

Oct. 10, 1939.

M. W. LETHLY

2,175,271

METALLIC BUILDING

Filed Aug. 26, 1937

4 Sheets-Sheet 1

FIG 1

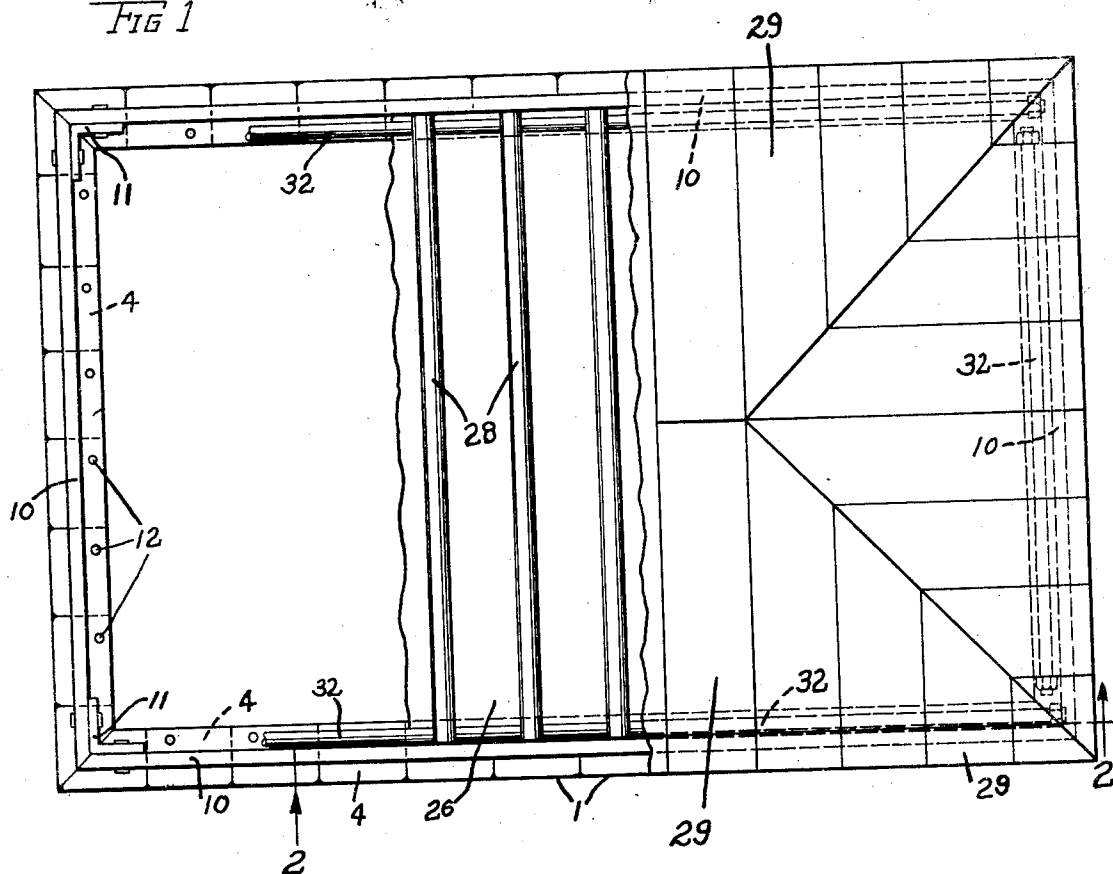
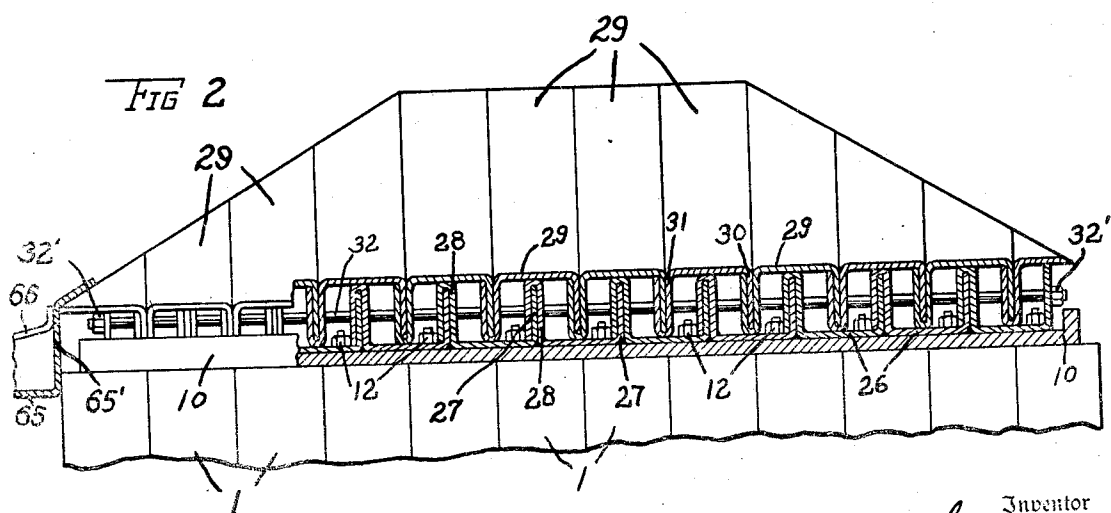


FIG 2



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FIG 3

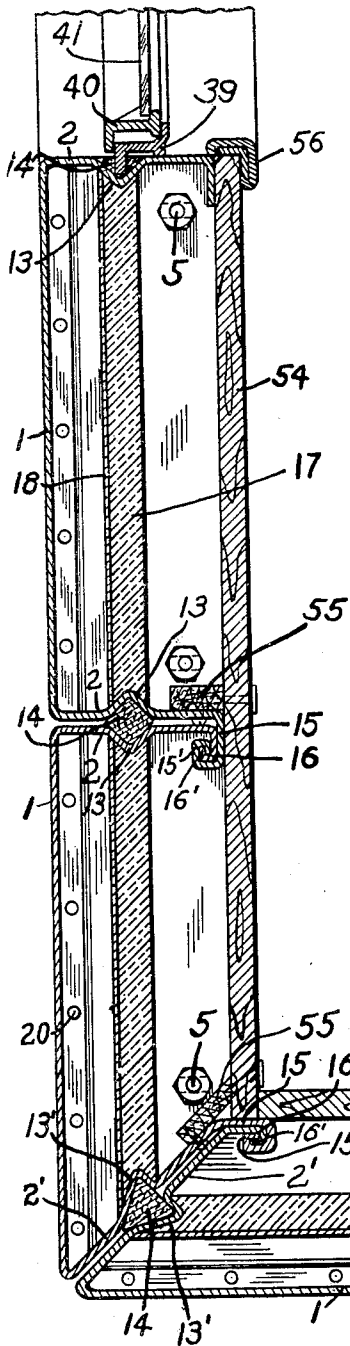


FIG 4

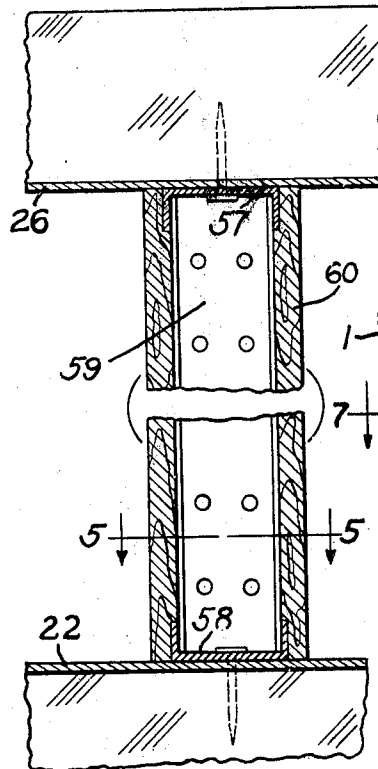


FIG 6

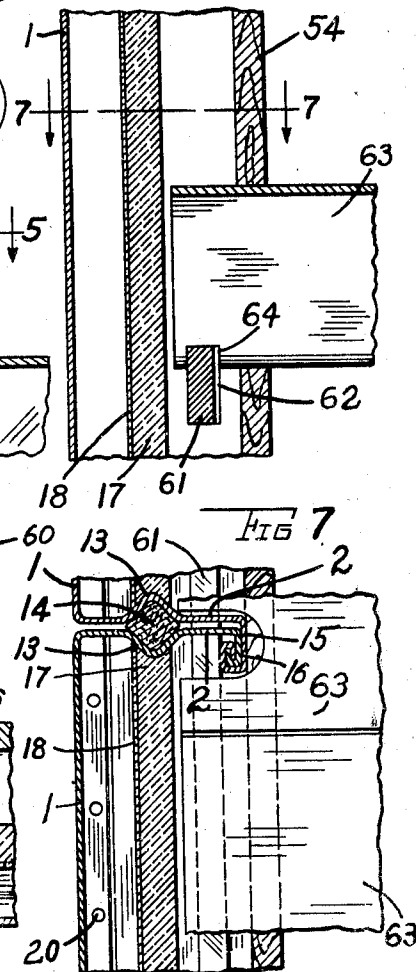


FIG 5

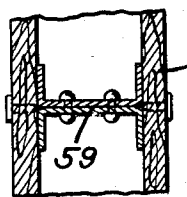
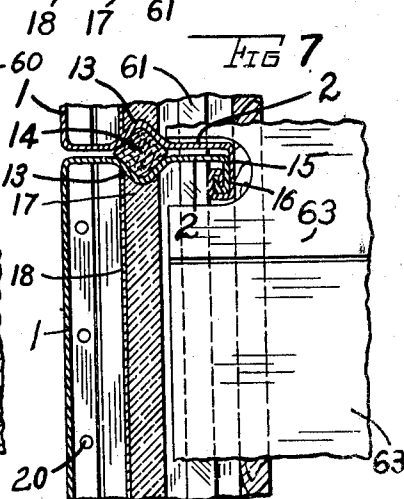


FIG 7



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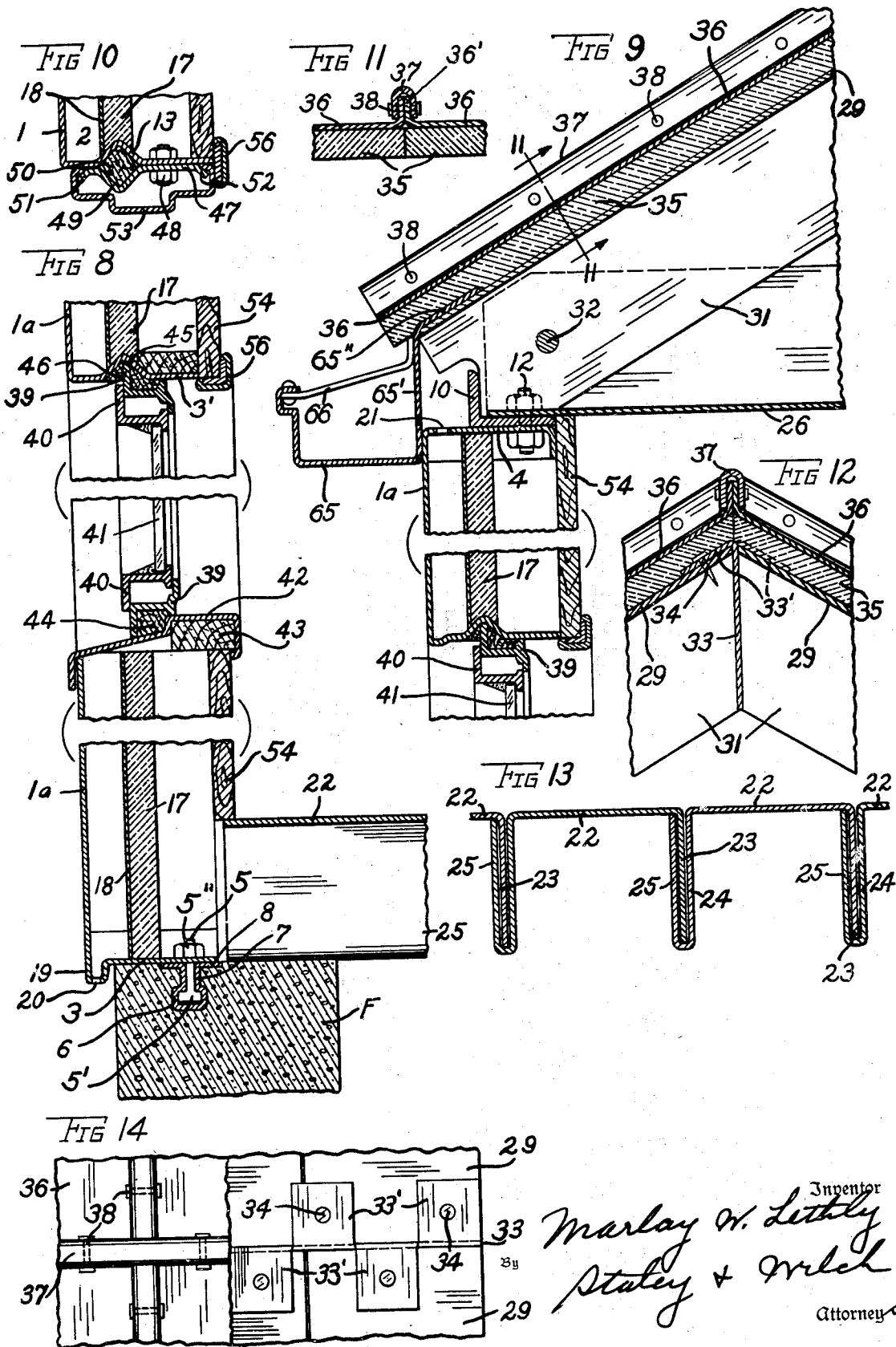
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FIG 15

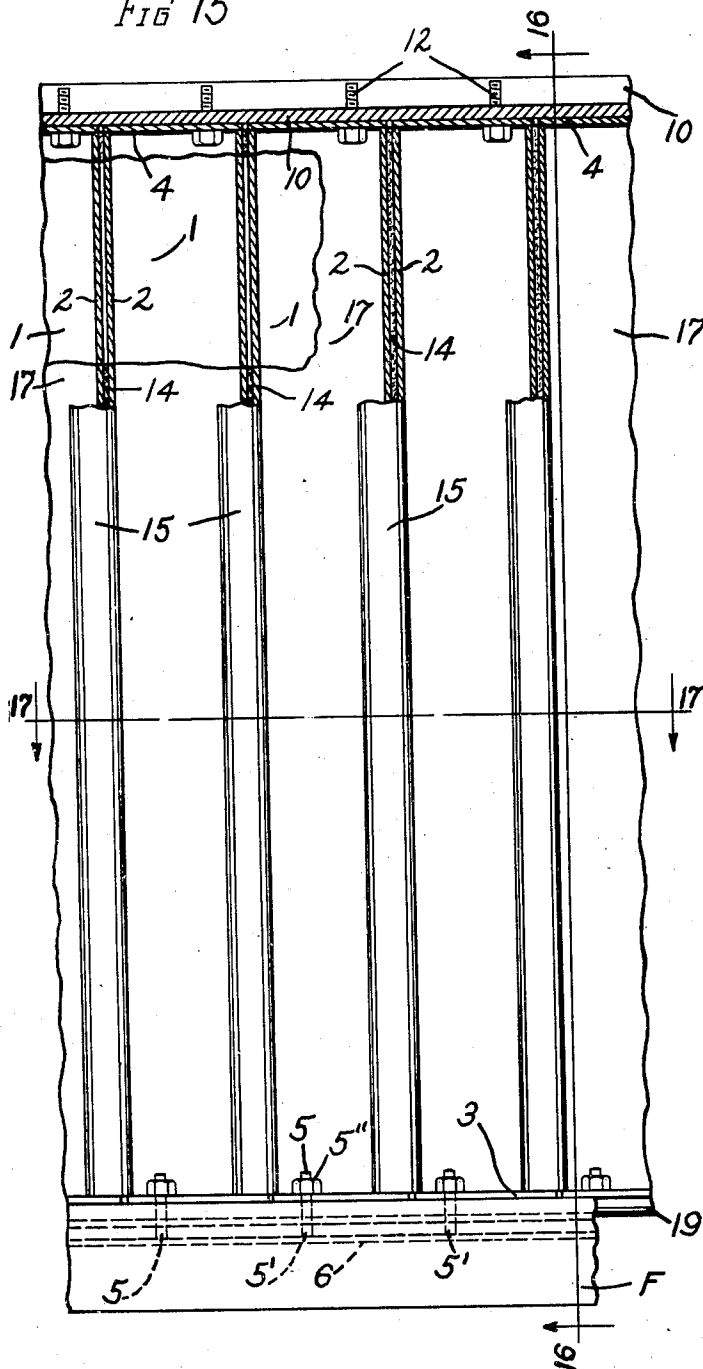
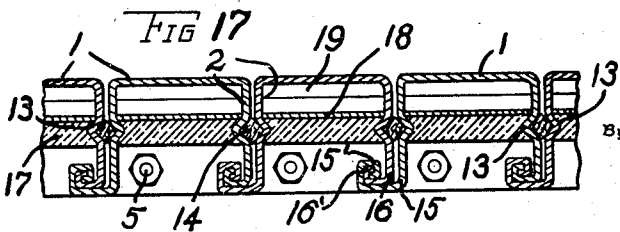
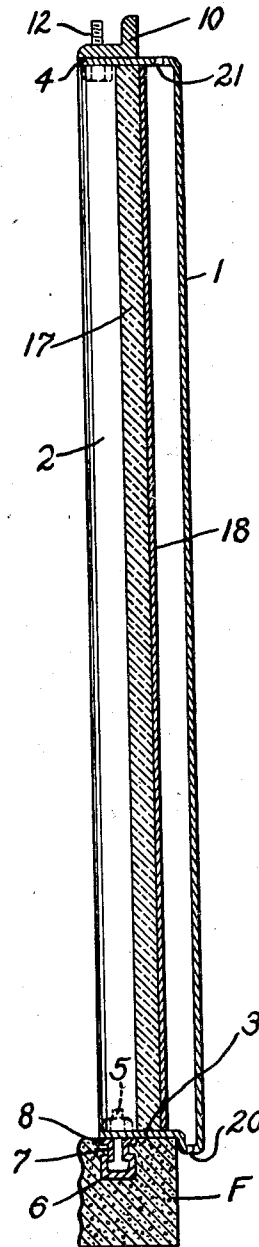


FIG 16



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UNITED STATES PATENT OFFICE

2,175,271

METALLIC BUILDING

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Application August 26, 1937, Serial No. 161,002

7 Claims. (Cl. 189—34)

This invention relates to metal buildings, it particularly relating to buildings which are fabricated at the factory and from there shipped to the building site in condition for ready erection.

In the construction of metal dwellings in the past the labor cost at the building site has amounted to a very considerable proportion of the total cost of the building. It is one of the objects of this invention that this labor cost be materially reduced by eliminating the necessity of cutting, spot welding and substantially all riveting, bolting and nailing at the building site so as to make it possible to erect the building complete without any skilled labor except for the interior finish of the walls, floor and ceilings; the fastening means for the various sections of the exterior of the building consisting of but few bolts, nails and rivets.

Further and more specific objects of the invention will appear from the accompanying drawings, description, and claims.

In the accompanying drawings:

Fig. 1 is a plan view of the exterior wall construction, showing in place thereon some of the roof and ceiling joists.

Fig. 2 is a view partly in side elevation and partly in section, the section being on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged transverse section of a portion of the outer wall of the structure together with a portion of the lining for the interior structure.

Fig. 4 is a vertical section of one of the partitions in the interior of the building showing the manner of securing the same to the ceiling and floor joists.

Fig. 5 is a section on the line 5—5 of Fig. 4.

Fig. 6 is a vertical section through one of the side wall sections showing the manner of supporting the combined ceiling and floor joists for a two-story structure, one of the joists being shown partly in side elevation and partly in section and the support for the same being shown in section.

Fig. 7 is a section on the line 7—7 of Fig. 6.

Fig. 8 is a vertical section of two short side wall sections showing a metallic window installed therein also in section and also showing a portion of the foundation and one of the floor joists.

Fig. 9 is a vertical section of one of the short side wall sections of the structure, a portion of a window, a portion of one of the ceiling joists and one of the rafters and a portion of the roof.

Fig. 10 is a transverse section of a portion of

one of the side wall sections showing a door frame in section fitted thereto.

Fig. 11 is a section on the line 11—11 of Fig. 9.

Fig. 12 is a view in section of two of the roof rafters at their point of juncture together with a vertical section of a portion of the roof and the manner of securing the edges thereto at the ridge of the structure.

Fig. 13 is a vertical section of a portion of the floor structure showing the manner of joining the joists together.

Fig. 14 is a plan view of a portion of the roof and also a portion of two of the roof rafters at the point of juncture and the means for securing them together.

Fig. 15 is a view partly in elevation and partly in vertical section of some of the long side wall sections looking from the inside of the structure and also showing at the bottom a portion of the foundation and at the top a portion of the angle irons which connect the side wall sections together.

Fig. 16 is a section on the line 16—16 of Fig. 15.

Fig. 17 is a section on the line 17—17 of Fig. 15.

The side walls of the structure consist of a series of metallic sections. Each of these sections is pressed or stamped of sheet metal so as to form an outer wall 1, end walls 2, a base plate 3 and a head plate 4. All of these sections are for the full height of a one-story building with the exception of the places where the windows or doors are inserted at which places the sections are naturally shorter. The base plates 3 are secured to the foundation F by bolts 5. To this end an insert of sheet metal is placed in the concrete of the foundation when the same is poured and extends entirely around the building. This metal insert is of channel-form and has an enlargement 6 at the bottom to receive the heads of the bolts, which enlargement is approached by a neck 7 of substantially the diameter of the shank of the bolt, which neck terminates in horizontal flanges 8 which rest on the top of the foundation and are slightly imbedded therein so as to be flush with the top thereof. This arrangement provides for a continuous inverted T-shaped slot around the entire foundation, and the head 5' of each bolt is of a flat elongated character as shown in dotted lines in Fig. 15, the width of which permits it to be inserted through the neck 7 after which it is given a quarter turn. The base plate 3 is perforated to receive the bolt 5 and nuts 5'' on the bolts to clamp the parts together. The enlargement at the bottom of the insert serves

to anchor the insert in the cement without the aid of additional fastening devices.

The upper end plates 4 of each of the sections are connected together by angle iron plates 10 which extend around the entire structure, as shown in Fig. 1 in which the plates are shown partly in full lines and partly in dotted lines. In a four-sided structure four of these plates would be employed, the adjacent ends of which are connected together by angular straps 11 preferably riveted thereto. The said head plates 4 of the respective wall sections are connected to these plates 10 by bolts 12 (Figs. 1, 2 and 9).

The end walls 2 of adjacent sections are each formed with a V-shaped depression 13 which when pressed together form a vertical rectangular groove in which is inserted a suitable plastic material 14 to provide for calking and also furnish an expansion joint between adjacent sections. The end walls 2 of adjacent side wall sections are also interlocked by providing the inner edge of one end wall with a lateral flange 15 and the adjacent end wall with a lateral flange 16, the edge of the flange 15 being bent to hook form as indicated at 15' so as to receive a hook 16' formed on the edge of the flange 16.

To interlock these flanges, after one section has been properly positioned an adjacent section is held at a slight angle thereto so that the hook 15' may be engaged with the hook 16' after which the succeeding section may be swung parallel with the first section.

Located in each of the side wall sections is a plank of insulating material 17. Each of these planks of insulating material is centrally positioned in its corresponding side wall sections and is held in position by providing the side edges thereof with V-shaped grooves which receive the V-shaped depressions 13 of the ends 2 of the side wall sections. These insulating planks may be of any suitable material such as fiber impregnated with pitch and termite-proof compound and the outside surface is covered with a sheet 18 of aluminum, copper or other reflective type of insulation to add to its insulating value.

Each of the side wall sections is provided with means for draining the condensation on the inside thereof and for a circulation of air between the wall 1 and the insulation. Referring to Figs. 15, 16 and 17, the lower end of each side wall section at the point where the wall 1 joins with the base plate 3 is depressed to form a drain trough 19 having an opening 20. This opening 20 not only permits the escape of the condensation but also permits the entrance of air which will circulate upwardly and escape through an opening 21 in the head plate 4.

The floor joists for the structure are best shown in Figs. 8 and 13. Each joist is formed of sheet metal and consists of a flat central web portion 22 having mounted on one edge thereof a flange 23 which is received in a channel of the adjacent joist consisting of a flange 24 having its edge provided with a U-bend 25.

There is provided a series of roof joists which are constructed in all respects like the floor joists excepting that they are inverted (Figs. 1, 2 and 9). The horizontal portion of these joists is indicated at 26, having one edge thereof formed with an upwardly turned flange 27 and the other edge with an upwardly turned U-bend 28 which receives the flange 27 of the adjacent joists. These roof joists are secured to the angle iron plates 10 by the same bolts 12 which secure

the side wall sections and the plates together, these bolts passing through the horizontal portions 26 of the joists.

A series of roof rafters are employed, these rafters being shown best in Figs. 1, 2, 9, 12 and 14. Each of these rafters is formed of sheet metal consisting of a flat web portion 29 having a flange 30 on one edge which fits in a U-bend 31 on the edge of the adjacent rafter.

The flanges and U-bends of the rafters occupy positions between the flanges and U-bends of the floor joists and tie rods 32 pass through the flanges and U-bends of both the rafters and joists to anchor the rafters in position, these tie rods having nuts 32' on their ends to clamp against the flanges of the outermost joist.

To secure the upper adjacent ends of the rafters together there is inserted between adjacent ends thereof a sheet metal strip 33 (Figs. 12 and 14) the upper edge of which projects beyond the rafters and is slit to form tongues 33' which are alternately bent in opposite directions and secured to the rafters by nails 34 or other suitable fastening devices.

The roofing sections are formed of a base or sheathing 35 preferably of the same material as that of the insulating strips 17. A sheet of copper 36 is glued on the upper side of each section 35 with the sheets at adjacent edges of the sections 35 projecting beyond the sections so that they can be upturned in parallel relation as indicated at 36' in Fig. 11 and secured together by U-shaped clips 37 and rivets 38 (see also Fig. 9). The insulated sheathing material 35 is applied to the roof rafters with a mastic substance spread over the entire surface of the rafters, this substance being stock material now on the market known as roofers' mastic.

In Figs. 8, 9 and 10 there is shown a window installation. At the point where a window is to be installed the side wall sections indicated at 1a are short so as to leave space therebetween for the insertion of a metallic frame indicated at 39 which receives the window sash 40 and its glass 41. The window frame and the sash are of usual stock steel sections except that the overall width from jamb to jamb shall be a multiple of the width of the side wall sections in order that the same can be applied without cutting the wall sections. These window frames extend over two or more of the short side wall sections.

In installing the windows the lower short sections are erected, these sections being constructed the same in all respects as the side wall sections previously described with the exception that the upper head plate 4 is omitted. A metallic sill 42 is placed over the lower short side wall section, a portion of this sill preferably resting on a wooden strip 43 which is supported by the top of the short lower wall sections. The window frame is then placed in position on the sill with calking material 44 of the character used in expansion joints between the lower portion of the frame and sill, this calking material having been previously placed in the pocket formed by the usual angular construction of the window frame. The upper short top wall sections are then placed in position. Each of these top wall sections is constructed in the same manner as the long sections previously described with the exception that the lower base plate 3' is formed with a longitudinally extending groove 45 to receive calking material 46 into which the vertical flange of the upper portion of the window of the frame is placed, calking material having also been placed

in the pocket formed by the angular frame. The vertical flanges of the sides of the window frame are imbedded in the plastic 14 in the V-shaped grooves of the adjacent full-height side wall sections 1 as shown at the top of Fig. 3.

For the corner joints between the side wall sections the sections at the ends of the structure are slightly modified, as shown in Fig. 3, so that the vertical ends 2' of adjacent corner sections will be angularly arranged and the shape of the depression 13' altered so as to provide a triangular shaped groove instead of a rectangular groove. In erection one of these corner sections is first placed in position and bolted to the foundation, in the manner previously described by the bolts 5. The other corner section is turned at such an angle to the first section that its interlocking flange may be interlocked with the interlocking flange of the first section and then turned to its proper position, the flanges hinging upon each other. When this last section reaches its final position parallel with the wall the joints are interlocked perfectly tight and are ready to receive its securing bolts 5.

In Fig. 10 there is shown the manner of securing the door frame to one of the vertical ends 2 of a side wall section. In this case the interlocking flange on the end 2 is omitted and there is bolted to the outer surface of the end 2 a slip 47 by bolts, one of which is shown at 48. This slip has a V-shaped depression 49 which cooperates with the vertical depression 13 of the side wall section to provide a groove for calking compound 50. It also has its side edges downturned as indicated at 51 and 52 to provide grooves to receive the turned edges of substantially U-shaped door frames 53.

The interior finish consists of sheets of plywood 54 which are nailed to wooden strips 55, two only of which are shown in Fig. 3. These wooden strips are secured to the ends 2 of the side wall sections by screws or other suitable fastening devices. About all window frames and door frames a metallic clip trim 56 is employed, the details of which need not be described as these trims are stock articles now on the market.

In Figs. 4 and 5 there is shown an arrangement for providing a partition in the structure. U-shaped spacing channels 57 and 58 are secured respectively to the ceiling joists and floor joists and are of a length equal to the desired length of the partition. These channel members are secured to the joists by clincher nails as shown. A series of studs 59 built up of two sheet metal channels riveted together are positioned between the channels. After the channel members are in place the studs merely set in position on the inside of the channel member. An interior finish 60 of ply board is secured to the studs by means of steel clinching nails driven between the two members of the stud, the upper and lower edges of the ply board finish resting against the webs of the steel channel so as to keep them properly aligned.

For a two-story structure the side wall sections are made twice as high as for a one-story structure and means are provided to have these side wall sections support the ceiling joists for the first story as shown in Figs. 6 and 7. To this end a beam 61 is extended longitudinally through the ends 2 of the side wall section, the ends being provided with slotted openings 62 to receive the beam. Upon this beam rests the ceiling joist, a portion of one of which is indicated at 63, one of these beams being located

upon each side of the structure. The lower edges of the joists have recesses 64 to receive the beams. These joists are constructed in all respects like the ceiling joists heretofore described with flanges and U-bends, these flanges and U-bends being the part which rests upon the beam.

In Fig. 9 there is shown a sheet metal gutter 65, the inner wall 65' of which covers the open space between the side wall sections and the roof. This inner wall has a bent flange 65'' which is inserted between the roof and the roof rafters and braces 66 connect the inner wall 65' with the outer wall of the gutter.

Having thus described my invention, I claim:

1. In a metallic structure, a plurality of sheet metal side sections each consisting of an outer wall, end walls and top and bottom plates, a concrete foundation, an insert imbedded in said foundation forming an inverted T-shaped channel, bolts having their heads interlocked in said channels for securing the bottom plates of said sections to said foundation, means extending about the structure for connecting the top plates together, and means for securing adjacent sections together.

2. In a metallic structure, a series of sheet metal side wall sections consisting of long sections extending at least the height of a story, a metallic window frame of angular form, short side wall sections above and below said window frame, the upper short section being bent to form a transversely extending calking receiving recess and into which the vertical web of the upper portion of the window frame extends, the vertical ends of the adjacent long side wall sections being also bent to form calking receiving recesses into which the vertical webs of the window frame extend.

3. In a metallic structure, a series of sheet metal side wall sections consisting of long sections extending at least the height of a story, a metallic window frame of angular form, short side wall sections above and below said window frame, the upper short section being bent to form a transversely extending calking receiving recess and into which the vertical web of the upper portion of the window frame extends, the vertical ends of the adjacent long side wall sections being also bent to form calking receiving recesses into which the vertical webs of the window frame extend, a metallic sill supported on the lower short section beneath the window frame, said sill supporting said window frame, and calking material placed in the pocket formed by the angular shaped lower portion of the window frame.

4. In a metallic structure, a plurality of sheet metal side sections each having a bottom plate, a concrete foundation, an insert imbedded in said foundation forming a channel having an enlarged bottom, bolts having their heads interlocked in the enlarged portions of said channels for securing the bottom plates of said sections to said foundation, and means for securing adjacent sections together.

5. A metallic structure, including a plurality of sheet metal side sections each consisting of an outer wall, end walls and top and bottom plates, means for securing the bottom plates to the foundation of the structure, means extending about the structure and connecting the top plates together, means for securing the extreme inner edges of adjacent end walls together, with the remaining portions of said end walls otherwise free of connections, the outer end portions of ad-

adjacent end walls being closely positioned throughout and each being bent to form vertically-extending recesses, the recess of one end wall registering with the recess of an adjacent end wall to conjointly form a groove, the groove being spaced from the securing means, and calking material independent of the securing means packed in said groove, the said groove being located between said securing means and the outer margins of said end walls, and the said outer portions of the end walls by virtue of being free of connection with each other as aforesaid providing an expansion joint, in conjunction with the calking material.

6. A metallic structure in accordance with claim 5, wherein the confronting faces of the said adjacent sections have free space therebetween maintained by the calking material.

7. A metallic structure in accordance with claim 5, wherein the recesses are of concavo-convex configuration, with the concave sides thereof confronting each other, and wherein there are insulating slabs having marginal portions formed to receive and engage over the convex sides.

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