought together to form the vertical flange *d*, as shown in the drawings, and having its marginal parts spread to extend over the rafter, and bent at their edges into the form of troughs or gutters. The gutters d^2 d^2 are for the purpose of receiving and carrying away any water which may leak through the jointing between the edges of the tiles and the jointing-strips. To make the roof as tight as possible and prevent leakage at these points, the tiles will commonly be embedded in cem-

ent or putty, as indicated at *c*, and the joints between the tiles will be covered by a cap-piece, E, of inverted-U shape, placed over the upper part of the vertical flange *d*, and provided with oblique flanges *e e* at its lower edge, constructed to overlap the adjacent margins of the tiles C C. The constructions of the said several parts above set forth are more clearly shown in the enlarged sectional view in Fig. 3.

In order to carry the water away from the vertical joint where the edges of the tiles come against the vertical flange *d*, I make the tiles much thicker at their edges than elsewhere and bevel the edges, so as to form upwardly-extending flanges having inclined surfaces *c'* adjacent to and sloping away from the said flanges *d*. The said inclined surfaces *c'* serve to deflect and carry away water from the flanges *d*, thereby greatly lessening the liability of leakage at the joints between the tiles by preventing the accumulation of water near the metal flanges. The beveled flanges at the side margins of the tiles, together with the arched or convex upper surfaces thereof, form two longitudinal gutters or valleys in each row of tiles, one at each side thereof, in which gutters the water is confined as it flows downwardly toward the eaves.

I preferably make the metal cap-pieces E to fit over the inclined surfaces *c'* of the tiles in the manner clearly shown in the drawings, so that the joints will be covered or protected and the rain deflected away from the latter. The employment of the cap-pieces E is not, however, essential, and favorable results may be obtained when they are omitted and the joints made by the use of putty or cement alone, inasmuch as the leakage in the latter case would be slight and would be readily taken care of by the gutters provided for it. When the cap is present, furthermore, any putty or cement filling may be omitted, the main purpose of the latter, in case the cap-pieces E are present, being to afford a solid bearing for the tiles, which latter, being necessarily somewhat irregular in form, would rest at a few points only upon their supports in case no filling material was employed at the joints.

To receive and carry to the longitudinal gutters any water which may leak through the transverse joints between the tiles, or which may be deposited by condensation upon and run down the lower surfaces of the tiles, I provide cross-gutters arranged beneath the cross-joints and constructed to discharge at their ends into the longitudinal gutters.

In Figs. 1 and 2 I have shown a construction adapted for roofs of ordinary pitch, which is as follows:

F are transverse metal strips or clips, which extend between the edges of the tiles and are provided with a flange, *f*, extending over the outer surface of the lowermost tile, a flange, *f'*, embracing the lower surface of the same tile, and a flange, f^2, extending upwardly beneath the edge of the uppermost tile to a point somewhat above a horizontal line passing over the highest part of the clip. The strip F extends entirely across the space between the rafters or supports, and the flange f^2 thereof extends over and terminates above the longitudinal gutters d^2 d^2. Said flange f^2, together with the portion of the strip F which passes between the tiles, forms a triangular gutter to receive any water which may leak through the joint between the tiles, such water being free to pass from the ends of the flange f^2 into the gutters d^2. The inner edge of the flange f^2 being somewhat higher than any other part of the metal clip, in case a considerable quantity of water accumulates therein, the water will run over or pass from the clip over its part which extends outwardly through the joint before the water reaches a point sufficiently high to pass over the inner edge of said flange f^2, so that the possibility of leakage by the overflowing of the transverse gutter formed by the clip is thereby entirely prevented.

For steep roofs the construction shown in Fig. 9 may be used, wherein the upper tiles are lapped over the lower ones at their margins, the upper tiles being desirably rabbeted in the manner shown, to enable the edges of the tiles to be brought to a flat bearing upon the rafters or supports.

Any suitable provision may be employed at the lower ends of the gutters d^2 d^2 to provide for the discharge of water from said gutters to a drain-pipe or discharge-spout. I have shown in Fig. 2 one practical construction wherein the water is carried to an exterior gutter, such construction being as follows: At the lower end of the rafters is located a horizontally-arranged sheet-metal box or tube, G, provided with outer and inner walls, *g g'*, a bottom wall, g^2, and a top wall, g^3. To the lower part of the said box is attached a flange, G', which extends upwardly and inwardly from the lower edge of the box, and forms, with the inner wall, *g'*, a V-shaped trough or gutter. The lower ends of the gutters d^2 extend over the said flange G' and terminate inside of the wall *g'*, so that water therein is discharged into the said trough or gutter. Openings g^4 are formed in the inner wall, *g'*, at its lower part, and other openings, g^5, are formed in the outer wall, *g*, and water escaping from the gutters into the said trough passes through said openings g^4 into the box G, and thence out through the openings g^5, from which it may pass into a gutter, H, extending along the eaves of the house or building. The lower ends of the tiles are constructed to fit over or upon the top of the tubular part G, which latter is provided with a flange, G^2, against which the lower edges of the said tiles rest. In the particular construction shown the box G, together with the flanges G' G^2 thereon, is formed by a single piece of sheet metal bent and folded in the manner illustrated in the drawings, the free ends of the sheet metal being brought together

at the lower and outer corner of the box, where they are extended outside of and over the boards *h*, forming the inner wall of the gutter.

It will of course be understood that in carrying out my invention the tiles may be supported at their margins upon rafters or supports constructed otherwise than in the particular manner shown in Figs. 1 and 2—as, for instance, the rafters, instead of being made of wood, as shown in said Figs. 1 and 2, may be made of metal, as illustrated in Figs. 4 and 5. In Fig. 4 a metal T-beam, B′, is shown, to the upper flat surface of which the sheet-metal jointing-strip D is fitted and upon which the margins of the tiles rest. The said strip is shown as secured to the beam by means of metal clips d^3 d^3, soldered or riveted to the inner surface of the jointing-strips and bent around or against the metal beam. In Fig. 5 I have shown a metal T-beam, B^2, with its flat part downward, so that the central web of the beam extends upwardly between the edges of the tile, the metal jointing strip D in this instance being fitted over the surface of the central web and the horizontal parts of the beam.

In Figs. 6 and 7 I have shown a construction wherein the roof is supported upon joists or rafters B^3, extending in a direction transverse to the jointing-strips D D. In this instance the tiles are sustained upon longitudinal strips B^4 B^4, which extend across and are supported on the main rafters B^3 B^3. Other parts of the roof shown in Figs. 6 and 7 are like those shown in Figs. 1, 2, and 3, and are lettered in a similar manner in the drawings.

A tile roof constructed in the manner above set forth may be employed for both steep and slightly-inclined roofs, it only being necessary that the roof should be inclined in the direction of the gutters d^2 d^2 sufficiently to cause the water to flow away through the gutters. For very flat roofs, however, it may be desirable in some cases to modify the shape of the tiles, so as to make them more arching or pointed in the middle and with sloping sides, as clearly shown in Fig. 8, in which the roof is made like that shown in Figs. 1 and 2, with the exception that the tiles are V shape in cross-section instead of being slightly curved or arched. The purpose of making the tiles in the manner last described may be understood from the following: In roofs having considerable pitch any water leaking through one of the transverse joints between the tiles, and which fails to enter the transverse gutters f^2, will run down or along the lower surface of the adjacent tile and will be caught in the next transverse gutter below the joint. In a roof which is nearly flat, however, such water leaking through the joint in this manner is liable to drip from the lower surface of the tile. To prevent this result, I make the tile considerably higher in its center than in its sides, and preferably of V shape, as shown in said Fig. 8, so that any water which in any manner reaches the under surface of the tile will run down or along the latter sidewise until it reaches the longitudinal gutters d^2 d^2.

In Fig. 11 I have shown a construction wherein the roof is provided with rafters covered with sheathing-boards in the usual manner, and in which the longitudinal strips supporting the tiles are placed over the sheathing-boards without reference to the location of the rafters beneath. In this instance B^5 B^5 are the main rafters, and B^6 the sheathing placed over the same. B^7 B^7 are longitudinal strips resting on and secured to the sheathing. The tiles C and jointing-strips D and cap-pieces E are constructed and arranged in this instance in the same manner as illustrated in Figs. 1, 2, and 3.

It is not essential, as far as the main features of my invention are concerned, that the jointing strip should be so constructed as to bring the gutters at the exterior edges of the strip, and such gutters may be located adjacent to the vertical part of the strip by suitably bending or shaping the latter. In a construction of this kind suitable supports for the margins of the tiles may be provided in a variety of ways. In Fig. 10 I have illustrated one way of carrying out this form of the invention, the parts therein illustrated being made as follows:

J J are the roofing-tiles, which are arched and provided at their side edges with flanges having flat bearing-surfaces *j j*.

K K are two supporting strips or bars arranged parallel with each other a short distance apart and sustained upon transverse rafters K′ or other supports.

L is the jointing-strip, which is bent or folded in its middle to form a vertical flange, *l*, which latter is extended downwardly below the edges of the tiles J J and between the bars K K. The side portions of said strip are bent upwardly and outwardly to form two troughs or gutters, *l′ l′*, inside of the said bars K K and adjacent to the vertical flange *l*, while the marginal parts of the strip are bent outwardly over and rest longitudinally upon the upper surfaces of the bars K, as indicated at l^2, the extreme edges of the strips being bent upwardly, as indicated at l^3. The flat bearing-surfaces *j j* of the tiles rest upon the horizontal parts l^2 l^2 of the jointing-strips.

j′ j′ are transverse cuts or grooves formed in or through the lower bearing-surfaces, *j j*, upon the flanges of the tiles, in order to afford spaces or passages for allowing the flow of water along or over the jointing-strips from the flanges l^3 thereof into the gutters *l′*.

M indicates one of the clips for forming the transverse joints between the tiles, the lower flange, *m*, of which is shown as extending to a point inside and over the flange l^3 of the jointing-strip, so as to conduct water which may leak through the transverse joints inside of the said flange, from which point it may gain access to the gutters *l′ l′* through the openings or cross-passages *j′*. The joint illustrated

in this instance is made with a cap-piece, N, in the same manner as before described.

The particular construction in means for sustaining the bars which immediately support the tiles and in the said bars themselves is immaterial, inasmuch as said parts may be constructed in several different ways, several of which are herein shown. The particular construction illustrated in Figs. 1, 2, and 3, however, has special advantages in point of simplicity and economy, and such construction is therefore also claimed as part of my invention, together with other features of construction illustrated.

The making of the tiles of arched form between their supports or rafters in the manner set forth has several advantages. One is that it enables a tile of sufficient strength to be made of less thickness and with the use of less weight of material than would otherwise be necessary. Another advantage is that the arched form tends to cause the water falling thereon to flow immediately to the sides of the tiles, thereby lessening the liability of leakage through the cross-joints, while at the same time water which may flow to or become condensed upon the lower or under surface of the tiles is caused to flow laterally into the longitudinal gutters. The arched form of the tiles, furthermore, greatly facilitates the prompt discharge of water from the cross-gutters beneath the transverse joints of the tiles to the longitudinal gutters.

I claim as my invention—

1. A tile roof comprising supporting beams or rafters, tiles arranged edge to edge and resting thereon, and metal jointing-strips extending between and beneath the edges of the tiles and provided with longitudinal gutters, said tiles being provided with beveled flanges at their side edges and arched in their central parts, substantially as described.

2. A tile roof comprising supporting beams or rafters, tiles arranged edge to edge and resting thereon, metal jointing-strips extending between and beneath the edges of the tiles and provided with longitudinal gutters, said tiles being provided with beveled flanges at their side edges and being arched in their central parts, and cross-gutters located beneath the transverse joints between the tiles and discharging at their ends into said longitudinal gutters, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

ARTHUR W. COOPER.

Witnesses:

C. CLARENCE POOLE,

O. N. WILLIS.