

June 1, 1937.

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2,082,191

BUILDING CONSTRUCTION

Filed Nov. 12, 1935

2 Sheets-Sheet 1

Fig. 1.

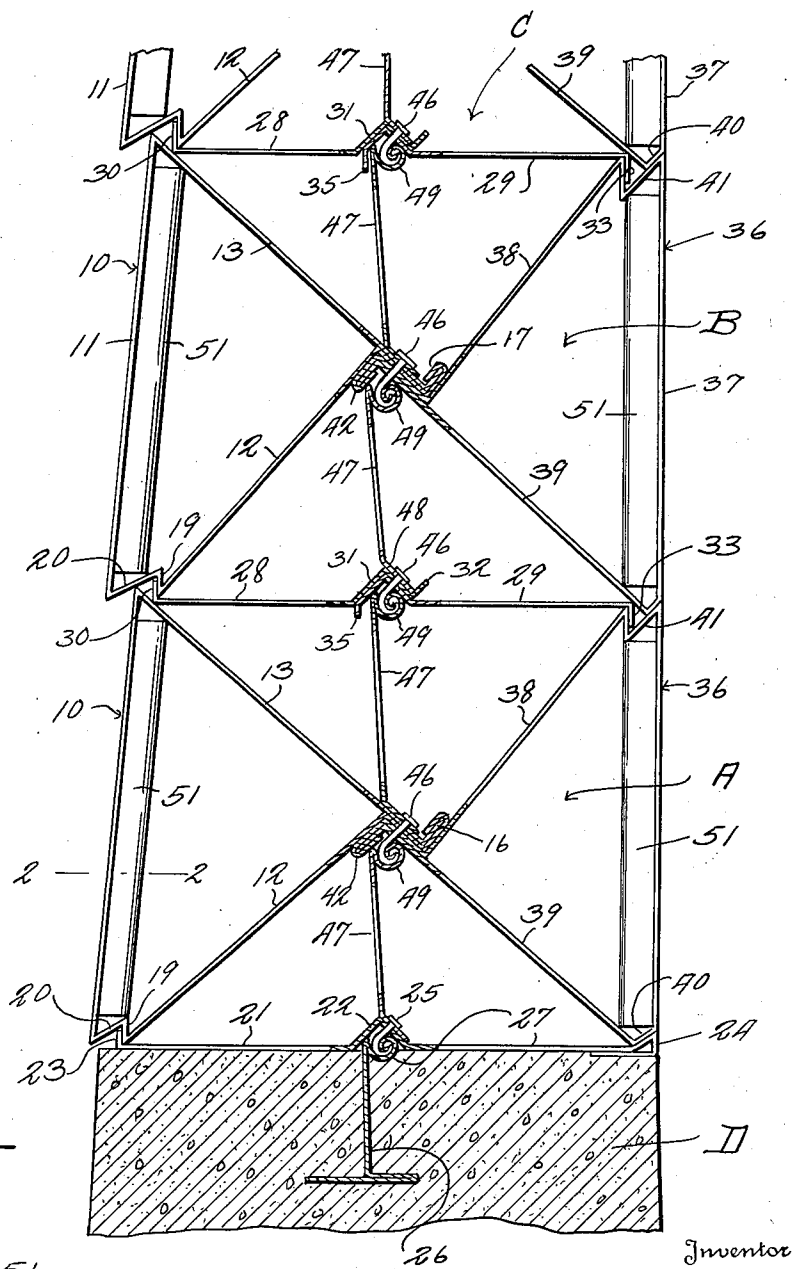
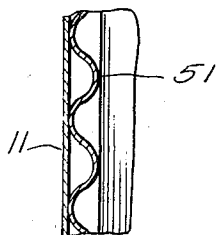


Fig. 2.



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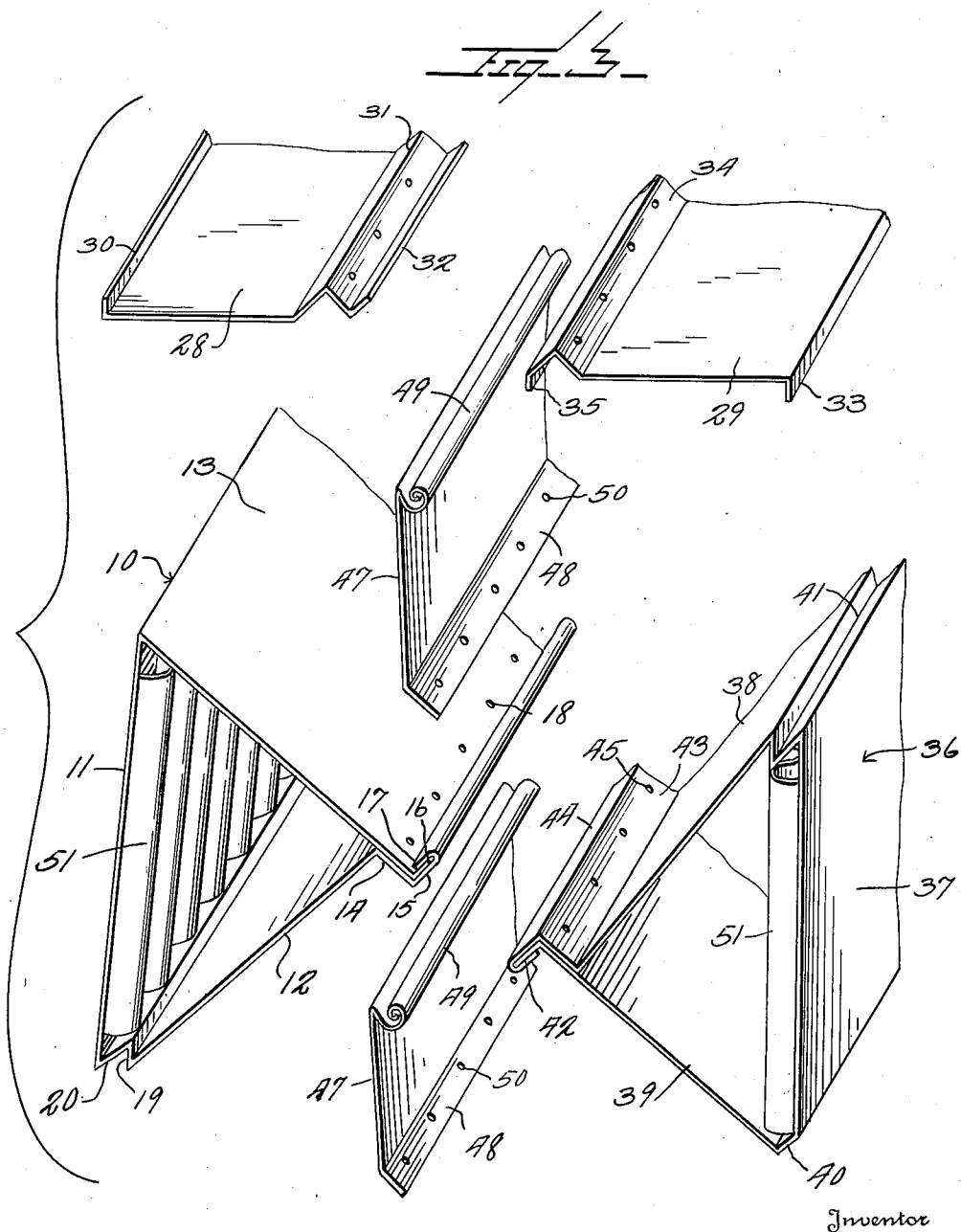
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2 Sheets-Sheet 2



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BUILDING CONSTRUCTION

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12 Claims. (Cl. 189—34)

This invention relates to buildings or like structures and particularly to metallic buildings.

The general object of the present invention is to provide what may be termed a unit of building construction, which unit may be used in forming inner or outer walls, floors, ceilings, roofs and the like.

Another object is to provide a structure of this character in which the unit is extended longitudinally to form what may be termed generally a beam and which is composed of a plurality of sheet metal pieces which, when joined to each other, will constitute an elongated hollow element.

A further object is to provide a structure of this character in which these sheet metal pieces may be readily engaged with each other by ordinary nails driven with a hammer and automatically clinched upon engagement with certain beads formed in the structure.

A further object is to provide a structure of this character which is formed of a plurality of pieces of sheet metal, which pieces are so constructed that they can only be fitted to each other in one way, thus rendering it a very simple matter for the constructor to put together the pieces from which the unit is composed.

Other objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawings wherein:

Figure 1 is an elevation partly in section of a plurality of my structural units arranged to form an outside wall of a building, the concrete base structure being shown in section;

Figure 2 is a section on the line 2—2 of Figure 1;

Figure 3 is a perspective view of all the pieces of a unit separated from each other.

Referring to Figure 1, it will be seen that I have illustrated two units of a building with a fragment of a third unit. These units are disposed in superposed relation one upon the other and extend longitudinally the whole length of the wall. While these units may be used as hollow sheet metal elements constituting the floor, roof or ceiling of a building, I have only illustrated the units as disposed to form a wall.

By reference to Figures 1 and 3, it will be seen that the unit A includes an outer approximately triangular element 10 having a vertical portion 11, an upwardly and inwardly extending portion 12 and a downwardly and inwardly extending portion 13. The portions 11, 12 and 13 are formed of an integral sheet of metal angularly

bent in the general form of a triangle. The portion 12 at its upper and inner margin is bent outward and downward at 14, and then extends upward at 15. The portion 13 has an upwardly extending flange 16 and the flange 15 is bent over this flange 16, as at 17. A series of nail holes 18 are provided adjacent this turned over edge 17, as shown in Figure 3. The lower front corner of the plate 12 is formed with a longitudinally extending triangular indentation defined by bending the sheet upward, as at 19, and downward and outward, as at 20. Preferably, though not necessarily, I reinforce the vertical portion 11 by applying to the inside face thereof the vertically corrugated metal sheet 51, as shown in Figure 2.

The bottom portion of the structural element A, as illustrated in Figure 1, is formed of a plate 21. This plate at its middle has an upwardly extending triangular bead 22. At its outer edge, the plate 21 has the upwardly extending flange 23 which fits against the wall 19 and at its inner edge is upwardly extended, then downwardly extended, then extended horizontally inward to form a triangular bead 24. The triangular bead 22 on its inner face is formed with a plurality of nail holes through which nails 25 may be driven.

In order to anchor this lower plate to the base or foundation D, I embed in said foundation or base the preferably sheet metal I-beam-like element 26 which at its upper edge is downwardly and then upwardly and then inwardly coiled at 27, as shown in Figure 1. The nail 25, when driven through the opening in the rear wall of the triangular bead 22, strikes this bead 27 and as the nail is driven, the point of the nail is bent around into the bead 27 and clinched so as to have full locking engagement with this bead, thus locking the plate 21 to the element 26.

The top wall of the unit A is constituted by the lower wall of the unit B or it may be considered that the top wall of the unit A constitutes the bottom wall of the unit B, as shown in Figure 1. This top wall of the unit A is formed of two sheet metal plates 28 and 29. The plate 28 at its outer edge is upwardly flanged, as at 30, and at its inner margin is formed with an upwardly extending triangular bead 31 having the upwardly and inwardly extending flange 32, the inner wall of this bead being perforated. The plate 29 at its outer edge is flanged at 33, and at its inner margin is bent to form the upwardly extending triangular bead 34, the edge of this bead having a depending

flange 35. The triangular bead 31 is overlapped on the triangular bead 34, as shown in Figure 1.

Opposed to the triangular section 10 is the triangular section 36 which has the vertical portion 37, the downwardly and inwardly extending portion 38, and the upwardly and inwardly extending portion 39. The portion 37 may be reinforced by a corrugated sheet 51 as is the section 10. The lower margin of the portion 37 is extended downward and inward, as at 40, so as to seat against the upper face of the bead 24. At the junction of the portions 37 and 38, there is formed a V-shaped depression 41 having a vertical inner wall and an upwardly inclined outer wall. The flange 33 of plate 29 fits down in this depression against the vertical wall thereof, as shown in Figure 1. The portion 39 at its upper and inner end is angularly flanged at 42 and the portion 38 extends downward and abuts against the portion 39, then extends upward at 43 against the face of this portion 39, and then is extended downward and bent around the flange 42, as shown most clearly in Figure 3. Thus a hollow triangular element 36 is formed which is opposed to the hollow triangular element 10. As shown in Figure 1, the angular bend 14 of portion 12 of element 10 seats upon the angularly bent portion 43 with the portion 12 abutting against the overturned flange 44. The portion 43 is formed with nail holes 45 which coincide with the nail holes 18 in the section 10. It will be seen that the plate 21 in conjunction with the portions 12 and 39 defines a hollow triangle and that the plates 28 and 29 in conjunction with the portions 38 and 13 also define a hollow longitudinally extending triangle.

For the purpose of bracing the portions 10 and 36 at their junction and for clinching the nails 46, I provide a vertical longitudinally extending web or plate 47. The lower margin of this plate is angularly bent at 48 to provide a foot with nail holes coinciding with the nail holes in the triangular portion 22. This plate at its upper margin is bent downward and coiled around spirally to form a coiled bead 49.

Adapted to be connected to the upper plates 28 and 39 and to the upper unit B is a second plate 47 of the same character as heretofore described and having the angularly bent flange 48 and the bead 49. The lower edge of this second brace 47 has its foot 48 resting upon the upper surface of the portion 13 with the nail holes 50 in coincidence with the nail holes 18. The lower brace 47, as illustrated in Figure 1, for the unit A, extends upward from the triangular bead 22 and is held in place by the nails 25 driven through the nail holes 50 of this brace. The second brace 47 is held in place against the plate 13 by the nails 46 which are forced through the nail holes 50, 18 and 45, and pass into the bead 49 of the lower brace. By driving these nails 46 through these nail holes, the nails are automatically clinched within the coiled bead 49, as shown in Figure 1, thus locking all of the elements 10, 36 and 47 to each other at the center of the unit. The unit B is of exactly the same construction as unit A and the unit C is the same construction as the unit D.

While I have referred to the wall 11 as being vertical, it is to be understood that preferably it is not quite vertical but slants upward and inward, the portion 37 of the unit 36 being truly vertical. The outside face of each unit, therefore, slants upward and inward and thus the lower end of one unit projects slightly beyond

the upper end of a lower unit, as shown in Figure 1, so as to give a weatherboarding effect and so as to form a water shed.

As before remarked, the units A, B and C may be used in a wall by using these units disposed in a horizontal plane with one unit superposed upon another. This is merely illustrative of the manner in which the units may be used. It is equally possible to dispose these units side by side to constitute a floor, in which case the outer portion of the triangular section 10 will not be inclined but will be disposed parallel with the outer portion 37 of the section 36 and in this case, the portion 11 will be the upper face of a floor while the portion 37 will constitute the face of the ceiling and the brace plates 47 will be disposed in an approximately horizontal plane. In the same manner, with a slight modification, these hollow elongated units may be disposed side by side to form a pitched roof. The only tool necessary to erect this structure is a hammer to drive the nails 25 and 46. Inasmuch as the various pieces or sections cannot be arranged any other way than as illustrated, it is obvious that even the most ignorant workman can assemble these elements with dispatch.

While I have illustrated two sheets 28 and 29 as being used for the end walls of all of the units above the unit A, it is to be understood that I might use one sheet like the sheet 21 for this purpose without departing from the spirit of the invention, though I prefer to use two sheets as it makes the assembling of the units somewhat easier.

It will be seen that I have provided a structural unit which is approximately rectangular in cross-section and that this unit is formed of the opposed triangular sections 10 and 36 having the abutting and overlapping portions 43 and 17 at the center of the unit and thus providing two spaced approximately parallel walls 11 and 37 and that each unit has two spaced approximately parallel walls formed by the sections 28 and 29 extending approximately at right angles to the first named walls and each engaging at its ends with opposite ends of the first named walls 11 and 37, and that I have provided the bracing members 47 which engage with the middles of these second named walls formed by the parts 28 and 29 or by the part 21, these bracing members extending to the overlapped portions 43, 44 and 17 of the two sections 10 and 36 and being locked thereto by the nails 46. While one unit would consist of the sections 10 and 36 and the upper and lower walls formed by the members 28 and 29, yet it is to be understood, of course that in actual construction, the pieces 28 and 29 constitute the upper wall of one section and the lower wall of the superposed section or next adjacent section.

It is also pointed out that each triangular section 10 or 36 provides an outer wall and two integral bracing portions as, for instance, 12 and 13 for the section 10 or 38 and 39 for the section 36, so that the unit is provided with outer walls arranged substantially or approximately to define a rectangle or trapezium. This rectangular or trapezoidal unit being braced by a plurality of braces extending to a central point, these braces being formed in the portions 12, 13, 38, 39 and 47.

It will be seen also that where the units are to form the outside wall of a building that the cross-section of each unit will be trapezoidal so that each unit tapers upward and is smaller in area at its upper end than at its lower so that

the outside face of the units will be successively offset, as shown in Figure 1, but that where these units are to be used to form an inside wall, they will not taper upward but the upper end of each unit will be the same as its lower end, and this is true, of course, where the units are disposed in a horizontal plane and side by side.

The corrugated sheet 51 may be applied to the wall or portion 11 and to the wall or portion 37 in any suitable manner as by welding, riveting or the like.

It is also obvious that minor changes will be made in adapting these elements to the formation of floors, ceilings, roofs, etc., and that I do not wish to be limited to the exact form of the various elements forming the unit except as defined in the appended claims.

While I have heretofore referred to the corrugated sheet 51 as being applied against the walls 11 and 37 by welding, riveting, etc., it will be seen from Figure 1 that the re-entrant angles of the portions 13 and 12 and 38 and 39 will also act to hold these corrugated sheets in place without the necessity of riveting or welding. It is also within the purview of my invention, where the units are to be used as beams, girders or the like structural elements disposed in a horizontal plane, that the parts 29, 38 and 39 may be made of relatively heavy material while the parts 28, 13 and 12 may be made of relatively lighter material so as to afford the required strength for the tension and reaction below what will be the neutral axis of the unit when the units are assembled and fastened together by the nails.

What is claimed is:—

1. A hollow sheet metal building unit formed of sheet metal elongated sections, the sections being combined to define an element approximately rectangular in cross-section having two walls approximately parallel to each other and two walls approximately at right angles to the first-named walls, braces extending diagonally inward and centrally from the opposite ends of the first named walls, and braces connecting the middles of the second named walls with the inner ends of the angular braces of the first named walls, each of said last named braces having an open helically coiled bead at one end and at the other a foot, and nails connecting said braces together at the center of the unit, the extremities of the nails extending into the bead of one of said braces and being clenched thereby.

2. A hollow structural unit approximately rectangular in cross-section and formed of opposed sheet metal sections approximately triangular in cross-section and having abutting overlapping flanged portions at the center of the unit, the sections providing two spaced approximately parallel outer walls; outer walls extending approximately at right angles to the first named walls and engaging at their lateral margins respectively with opposite margins of the first named walls, each of said second named walls having a triangular portion at its middle apertured at intervals for the passage of nails; braces connecting the triangular portions of the second named walls with the overlapped portions of the triangular sections, each of said braces having at one edge an angular foot and each brace at its other edge being formed with a coiled bead, the coiled bead of one brace being disposed immediately adjacent the overlapped portions of the triangular sections and the foot portion of the other brace being disposed against the overlapped portion, nails passing through the foot portion of one brace through the

overlapped portions of the triangular sections and into the coil of the other brace, and nails passing through the triangular middle portions of the second named walls and into the adjacent coiled portion of one of said braces.

3. A hollow structural unit approximately rectangular in cross-section formed of transversely opposed sections, each approximately triangular in cross-section and having abutting overlapping reversely flexed portions disposed at the apices of the triangular sections and at the center of the unit, said triangular sections providing two spaced opposed parallel outer walls; walls separate from but extending approximately at right angles to the first named outer walls and each engaging at its ends with opposite ends of the first-named walls respectively; and braces engaging the middles of the second named walls and extending to the overlapped flanged portions of the triangular sections, means passing through the overlapped portions of the triangular sections and through the adjacent ends of braces for engaging the parts with each other, and means for engaging each brace at its outer end with a corresponding second named wall.

4. A metallic building, comprising a plurality of units disposed in abutting relation, each unit including triangular hollow elongated sheet metal sections, the two sections providing opposed parallel outer walls, the two sections having overlapped angularly flanged portions at the center of the unit; walls extending at right angles to the first named walls and engaging at their ends, respectively, with the opposite ends of the first named walls, each of the second named walls having interlocking engagement at one edge with a triangular section of one unit and at its other edge with the opposed triangular section of the next adjacent unit; sheet metal braces for each unit extending approximately parallel to the first named walls; means connecting the overlapped portions of the triangular sections and to the inner ends of each brace, and means connecting the outer ends of said braces to the middle portions of the second named walls.

5. A metallic building, comprising a plurality of successive abutting longitudinally elongated units, each unit including opposed triangular sections of sheet metal providing approximately parallel outer walls and inwardly convergent braces, the braces at their inner ends being angularly flanged, the angular flanges of the braces of the opposed triangular sections being overlapped with each other; walls extending at right angles to the first named walls and engaging at their ends respectively with the opposite ends of the first named walls, each of the second named walls having interlocking engagement at one edge with a triangular section of one unit and at its opposite edge with the opposite triangular section of the next adjacent unit, each of the second named walls being formed with V-shaped portions extending in the same direction; and braces extending between the triangular portion of each second named wall and the overlapped margins of the triangular sections, each brace at one end having an angular foot at one edge and at the other edge having a spirally coiled open bead, the braces being disposed with their foot portions extending all in one direction, one of the braces for each unit having a foot disposed against the exterior face of the triangular portion of a second named wall and with its bead disposed within the re-entrant portion of the overlapping flanges of the triangular sections, the succeed-

ing brace having its foot disposed over the overlapping portions of the triangular sections and its bead disposed within the re-entrant face of the next adjacent second named wall; and nails driven through said overlapping portions of the braces and triangular sections and into the adjacent coiled portion of a brace, and nails extending through the foot of one brace and through the triangular portion of the adjacent second named wall and into the coiled bead of the next adjacent brace, the nails being clenched by said coiled beads.

6. A hollow structural building unit approximately rectangular in cross-section formed of opposed sections approximately triangular in cross-section and having abutting flanged overlapping portions at the center of the unit and providing two spaced approximately parallel walls; an integral wall extending across the like ends of the triangular sections and having a V-shaped portion at its middle; and a wall extending across the opposite end of the unit and engaging the like ends of the triangular sections, said last named wall being formed in two sections, both of said sections having V-shaped nesting margins, the V-shaped portions of the two walls extending in the same direction and braces connecting said last named walls with the flanged inner ends of the triangular sections, each of said braces having a foot at one end and at the other end being formed with an open spirally coiled bead, the braces extending in the same direction, the foot of one brace being disposed against the triangular portion of the first named transverse wall and being attached thereto and having its bead disposed within the re-entrant angle formed by the re-entrant portions of the overlapped inner ends of the triangular sections, the next adjacent brace having its foot disposed against said overlapped portions and having its bead disposed within the re-entrant angle formed by the overlapped V-shaped portions of the second named transverse wall, and nails extending through the overlapped and nested portions and into said beads and clenched thereby.

7. A hollow structural building unit elongated in one direction formed of a plurality of sheet metal elongated sections, the sections being combined to define an element approximately rectangular in cross-section, the sheet metal sections having interlocking engagement with each other at the abutting corners, sheet metal braces connected to each other at the center of the element and radiating to the outer walls thereof and connected to the outer walls, and corrugated metal reinforcing sheets applied to the inner faces of said walls, the ends of the corrugations being disposed to abut against the interior faces of the converging braces of the outer section.

8. A hollow structural elongated approximately rectangular unit including lateral outer walls having bracing portions extending inward to the center of the unit and overlapped, transverse walls at right angles to the first named walls; longitudinally elongated braces of sheet metal, each brace having at one end a foot and at the other end having a spirally coiled open bead, one brace being disposed with its bead against the overlapped parts of the first named bracing portions and with its foot engaged with one of the transverse walls, the other brace having its foot disposed against said overlapped portions and with its bead disposed against the

other transverse wall; nails passing through the foot of one brace, through the overlapping parts and into the bead of the other brace; and nails passing through the last named transverse wall and into the coiled bead of the last named brace, the beads acting to clench the nails within the coils when the nails are driven into place.

9. In a sheet metal structure, elongated sheet metal members approximately radially related, and having angularly disposed flanges at their meeting edges, the flanges overlapping each other, the overlapping flanges being pierced at intervals for the passage of nails; a fixed elongated element having a spirally coiled edge portion with the open end of the spiral disposed toward the overlapping flanges of said members; and nails passing through the apertures in the overlapping flanges of said members and into the opening of the spiral coil and clenched thereby when the nails are driven home.

10. A hollow sheet metal building unit formed of sheet metal elongated sections, the sections being combined to define an element approximately rectangular in cross-section having two walls approximately parallel to each other and two walls approximately at right angles to the first-named walls, braces extending diagonally inward and centrally from the opposite ends of the first-named walls, braces connecting the second-named walls with the inner ends of the angular braces of the first-named walls, each of said last-named braces having a hollow bead at one end and at the other end a foot, and nails connecting said braces together at the center of the unit, the extremities of the nails extending into the bead of one of said braces and being clenched by contact with the inner face of the bead.

11. In a metallic structure of the character described, a plurality of separate sheet metal elements disposed in substantially radial relation; two of said elements being disposed substantially opposite each other and each having a right angular flange, the flange of one of said elements extending in an opposite direction to the flange of the other element; two more of said elements being disposed in substantially opposed relation and in angular relation to the first-named elements, each having its margin bent at right angles to the plane of the sheet and then bent parallel to the plane of the sheet and then returned upon itself to receive the flange of one of the first-named elements; the inner margins of all of said elements being overlapped and another of said elements having a hollow interiorly cylindrical bead whereby a nail extending through the overlapped portions of the several elements and into said bead will have its point clenched by the curvature of the inner surface of the bead.

12. In a sheet metal structure, a plurality of substantially radial sheet metal elements, two of the elements having re-entrantly angular inner margins, fitting one within the other; another element having an angularly bent inner margin fitting against the exterior face of the angular portion of one of the first-named elements; and a fourth element having at its end a hollow bead having a substantially cylindrical inner surface whereby a nail extending through the overlapping portions of the first three elements and into the bead will be clenched within said bead.

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