Sept. 22, 1936. J. H. GOODWIN 2,055,127

METALLIC ROOF CONSTRUCTION

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Fig. 1.

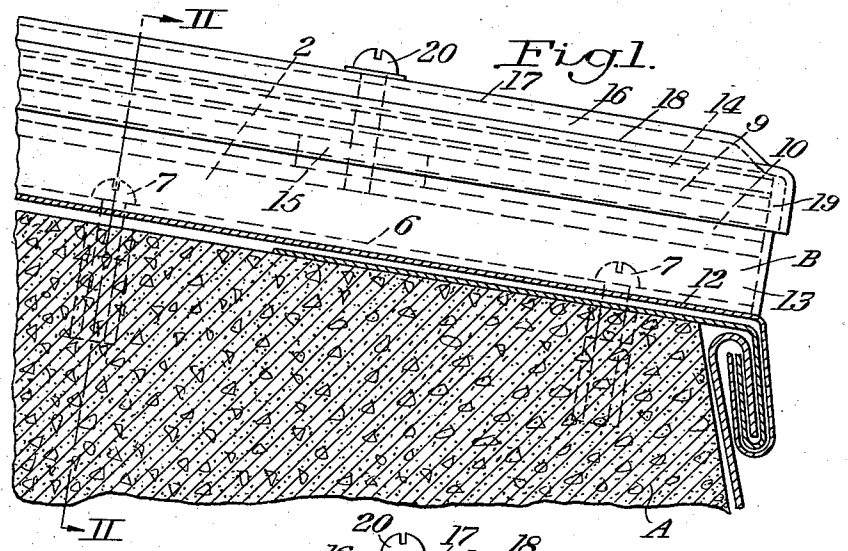

Fig. 2.

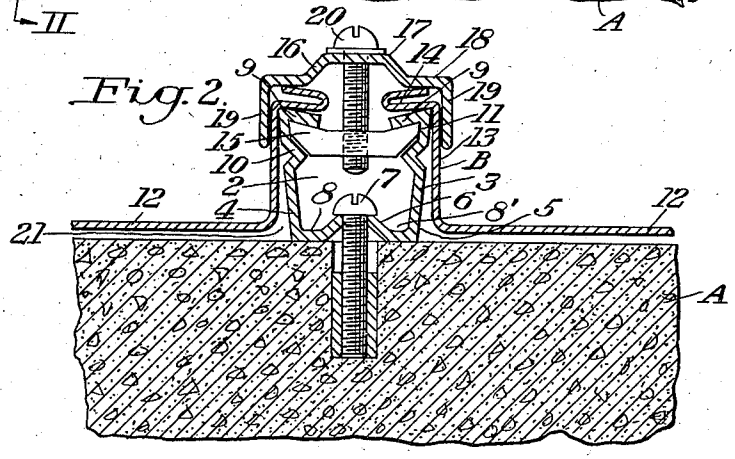

Fig. 3.

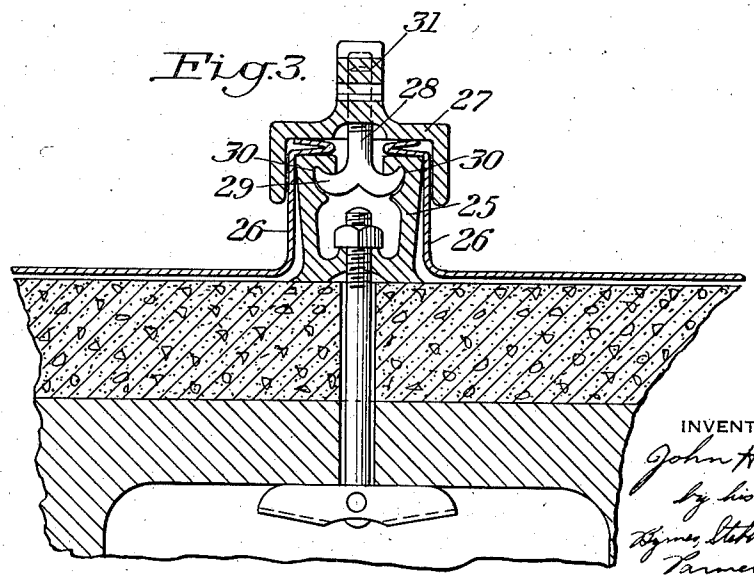

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Fig. 4.

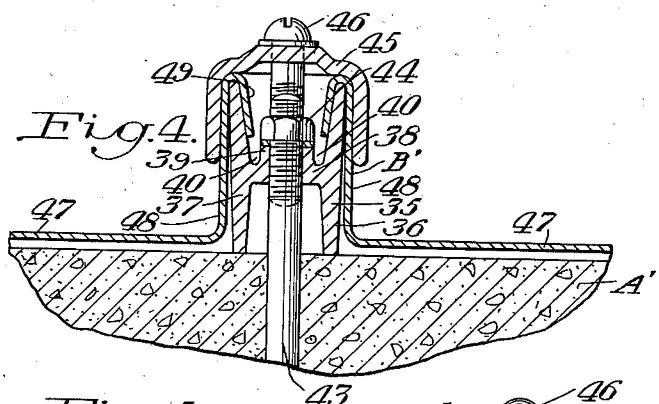


Fig. 5.

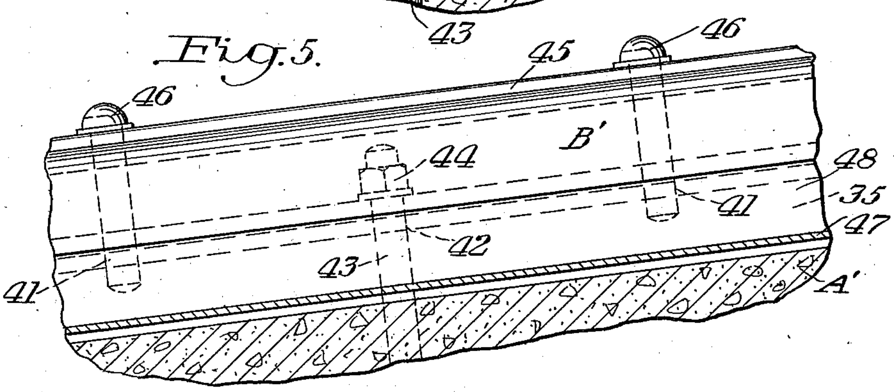
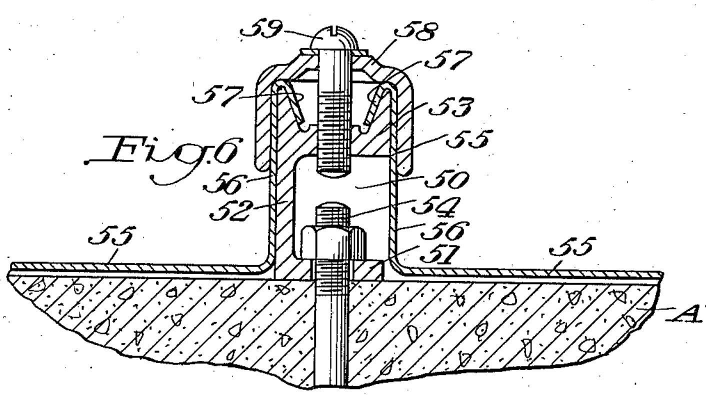


Fig. 6



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2,055,127

METALLIC ROOF CONSTRUCTION

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Application February 3, 1933, Serial No. 655,049

1 Claim. (Cl. 108—19)

This invention relates to roof structures, and more particularly to an improved roof of that class in which metal sheets are secured to the roof structure through the use of spaced battens.

Metal roofs are commonly employed in which wooden battens arranged parallel to one another are placed on the roof structure to be covered, these battens running down the roof from the ridge to the gutter. The metal roofing sheets are laid between these battens and a seam is formed between the edges of the sheets. Roofs so constructed require that the metal sheets be bent when they are being applied to the roof. The bending and hammering operation leave marks in the metal which cannot be subsequently ironed out. If the roof is an expensive roof formed of sheet aluminum, these marks are detrimental to the appearance of the job. Moreover, galvanized steel sheets cannot be used in such roofs because the denting of the metal necessary in working it, or the hammering which is necessary in bending it to shape, breaks the surface finish which affords the protection to the sheets.

A further difficulty with roofs of this nature is that no adequate provision can be made for relative expansion and contraction between the metal sheets themselves, or between the sheets and the roof which supports the sheets, with the result that the sheet frequently buckle and wrinkle to a very undesirable extent.

In accordance with the present invention there is provided a roof construction which permits of all of the bending operations on the sheets to be formed in the factory or shop where the roofing is being made up, or in a sheet metal bending plant, so that all of the sheets are uniformly bent, and bent under conditions and by mechanism which does not produce dents or cracks or otherwise mar the appearance of the roofing sheets. Further than this, the invention provides a structure which is more permanent, more satisfactory and more easily installed than the present type of metal roofing, and one which takes care of expansion and contraction in the roofing sheets or between the roofing sheets and the other parts of the roof structure so as to eliminate buckling or wrinkling of the strips.

The invention may be readily understood by reference to the accompanying drawings, which illustrate certain preferred embodiments of my invention and in which:

Figure 1 is a cross-section through a roof structure showing the joint embodying the present invention in elevation;

Figure 2 is a transverse section in the plane of line II—II of Fig. 1;

Figure 3 is a view similar to Fig. 2 of a slightly modified construction;

Figure 4 is a view also similar to Fig. 2 showing a further modified arrangement;

Figure 5 is a side elevation of the joint structure shown in Fig. 4; and

Figure 6 is a view similar to Fig. 4 illustrating still a further embodiment of the invention.

Referring first to the embodiment shown in Figs. 1 and 2 of the drawings, A designates the roof structure of a building. B designates generally the joint structure between adjacent roofing sheets forming the covering for the roof. This joint structure, as illustrated in Fig. 1, is formed lengthwise of the slope of the roof.

The joint B comprises a batten to which the opposite edges of adjacent sheets are secured. These battens are placed at regularly spaced intervals along the roof, depending upon the width of the roofing sheets which form the roof. In Fig. 1 the batten, designated 2, is shown as comprising a metal channel having side walls 3 and 4 and a bottom web 5, this bottom web preferably having an inwardly bent corrugation 6 providing a longitudinally extending groove on the outside of the bottom of the batten and providing an upwardly projecting rib on the inside of the batten.

This form of bottom has a double purpose. First, it serves to provide a two-point contact with the roof which will adjust itself more readily to irregularities in the roof than would a continuous flat channel. Secondly, it provides an arrangement whereby the bolts 7 through which the battens are secured to the roof structure can pass through holes spaced above the plane of the bottom of the channel. The rib, in other words, provides parallel grooves or gutters 8 and 8' at each side thereof through which any water or condensate collecting or getting into the batten can flow while the bolts by means of which the batten is secured to the roof pass through holes which are so located that this water can not get through the holes and the heads of the screws are in a plane above these channels.

The side walls 3 and 4 preferably diverge upwardly from the bottom of the channel so that the channel is slightly wider at the top than at the bottom. The upper edges of these side portions 3 and 4 are bent inwardly to provide overhanging flanges 9. Spaced downwardly from the flanges 9, the side walls are provided with inwardly projecting longitudinally extending ribs 10. Between the ribs 10 and the overhanging flanges 9 longitudinally extending grooves or channels 11 are formed.

In laying the roofing, the battens are secured to the roof at the proper intervals, the present drawings showing but a single batten. The roofing sheets, designated 12, are formed to shape in the plant in which the roofing is manufactured, the edges of the sheets being bent upwardly to form vertical flanges 13, the extreme edge portions being bent inwardly and doubled over to

form horizontally extending portions 14. The height of the flanges 13 is approximately the same as the height of the battens, so that when the roofing sheets are laid in place the portions 14 will rest on the upper edges or flanges 9 of the batten.

After the sheets are in place, as shown in Fig. 2, a plurality of separate cross strips 15 are slipped into the grooves 11 and distributed along the length of the batten at regular intervals. A cap strip 16 is then applied to the top of the batten. This cap strip has a central rib portion 17, shoulder portions 18, and depending side flanges 19. The strip is perforated at regular intervals to receive screws or bolts 20, the perforations being in the rib 17. The bolts 20 engage the threaded openings in the cross pieces or nuts 15, a nut 15 being provided for each bolt 20. As the bolts 20 are screwed down, the cap strip is forced down into engagement with the doubled-over portions 14 of the roofing sheets, forming a tight seal between the flat portions 18 of the cap strip and the doubled-over portions of roofing sheet. At the same time the flanges 19 project down over the vertically extending portions 14 of the roofing sheets so as to hold these sheets against displacement. In constructing the roofing, the workman takes up on the bolts 20 until he feels, from the manner in which the bolts are turning, that he is just beginning to compress the double-over portions 14 of the strips, and then he stops. The cap strips are preferably not screwed down so tightly as to actually clamp the horizontal portions 14 of the sheet, but only far enough to make a tight fit. The reason for this is that the sheets may have a longitudinal coefficient of expansion greater than that of the cap strips or of the battens.

Even though the coefficients of expansion may be the same, the thin roofing sheets may heat up and expand more quickly than the cap strips and the battens. In either case, the fact that there is a tight joint, but not one which immovably clamps the sheets to the battens, permits such relative longitudinal motion to take place between the sheets and the batten construction as may be necessary to prevent buckling. At the same time, the depending flanges 19 serve to exclude most of the water which may beat up, while the contact between the doubled-over portion 14 and the cap strip serves to further exclude moisture. If desirable, caulking may also be used, but this is ordinarily not necessary. If any water does beat up over the turned-over edge of the sheets, it tends to fall down into the channel, collect in the bottom grooves or gutters 8 and 8', and flow down the inside of the batten where it can discharge from the open end of the batten.

It will be further observed that the portions 13 are turned up at substantially right angles to the roofing sheets, while the side walls 3 and 4 of the batten flare outwardly. As a result of this, the sheets make a very close contact with the top of the batten, but at the bottom there is a considerable space, marked 21, beween the sheets and the batten. This space is sufficient to take care of the transverse expansion and contraction of the sheets relatively to the batten.

Since the cross pieces or nuts 15 are slidably received in the channels 11 formed in the side flanges, the cap strip may expand and contract relatively to the batten and relatively to the roofing sheets with freedom.

The batten, which may be formed by extrusion or by any other process, and which may be made of metal or of a suitable weather resistant material, is more durable than the wooden battens heretofore provided. The channel form of the batten provides a trough which carries away moisture which leaks into the batten or which condenses therein. The batten, along with the cap strip, provides a means for effectively holding the sheets in place on the roof, forms a water tight seam between adjacent sheets, and at the same time permits of relative expansion and contraction between the various parts. The battens themselves can be made relatively cheaply and have relatively little weight per unit of length.

The roof can be more cheaply installed than can present sheet metal roofs for the reason that all bending of the metal can be done in the shop, and it is unnecessary for the workman to do any bending on the roof. Moreover, he does not have to puncture the metal with nails.

The completed roof has a better appearance because of the fact that the metal is not dented or marred or irregular, as is the case where the sheets have to be bent on the job, and the entire job will look neater and be more effective and durable than roof structures of this nature as heretofore constructed.

The arrangement shown in Fig. 3 is substantially the same as that previously described, the channel shaped batten being designated 25, the flanges of the roof strip being designated 26, and the cap strip being designated 27. Instead of using cross pieces or nuts 15 for the bolts 20 as described in connection with Figs. 1 and 2, the bolts are formed substantially in the shape of inverted T's. In Fig. 3 the bolt, designated 28, has a cross head portion 29 the ends of which are received in the opposite channels 30 in the side walls of the batten. The threaded stem of the bolt passes through a hole in the cap strip, and the cap strip is held down by a cap nut 31 on each bolt.

In both of the constructions just described, the arrangement is such as to permit of relative longitudinal movement between the cap strip and the batten. This is not, however, necessary in all cases, and where it is desirable to use a smaller batten, arrangements such as shown in Figs. 4 and 6 may be used.

In Figs. 4 and 5 the roof structure is designated A', while the joint structure as a whole is designated B'. The batten, 35, is essentially of the same shape as that previously described in that it has an upper portion of channel shaped cross-section with an internal rib in the bottom of the channel and with a longitudinally extending recess on the underside of the batten so as to provide a two-point contact with the roof. In this arrangement the batten is substantially in the shape of the letter H in cross section. It has side flanges 36 and 37 connected by a cross web 38. The side flanges 36 and 37 preferably diverge from the bottom toward the top so that the batten is wider at its top than at its bottom. On the top of the cross web 38 there is an internal rib 39 and at each side of this rib there is a channel or gutter 40 through which moisture and condensate may be drained out of the batten.

The cross web has a series of holes 41 extending through the rib, these holes being internally threaded. It has another series of holes 42 also extending through the rib which are offset with respect to the holes 41. Bolts 43 passing through the holes 42 serve to secure the batten to the roof structure A', nuts 44 being provided at the upper ends of these bolts. The cap strip, desig-

nated 45, is held in place by bolts 46 projecting therethrough and having their lower ends screwed into the holes 41.

In this figure, the roofing sheets 47 have vertically turned edge flanges 48, the uppermost portions of which are turned downwardly as indicated at 49 to hook over the uppermost edges of the batten, as shown in Fig. 4. The cap strip 45 is screwed down sufficiently tight to make an effective weatherproof joint and to hold the roofing sheets in place, but is preferably left loose enough so that the strips are free to expand and contract longitudinally.

Figure 6 illustrates still a further modification in which the batten, designated generally as 50, has a single bottom flange 51, a vertical web portion 52, and a channel-shaped upper portion 53. Bolts 54 passing through holes in the base flange 51 serve to secure the batten to the roofing. It will be observed that the holes in the base flange for the bolts 54 are oversized to provide clearance for thermal expansion and contraction. This oversized hole may be safely employed in this form of batten, because the channel portion above the base flange prevents any water from getting onto the base flange, whereas in the other forms of battens herein described there is some likelihood of the water getting in around the bolt, particularly if the central ridge were not provided inside the channel. It will be seen that in the other forms if the hole were made larger than the bolt, there would be greater likelihood of leakage. With the form shown in Figure 6, however, water flows along the base of the batten, and the channel above the base prevents any water from getting onto the base. The roofing sheets 55 have vertical flanges 56, the upper edges of which are folded down as indicated at 57 to hook over the upper edges of the channel-shaped portion of the batten. The cap strip 58 is held in place by bolts 59, these bolts being screwed into holes extending through the rib on the bottom of the channel portion 53. Here again the bottom of the channel portion has the middle higher than the outer edge portions so as to take care of moisture which collects inside of the channel.

The cap strip 58 is preferably held down tight enough to keep the roofing sheets in place, while it is loose enough to permit of relative movement effected by expansion and contraction. With the form of batten shown in Fig. 6 there is nothing at one edge of the strip to limit the transverse expansion and contraction and therefore it is unnecessary to provide at the left-hand side of the joint, as viewed in Fig. 6, any space corresponding to the space 21 referred to in connection with Fig. 2.

In the various forms of the invention as herein specifically described, the batten has a channel portion over which the edges of the roofing sheets are engaged, the roofing sheets, however, not extending to the middle of this channel portion. Each construction provides for the use of a cap strip of inverted channel shape straddling the batten and secured to the batten without passing through the roofing sheets, the seam structure being so arranged as to permit of relative expansion and contraction longitudinally and transversely.

As the wall thickness of the various members of the several battens as well as the cap strips are the same thickness the battens and caps will expand and contract as a unit.

While I have described specifically several embodiments of my invention, it will be understood that various changes and modifications may be made in these specific constructions within the contemplation of my invention and under the scope of the following claim.

I claim:

A sheet metal covering for a roof, comprising a batten having an upwardly opening channel, a central rib on the bottom wall of the channel forming gutters between the side walls of the channel and the rib, the side walls and bottom wall of the channel being substantially the same thickness, means free of the gutters for securing the batten to the roof, metal roof covering sheets substantially thinner than the thickness of the batten elements having the longitudinal edges thereof bent upwardly and turned over the upper edges of the side walls of the channel, a cap strip having a web and downwardly extending flanges substantially the same thickness as the batten elements straddling the batten and overlapping the upper portions of the upwardly bent edges of the sheets, there being spaced threaded openings extending through the central rib on the bottom of the channel, there being similarly spaced bolt openings in the web of the cap, and bolts extending through the openings in the cap and threaded in the openings in the rib for drawing the cap into a position to hold the covering sheets in place but free enough to permit longitudinal movement of the sheets relative to the batten and cap effected by expansion and contraction.

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