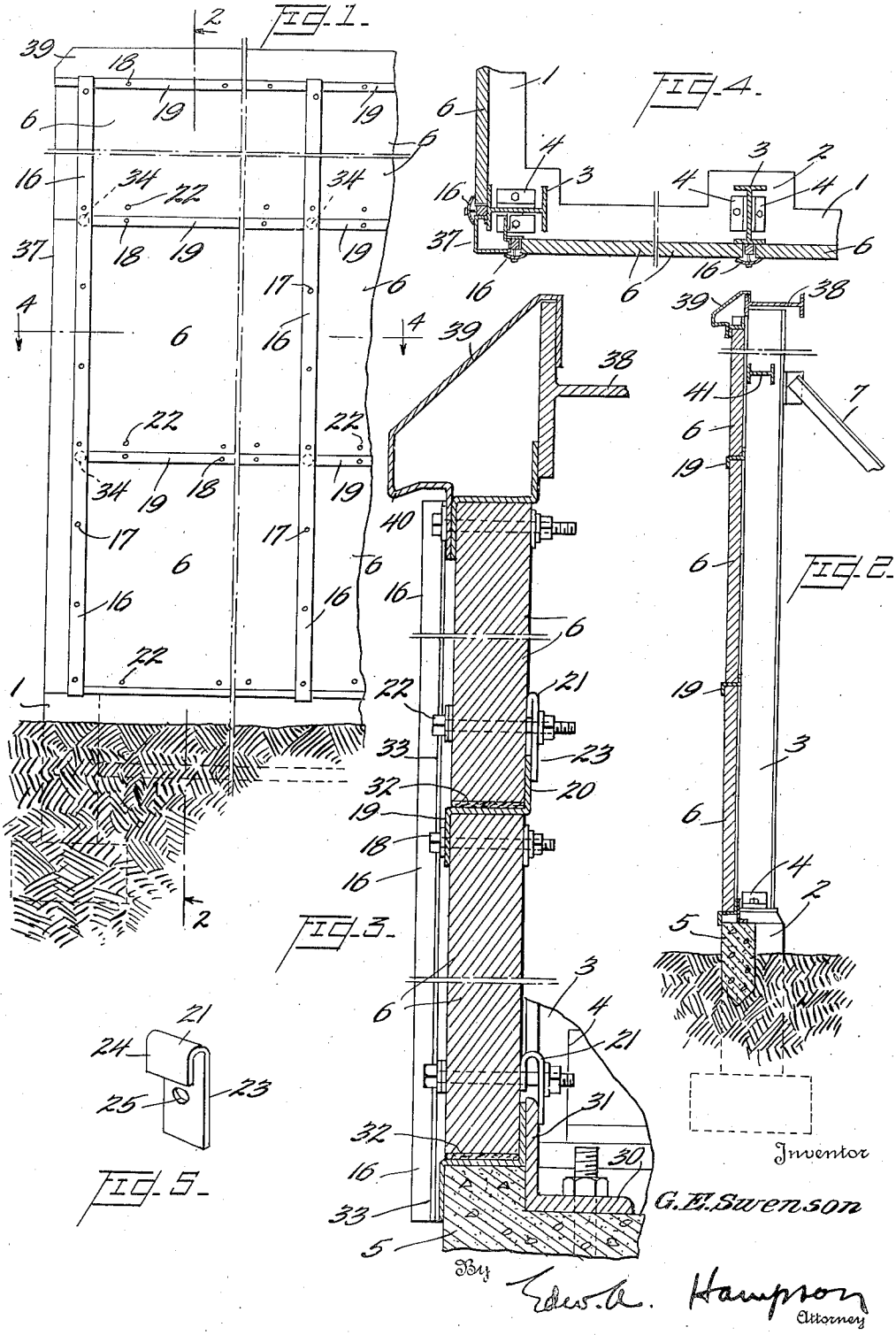
May 2, 1944. G. E. SWENSON 2,347,756

WALL CONSTRUCTION

Filed Jan. 8, 1942 4 Sheets-Sheet 1



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WALL CONSTRUCTION

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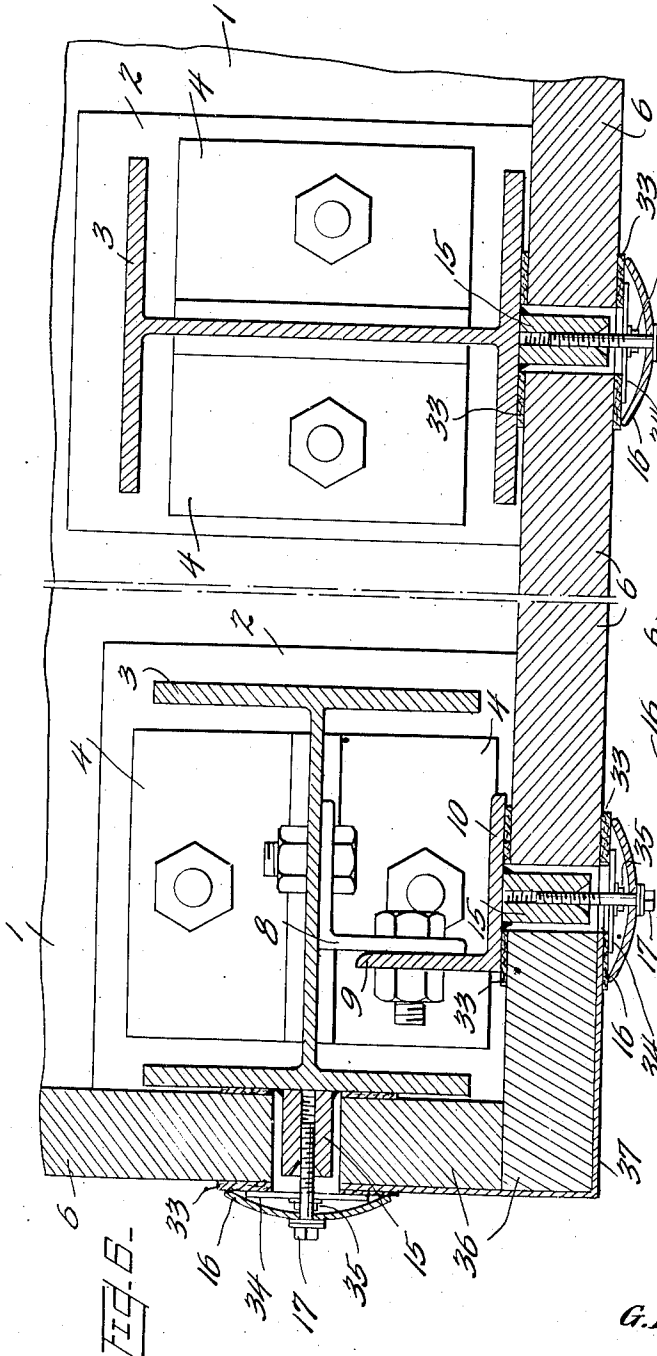

FIG. 6.

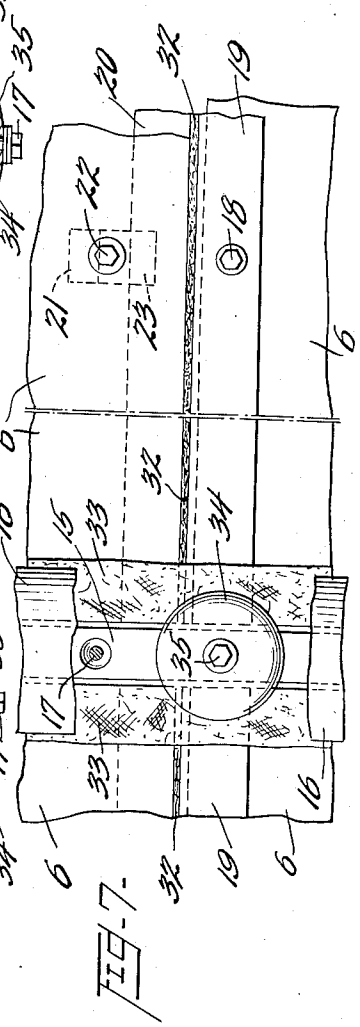

FIG. 7.

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FIG. 8.

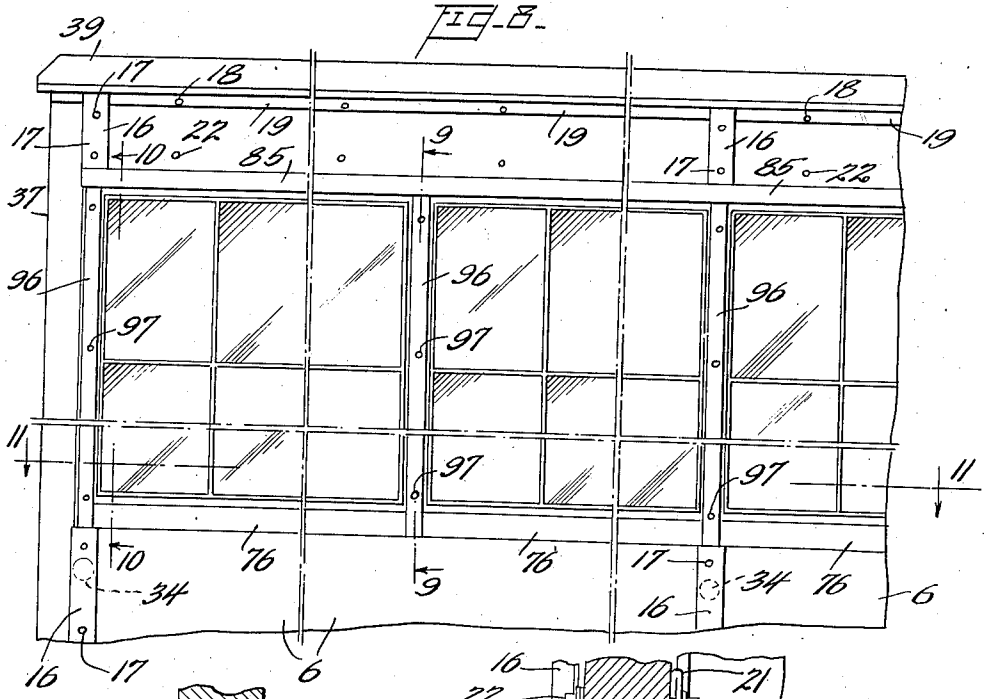


FIG. 9.

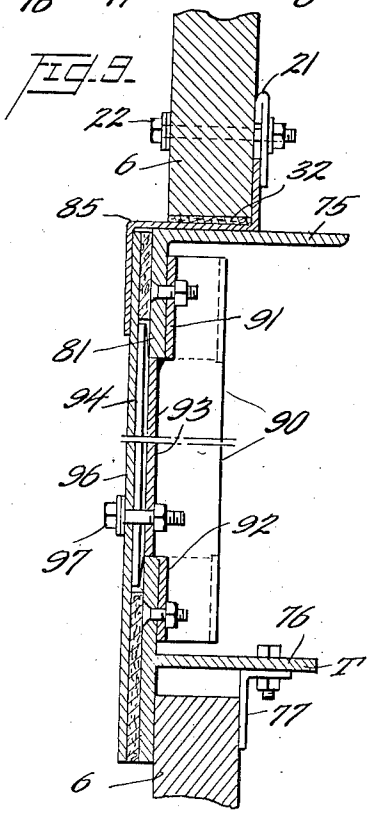
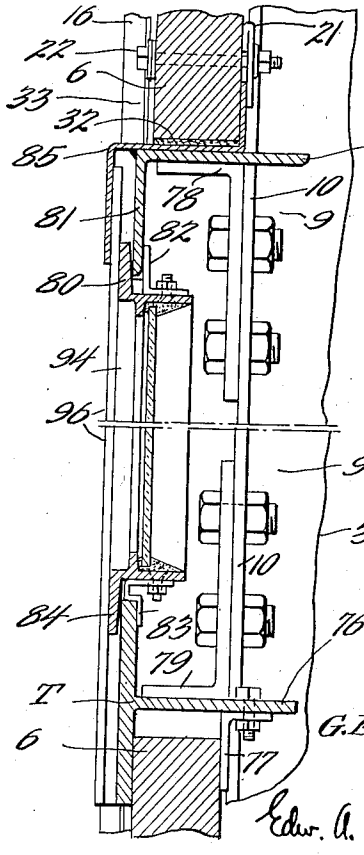


FIG. 10.



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WALL CONSTRUCTION

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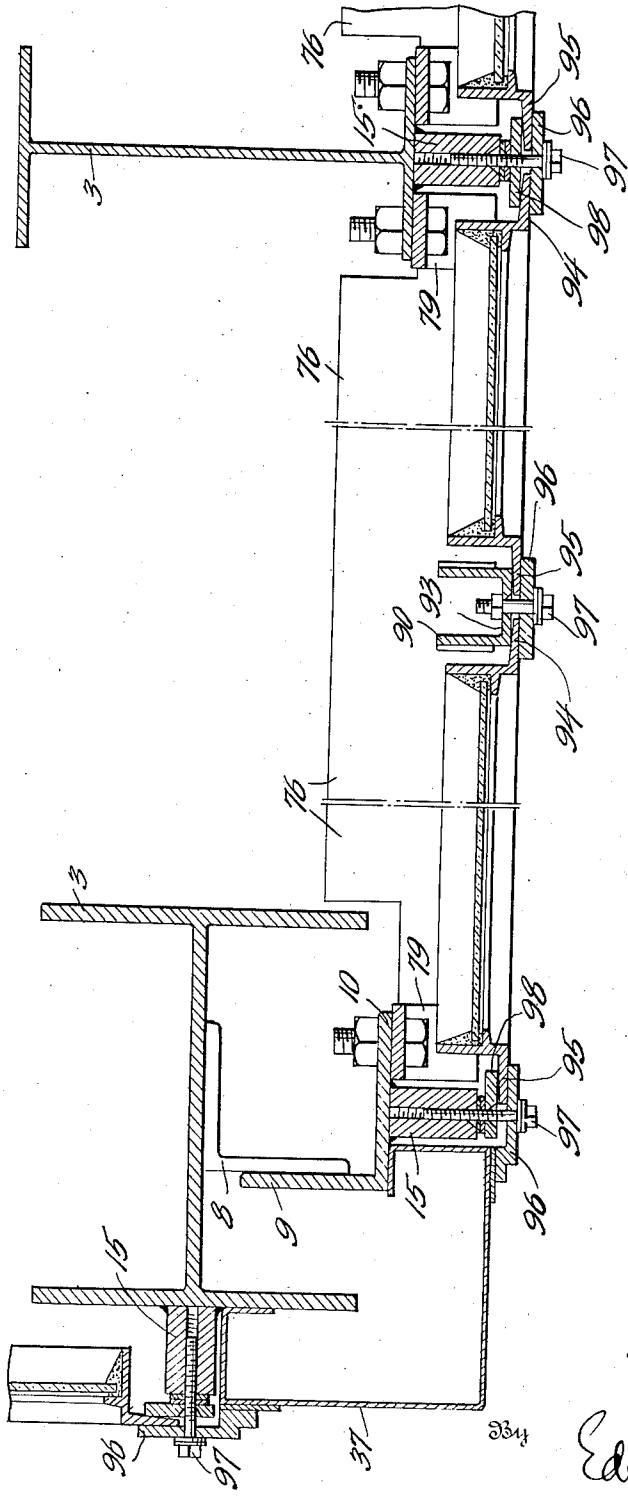

FIG. 11.

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Patented May 2, 1944 2,347,756

UNITED STATES PATENT OFFICE

2,347,756

WALL CONSTRUCTION

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Application January 8, 1942, Serial No. 426,091

6 Claims. (Cl. 189—34)

This invention relates to wall construction and more particularly to wall construction for low-cost houses, factories, and other buildings, and has for its object to provide a simple and efficient wall, less costly to manufacture and erect, than those heretofore proposed.

With these and other objects in view the invention resides in the novel details of construction and combinations of parts as will be disclosed more fully hereinafter and particularly covered by the claims.

Referring to the accompanying drawings forming a part of this specification and in which like numerals designate like parts in all the views,

Fig. 1 is a side elevational view of a building adjacent the corner thereof, wherein the wall has been made in accordance with this invention;

Fig. 2 is a vertical sectional view of the parts illustrated in Fig. 1, said view being taken on the line 2—2 of Fig. 1 and looking in the direction of the arrows;

Fig. 3 is a view similar to Fig. 2 but on an enlarged scale in order to illustrate more clearly the details of construction;

Fig. 4 is a horizontal sectional view taken as on the line 4—4 of Fig. 1 and looking in the direction of the arrows;

Fig. 5 is a perspective view of one of the clips used in this wall construction;

Fig. 6 is a view similar to Fig. 4 but on an enlarged scale to illustrate more clearly the details of construction;

Fig. 7 is an exterior elevational view of a portion of the wall in the region of the joint between horizontally and vertically disposed, and adjacent, wall panels;

Fig. 8 is a view similar to Fig. 1 but illustrating a modification of the invention when used in conjunction with windows or the like inserted in the wall;

Fig. 9 is a vertical sectional view taken as on the line 9—9 of Fig. 8 and looking in the direction of the arrows;

Fig. 10 is a vertical sectional view taken as on the line 10—10 of Fig. 8 and looking in the direction of the arrows; and

Fig. 11 is a horizontal sectional view taken as on the line 11—11 of Fig. 8 and looking in the direction of the arrows.

This invention is particularly adaptable to buildings which can be erected quickly, and at extremely low costs, and wherein each exterior wall comprises a plurality of preformed wall panels which can be readily inserted in place and secured to a framework comprising principally primary and secondary structural members disposed vertically and/or horizontally.

Each wall panel may be fabricated as desired of any suitable material or materials, and of any suitable dimensions, though it is highly desirable to form each panel of durable material which has heat-insulating characteristics, each panel preferably being of considerable size in order to reduce the number of panels comprising the wall. In practice it has been found convenient and highly practical to provide a panel substantially ten feet long by four feet wide by two inches thick, the core of such panel comprising a relatively fibrous compressed material, with a lamination of a relatively hard substance such as cementitious material on each of the two large surfaces, and such a panel is to be found on the market under the trade name "Cemesto" manufactured by The Celotex Corporation, of Chicago, Illinois.

The framework may comprise steel, wood, or other members spaced in accordance with the dimensions of the wall panels so that each panel may be slipped readily into position, with a relatively close fit, with respect to the said members, and the primary structural members will of course be disposed vertically in order to take the load of the building, and the secondary structural members may be vertically and/or horizontally disposed in accordance with the conditions of height of building, maximum load to be supported, and/or the dimensions of the wall panels. In the drawings, the framework is illustrated as comprising metallic structural members.

More specifically, and referring to the drawings, the numeral 1 designates a concrete foundation for supporting the building wall, and said foundation may comprise spaced piers 2 to which the vertical primary structural members such as 3 may be secured as by the angles 4, as well as comprise concrete sills 5 upon which the wall panels such as 6 may rest, suitable braces such as 7 being secured at their upper ends to the primary members 3 and at their lower ends to the concrete foundation and/or to adjacent primary members, in order to brace the framework against lateral pressures. In the drawings the primary members 3 have been illustrated as steel I-beams but they may be structural members of other shapes as desired, but preferably an outer surface of each primary member is disposed substantially in the plane of the inner large sur-

face of the wall panels 6 forming the building wall. At a corner of the building, and as clearly illustrated in Fig. 6, additional or secondary structural members such as the vertically disposed steel angles 8 and 9 may be carried by the primary member, said angles being of such dimensions that the outer surface of the flange 10 of the outermost angle 9 will be substantially in the plane of the panels 6 to provide a support for said panels.

To the outer surfaces of each primary member 3 as well as to the outer surface of each steel angle 9, is suitably secured as by welding a vertically disposed anchor bar 15 of a dimension no greater than the thickness of the wall panel 6, and in the outer surface of each anchor bar 15 there is provided a plurality of spaced conical counterbores communicating with a tapped or threaded hole the axis of which is substantially perpendicular to the outer face of the wall. Each panel 6 relatively closely fits the space between two adjacent anchor bars 15, and the joint between two horizontally adjacent panels, as well as said anchor bar, is covered by a vertically disposed batten 16 secured in place by spaced studs 17 extending therethrough and threaded into the holes of the anchor bars, said counterbores assisting in directing the studs into said holes. The anchor bars, the battens 16 and the primary and secondary structural members, may be continuous from bottom to top of the building, or there may be a plurality thereof in such vertical extent in which latter case the battens will have their ends overlapped as proof against entry of storm.

Each preformed wall panel 6 has a Z-bar secured to one edge thereof, as by bolts such as 18, said bolts passing through one flange of the Z-bar, the web or intermediate portion of the Z-bar being in surface contact with the long edge of the wall panel and of such a dimension that the other flange of the Z-bar will lie substantially in the plane of the surface of an adjoining wall panel, see Figs. 3 and 7. In other words, the flange 19 of said Z-bar is bolted in surface contact with the outer surface of the wall panel, and the other flange 20 will lie in surface contact with the inner surface of an aligned superposed wall panel when said panels are assembled in the building wall. Therefore, only one of the long edges of a wall panel has such a Z-bar secured thereto, and when erecting the panels in the building wall, the panels will be so positioned that their Z-bars will be at the upper edges thereof.

The superposed aligned panel is secured to the upwardly extending flange 20 of the Z-bar of the lower panel by a plurality of similar clamps 21 each carried by a bolt 22 passing through the lower edge portion of the superposed panel. Each clamp may be formed conveniently of a piece of sheet metal bent upon itself into a U-shape to provide a leg 23 adapted to overlie the flange 20 of the Z-bar, and a spacing leg 24 adapted to lie in contact with the inner surface of the superposed panel, there being provided a bore 25 through the leg 23 for receiving said bolt 22. Felt or other weatherproof washers may be provided on the exterior of the building wall in association with the heads of all bolts such as 17, 18 and 22.

To the sill 5 is secured a horizontal structural member such as the angle 30, the vertical flange of which is substantially in the plane of the inner surface of a wall panel, said flange extending upwardly (see Fig. 3) a sufficient distance to have surface contact with the upper flange of a similar Z-bar, the lower flange of said bar having surface contact with the outer surface of said sill, and upon the horizontally disposed web of this Z-bar is laid the bottommost wall panel of the building wall, said panel being secured in place by a plurality of holding clamps similar to the clamp 21 just described.

In laying the wall panels, a sealing strip 32 of impregnated felt or other waterproof material is laid to receive thereon the bottommost edge of each panel, thereby preventing seepage of water into each horizontal panel joint.

At the vertical joint between horizontally adjacent wall panels, a sealing strip such as 33 of the same or similar waterproof material (i. e. felt) is laid or cemented along the outer surface of said panels at the vertical edge portion thereof (see Fig. 7) and said strip is of a width sufficient to extend slightly beyond the edge of the vertical battens 16, said strips preferably being continuous from top to bottom of the wall so as to provide a single thickness of the strip between said batten and the outer surface of the wall panels. Preferably, each vertical batten is made of relatively thin metal and arcuate in cross-section as illustrated in Fig. 6 so that when the bolts 17 are tightened the batten will be placed under tension sufficient to cause the vertical edges of said batten to tightly engage and compress the waterproof strip 33 to provide a weatherproof joint, as will be clearly understood.

In the bottommost tier of wall panels, the lower portions of each panel are secured by the clamps such as 21 against any movement transversely of the building wall, but means are provided for securing the upper edge portions from such lateral movement, and the said means may comprise, as illustrated, a metallic plate such as the circular washer 34 of a dimension to overlap the adjacent vertical edges of said panels and secured as by the bolt 35 threadingly engaging a hole formed in the anchor bar 15. If found necessary, due to the vertical dimension of the wall panel, a plurality of such holding washers may be provided. In like manner similar washers are provided to secure the upper portions of the panels in each superposed tier of wall panels.

The corner of the building wall may be finished as desired, two ways being illustrated in Figs. 4 and 6. According to Fig. 6, the corner is built up of short sections 36 of wall panels, with an exterior metallic sheath 37 disposed thereover and secured in place in any suitable manner. According to Fig. 4, the metallic sheath 37 is provided to complete the corner of the building, but the short sections 36 of panel material are omitted and the space within the sheath filled with any suitable insulating mateiral.

At the roof of the building any suitable finish may be provided, there being illustrated the horizontally disposed I-beam member 38 to which the roof proper is applied and which carries a metallic eave or coping 39 preferably provided with a depending drip edge 40 to prevent rain from entering the top of the wall panel construction, and the interior space within such eave or coping may be lined or filled with any suitable insulating material as desired. Should the building be more than one story, there may be provided in the plane of each floor above the first, a horizontally disposed framing member such as the I-beam 41 shown in Fig. 2 and secured to

the primary structural members 3, one flange of the beam 41 preferably lying substantially in the plane of the wall panels. The beam 41 may also be employed in the framework of a building having no intermediate nor upper floors, but when the vertical height of the wall is relatively great.

Coming now to the modification of construction shown in Figs. 8 to 11, substantially the same construction is employed as heretofore described in that portion of the walls of the building where no window openings are provided and therefore the same reference numerals as heretofore given have been applied to the similar and corresponding portions of this modified construction.

Where a window opening is contemplated, there is provided a lintel at the top of such opening, and a sill member at the bottom thereof, such lintel and sill constituting secondary structural members. In the drawings such lintel has been shown as comprising a horizontally disposed steel angle 75, the horizontal flange of which forms the support for a superposed wall panel 6, and the vertical flange of which is disposed substantially in the plane of the window, and such sill has been shown as comprising a horizontally disposed steel T-bar 76, the web of which is horizontal and the head of which is disposed substantially in the plane of the window, the web carrying brackets such as 77 engaging the inner surface of a lower wall panel 6, the outer surface of said lower panel being in contact with the head of the T-bar (see Fig. 9). The lintel is secured at its ends, as by welding, to angles such as 78, which angles are bolted or otherwise secured to the flanges such as 10 of the vertical angles 9 carried by the primary structural members 3, and similarly the ends of the web of the T-bar 76 are welded to angles such as 79, which angles are bolted or otherwise secured to said flanges 10 of said vertical angles 9 (see Fig. 10).

The windows may be of any construction but preferably they are provided with a metallic frame 80 the upper member of which (see Fig. 10) is in surface contact with the outer surface of the depending flange 81 of the lintel 75 and, to secure the window frame to said lintel, there is provided an angle 82 bolted to the window frame and engaging the opposite surface of said flange 81. The window frame is secured at its lower extremity by an angle member 83 carried by the window frame and of such character as to engage the inner surface of the head of the T-bar 76 (sill), and to force the lower member 84 of the window frame into contact with the outer surface of said T-bar head. A Z-bar 85, similar to that previously described, is employed at the joint between the superposed wall panel 6 and the lintel 75, the web or intermediate portion of said Z-bar being welded or otherwise secured to said lintel and the clip 21 being provided to secure the lower extremity of said panel to said Z-bar, the depending flange of said Z-bar overlying the upper member 80 of the window frame.

Where the window frames are of a width less than the distance between adjacent primary structural members 3, or where plural window frames are positioned between said members, and/or where it may be necessary to provide a brace or support for the windows at a point intermediate said members, the construction illustrated in Fig. 9 is employed in conjunction with the lintel 75 and the sill 76. This auxiliary support comprises a vertically disposed channel member or mullion generally identified by the numeral 90 the upper web portion 91 of which is bolted or otherwise secured to the depending flange 81 of said lintel, the lower web portion 92 of said channel being similarly secured to the head of the T-bar 76 (sill), these end portions of said web being inset, or displaced out of the plane of the central web portion 93 of said channel, in order that said central portion may contact the inner surface of a side member (such as 94 and/or 95) of the window frame (see Fig. 11), and a vertical batten 96 is provided to overlie said side member, said batten being secured in place by bolts such as 97 engaging the web 93 of said channel or mullion, the upper extremity of said batten lying beneath the depending flange of the Z-bar 85. Weatherproof felt strips may be provided at all exterior joints in connection with the window frame. Where the sides of a window frame coincide with the primary structural members 3 (see Fig. 11) the same anchor bars 15 are provided but it may be necessary to provide spacer members 98 over the outer face thereof in order to correctly position the window frames in the wall.

It is obvious that those skilled in the art may vary the details of construction and arrangements of parts without departing from the spirit of this invention and therefore it is desired not to be limited to the exact foregoing disclosure except as may be required by the claims.

What is claimed is:

1. In a building wall the combination of vertical structural members; an anchor bar disposed centrally of the outer face of each of such members and forming a recess therewith, each bar provided with a plurality of bores extending inwardly from the outer surface thereof; a plurality of similarly formed wall panels arranged in a horizontal row, each wall panel spanning the space between two adjacent such members, the ends of each panel closely fitting such recesses, adjacent panels separated from each other by an anchor bar; tension means engaging a bore of each of said bars and securing said wall panels in place; a batten disposed at the vertical joint between said adjacent panels, said batten being arcuate in transverse section with the side edges thereof engaging the outer surfaces of said adjacent panels and the central portion of said batten spanning said tension means and an additional tensioning means engaging a bore of said bar and securing said batten in place.

2. In a building wall the combination of vertical structural members; an anchor bar disposed centrally of the outer face of each of such members and forming a recess therewith; a plurality of similarly formed wall panels arranged in horizontal and vertical rows, each panel spanning the space between two adjacent such members, the ends of each panel closely fitting such recesses; tension means carried by each of such bars and securing the vertical edges of said panels to such members; and a reinforcement secured along a horizontal edge of each panel and extending across the adjacent edge face of the panel, said reinforcement lapping and secured to an unreinforced horizontal edge of the next vertically adjacent panel thereby securing the horizontal joint between panels against transverse displacement.

3. In a building wall the combination of vertical structural members; an anchor bar disposed centrally of the outer face of each of such members and forming a recess therewith; a plurality

of similarly formed wall panels arranged in horizontal and vertical rows, each panel spanning the space between two adjacent such members, the ends of each panel closely fitting such recesses; tension means carried by each of such bars and securing the vertical edges of said panels to such members; and a reinforcement secured to the outer face of each panel at one horizontal edge thereof, said reinforcement extending through the joint between vertically adjacent panels and secured to the inner face of the adjoining panel thereby securing the horizontal joint between panels against transverse displacement.

4. In a building wall the combination of vertical structural members; an anchor bar disposed centrally of the outer face of each of such members and forming a recess therewith; a plurality of similarly formed wall panels arranged in horizontal and vertical rows, each panel spanning the space between two adjacent such members, the ends of each panel closely fitting such recesses; tension means carried by each of such bars and securing the vertical edges of said panels to such members; and a reinforcement comprising a Z-bar one flange of which is secured to the outer face of each panel along one horizontal edge of the panel, the web of said Z-bar extending through the joint between vertically adjacent panels, and the other flange of said Z-bar secured to the inner face of the adjoining panel thereby securing the horizontal joint between panels against transverse displacement.

5. In a building wall the combination with a foundation, of a plurality of similar vertically aligned wall panels, and a reinforcement for each horizontal joint formed thereby, said reinforcement comprising a Z-bar the web of which is disposed in such joint, the lower flange of the Z-bar engaging the outer surface of its supporting member, and the upper flange of the Z-bar engaging the inner surface of its supported member and the flanges of the Z-bar secured to the upper edge of the lower panel and the lower edge of the upper panel.

6. In a building wall the combination with a plurality of similar vertically aligned wall panels, of a reinforcement for each horizontal joint formed thereby, said reinforcement comprising a Z-bar the web of which is disposed in such joint, the lower flange of the Z-bar engaging the outer surface of the lower panel, and the upper flange of the Z-bar engaging the inner surface of the upper panel, the flanges of each Z-bar secured to their engaged panels.

GEORGE E. SWENSON.