

May 6, 1952

T. B. HURD
WALL CONSTRUCTION

2,595,665

Filed July 11, 1946

3 Sheets-Sheet 1

Fig. 1

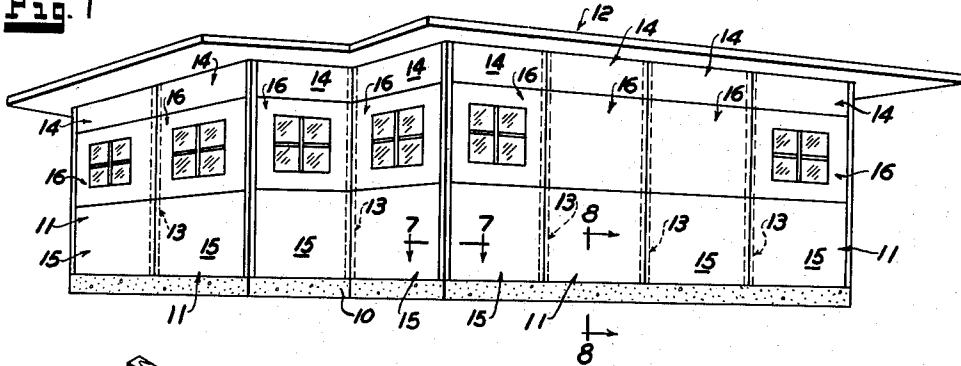


Fig. 2

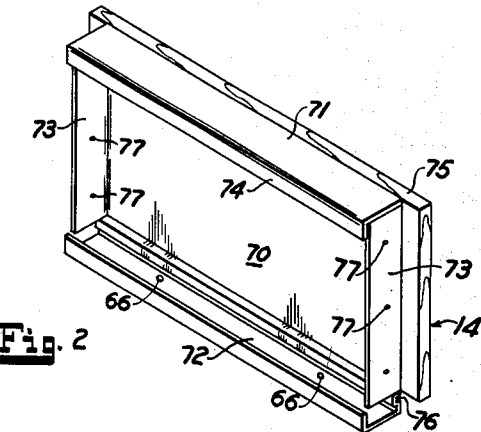


Fig. 3

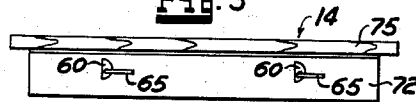


Fig. 4

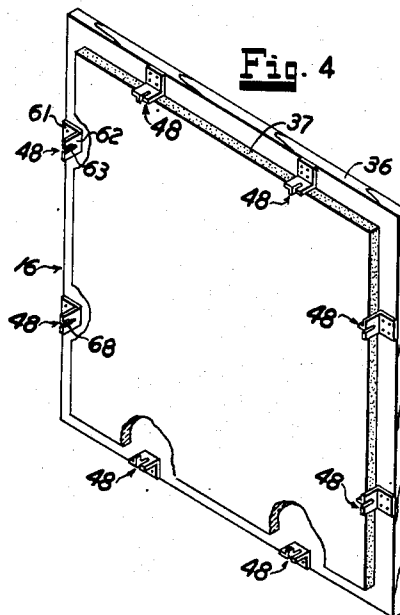
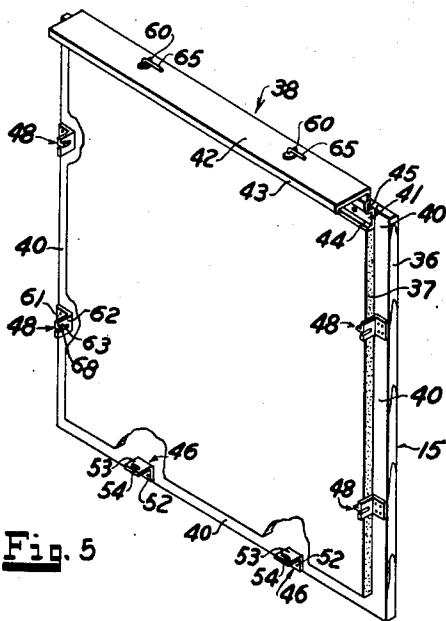


Fig. 5



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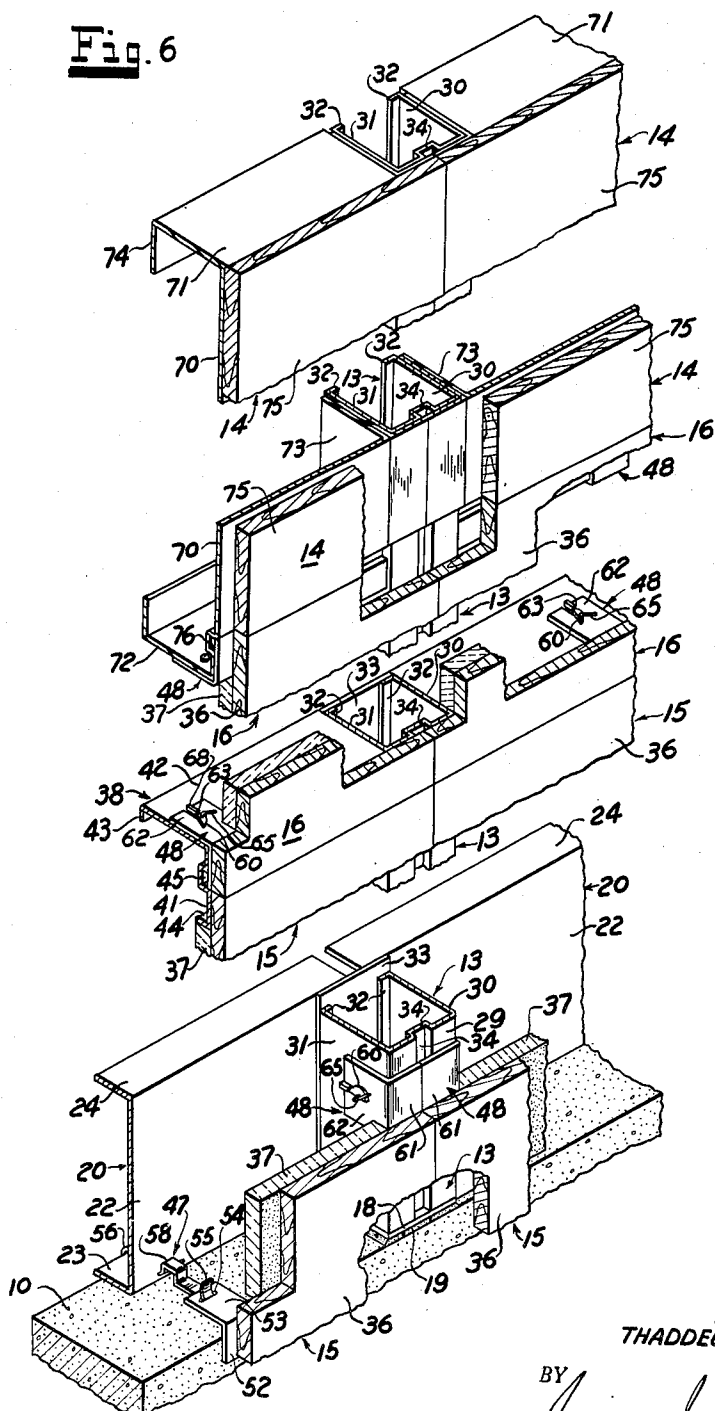
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Filed July 11, 1946

3 Sheets-Sheet 2

Fig. 6



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2,595,665

Filed July 11, 1946

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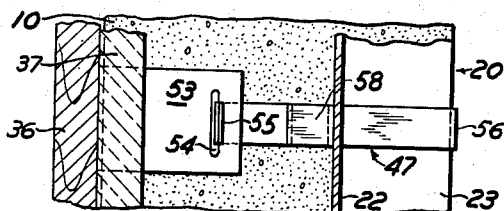


Fig. 7

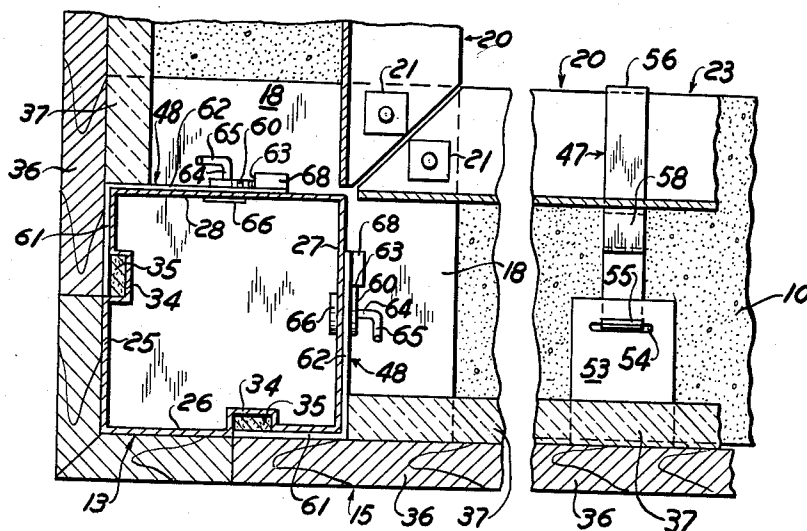


Fig. 8

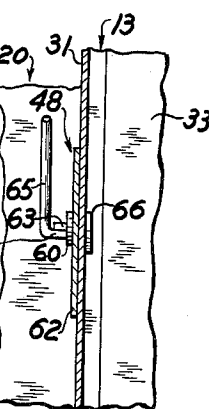
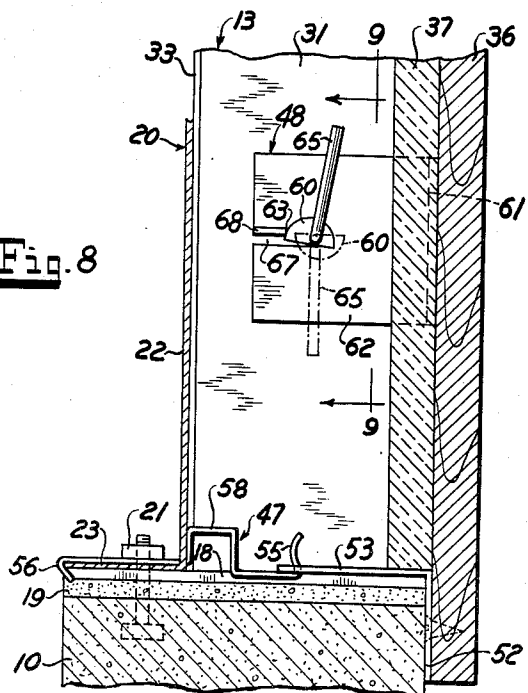


Fig. 9

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UNITED STATES PATENT OFFICE

2,595,665

WALL CONSTRUCTION

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Application July 11, 1946, Serial No. 682,875

9 Claims. (Cl. 189—34)

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This invention relates generally to buildings and more particularly to wall structure therefor.

It is an object of the present invention to provide a new and improved rigid, building wall constructed of prefabricated building elements which can be readily assembled.

Another object of the invention is to provide a new and improved arrangement and connection of co-operating wall structural elements.

A further object of the invention is to provide new and improved releasable fastening means for holding wall panels to wall framing members.

Other objects of the invention will become apparent from the following description taken in connection with the accompanying drawings in which:

Figure 1 is a perspective view of a building embodying features of the present invention;

Figure 2 is an isometric view of a panel-girder section of the building of Figure 1;

Figure 3 is a view of the bottom edge of the panel-girder section of Figure 2;

Figure 4 is an isometric view of an upper wall panel of the building of Figure 1;

Figure 5 is an isometric view of a lower wall panel of the building of Figure 1;

Figure 6 is a broken isometric view of a wall of the building of Figure 1;

Figure 7 is a cross sectional view of the building, taken along the line 7—7 of Figure 1;

Figure 8 is a vertical sectional view of the building, taken along the line 8—8 of Figure 1; and

Figure 9 is a vertical sectional view of the building, taken along the line 9—9 of Figure 8.

In the drawings, which illustrate a preferred form of the invention, the building shown comprises, in general, a foundation 10, exterior walls 11, and a roof 12. The foundation 10 and the roof 12 may be of any suitable type. In the present construction, the foundation 10 is a poured, continuous slab of concrete and the roof 12 is of the so-called flat type. The building walls 11 each comprises, in general, a plurality of spaced upright structural members or columns 13, a plurality of panel-girder sections 14, a plurality of lower wall panels 15 and a plurality of upper wall panels 16. The panel-girder sections 14 connect the columns 13 together, adjacent the upper ends thereof and are respectively disposed between adjacent columns. At their side edges, the panel-girder sections 14 and the panels 15, 16 overlap the columns 13 exteriorly thereof and form butt joints respectively with the adjacent panel-girders and upper and lower panels.

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The lower panels 15 seat on the foundation 10 and the upper panels 16 are supported by the lower panels. These panels 15, 16 are in vertical alignment or are vertically coplanar with each other and with the panel-girders 14. The columns 13 are each provided with a base plate 18 which may be welded or be otherwise secured to the lower ends of the columns. On the foundation 10, at each column, there is preferably provided a slightly raised seat 19 of cement or other suitable material having an accurately leveled upper surface for seating of the column base plates 18.

Grade beams 20 connect the columns 13 together at the foundation 10, the grade beams extending along the foundation inwardly of the columns. These grade beams 20, like the panel-girders, preferably comprise a number of sections, each of a length to extend between adjacent column base plates 18. Preferably, the grade beam sections are channel members, each comprising a web 22, a lower seating flange 23 and an upper flange 24. As shown, the grade beams 20 are preferably arranged so that their flanges 23, 24 are directed or extend inwardly of the building, the upper grade beam flanges 24 serving to support flooring (not shown).

The columns 13 are preferably four sided structural members, the corner columns, as shown in Figure 7, having adjacent outer sides 25, 26 and adjacent inner sides 27, 28 forming a rectangular and preferably substantially square structural member, as seen in cross section. The intermediate columns 13 each comprises, an outer side 29 and a pair of adjacent, oppositely disposed sides 30, 31 coextensive therewith. Inner edge portions 32 of the intermediate column sides 30, 31 are bent inwardly and are connected together by a reinforcing plate 33 which may be welded or may be otherwise secured to the column edge portions 32. In each of the outer sides 25, 26 of the corner columns and of the outer side 29 of the intermediate column, there is an inwardly directed, vertically extending groove or recess 34 in which a sealing material 35 is preferably used, co-operable with the panel girders 14 and with the panels 15, 16 to effect a weatherproof construction. The sealing material 35 may comprise any suitable mastic or gummy material.

Each of the lower panels 15 comprises an outer sheet 36, an inner sheet 37 and a connector member or header 38. The outer panel sheet 36 may be plywood and the inner panel sheet 37 may be made of a suitable heat insulating material. These inner and outer sheets of each panel 15 may

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be cemented or be otherwise suitably secured together. As shown more clearly in Figure 5, the inner panel sheet 37 and the outer panel sheet 36 are preferably substantially square-shaped, the inner sheet 37 being smaller than the outer sheet 36 and being located centrally thereof. This relative arrangement of the inner and outer panel sheets provides a rabbet in the inner side of the composite panel 15, along or around the four edges thereof, the side edge rabbets to receive the columns 13. Also, the exposed inner surface of the outer sheet, as at 40, along the rabbet presents a mounting surface for panel attaching means, hereinafter described in detail.

The panel connector member or header 38 is preferably a steel, generally angle shaped member having a vertical leg 41 and an upper horizontal leg 42. This panel connector member 38 is carried by the panel 15 adjacent the upper edge thereof, extending substantially coextensive of the width of the inner panel sheet 37. The outer side of the panel connector member leg 41 is disposed flat against the rabbeted inner surface 40 of the panel sheet 36 at the upper edge of the panel to which the panel connector member 38 may be secured by screws or by other suitable means. The upper or horizontal leg 42 of the panel connector member 38 extends inwardly of the building away from the inner surface of the panel and is located above the upper edge of the outer panel sheet 36. An edge portion or flange 43 of the leg 42 is bent down to reinforce the leg. Similarly, a lower edge portion or flange 44 of the vertical leg 41 of the panel connector member 38 is bent inwardly to reinforce the leg, this bent edge portion 44 locating immediately above the upper edge of the inner panel sheet 37. In the vertical leg 41 of the panel connector member 38, an inwardly directed groove 45 extends coextensive thereof, just above the upper edge of the outer panel sheet 36. This horizontal groove 45, like the vertical grooves 34 in the columns 13 is provided to contain a mastic or gummy sealing material. This sealing material in the groove 45 serves to seal the horizontal joints between panels.

Carried by each of the panels 15, adjacent the lower edge thereof, is a pair of horizontally spaced keepers 46 co-operable with a pair of hook fasteners 47 on the grade beams 20 to hold the panels in at the bottom against the foundation 10. Also carried by each of the panels 15, is a pair of vertically spaced cam fastener members 48 located adjacent each side edge of the panel. The keepers 46 each comprises an angle member having a vertical leg 52 and a horizontal leg 53. As shown, the vertical leg 52 is disposed flat against the inner surface of the panel outer sheet 36 to which the keepers may be secured by screws or by other suitable means. In the upper leg 53 of each keeper 46 is a slot 54 to receive the upturned end 55 of the longitudinally flexible hook member 47. This hook member is preferably formed out of a strip of spring steel, having, at the end thereof opposite the upturned hook end 55, a reversely bent portion 56 to hook over the inner edge of the grade beam lower supporting flange. The strip-like hook 47 extends through a slot in the grade beam web 22 and outwardly of the grade beam has an upwardly directed loop 58 immediate its ends. This loop 58 serves as a stop against the beam 20 to prevent the hook 47 from being dislodged inwardly and become unhooked from the beam when the keeper is not interlockingly engaged with the

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hook 47, and the loop 58 also gives greater flexibility or elongation to the hook which when interlocked with the keeper 46 is under tension longitudinally, acting to hold the panels in at the bottom, tightly against the foundation 10.

The panel, side fastener members 48 respectively co-operate with cam fastener members 60 carried by the columns 13 to draw and hold the panels 15 adjacent the side edges thereof to the columns. These cam fastener members 60 are mounted on the adjacent sides 27, 28 of the corner columns and on the opposite sides 30, 31 of the intermediate columns, externally thereof. The fastener members 48 preferably are angle members each having a leg 61 for attachment to the panel and a leg 62 having a cam engaging abutment 63 engageable by the cam fastener members 60. The panel fastener members 48 are disposed adjacent the side edges of the panel with their legs 61 secured flat against the inner surface of the outer panel sheet 36, preferably by wood screws. The other fastener member legs 62 extend substantially normal to the inner side of the panel, spaced inwardly from and extending substantially parallel to the adjacent side edges of the panel. These legs 62 of the fastener members 48 are horizontally spaced apart a distance slightly less than the distance between opposed sides of adjacent columns and thus have the additional function of locating the panels. As shown, the angle fastener member fits complementarily with the external corner of the columns.

In the interests of economy, the cam clamping fasteners 60 may be segments of circular disks, eccentrically pivoted to effect a camming action between its peripheral cam surface and the cam-engaging abutment 63 on the fastener leg 62. The cam fasteners 60 are respectively secured on and to pivot pins 64, pivotally supported in apertures in the column side walls, the pivot pins each having an integral operating lever 65. On the inner end of each pivot pin 64 is a retainer head 66 which is spaced sufficiently from the cam 60 to permit the panel fastener leg 62 to slip between the cam member 60 and the adjacent side of the column. A horizontally extending slot 67 is provided in the fastener member leg 62 bifurcating the leg to receive the cam pivot pin 64. In slotting these legs 62, a tab 68 is formed out of the slot adjacent the outer edge of the leg and is bent upwardly to a horizontal position to provide the cam engaging abutment 63. A pair of the cam clamping fastener members 60 is carried by the panel connector member 38 on the upper surface thereof, to hold the bottom of the upper panel in against the outer surface of the panel connector member. This pair of fastener members 60 is mounted in the horizontal leg 42 of the panel connector member 38 with the pivot pin vertically or so that the cam fasteners pivot on the horizontal.

The upper panels 16 are similar in construction to the previously described lower panels 15 and therefore like parts are designated by like numerals to avoid unnecessary repetitious description. As shown in Figure 4, each of the upper panels 16 carries a number of the fastener members 48, there being a pair of the fastener members 48 adjacent the lower panel edge for co-operation with the pair of cam fastener members 60 on the panel connector member 38 of the lower panel 15. Adjacent each side edge of each of the upper panels 16 there is a pair of the

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panel fastener members 48, vertically spaced and co-operating with pairs of the cam fastener members 60 on the columns 13 to hold the panel at the sides thereof to the columns.

Referring now to the panel-girder sections 14, each of these sections is preferably of steel construction comprising a web 70 having inturned upper, lower and end flanges 71, 72 and 73 respectively. In the present construction the upper flange 71 is bent down against the upper edges of the side flanges and has an edge flange portion 74 bent down against the rear edges of the side flanges for the purpose of welding these flanges together and generally reinforcing the panel-girder sections. The lower flange 72 of this panel-girder constitutes a panel connector member similar to the panel connector member 38 of the lower panels 15. Carried by the flange or panel connector member 72 there is a pair of the cam fastener members 60, disposed on the underside of the flange (see Figure 3). This pair of the cam fastener members 60 is arranged to co-operate respectively with the pair of fastener members 48 carried by the upper panel 16 adjacent the upper edge thereof to hold the panel 16 at its upper edge in against the lower edge portion of the panel-girder web 70. An outer panel sheet 75, like the outer panel sheets 36 of the panels 15, 16, is secured to the outer face of the web 70, the upper edge of the sheet 75 preferably terminating flush with the upper girder flange 71. The lower edge of the panel sheet 75 terminates just above an elongated groove or recess 76 extending across the girder webs 70 to retain a mastic sealing material to seal the joints between the upper and lower panel sheets 75, 36. Apertures 77 are provided in the side flanges 73 of the panel-girder sections 14 to receive self-threading screws for securing the panel-girder sections to adjacent columns 13.

Although in the present showing the panels are substantially square, it will be apparent that they could be elongated, relatively narrow panels. For example, instead of having a tier of the panels 15, 16 between adjacent columns, vertically elongated panels could be used with or without columns extending from the foundation up to the roof and be held to the columns or to each other by the above described cam fasteners. In this case, panels similar to panel 16, but vertically elongated, could be used extending from the foundation 10 up to the panel-girder 14. Also, if desired, the panels could be horizontally elongated to space the columns of a building wall at greater distance and be attached to each other and to the columns by the cam fasteners. In this case, panels similar to panels 15, 16, but elongated horizontally could be used, attached to each other and to widely spaced columns by the cam fasteners.

I claim:

1. In a building structure the combination comprising, a lower panel, an upper panel above the lower panel with the lower edge portions of the upper panel adjacent the upper edge portion of the lower panel, a connecting member carried by one of the panels, the connecting member extending along and in the rear of the adjacent edge portion of the other panel, a fastener member carried by the other panel, the fastener member having a leg extending rearwardly from the other panel in close proximity to the connecting member, a slot leading through a rear edge of the leg, a rotatable member rotatably mounted on the connecting member and extending

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through the slot, the rotatable member being rotatable about an axis extending transversely of the leg and parallel to the other panel, a cam member mounted on the rotatable member, the cam member having a cam surface eccentric about the axis, a cam abutment member mounted on the leg of the fastener and engaged by the eccentric cam surface releasably holding the panels together and urging the adjacent edge portion of the other panel toward the connector member.

2. In a building construction the combination comprising, an exterior panel member, a keeper carried by the panel member, a foundation member, an elongated hook member extending through a slot in the foundation member and outwardly toward the keeper, the elongated hooked member having a hook portion on the outer end engaging the keeper under tension and urging the panel member toward the foundation member, and a loop formed in the elongated hook member between the foundation member and the hook portion for preventing movement of the elongated hook member inwardly through the slot and for increasing the elongation flexibility of the elongated hook member.

3. Releasable holding means attaching a panel member and a building member together comprising, an angle fastener carried by one of the members, the fastener member having a slot leading through an edge of one leg of the angle fastener, a pin supported on the other of the members extending through the slot transversely to the said one leg of the angle fastener, a cam fastener carried by the pin, and a cam abutment member formed out of the said one leg of the angle fastener and engaged by the cam fastener.

4. In a building construction the combination comprising, a column member, a panel member arranged with an edge portion adjacent an edge portion of the column member, a fastener carried by the panel, the fastener having a leg in close proximity to the adjacent edge portion of the panel, a slot leading through an edge of the leg, a rotatable member mounted on the column extending through the slot, the rotatable member being rotatable about an axis extending transversely to the leg of the fastener and parallel to the panel, a cam member carried by the rotatable member, the cam member presenting a cam surface eccentric about said axis, and a cam abutment member on the fastener leg engaged by the eccentric cam surface of the cam member for releasably holding the panel and for urging the panel toward the column member.

5. In a building construction the combination comprising, a column having an outwardly facing side and having an adjacent side extending inwardly therefrom forming an external corner with the outwardly facing side, a vertically extending, inwardly directed groove in the outer side of the column, a mastic sealing material in the groove, a panel having a side portion overlapping the outwardly facing side of the column and the groove filled with mastic sealing material, a fastener member carried by the panel, the fastener having a leg disposed in close proximity to the adjacent inwardly extending side of the column, a slot leading through an inner edge of the leg, a rotatable pin carried by the column extending through the slot transversely to the leg of the fastener, a cam member carried by the rotatable member presenting an eccentric cam surface, and a cam abutment member on the fastener leg and engaged by the cam surface

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of the cam member releasably holding the panel to the column and against the mastic material in the groove.

6. In a building construction the combination comprising, a foundation, a pair of spaced columns supported by and extending upwardly from the foundation, a grade beam supported on the foundation inwardly of the pair of columns, a panel-girder extending between and connecting the columns together adjacent the upper ends thereof, a lower panel extending upwardly from the foundation spanning the pair of columns, resilient co-operable attaching means on the panel and on the beam holding the panel in at the bottom thereof against the foundation and against the columns, cam fastener means on the columns, fastener means carried by and adjacent the side edges of the lower panel co-operable with the cam fastener means to hold the panel at the side edge thereof to the pair of columns, a metallic supporting member carried by and extending along the upper edge of the lower panel, an upper panel seating on the supporting member, fastener means carried by the upper panel adjacent its lower edge, cam fastener means carried by the supporting member above the upper surface thereof co-operable with the fastener means on the upper panel to hold the panels together, fastener means carried by and adjacent the side edges of the upper panel, cam fastener means on the pair of columns co-operable with the fastener means adjacent the side edges of the upper panel holding the upper panel to the pair of columns, fastener means carried by the upper panel adjacent the upper edge thereof, a metallic supporting member carried by and extending along the lower edge of the panel-girder member in opposed relation to the upper edge of the upper panel, and cam fastener means carried by the panel-girder supporting member below the lower surface thereof co-operable with the fastener means adjacent the upper edge of the upper panel to hold the upper panel and the panel-girder together.

7. In a building structure the combination comprising, a column having an outwardly facing side and having an adjacent side extending inwardly therefrom with the two sides forming an external corner, a panel having a rabbet extending along an edge thereof overlapping the outwardly facing column side outwardly thereof, a fastener carried by the panel in the rabbet complementarily fitting said external corner of a column and locating the panel relative to the column, the fastener having a leg disposed in close proximity to the adjacent inwardly extending side of the column, a slot leading through an inwardly directed edge of the leg, a rotatable member mounted on the column extending through the slot the rotatable member being rotatable about an axis extending transversely to the leg of the fastener and parallel to the panel, a cam

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carried by the rotatable member, the cam presenting a cam surface eccentric about said axis, and a cam abutment member on the fastener leg engaged by the eccentric cam surface of the cam holding the panel tightly against the outwardly facing side of the column.

8. In a building construction the combination comprising, a column having an outwardly facing side and having an adjacent side extending inwardly from the outwardly facing side from an external corner, a panel having a side edge portion overlapping the outwardly facing side of the column outwardly thereof, an angle fastener member having one leg thereof attached to the inner side of the overlapping side portions of the panel and having its other leg disposed substantially parallel and in close proximity to the adjacent side of the column, a pivot pin supported by and extending laterally from the said adjacent side of the column, a cam fastener member carried by the pivot pin in spaced relation to the said adjacent side of the column, a slot in the said other leg of the angle fastener member receiving the pivot pin between the cam fastener member and the said adjacent side of the column, and an abutment member on the said other leg of the angle fastener member engaged by the cam fastener member urging the panel toward the outwardly facing side of the column.

9. In a building wall construction the combination comprising, a lower panel, an upper panel immediately above the lower panel with the lower edge portion of the upper panel adjacent the upper edge portion of the lower panel, an angle fastener carried by one of the panels, the angle fastener having a leg in close proximity to the adjacent edge portion of the other panel, and a slot leading through an edge of the leg, a rotatable pin carried by the other panel extending through the slot transversely to the leg of the angle fastener, a cam member carried by the pin, and a cam abutment member formed out of the leg of the angle fastener and engaged by the cam member for releasably holding the panels together.

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