

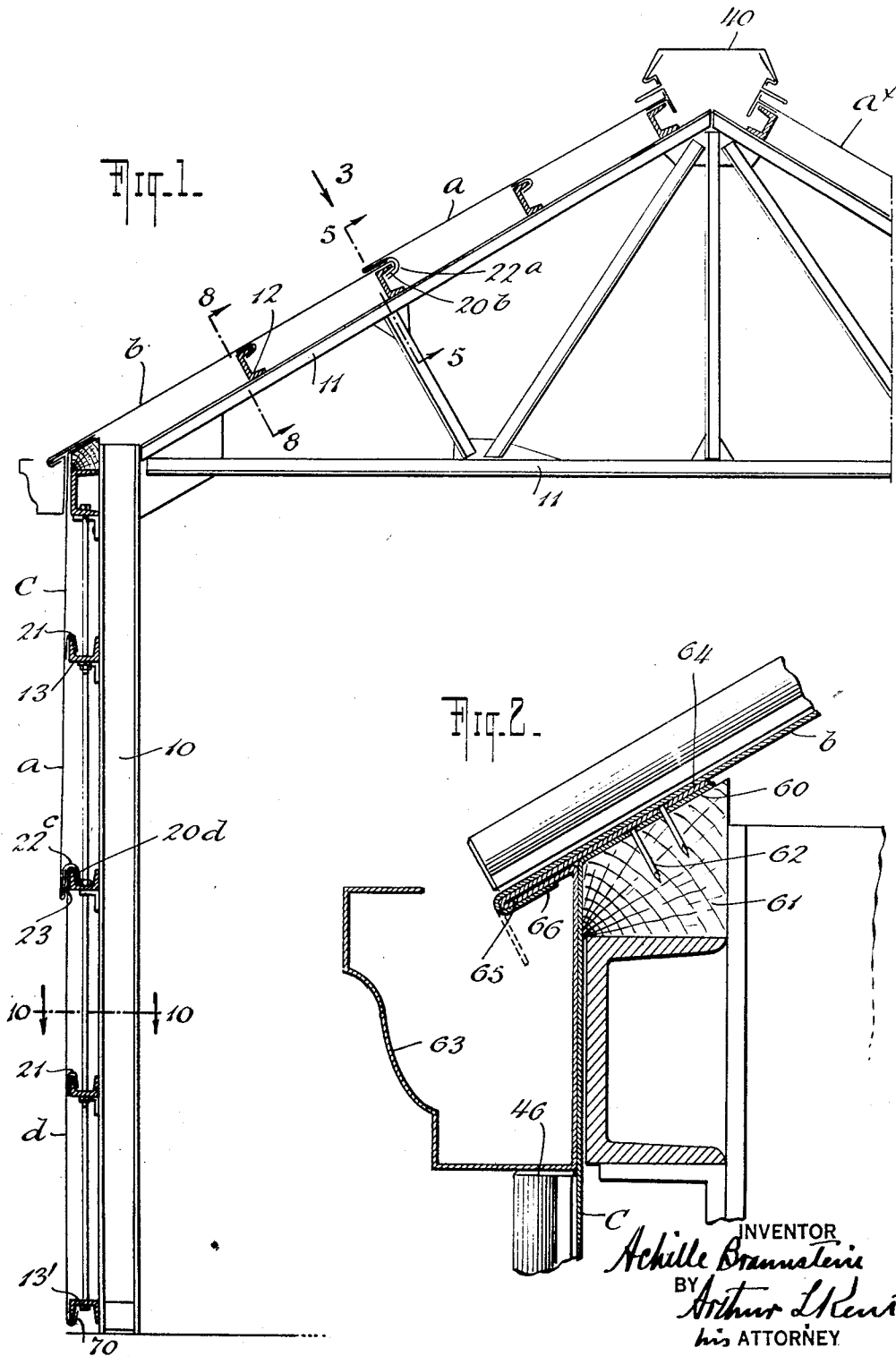
June 10, 1930.

A. BRAUNSTEIN
BUILDING CONSTRUCTION

1,762,756

Filed Feb. 25, 1926

4 Sheets-Sheet 1



June 10, 1930.

A. BRAUNSTEIN

1,762,756

BUILDING CONSTRUCTION

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4 Sheets-Sheet 2

Fig. 3.

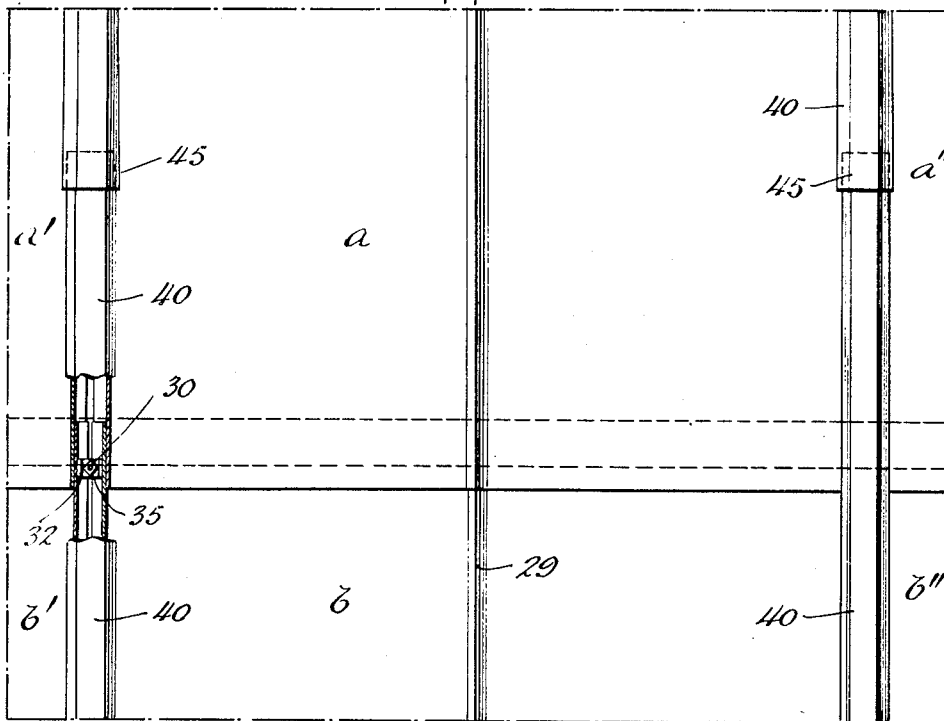
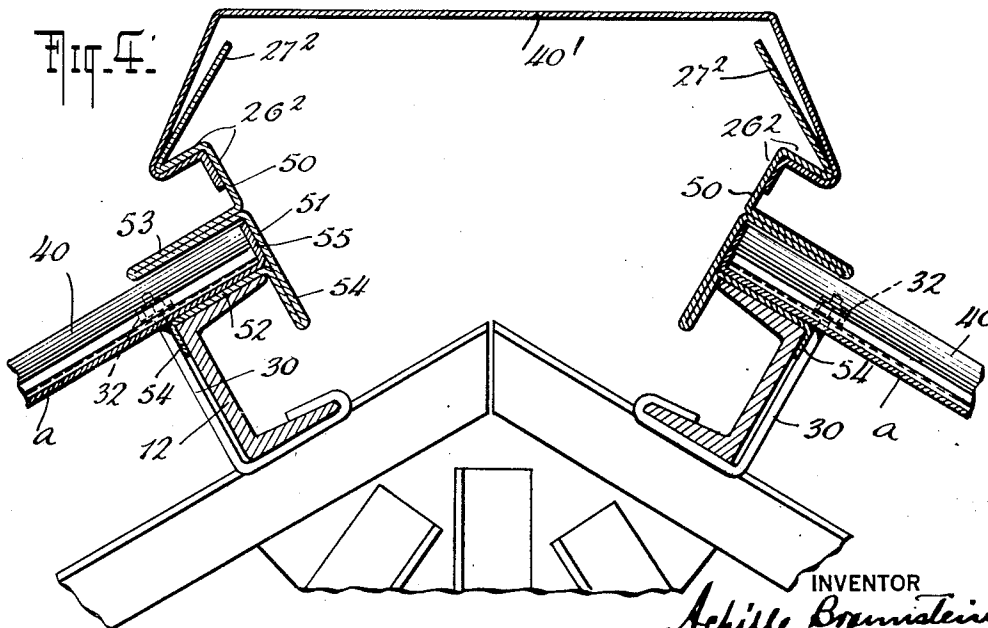


Fig. 4.



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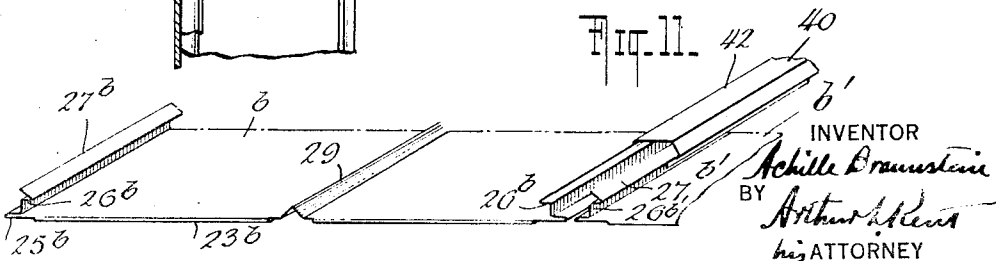
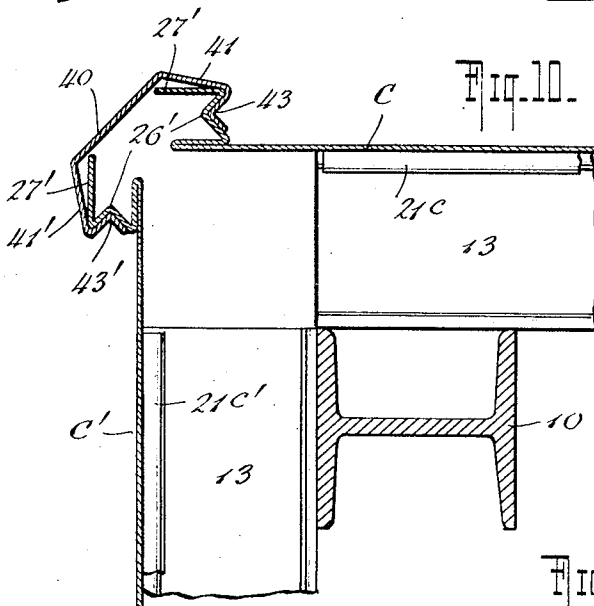
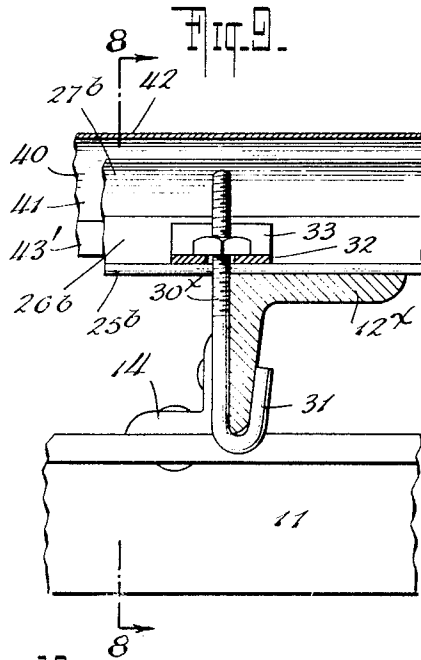
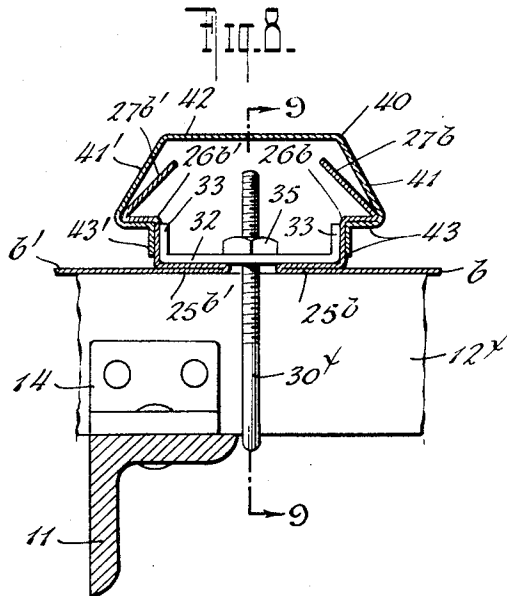
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A. BRAUNSTEIN
BUILDING CONSTRUCTION

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4 Sheets-Sheet 4



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BUILDING CONSTRUCTION

Application filed February 25, 1928. Serial No. 90,447.

This invention relates to building construction, and particularly to buildings having a structural metal frame and a metal sheathing, and aims to provide a building of this character which may be easily and economically erected.

In applying metal sheathing directly to structural metal framework, it has heretofore been customary to attach the metal sheets of which the sheathing is composed to each other and to the frame by means of bolts or rivets, each of which must be held or headed by two skilled workmen, one located inside and the other outside the frame of the building. A further disadvantage of the usual construction lies in the fact that the bolts or rivets extend through holes in overlapped sheets and are sometimes sheared off by contraction and expansion of the sheets caused by changes in temperature. Also, when the sheets are galvanized, as is usually the case, rust and corrosion occurs around the bolt, rivet or nail holes formed in the sheets in applying them to the frame of the building.

The present invention reduces the cost of erection of such buildings by providing an improved sheathing which may be secured together and to a structural metal frame to form a weather-tight wall and roof by a single unskilled workman located outside the frame of the building. This result is obtained by providing fastening means for securing the sheets to the beams which may be inserted from the outside between spaced edges of the sheets, and cover pieces which may be attached from the outside directly to the edges of the sheets to cover the fastening means and the open spaces between the edges of the sheets. In this construction the bolts which form part of the fastening means do not pass through holes in the sheets and are therefore not injured by any contraction or expansion of the sheets.

The various features of the invention and its advantages may best be understood by a detailed description of a specific embodiment of the invention which is illustrated in the accompanying drawings; in which

Fig. 1 is an end view of a building sec-

tioned on a vertical plane perpendicular to the eaves and ridge of the building, omitting the cover pieces for the butt joints and the fastening bolts;

Fig. 2 is an enlarged view of the eaves and gutter sectioned on the same plane as Fig. 1;

Fig. 3 is an outside view of part of the roof sheathing showing one lap joint and two butt joints, with parts broken away;

Fig. 4 is an enlarged view of the ridge of the roof sectioned on the same plane as Fig. 1;

Figs. 5, 6 and 7 are enlarged details of the fastening means at the intersection of a butt joint and a lap joint, Fig. 5 being sectioned on the plane indicated by the line 5—5 in Figs. 1, 6 and 7; Fig. 6 on a plane parallel to the section plane of Fig. 1 and indicated by the lines 6—6 in Figs. 5 and 7; and Fig. 7 being the outside view similar to Fig. 3 sectioned on the line 7—7 of Fig. 5 with the cover piece broken away;

Figs. 8 and 9 are details showing the fastening means at the middle of a butt joint in a modified construction, Fig. 8 being sectioned on the line 8—8 of Fig. 9 and on a plane corresponding to the line 8—8 in Fig. 1, and Fig. 9 on a plane corresponding to the section plane of Fig. 1 and indicated by the line 9—9 in Fig. 8;

Fig. 10 is a detail of a corner of the building sectioned on a horizontal plane indicated by the line 10—10 in Fig. 1; and

Fig. 11 is a perspective view showing two of the sheets and one of the cover pieces.

The frame of the building illustrated is of usual construction, consisting of corner posts 10 and roof trusses 11, which serve to support spaced horizontal side beams 12 along the roof and similar beams 13 along the walls. When the building is of substantial size, the side beams 12 and 13 take the form of channel irons. When the building is smaller, the side beams may consist of angle irons 12^x secured to the roof trusses 11 or the corner posts 10 by knees 14 as shown in Figs. 8 and 9. The frame is covered with a metal sheathing consisting of rectangular galvanized metal sheets here-

inafter described in detail. The sheets cover the entire roof and sides of the building (although windows may, of course, be provided where desired). The sheets have lap joints along their upper and lower edges and spaced butt joints along their side edges.

In the specific building illustrated in the drawings there are four horizontal rows of sheets, two on the wall and two on the roof. The sheets of these four rows are designated respectively by the letters *a*, *b*, *c*, *d*. Where it is necessary to distinguish between two or more sheets in the same horizontal row the symbols *a*, *a'*, *b*, *b'*, etc. are used. All the sheets have many features in common. Each of these features is designated by a numeral to which is added the letter designating the sheet when this is necessary for the sake of clearness.

In order to retain the sheets in position on the frame before they are permanently fastened to the frame, and thus facilitate the work of fastening them to the frame, each sheet is provided on its inner side with hook flanges adapted to fit over the upper edges of the side beams of the frame and thus suspend the sheet against the outer side of the frame. If the height of each sheet is equal to the distance between two adjacent side beams, such hooks are provided at the upper and lower edges of the sheet only, whereas when the sheets are of sufficient height to extend across several side beams, a hook flange may be provided for each such side beam. The hook flanges also serve to assist in holding the sheets on the frame after the fastening means have been applied, and to prevent lateral bulging of the sheets.

In the form illustrated, each of the sheets extends across the space between three side beams and is therefore provided on its inner side with hook flanges for engaging these beams, except that no hook flange is provided at the upper edges of the sheets *a* and *c* which lie at the ridge and the eaves of the building respectively, and no hook flange is provided at the lower edge of the sheets *b* and *d* which lie at the eaves and the base of a building respectively. With these exceptions, each sheet has at its upper edge a hook flange 20^b formed by turning in sections of the upper edge portion of the sheet, has at its middle a hook flange 21 made separate from the sheet and attached to it by riveting or otherwise, and has at its bottom edge a hook flange 22^a which may be made separate from the sheet and secured to the sheet within the inturned lower edge 23 of the sheet. The shape of the hook flanges depends upon the shape of the side beams. When these beams have the form of upturned channels as shown the hook flanges are adapted to fit over the outer edge of such channels.

The first step in applying the sheathing to the frame is to place the sheets in proper position on the outside of the frame by hanging them together to the side beams by means of their hook flanges. The lowermost sheets *d* are placed in position first, and the lower edge of each sheet (except the lowest sheets of the wall and roof *d*, *b*) is lapped over the upper edge of the sheet below it. The lower hook flange 22 of each sheet thus hooks over the upper hook flange 20 of the sheet below it (see 22^a, 20^b and 22^c, 20^d, in Fig. 1).

In placing the sheets upon the frame a space is left between the side edges of adjacent sheets *a*, *a'*, *b*, *b'*, etc. in order to provide for the insertion of fastening means, and this space is finally covered by a cover piece. To provide for the fastening means and for retaining the cover piece, each side edge of each sheet is provided with a double clamping flange 25 lying in the plane of the sheet, a retaining flange 26 having the form of an angle flange spaced inwardly from the outer edge of the clamping flange and turned inward, and a cam flange 27 extending from the inner edge of the angle flange and inclined outwardly and away from the sheet. The clamping flanges, retaining flanges and cam flanges of each sheet are integral with the sheet and are formed by bending the side edge portion of the sheet first back on itself at the outer side of the sheet, then outwardly perpendicular to the plane of the sheet, then inwardly parallel to the plane of the sheet, and finally outwardly and away from the sheet. In assembling the sheets on the frame, as hereinbefore described, so as to provide lap joints at the upper and lower edges, the lower portions of the clamping flanges and angle flanges of each sheet are telescoped within the upper portions of the clamping flanges and angle flanges of the next sheet below. The material of the sheets has sufficient flexibility to permit fitting the clamping flanges of one sheet within those of the next sheet below; particularly when each sheet is provided with a central V-shaped ridge which facilitates lateral expansion and contraction of the sheet while stiffening it longitudinally.

At the points where the clamping flanges of the sheets cross the outer sides of the side beams 12, 13, they are clamped against the side beams by means of hook bolts 30. These bolts are inserted from the outside in the space between two adjacent clamping flanges. They are provided with hooks 31 adapted to fit over the inner edge of the side beams. When the side beams have the form of upturned channel irons, the bolts 30 have the form shown in Fig. 6. When the side beams have the form of angle irons, hook bolts 30^{*} of the form shown in Fig. 9

are used. After each hook bolt is placed in position a clamping plate 32 is slipped over its outer end. This clamping plate rests on the clamping flanges 25 of the adjacent sheets and is provided with upturned side flanges 33 which engage the outer sides of the angle flanges 26 of the sheets and thus serve to space the adjacent edges of the sheets uniformly. A nut 34 is screwed on each hook bolt 30 to force its clamping plate 31, and consequently the clamping flanges 25 of the sheets, against the outer surface to one of the side beams 12 and 13.

The hook bolts which are inserted at the intersections of the butt and lap joints serve to secure the corners of four sheets (for example, *a*, *a'*, *b*, *b'*) to the frame since the overlapping upper and lower sheets have their clamping flanges telescoped at this point as already described, so that the clamping plate 33 is forced down against four clamping flanges (for example, the flanges 25^a, 25^b, which are telescoped together, and the flanges 25^{a'}, 25^{b'}, also telescoped together, as shown in Fig. 5). The hook bolts which are supplied at the middles of the butt joints serve to secure the clamping flanges of two adjacent sheets (for example, the flanges 25^b, 25^{b'}, as shown in Fig. 8).

The cover pieces 40 are made of sheet metal and each has the form of a downturned channel with its sides 41, 41' flaring outwardly from its top or main wall 42. At the lower edges of sides 41, 41' of each cover piece are engaging elements 43, 43' having the form of intumed angle flanges.

After the sheets have been secured in position by the hook bolts in the manner already described, the cover pieces are snapped over the angle flanges of the sheets. The manner in which this is done is indicated in Fig. 5. A cover piece 40 is first placed in the position indicated in dot and dash lines in that figure with one of its angle flanges 43 under the angle flange 26 of one of the sheets (for example, under the angle flange 26^a). This brings the lower edge of the other angle flange 43' of the cover piece over the upper edge of the cam flange 27 of the adjacent sheet (for example, 27^{a'}). The cover piece is then pressed down, and as it is made of resilient sheet material, its lower edges are spread apart as it is pressed against the cam flange so that its angle flange passes over the cam flange and snaps in against the angle flange 26 of the sheet. The cover piece is then held firmly in the position indicated in full lines in Figs. 5 and 8.

When the walls and roof of the building are of substantial height, it is inconvenient to make the cover pieces of sufficient length to cover the entire length of one of the butt joints. Consequently, a number of separate cover pieces are applied to each butt joint

with the lower end of each piece overlapping the upper end of the next piece below. The cover pieces are accordingly applied from the bottom up. When the lower end of a cover piece is lapped over the upper end of the next cover piece below, the upper portion of one of the inclined side walls 41, 41' of the lower cover piece takes the place of one of the cam flanges 27 in spreading the lower end of the upper cover piece so that it may be snapped into position by pressure from the outside. The lap joints 45 of the cover pieces are placed at different positions from the lap joints of the sheets as shown in Fig. 3. The upper end of the upper cover piece on each butt joint of the wall is closed by an end flange 46 (Fig. 2), which may be formed integral with the cover piece, so that no water can enter with the cover pieces even when the gutter, shown in Figs. 1 and 2, is not used.

It is apparent that the new construction which has been described provides a tight weather-proof sheathing which may easily be applied to the horizontal beams 12 and 13 by a single workman located outside the frame of the building. Since the sheets are secured in position without forming any bolt or rivet holes therein in applying them to the frame of the building, the protective coating applied when the sheets were galvanized is not broken or injured in any way. The sheathing is therefore rust-proof and durable. Furthermore, the new construction avoids all danger of shearing the fastening bolts when expansion or contraction of the sheets occurs, since the bolts 30 are spaced from the edges of the sheets. Some buckling of the sheets may occur in very hot weather but this does not injure the fastening means and can, if desired, be avoided by leaving a slight clearance between side flanges 33 of the clamping plates 32 and angle flanges 26 of the sheets.

The construction which has been described may be applied in a uniform manner on any flat wall or roof surface of a building. In addition to this standard construction the invention involves certain special features of construction for forming water-tight joints in the sheathing at the corners, ridge, and eaves of a building.

The construction at the corners of the walls is illustrated in Fig. 10. It shows that the angle flanges 26' at the side edges of the sheets *c*, *c'* at the corners of the building are inclined at 45° to the sheets, and the cam flanges 27' are correspondingly inclined, so as to provide for the application of a cover piece 40 at a corner of the building.

The construction at the ridge of the building is best shown in Fig. 4. The cover piece 40' which is applied at this point is in general similar to the cover pieces 40, although

of greater width. The angle flanges 26² and the cam flanges 27² to which it is applied are, however, not formed integral with the uppermost sheets *a* of the roof sheathing since such flanges if formed directly on these sheets would necessarily interfere with the flanges at the side edge of these sheets. They are, therefore, formed on separate connecting pieces 50 which are secured to the upper edge portions of the upper sheets *a* by means of the uppermost hook bolts and clamping plates. Each connecting piece 50 has an upright portion 51 extending perpendicularly across the upper edge of the upper sheets and carrying the angle flange 26² and the cam flange 27² and two additional outwardly projecting flanges 52 and 53. The flange 52 lies under the upper edge portion of the upper sheet and is clamped between this portion of the sheet and the upper surface of the upper side beam 12. To steady it in position before it is clamped it may be provided with two turned down flanges 54 fitting over the upper edges of the beam 12. The flange 53 lies over the upper ends of the cover pieces 40 of the roof sheathing and thus effectively prevents rain water from entering the upper ends of these cover pieces. Each connecting piece 50 and its various flanges may be formed of a single piece of sheet material, as clearly illustrated in Fig. 4. Unless the building is of great length, each connecting piece 50 will extend the entire length of the roof. If desired, however, the connecting pieces may be made in sections. In that case, the ends of the individual sections are placed out of line with the cover pieces 40 of the roof sheathing, so that no break in the flange 53 occurs over one of these cover pieces.

In erecting the ridge construction which has been described, the connecting pieces 50 are secured in position by the hook bolts at the same time that the upper sheets *a* of the roof sheathing are secured by these bolts. The upper cover pieces 40 of the roof sheathing are snapped on the angle flanges of the roof sheets *a* just below the lower ends of the flanges 53 of the connecting pieces, and are then slid longitudinally so as to bring their ends under these flanges as shown in Fig. 4. The ridge cover piece 40' is then snapped into position over the angle flanges 26² being spread in this operation by engagement with one of the cam flanges 27². The upper edges of the upper roof sheets *a* are not provided with hook flanges but instead are turned upwardly to provide upstanding flanges 55 as shown in Fig. 4.

The eave construction is best shown in Fig. 2. The upper edges of the upper wall sheets *c* are not provided with hook flanges but instead with inwardly inclined flanges 60 which lie over a wooden eave-piece 61 and may be secured thereto by means of nails 62.

A gutter 63 has at its upper edge an inclined flange 64 which is applied over the flange 60 and also secured to the eave-piece 61 by a nail. The gutter has also an outwardly projecting eave flange 65 over which the lower edge portion 66 of the lowest roof sheets *b* may be bent as shown in Fig. 2 after these sheets have been secured in position on the roof by means of the hook bolts. The edge portion 66 is bent at right angles to the sheet *b*, as shown in dotted lines in Fig. 2, before the sheet is applied to the building so as to facilitate turning it in under the eave-piece 65.

Similar right-angle flanges 70 are provided at the lower edges of the lowest wall sheets *d*, to be turned in under the lowest side channel 13', which is inverted, as shown in Fig. 1.

What is claimed is:

1. In building construction, the combination with a frame having spaced horizontal beams, of a sheathing consisting of sheets with their side edges spaced apart having on their inner surfaces hook flanges engaging the beams, fastening means insertable from the outside for securing the side edges of adjacent sheets to the beams, and cover pieces engaging the side edge portions of the sheets and covering the spaces between the side edges of adjacent sheets.

2. In building construction, the combination with a frame having spaced horizontal beams, of a sheathing consisting of sheets with their side edges spaced apart, fastening means insertable from the outside for securing the side edges of adjacent sheets to the beams, and cover pieces engaging the side edge portions of the sheets and covering the spaces between the side edges of adjacent sheets.

3. In building construction, the combination with a frame having spaced beams, of two sheets located side by side with their side edges spaced apart, a bolt extending between the side edges of the sheets and having a hook on its inner end engaging an inner edge of a beam, and a clamping plate on the bolt engaging the edge portions of the sheets and forcing them against the outer surface of the beam.

4. In building construction, the combination with a frame having spaced beams, of two sheets having their side edges spaced apart and provided with laterally projecting clamping flanges, inturned retaining flanges and outwardly inclined cam flanges, means for securing the clamping flanges of the sheets against the beams, and a resilient cover piece adapted to snap over the cam flanges of the sheets and to engage their retaining flanges.

5. In building construction, the combination of two sheets located side by side and spaced apart, upstanding inturned retain-

ing flanges at the opposed edges of the sheets, and a cover piece having at its sides engaging elements adapted to fit under the retaining flanges of the sheets, the cover piece being of sufficient flexibility to permit its engaging elements to spread apart and snap over the retaining flanges of the sheets, and the inner portions of the inturned retaining flanges of the sheets being spaced away from the sheets to permit the engaging elements of the cover piece to move sidewise into position beneath them.

6. In building construction, the combination of two sheets located side by side and spaced apart, upstanding inturned retaining flanges at the opposed edges of the sheets, outwardly inclined cam flanges extending from the retaining flanges, and a cover piece having at its sides engaging elements adapted to fit under the retaining flanges of the sheets, said flanges and said cover pieces having a sufficient flexibility and resiliency to permit the engaging elements of the cover piece to spread apart when pressed against the cam flanges and to snap together against the retaining flanges after passing the cam flanges.

7. In building construction, the combination of sheets located side by side and spaced apart, upstanding inturned retaining flanges at the opposed edges of the sheets, outwardly inclined cam flanges extending from the retaining flanges, and a plurality of cover pieces each having inclined slides and engaging elements on the lower edges of its sides, each cover piece having sufficient flexibility to permit the spreading of its engaging elements when it is pressed against said cam flanges or against the inclined sides of the other cover piece.

8. A metal sheet for use in building construction, having each of its side edges turned back upon itself, then extended outwardly from the sheet, then inwardly away from the edge of the sheet, and then inclined away from the sheet and toward the edge thereof to provide a cam face.

9. In building construction, the combination of spaced rows of sheets in which each sheet has its side edge portions turned inward and forming an inturned retaining flange and in which the lower end of the turned-in edges of each sheet is fitted within the upper end of the inturned edges of the sheet below it, and cover pieces mounted on the retaining flanges of the sheets and bridging the spaces between the rows of sheets, said cover pieces having lapped joints spaced from the lapped joints of the sheets.

10. In building construction, the combination of four sheets, each having its side edges folded inward, the two upper sheets having the lower portions of their inturned edges telescoped within the inturned edges of the two lower sheets, a clamping plate

engaging the telescoped portions of the inturned edges of the sheets, and means for drawing said clamping plate against the framework of a building to secure one corner of each of the four sheets thereto.

11. A cover piece for use in metal building sheathing having the form of a resilient sheet metal channel, and having engaging elements formed at the edges of the sides of the cover piece and a flap extending from one end of the main wall of the cover piece to cover that end of the channel, said flap and the sides being unattached so that the sides may be spread outwardly from each other.

12. In building construction, the combination with a frame having spaced beams, of galvanized sheets located side by side with their side edges spaced apart, bolts securing the sheets to the beams and located between the side edges of the sheets, clamping plates engaged by the bolts and engaging edge portions of the sheets, and galvanized cover pieces engaging the side edge portions of the sheets and covering the spaces between them.

In testimony whereof, I have hereunto set my hand.

ACHILLE BRAUNSTEIN.