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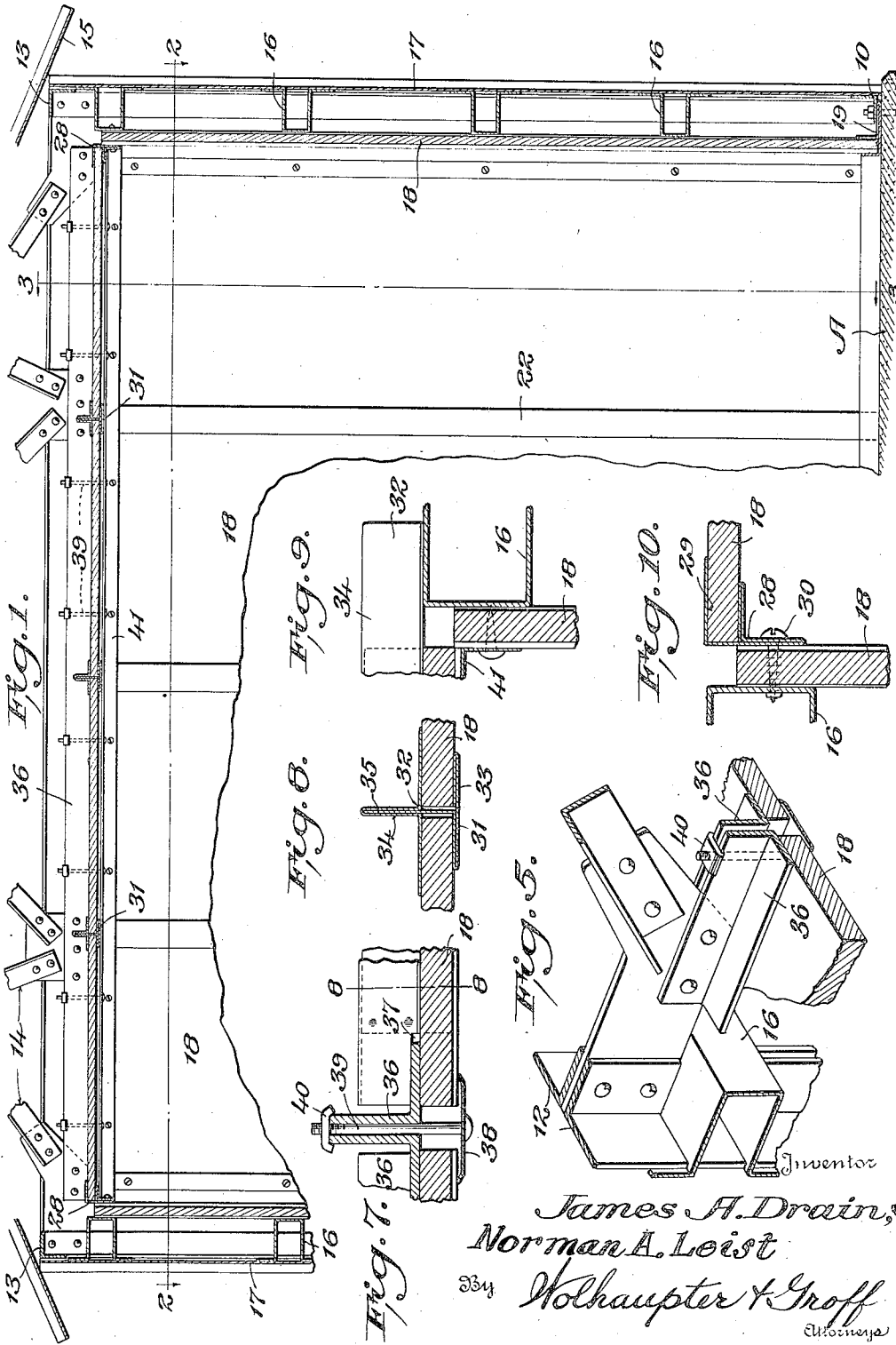
J. A. DRAIN, JR., ET AL

2,212,982

INSULATED METAL BUILDING CONSTRUCTION

Filed April 10, 1939

3 Sheets-Sheet 1



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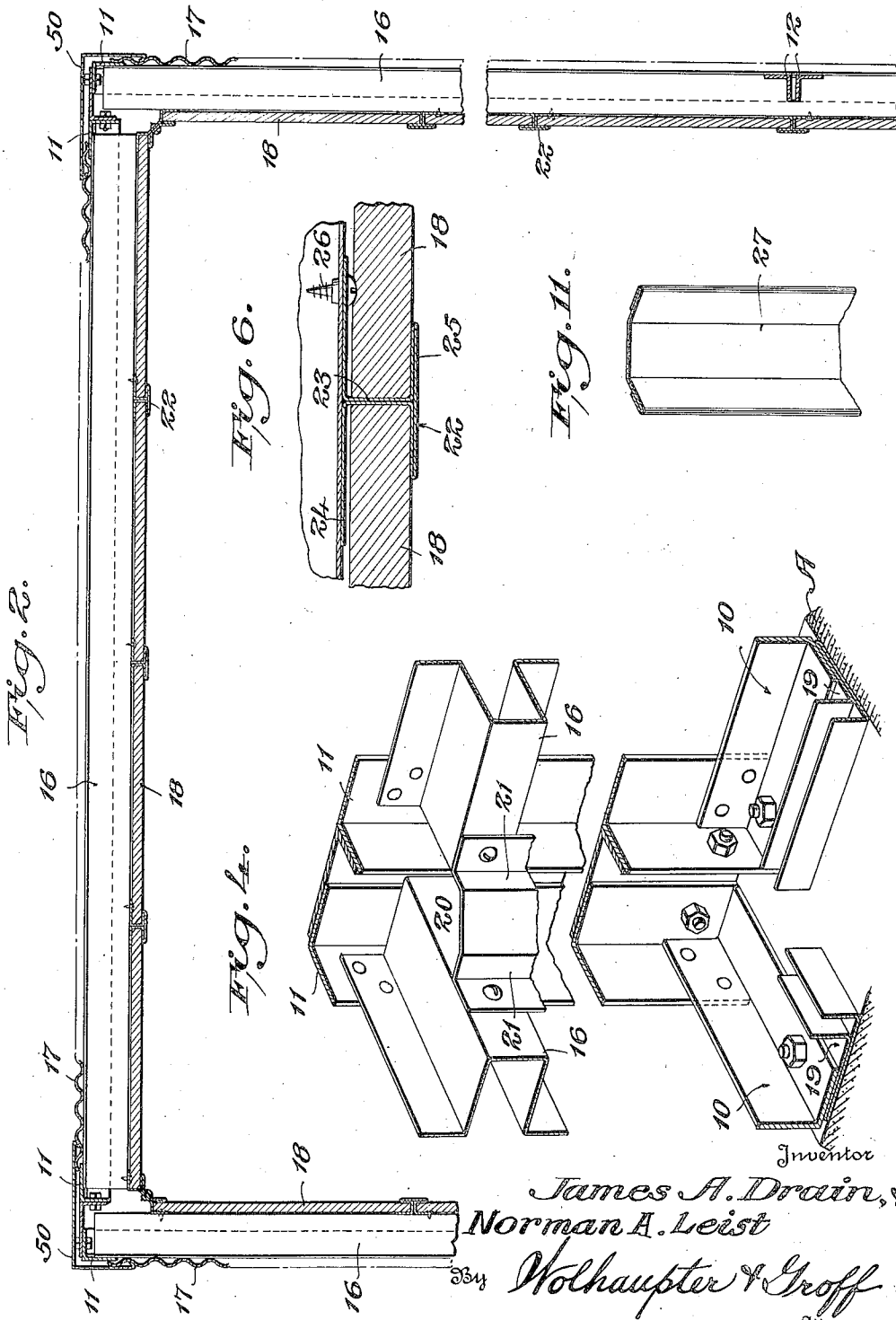
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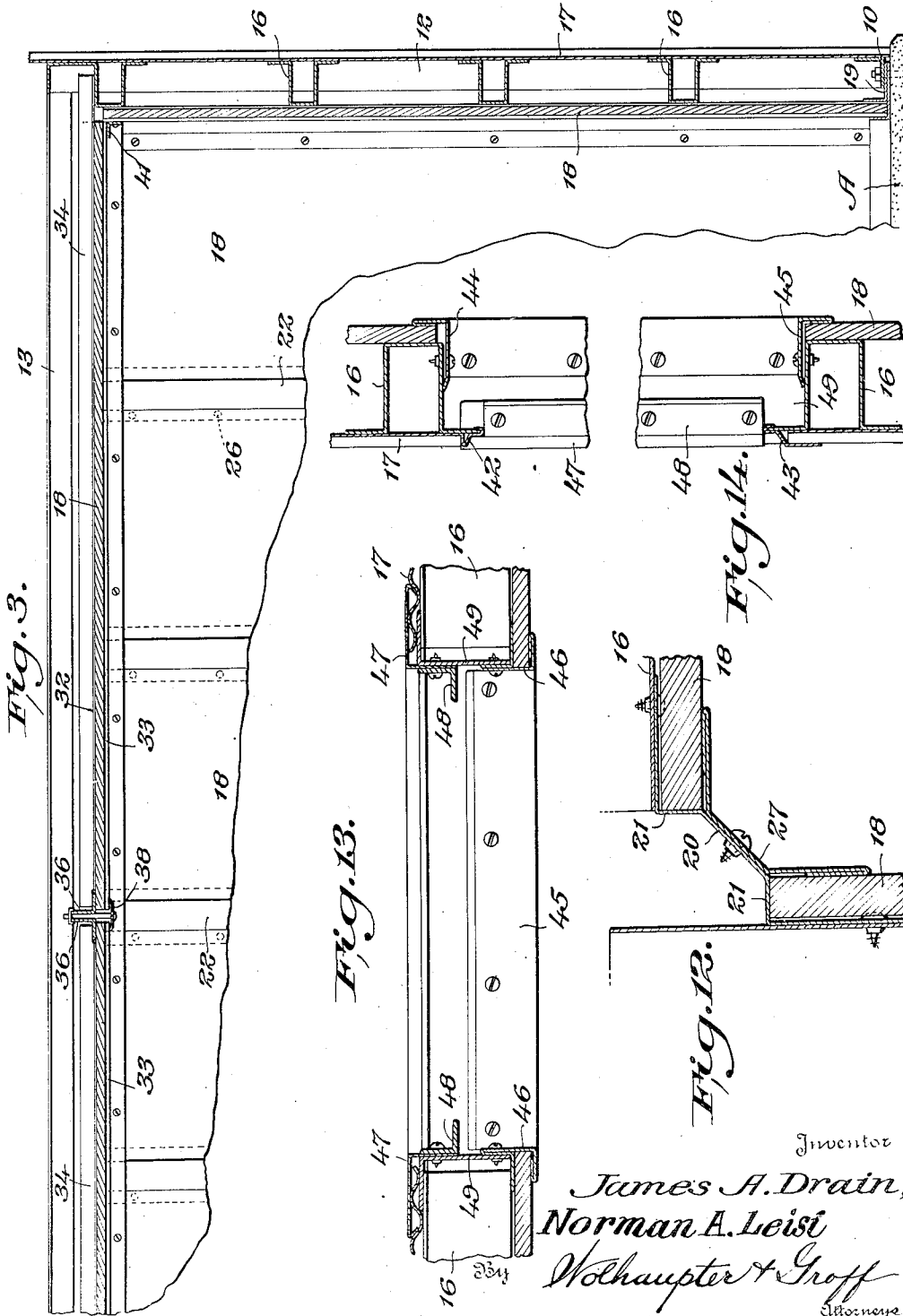
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INSULATED METAL BUILDING CONSTRUCTION

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5 Claims. (Cl. 189—1)

This invention relates to building construction, and has particular reference to improvements in sectional buildings of the type comprising a frame, an outer covering of sheet metal or other suitable material, and interior finishing walls composed of panels of insulating material mounted in spaced relationship to the outer covering.

Generally speaking, the objects of the invention are: to provide a building construction of the type mentioned, the parts of which are of low production cost; which are readily portable and readily, easily and economically erectable by unskilled labor; which, when erected, afford a structure which is exceptionally strong and rigid, and which may readily, easily and completely be disassembled or salvaged without damage.

Other objects of the invention are: to provide interior wall and ceiling panel mounting means which are simple, of low cost, efficient for their purpose and which enable erection of the panels to be effected very expeditiously; to provide novel means for covering and finishing joints between adjacent panels, and to provide novel means for finishing wall openings such as doors, windows and the like.

With the foregoing and other objects in view, which will become more fully apparent as the nature of the invention is better understood, the same consists in the novel features of construction, combination and arrangement of parts as will be hereinafter more fully described, illustrated in the accompanying drawings and defined in the appended claims.

In the accompanying drawings, wherein like characters of reference denote corresponding parts in related views:

Figure 1 is a transverse section through a conventional building constructed in accordance with the invention.

Figure 2 is a horizontal section on the line 2—2 of Fig. 1.

Figure 3 is a vertical section on the line 3—3 of Fig. 1.

Figure 4 is a fragmentary perspective view of a corner portion of the building frame.

Figure 5 is a fragmentary perspective view of a ceiling portion of the building.

Figure 6 is a horizontal section through a joint between a pair of side wall panels of the building.

Figure 7 is a vertical section through a ceiling portion of the building.

Figure 8 is a detail section on the line 8—8 of Fig. 7.

Figure 9 is a vertical sectional view through a

joint between ceiling and end wall panels of the building.

Figure 10 is a vertical section through a joint between ceiling and side wall panels of the building.

Figure 11 is a fragmentary perspective view of one of the corner finishing strips.

Figure 12 is a horizontal section through a corner of the building.

Figure 13 is a horizontal section through a window or door opening of the building; and

Figure 14 is a vertical section through a window or door opening of the building.

In accordance with the invention there first is provided a foundation A of concrete or other suitable material, and then flatly upon this foundation, are suitably fastened angle iron or equivalent elements 10 disposed to underlie the building walls to be erected. Next, upright angle iron or equivalent elements 11 are mounted at the corner points of the building to be erected, being bolted, riveted or otherwise secured at their lower ends to the angle iron or equivalent elements 10, and, in case any given wall is to be of considerable length, other upright angle iron or equivalent elements 12 are mounted intermediate the related corner elements 11, being also bolted, riveted or otherwise secured at their lower ends to the related elements 10.

At or near their upper ends, the upright corner elements 11 are connected together by angle iron or equivalent elements 13, and, in case upright intermediate elements 12 are employed between any two upright corner elements 11, said elements 12 are connected, at or near their upper ends, to the related corner elements 11 by the elements 13.

The elements 10, 11, 12 and 13, generally speaking, constitute the building frame to the top of which is suitably mounted a supporting structure, fragmentarily illustrated in Fig. 1 and designated generally as 14, for a roof, also fragmentarily illustrated in Fig. 1 and designated as 15.

Following erection of the upright corner elements 11 and the intermediate upright elements 12, if the latter are provided in any particular instance, related corner elements 11 and the intermediate elements 12, if provided, are connected together by stringer elements 16 of preferably U-shape in cross section as shown. These stringer elements are horizontally disposed and are spaced suitable distances apart vertically and may be fastened to the corner elements 11 by bolts, rivets or in any other suitable manner. Moreover, they may be of lengths to extend from

corner element 11 to corner element 11, in which event they may be intermediately notched to accommodate the intermediate upright elements 12 if the latter are provided, or, alternatively, they 5 may be of lengths to extend from corner elements 11 to intermediate upright elements 12, in which case they may, of course, be bolted, riveted or otherwise suitably fastened at their inner ends to the intermediate elements 12. In either case, 10 the closed sides of said stringer elements preferably are disposed inwardly and their upper and lower walls at their outer ends preferably are flanged upwardly and downwardly, respectively, to afford relatively wide surfaces against which 15 to secure the outer covering 17 of the building.

The outer covering 17 may be comprised by any suitable material and may be fastened to the stringer elements 16 in any suitable manner. Preferably, however, said outer covering is comprised by corrugated sheet metal and is riveted 20 to the flanged outer portions of the stringer elements. The wall frames, including the stringer elements 16, thus are reinforced and the side walls of the building are rendered exceptionally stiff 25 and rigid.

Following erection of the building frame, roofing of the same, and application thereto of the outer covering 17, insulating and finishing side and end wall and ceiling panels 18 are mounted 30 interiorly of the building. In this connection and reverting to the frame structure, it will be observed that there are clamped between the foundation A and the angle iron or equivalent elements 10 the outer portions of retaining elements 19 for the bottom portions of the side and 35 end wall panels 18. These retaining elements 19 are formed from strips of sheet metal bent upon themselves to provide their outer portions which are confined beneath the elements 10, and have their marginal portions flanged upwardly in 40 spaced relationship to each other to provide channels to accommodate the bottoms of the side and end wall panels 18.

Furthermore, there are riveted, bolted or otherwise suitably fastened to the stringer elements 16 45 at the corners of the building frame, vertically disposed sheet metal elements 20 to constitute abutments for the adjacent side edges of the side and end wall panels 18. The elements 20 extend 50 diagonally at the corners of the building frame, are marginally secured to the stringer elements 16 and have offset portions 21 (Figs. 4 and 12) providing the aforesaid abutments for the adjacent side edges of the side and end wall panels 18.

The panels 18 may be of any suitable width and thickness and may be formed from any suitable material. Preferably they are of lengths or 55 heights to extend from the floor or foundation A of the building to the ceiling thereof.

In erecting the side and end wall panels the operator begins at one corner of the building. First, there is applied to the outer side edge of the first panel to be erected a double-channel strip 22 of substantially H shape in cross section 65 as shown in Fig. 6. The strip 22 is stock material formed preferably from sheet metal bent upon itself to provide a web 23 and inner and outer flanges 24 and 25, respectively, extending in opposite directions from said web and providing 70 the double channels mentioned. The outer side portion of the first panel to be erected is engaged in one of said channels and the other channel is left open. The panel then is inserted at its bottom into the channel of the retaining element 75 19 and at its inner side edge is engaged against

the related offset or abutment portion 21 of the element 20. Holes then are punched through the exposed, inner flange 24 of the strip 22 and through the stringer elements 16 and the strip 22 5 is fastened to said stringer elements by screws 26 passed through the holes in the said flange 24 and threaded into the holes in the stringer elements. A second strip 22 then is applied to one side edge of a second panel 18, the second panel then is 10 inserted at its bottom in the channel of the retaining strip 19 and the other side edge of the second panel is inserted into the open or outwardly facing channel of the first mentioned strip 22. The second mentioned strip 22 then is fastened 15 to the stringer elements 16 in the same manner as the first mentioned strip 22. Thus, the first and the second side or end wall panels, as the case may be, are secured in place. The operation is repeated for successive side and end 20 wall panels until the side and end walls of the building are completely paneled. Finishing corner strips 27 of sheet metal as illustrated in Figs. 11 and 12 then are screw fastened to the elements 20 in overlying relationship to the adjacent side 25 edge portions of the adjacent side and end wall panels 18 to retain said portions of said panels in place and, of course, to finish the side and end panel walls at the corners of the building.

Next, against the inner faces of the side wall panels, near the tops thereof, are secured finishing 30 elements 28 having inwardly opening channels 29 to accommodate the side marginal portions of the ceiling panels 18. The elements 28 preferably are formed from sheet metal and are, or may be, duplicates, or substantially duplicates, 35 of the channel elements 19. In any event, said elements 28 have vertical portions extending downwardly from their inwardly opening channel portions 29 to be fastened to the side wall panels by screws 30 which may extend into the 40 upper stringer elements 16 to assist in fastening the tops of the side wall panels.

Beginning at one side of the building, the ceiling panels 18 are mounted in generally the same 45 way as the side and the end wall panels. That is to say, there is applied to the outer side edge of the first ceiling panel to be mounted, a double-channel strip 31 as illustrated in detail in Fig. 8 of the drawings. The strip 31, which is of stock 50 material, is composed of top and bottom, T-shaped, sheet metal parts 32 and 33, respectively, of which the top part 32 is bent upon itself to provide an upwardly extending medial stiffening flange 34 of channel form accommodating an upwardly extending medial flange 35 of the bottom 55 part 33. The flange 35 is spot-welded or otherwise suitably secured between the walls of the channel flange 34. The strip 31 thus is rendered quite stiff and rigid so that, although it may be supported only at its ends, it serves effectively to 60 hold against sagging the medial portions of the ceiling panels to which it is applied.

Should the ceiling space from end wall to end wall of the building be of not greater length than 65 the panels 18, the top parts 32 of the strips 31 are made sufficiently longer than the bottom parts 33 of said strips to rest upon the tops of the top stringer elements 16, as illustrated in Fig. 9 of the drawings. Usually, however, the ceiling space 70 is equal in length to the lengths of two or more of the panels 18. In that case, pairs of horizontally disposed angle iron elements 36 are mounted, as illustrated in Fig. 3 of the drawings, transversely of the building at the ceiling level and at points 75 spaced panel lengths from the building end walls.

If more than one pair of the angle iron elements 36 are employed, the pairs are, moreover, spaced panel lengths apart. Furthermore, if the strips 31 are to be used between adjacent pairs of angle-iron elements 36, the ends of the upwardly extending stiffening flanges 34 of said strips are slotted, as indicated at 37 in Fig. 7 of the drawings, to receive the outwardly directed, bottom flanges of the angle iron elements 36. If, on the other hand, the strips 31 are to be used between an end wall of the building and an adjacent angle-iron element 36, the top members 32 of the strips are made longer at one end than the bottom members 33 to rest upon the top of the end wall stringer element 16 at the ceiling level, and at their other ends the upwardly extending stiffening flanges of said strips are slotted as at 37.

Assuming that the first ceiling panel to be mounted is to extend from an end wall of the building to an angle-iron element 36, one of the strips 31 as last described is applied to one side edge of the ceiling panel. The panel then is manipulated to engage its other side edge portion in the channel 29 of the member 28 at one side of the building; to interfit the slot 37 at the inner end of the strip 31 with the flange of the angle-iron member 36, and to rest the projecting portion of the top element 32 of the strip 31 at the other end thereof upon the end wall stringer element 16 at the ceiling level. The first ceiling panel thus is mounted in position. To one side edge of a second ceiling panel a second strip 31 is applied and the second panel is manipulated to be mounted in place in the same manner as the first panel, except that the other side edge of the second panel is engaged in the open or second channel of the first applied strip 31. This operation is repeated for succeeding ceiling panels entirely across the building, working either from one side to the other or from both sides toward the center of the building, as may be desired.

After mounting of all of the ceiling panels, the exposed joints between the ends of adjacent of said panels are covered by finishing strips 38 which are secured in place by screws 39 passed through openings in said strips, upwardly between the spaced angle-iron elements 36 of the pairs of said elements and threaded into nut 40 engaged with the tops of the vertical flanges of said angle-iron elements 36.

Finally, the interior wall structure is finished by applying sheet metal, angle strips 41 over the exposed upper ends of the end wall panels and the exposed adjacent ends of the ceiling panels, as illustrated in Figs. 3 and 9.

As will be apparent from the foregoing, the various elements comprising a building constructed in accordance with the invention, may be of stock construction; are readily portable and easily erectable; afford a structure which is exceptionally strong and rigid and which may, should occasion arise, be readily dismantled or salvaged.

When a window opening is formed in a side or end of the building, the top and the bottom of the opening may appropriately be at the levels of a pair of the stringer elements 16, and in that case sheet metal elements 42 and 43 may be engaged over the flanges of said stringer elements and with the exposed top and bottom edges of the outer covering at the window opening to finish said edges and to prevent rain, snow or the like from entering the building. In addition, top and bottom angle strips 44 and 45 may be fastened

in covering, finishing relation to the panel edges at the top and the bottom of the window opening at the inner side of the building, and other angle strips 46 may be fastened in covering, finishing relation to the panel edges at the sides of the window opening at the inner side of the building. On the other hand, at the outer side of the window opening, angle strips 47 may be fastened in covering, finishing relation to the edges of the outer covering 17 at the sides of the window opening, said strips 47 being secured, for example, beneath angle-iron sash stop elements 48 which, in turn, may be fastened by screws or in any other suitable manner to angle-iron members 49 carried by the stringer elements 16 and which serve as closures for the sides of the window opening.

A door opening may be finished in generally the same manner as a window or opening, except that a suitable sill may be employed in lieu of the bottom finishing members of a window opening.

The outer covering 17 may extend around the corners of the building. On the other hand, the side and end wall outer coverings 17 may be separate from each other. In the latter event, sheet metal angle coverings for the exposed ends of the said side and end wall outer coverings 17 may be employed as illustrated in Fig. 2 of the drawings and may be fastened in place in any suitable manner.

For the sake of simplifying the foregoing description it has been assumed that the building is rectangular and is devoid of offsets and the like. However, it will be appreciated that, by means of the elements described, buildings with offsets or of otherwise irregular form, may be erected in accordance with the invention with substantially the same facility as the conventional building shown.

It will further be appreciated that some, or all, of the stringer elements may be disposed vertically if desired, particularly in partition walls, and that the wall panel elements may, if desired, be disposed horizontally instead of vertically; also, that the space between the outer covering and the paneled walls, or between double-paneled partition walls may, if desired, be filled with suitable insulating material.

Without further description it is thought that the features and advantages of the invention will be readily apparent to those skilled in the art, and it will, of course, be understood that changes in the form, proportion and minor details of construction may be resorted to, without departing from the spirit of the invention and scope of the appended claims.

We claim:

1. A building construction comprising a frame including upright members, horizontal metallic stringer elements of U-shape in cross section secured to said upright members and extending therebetween, said U-shaped elements having their closed sides disposed inwardly and their open sides disposed outwardly and their top and bottom walls at their outer ends flanged upwardly and downwardly, respectively, a metallic outer covering secured to said flanged portions of said elements, and an interior finishing and insulating panel structure secured to the closed inner sides of said stringer elements and disposed in spaced relationship to said outer covering.

2. In a building construction, a frame including a pair of spaced, horizontally disposed angle-iron cross members at ceiling level, said cross

members including outwardly directed bottom flanges and vertical flanges extending upwardly from said bottom flanges, channel members supported upon said bottom flanges, ceiling panels
 5 having edge portions disposed in the channels of said channel members whereby they are supported by said channel members, a finishing strip covering the joint between adjacent edges of the panel elements which underlie said angle-iron cross
 10 members, nuts engaged with the tops of the vertical flanges of said angle-iron cross members, and finishing strip fastening screws extending through said finishing strip, upwardly between said angle-iron cross members and engaged with
 15 said nuts.

3. A building construction comprising a frame including upright members, horizontal metallic stringer elements of U-shape in cross section secured to said upright members, said stringer
 20 elements having their closed sides disposed inwardly and their open sides disposed outwardly and their top and bottom walls at their outer ends provided with vertically disposed flanges, a metallic outer covering secured to said flanges,
 25 vertically disposed elements of I-shape in cross section secured to the inner closed sides of said stringer elements and providing oppositely facing channels, and interior finishing and insulating panel elements having their side edge portions
 30 disposed in said channels.

4. A building construction comprising a frame

including upright members, horizontal metallic stringer elements secured to said upright members, said stringer elements having vertically spaced, horizontally disposed top and bottom walls and an inner wall connecting said top and
 5 bottom walls, a metallic outer covering secured to said stringer elements, vertically disposed elements of I-shape in cross section secured to the inner walls of said stringer elements and providing oppositely facing channels, and interior
 10 finishing and insulating panel elements having their side edge portions disposed in said channels.

5. In a building construction, a frame including a pair of spaced, horizontally disposed angle-iron cross members at ceiling level, said cross
 15 members including outwardly directed bottom flanges and vertical flanges extending upwardly from said bottom flanges, channel members supported upon said bottom flanges, ceiling panels having edge portions disposed in the channels
 20 of said channel members whereby they are supported by said channel members, a finishing strip covering the joint between adjacent edges of the panel elements which underlie said angle-iron cross members, threaded means carried by said
 25 cross members and fastening screws for said finishing strip extending upwardly through said strip between said cross members and engaged with said threaded means.

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