

Feb. 24, 1953

**A. F. THELANDER**  
**BUILDING CONSTRUCTION**

2,629,139

Filed May 2, 1946

4 Sheets-Sheet 1

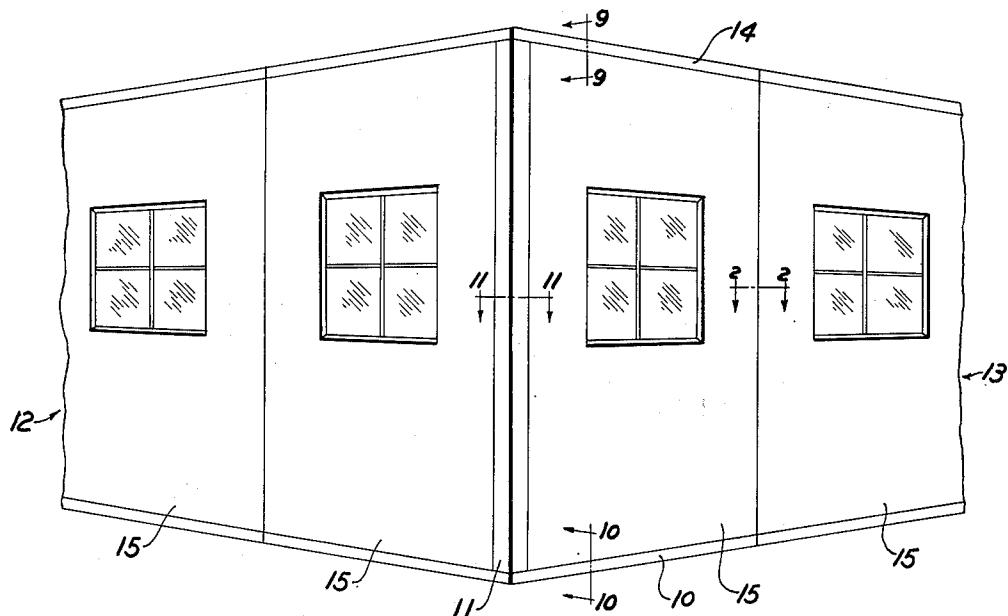


Fig. 1

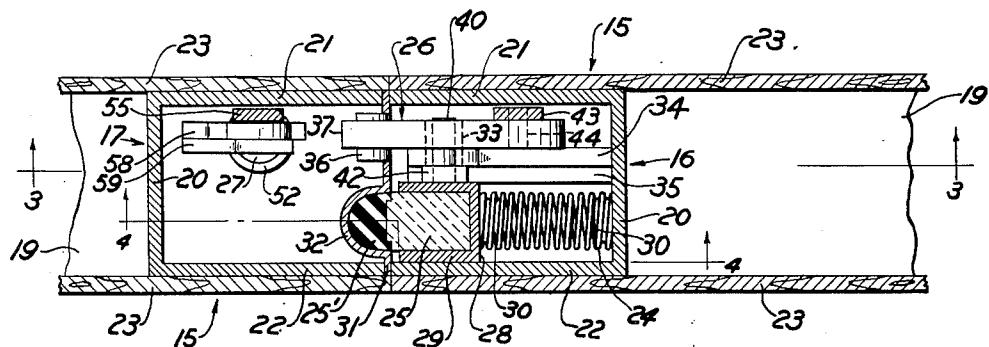


Fig. 2

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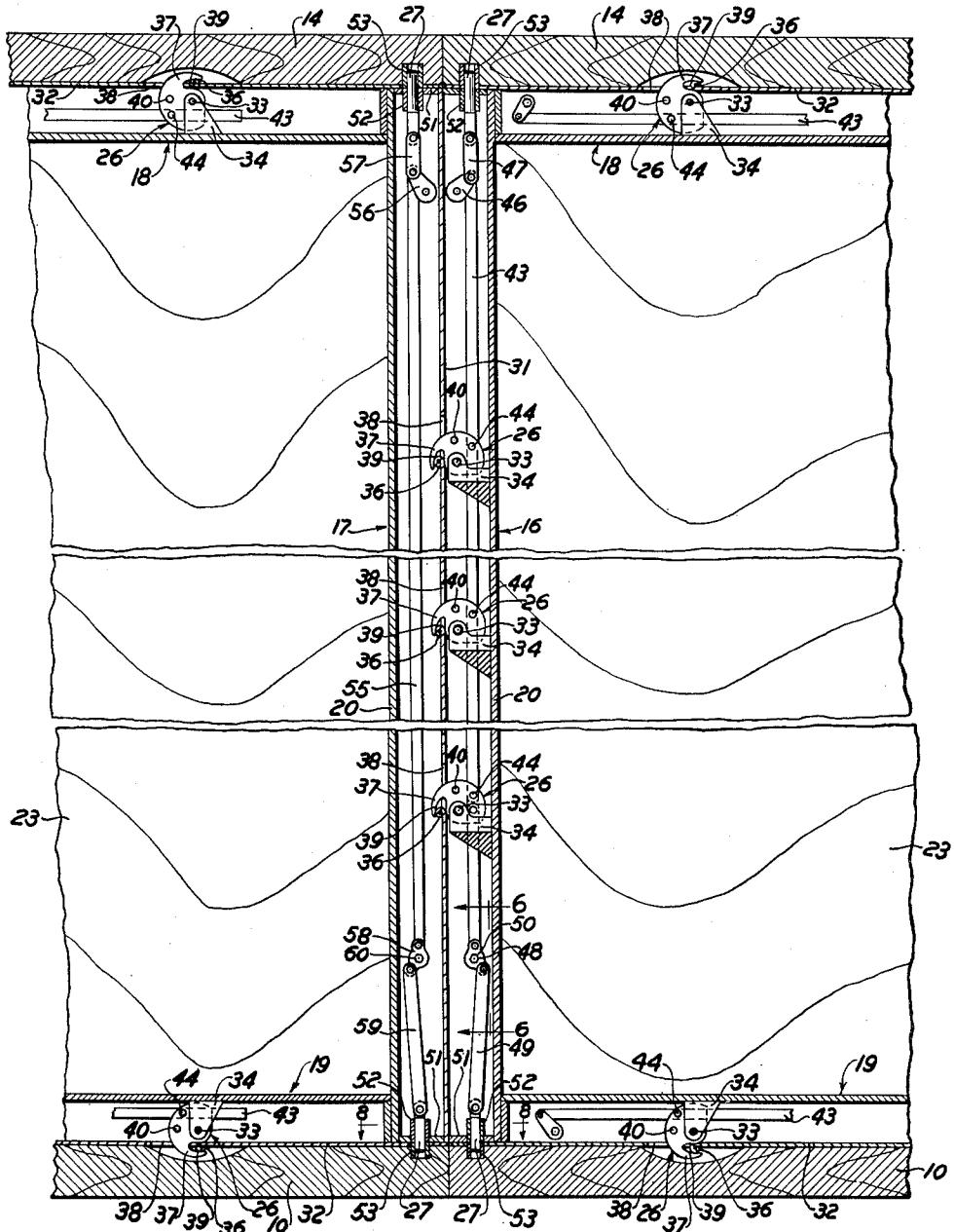
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## BUILDING CONSTRUCTION

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Fig. 3

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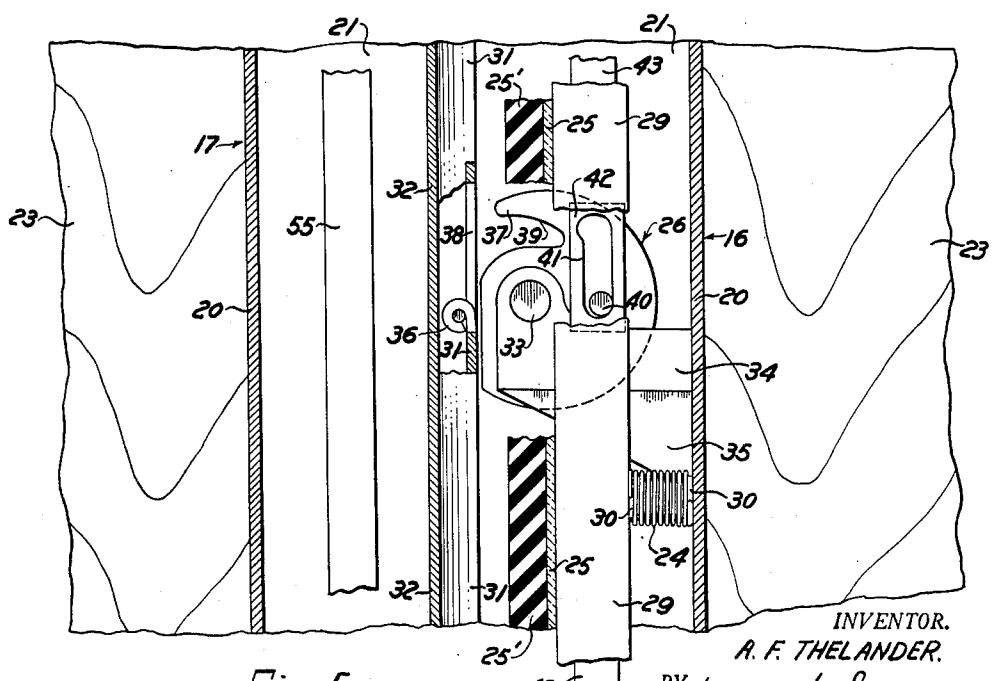
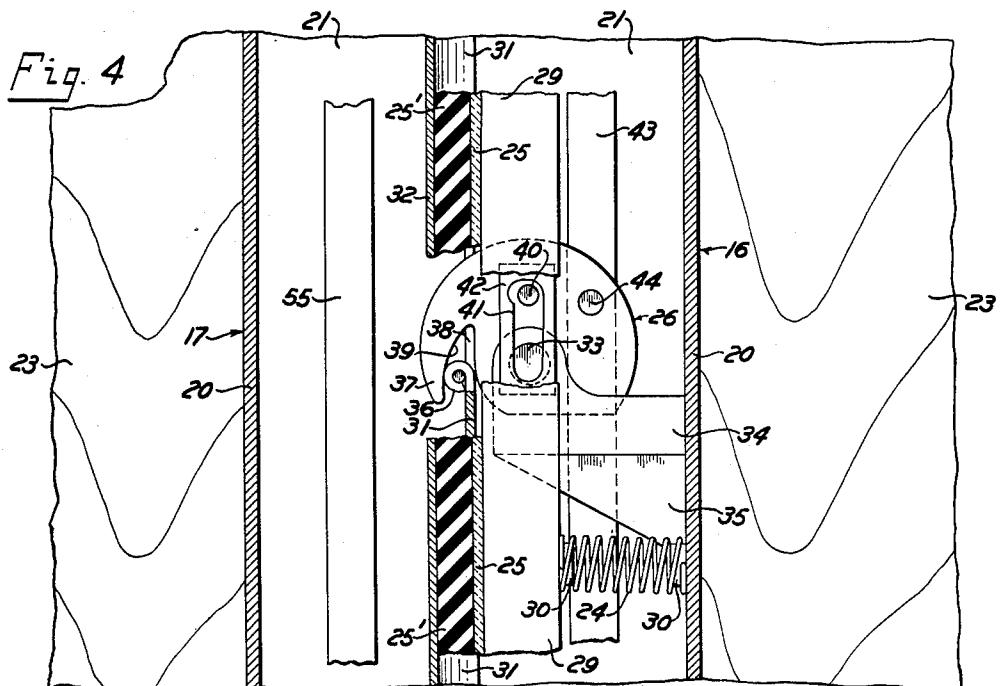


Fig. 5

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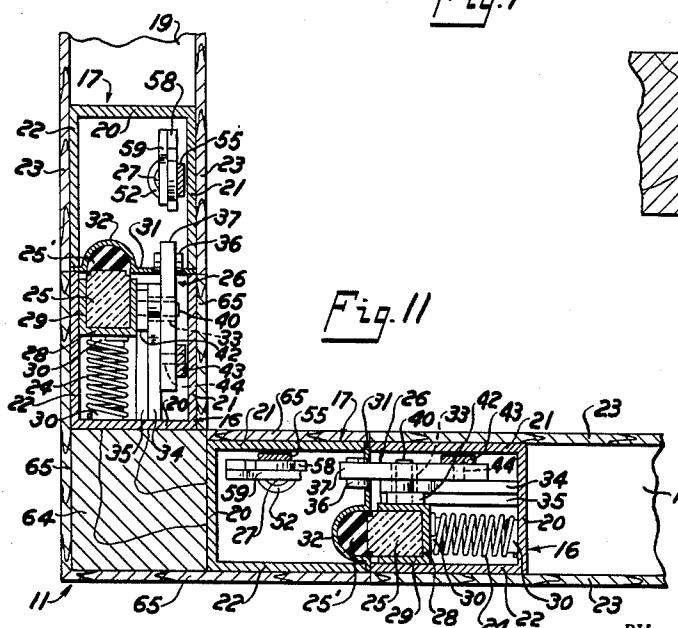
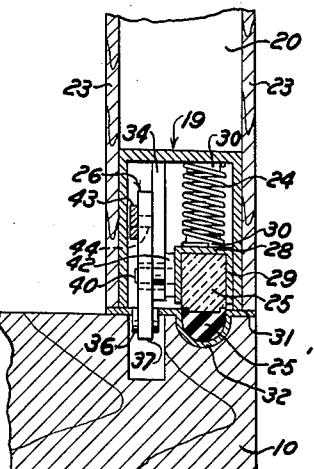
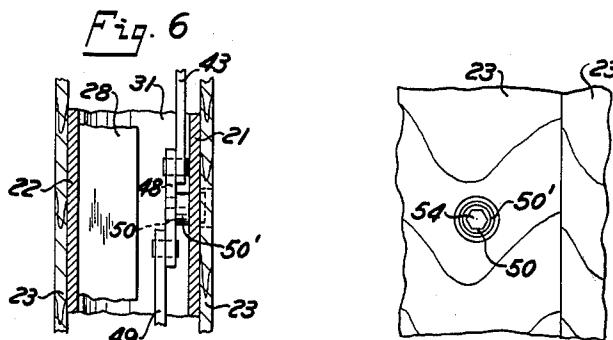
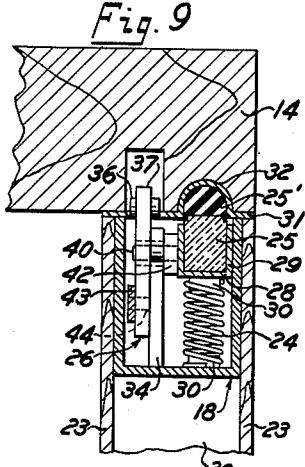
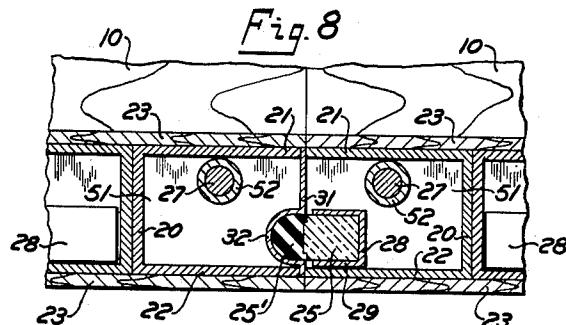
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BUILDING CONSTRUCTION

2,629,139

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4 Sheets-Sheet 4



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## UNITED STATES PATENT OFFICE

2,629,139

## BUILDING CONSTRUCTION

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Application May 2, 1946, Serial No. 666,754

7 Claims. (Cl. 20—4)

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This invention relates generally to building construction and more particularly to prefabricated building units therefor.

In the past, prefabricated building units or structures, such as panels, have been provided for the purpose of decreasing building costs, but these panels have not been entirely satisfactory for the following, among other reasons. In many instances it has been the practice to have wall framing, including studding, to which to secure the panels in order to obtain a satisfactorily rigid wall. In other instances, a somewhat less rigid wall is obtained by using panel joiners in place of the studding. In each of the above mentioned constructions the panels are usually made fast to the framing or to the joiners or are secured together in such manner that they cannot be readily removed. In other cases where the panels are readily removable, it is usually at the expense of weather-tightness which is, of course, objectionable in exterior walls. However, it is desirable, at least in some buildings, that the panels be readily removable, in order to obtain flexibility of construction and arrangement with ease and without need of skilled labor. Also, in these types of buildings, it is desirable that additional units or rooms can be easily added thereto; that the walls can be rearranged or relocated and that even the entire building can be disassembled and reassembled on a new site, if desired. It has been proposed to use tongue and grooved panels to obtain the added wall rigidity and weathertight joints which interlocking, tongue and groove panels afford. However, if the tongue and groove panels are not secured together or to a common connector, there is no assurance that the joints will be weathertight. In addition, such interlocked panels, because of the tongue and grooves, are not readily removed particularly an intermediate panel for in order to remove an intermediate panel, it has, in the past, been necessary that all of the panels from one end of the wall up to the intermediate panel must first be removed, which is, of course, objectionable.

It is an object of the present invention to provide new and improved interlocking construction members by means of which weathertight rigid buildings may be readily constructed which are flexible with respect to removal, rearrangement and disassembly of the members.

Another object of the invention is to provide a new and improved building panel of a character such that need for wall framing is eliminated for certain types of small buildings.

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Another object of the invention is to provide new and improved wall structure by means of which a rigid, weathertight exterior wall may be constructed without framing and with only a single course of the panels.

A further object of the invention is to provide new and improved interlocking tongue and groove panels any one of which may be removed without disturbing the others.

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

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

Figure 2 is a horizontal sectional view of an exterior wall of the building, taken along the line 2—2 of Figure 1;

Figure 3 is a vertical sectional view of an exterior wall of the building, taken along the line 3—3 of Figure 2;

Figure 4 is an enlarged vertical sectional view, taken along the line 4—4 of Figure 2, of the wall of the building showing the panels connected;

Figure 5 is a view similar to Figure 4 showing the panels disconnected;

Figure 6 is a fragmentary vertical sectional view of a wall panel, taken along the line 6—6 of Figure 3;

Figure 7 is a fragmentary elevational view of a pair of adjoining panels, looking from right to left at Figure 6;

Figure 8 is a horizontal sectional view of the building, taken near the floor along the line 8—8 of Figure 2;

Figure 9 is a vertical sectional view of the building, taken at the roof along the line 9—9 of Figure 1;

Figure 10 is a vertical sectional view of the building, taken at the floor along the line 10—10 of Figure 1; and

Figure 11 is a horizontal sectional view of a corner of the building, taken along the line 11—11 of Figure 1.

In the drawings which illustrate a preferred embodiment of the invention, the building shown is constructed in part by building elements including a floor 10, a building member 11, adjacent exterior walls 12, 13 and a roof 14. The walls 12, 13 are each constructed preferably of a single course of prefabricated building members or panels 15 which seat on the floor 10 and extend up to the roof 14 which in turn may seat on the upper edges of the wall panels. The build-

ing member 11 may be a post to aid in supporting the roof or it may be an adapter or corner finishing panel joiner, as desired. The floor 10 may comprise a plurality of large wooden panels which may be laid on any suitable foundation (not shown). Similarly, the roof 14 may comprise a number of large wooden panels which may be joined together in any well known manner to effect a weathertight roof.

The wall panels 15 are preferably of like construction, each including a rectangular frame, preferably of steel construction, comprising opposite side frame members 16, 17, a top frame member 18 and a bottom frame member 19. These frame members are preferably in the form of channels each comprising, a web 20 and oppositely disposed sides 21, 22, the channels being preferably arranged to face outwardly or so that the sides 21, 22 are directed outwardly around the four edges of the panel. At the corners of the panel frames, the side, top and bottom frame members may be welded or may be otherwise suitably secured together. Opposite sides of the panel frames may be covered with cover or finish sheets 23 of any suitable material which may be cemented, screwed, or otherwise suitably secured to the frames.

Carried by and in the side edge channel frame member 16 of each of the panels 15 there is a retractable tongue 25, locking means in the form of a plurality of vertically spaced latching members or crank-hooks 26 and upper and lower retractable lock and locating members or pins 27. The retractable tongue 25, in extended position, is adapted to interconnect a panel with another building member, such as another panel 15 or with the corner member 11 and also is adapted to form weathertight joints therewith. The crank-hooks 26 are adapted to draw the panel edgewise toward another panel or toward the member 11, as the case may be, and releasably latch them together, thus additionally reinforcing the wall. The pins 27 serve to locate the panels 15 in desired relative positions and also hold the panels at top and bottom against tendency of the panels to sway.

The tongue 25 may be made of any suitable material but its outer edge portion, as at 25', is preferably made of a strip of compressible or displaceable resilient material, such as rubber, to insure a weathertight fit in the groove of another building member, such as, another panel or in the corner member 11. The tongue 25 is disposed adjacent the frame channel side 22, extending substantially coextensive therewith or extending substantially the height of the panel. Except for an outer edge portion along its length, the tongue 25 is preferably received and tightly held in a metallic reinforcing channel 28 fitting thereover, extending preferably coextensive with the tongue. A side flange 29 of the reinforcing channel 28 slidably engages the inner surface of the channel frame side member 22, thus serving a guide for the tongue 25. Yieldable means, preferably coil springs 24, urge the retractable tongue 25 outwardly of the panel edge to insure that the tongue remains seated in its groove, the springs 24 being suitably spaced along the length of the tongue. A pair of retainers 30 carried respectively by the tongue channel 28 and by the frame channel 16 engage in the opposite ends of the coil springs 24 holding the springs in place. Extending along the opposite side edges of each of the panels 15 from the tongue edge, there is a facing strip or plate

31 provided with a vertically extending groove 32 to receive the retractable tongue 25 of an adjacent panel 15 or of the corner member 11, the groove, like the tongue, extending substantially coextensive of the panel edge. The bottom of the groove 32 is preferably rounded, as is the outer edge of the rubber portion 25' of the tongue, to facilitate the entering and withdrawing of the tongue, and further to ensure a good weathertight fit between the tongue and the groove. The facing plate 31 is preferably made of sheet steel and may be welded to the edges of the channel frame member sides 21, 22, the outer surface of the facing plate 31 being preferably flush with the side edges of the panel finish sheets 23, as shown in Figure 2.

Laterally spaced from the tongue 25 in the frame 16, the crank-hooks 26 are pivotally mounted by pins 33 on individual plate-like brackets 34 which are positioned between the crank-hooks 26 and the tongue 25. The brackets 34 are preferably parallel with the sides 21, 22 of the panel side frame channel 16 and may be welded, or may be otherwise suitably secured to the channel web 20. A lower portion 35 of the brackets 34, offset toward the tongue 25, co-operates with the channel outer side 22 to provide a guideway for the retractable tongue 25. In the groove edge of each panel 15, vertically spaced locking or latching means in the form of keepers 36 are provided over which co-operable locking or latching means, such as curved hook portions 37 of the crank-hook members 26, engage to draw and hold the panels 15 together edgewise. These keepers 36 are preferably formed out of the facing plate 31 by cutting a tab out of the plate and rolling it down around a wire reinforcement into bead-like form extending along the lower edge of the slot, inwardly of the facing plate 31. The cutting of the tabs out of the facing plate 31 leaves clearance slots 38 for the crank-hooks 26. The hook portions 37 of the crank-hooks 26 are preferably provided with an inner cam surface 39 for engaging the keepers 36 to urge the panel edgewise, the keepers 36 being slightly resilient to increase friction with the hook cam surface 39. The crank-hooks 26 are preferably in the form of bell cranks, each carrying a laterally-extending crank arm or connecting pin 40 of a lost-motion connection which operatively connects the crank-hooks 26 to the tongue 25. Outer end portions of the connecting pins 40 freely engage respectively in slots 41 provided in plates 42 of the lost-motion connection, these plates being carried by and preferably welded to the side of the tongue retainer channel 28 adjacent or facing the crank-hooks 26. As shown, the slots 41 are elongated in the longitudinal direction of the tongue and are of a width to permit relative movement between the crank pins 40 and the tongue. The bottoms of the elongated slots 41 serve as stops for the pins 40 which engage therewith when the pins are in below center positions shown in Figure 5. The connecting pins 40 being freely movable in the slots 41 of the tongue plates 42, it will be seen with reference to Figure 4 of the drawings that when the crank-hooks 26 are rotated in a clockwise direction, the tongue 25 through the connecting pins 40 will be moved inwardly or retracted into the panel and when the crank-hooks 26 are rotated in the opposite direction, the tongue 25 will be moved outwardly by the springs 24. In the retracted position of the tongues 25, the panel may be readily removed from the wall.

without disturbing any of the other panels or without first removing all interconnected panels from an end of the wall.

The crank-hooks 26 are connected together for operation in unison by a long connecting link 43 positioned in and extending longitudinally of the channel frame member 16. Pivot pins 44 carried by and extending laterally from corresponding sides of the crank-hooks 26 pivotally connect the crank-hooks to the link 43. The upper end of the link 43 is pivotally connected to the free end of a lever 46 which is pivotally mounted on the frame channel member 16, the lever 46 being pivotally connected to the lower end of the upper locking pin 27 by a connecting link 47. The lower end of the link 43 is pivotally connected to one arm of a manually operable bell crank 48 which is provided with a stub shaft 50 rotatably journaled in a bushing 50' positioned in an aperture in the panel frame channel member 16, the other arm of the bell crank 48 being connected by a link 49 to the upper end of the lower locking and locating pin 27. In the end of the bell crank shaft 50, a socket 54 is provided, accessible through a small aperture in the panel inner cover 23, for receiving a wrench (not shown) or other suitable tool to turn the bell crank 48 and thus actuate the tongue 25, crank-hooks 26 and pins 27. As shown in Figure 3, the top and bottom of the panel frame channel 16 are closed by plate 51 which may be welded to the channel. In an aperture in each of these top and bottom plates 51 is rigidly secured, such as by welding, a guide sleeve 52 for the pins 27, the outer ends of the sleeves being flush with the outer surfaces of the end channel plate 51. These guide sleeves 52 are alignable respectively with similar sleeves 53 inserted in and secured to the roof and floor panels to receive end portions of the pins 27 for locking the panels in place and holding them against side sway.

At the groove edge of each of the panels 15, in the frame channel 17, there is a long connecting link 55 having its upper end connected to a lever 56 which is connected by a short link 57 to the lower end of the upper pin 27. Similarly, the lower end of the connecting link 55 is connected to one arm of a manually operable bell crank 58 having its other arm connected by a link 59 to the upper end of the lower pin 27. Like the other bell crank 48, the bell crank 58 is provided in its inner face with a socket 60 to receive a tool, such as a wrench, for operating the pins 27 in unison through the connecting link 55. The alignable pin sleeves 52, 53, are the same as those previously described in connection with the other, or tongue side edge of the panel 15.

The above described retractable tongue 25, crank-hooks 26 and associated mechanism may be duplicated, as shown, in the top and bottom frame channels 18 and 19 respectively of each of the panels 15 for interlocking and hooking the panels with the floor and ceiling. The tongue, hooks and associated mechanism being the same for the top and bottom edges of the panels as that above described for the panel side edges, like numerals have been given like parts in the drawings to avoid repetitious description. As shown in Figures 9 and 10, the floor 10 and roof panels 14 are recessed to receive the tongue receiving groove 32 formed in the facing plate 31, the floor and roof panels being provided with additional clearance recesses for hooks 26. The facing plates 31 may be screwed or may be otherwise

suitably secured to the roof and floor panels, adjacent the outer edges thereof.

In Figure 11, two end panels or right angle walls are shown releasably held by the tongue 25, crank-hooks 26 and locating pins 27 to the corner post 11. This post 11 may comprise a pair of upright channel members 16, 17 secured with their webs 20 flat against the inner adjacent sides of an upright timber 64 so that the pairs of sides of the channels extend at substantially right angles to each other. The upright timber 64 serves as a corner filler and the filler and channels may be covered by interior and exterior cover sheets 65. The tongue 25, crank-hooks 26, locating pins 27 and associated structure and mechanism carried by the post channel 20 are the same as that shown and described above in each of the panels 15 and therefore are designated by like numerals on the drawings in lieu of unnecessary repetitious description. While in the present disclosure, the invention is described in connection with the direct attaching together of panels or of the direct attaching together of a panel and a post, it will be apparent that the invention embraces the use between opposed, adjacent panel edges of tongue and grooved panel joiners or strips. As a matter of fact, the post may be replaced by a non-load bearing building member, such as a corner, panel joiner provided with the retractable tongue 25, crank-hook 26 and the locating and holding pins 27.

In applying a panel to the building structure, let it be assumed that the crank-hooks 26, locating pins 27 and the tongue 25 are in their respective retracted or unlocked positions, as shown in Figure 5. In the retracted or unlocked positions of the parts, the crank pins 40 will be slightly below so-called dead center or below the line of the spring force on the pivots of the crank-hooks 26, as shown, with the result that the springs 24 will be acting to hold releasably the parts in these positions. The crank pins 40 engaging the lower ends of their slots 41 limit movement of the crank-hooks by the springs 24 in a clockwise direction. After having located and aligned the guide sleeves 52, 53 of the locating pins 27, a wrench may be inserted in the socket 54 and applied to turn the bell-crank lever 46 in a clockwise direction, facing Figure 3. This clockwise movement of the bell-crank lever 46 through the connecting linkage, causes the crank-hooks 26 to be turned in counterclockwise directions, facing Figures 3, 4 and 5. When the crank pins 40 pass slightly above center of the line of force of the springs 24 acting on the center of the crank-hook pins 33, it will be seen that the force of the springs 24 then acts to turn the crank-hooks 26 counterclockwise. At the same time, through the connecting linkage, the locating and holding pins 27 are moved outwardly from the panel top and bottom edges into their respective guide sleeves 53 in the roof and floor panels, the crank-hooks 26 are being moved toward engagement with their respective keepers 36 and the tongue 25 is being moved toward the groove of the adjacent post or panel, as the case may be. The strength of the springs 24 may be made such as to exert sufficient force to move the crank-hooks, locating pins and tongue toward their locked positions upon manual movement of the crank pins 40 above center or the springs may be only sufficiently strong to seat and hold the tongue tightly in its groove. In either event, the springs 24 hold the edge of the slot 41 in the tongue carried plates 42 in engage-

ment with the crank pins 40 as the parts are moved toward locking positions. The tongue 25 seats in its groove before the hook cam surfaces are drawn down tightly over the keepers 36. During this tightening down of the hooks, there is a lost motion between the crank-hooks 26 and the tongue 25, the crank pins 40 moving away from the side edge of the slot 41 leaving the springs 24 free to exert their entire force in holding the tongue 25 tightly in its groove, thus assuring a weathertight joint. The enlarged upper end of the slot 41 is for clearance so that the pin 40 will not engage the edge of the slot when the hook is given its final tightening down turn. When the hooks are tightened down, the locating and holding pins 27 are moved to their final positions in the guide inserts 54 in the floor and ceiling panels. Thus, the panel is held at its top and bottom edges by the pins 27 and along its side edge by the hooks and by the weather sealing tongue 25 by readily releasable means. Sealing of the joint is further aided by the rubber edging 25 held under compression in its groove by the springs 24.

At the groove edge of the panel, the locating pins 27 are moved into their respective guide sleeves in the floor and roof panels by turning the bell-crank lever 58 in a counterclockwise direction. Similarly, the retractable tongues 25 and crank-hooks 26 along with the top and bottom edges of the panels 15 are actuated for detachably connecting the panel to the roof and floor respectively and to move the tongues 25 into their grooves so as to form weathertight, interconnected joints with the adjacent structures.

To remove a panel from the wall, the wrench is inserted in the socket 54 and applied to turn the bell-crank lever 48 in a counterclockwise direction, facing Figure 3. Through the connecting linkage, the crank-hooks 26 are turned clockwise disengaging from their keepers 36 and the locating and holding pins 27 are moved outwardly of their retainer sleeves 53. After predetermined lost motion turning of the crank-hooks 26 relative to the tongue 25, the crank pins 40 engage the side edge of the slot 41 and draw the tongue 25 out of its groove. During this retracting of the locating pins 27 and the tongue 25, the springs 24 are being compressed and when the pin 27 and tongue 25 are completely retracted, the crank pins 40 will engage against the lower ends of their slots 41 as stops. In these positions of the crank pins 33 below center, the force exerted by the springs 24 will then act to hold the hooks, tongue, and locating pins 27 retracted. With the hooks, tongue and locating pins retracted, the panel may be removed from the wall without disturbing the other panels or posts.

From the above, it will be seen that I have provided a new and improved prefabricated panel which may be readily applied and locked in its place in the wall structure without need of studding or panel joiners in order to provide a strong, rigid wall. It will further be seen that regardless of whether or not framing is used that, because of the retractable tongues, any one of the panels may be removed from the wall without disturbing the others in the event that replacing or interchanging of the panels is desired. In addition, it will be seen that although the tongues are retractable, they nevertheless act to insure tight joints between the panels and to interconnect the panels, thus contributing to-

ward the provision of a rigid panel wall construction.

I claim:

- 5 1. A building element comprising, a member having an opening in a surface thereof, a retractable tongue positioned in the opening, the retractable tongue being movable out of the opening to engage with another building element, a crank in the member positioned laterally from the retractable tongue arranged to pivot in a plane substantially parallel to the direction of movement of the tongue, a hook on the crank to engage a keeper on the other building element arranged to draw the building elements together 10 with the tongue therebetween, a slot in the tongue, a pin carried by and laterally extending from the crank engaging in the slot, and manually operable means for actuating the crank.
- 15 20 2. A building element comprising, a member having an edge thereof provided with an opening extending therealong, a retractable tongue carried by the member and being retractable thereinto through the opening in the edge of the member, the retractable tongue being movable outwardly of the member to engage another building element to interconnect and form a weathertight joint therewith, a hook laterally positioned in the member from the tongue, the hook being co-operable with means on the other building element to draw and hold the member thereto, a bracket interposed between the tongue and hook pivotally supporting the hook for movement in a plane substantially parallel to the direction of movement of the tongue, a portion of the bracket engaging and guiding the retractable tongue, means operatively connecting the hook and the tongue, and manually operable means for actuating the hook.
- 25 30 35 40 3. A building element comprising, a member having an elongated opening in a surface thereof, an elongated retractable tongue substantially coextensive of the elongated opening carried by the member, the tongue having an extended position and a retracted position, a pivoted hook carried by the member for releasably locking the member to another building element, a pin carried by the hook, a slot in the tongue receiving the pin, the slot being sufficiently larger than the pin to effect a lost motion connection 45 therebetween, a spring acting on the tongue to move the tongue to its extended position and holding the tongue in engagement with the pin, the pin being movable over center in one direction 50 when the tongue is moved toward its extended position by the spring and being movable over center in the opposite direction upon retraction of the tongue, stop means limiting movement of the pin by the spring in the said opposite direction, and manually operable means 55 carried by the member for operating the hook.
- 55 60 65 70 75 4. In a building wall construction, the combination comprising spaced apart first and second wall members, a panel member between the wall members, the three members forming a continuous wall portion, the first wall member and panel member having opposed edge surfaces forming a joint, the second wall member and panel member having opposed edge surfaces forming a second joint, a retractable tongue extending substantially coextensive with and along one of the opposed surfaces of each joint and being carried by one of the members adjacent the respective joint, a groove in and extending 75 along the other edge surface of each joint sub-

stantially coextensive thereof and receiving the retractable tongue, resilient means carried by each member carrying a retractable tongue for urging the tongue into the respective groove for releasably locking the members together and also for sealing the respective joint therebetween, retracting means carried by each of the members carrying a retractable tongue operable to retract the retractable tongue out of the respective groove, keeper means carried by one of the members adjacent each joint, cooperating locking means carried by the other member adjacent each joint, each locking means being movable from a non-locking position free of the respective keeper means into a locking position in engagement with the respective keeper means, each locking means and the respective keeper means being cooperable to draw the members adjacent the respective joint edgewise toward each other against the action of the resilient means upon movement of the locking means from the non-locking position to the locking position, and manually operable means carried by each of said other adjacent members for operating the locking means to the locking and non-locking positions.

5. The building wall construction claimed in claim 4, in which each of the locking means is carried by a member carrying a retractable tongue and which includes means connecting each of the locking means to the respective retractable tongue so that upon movement of the locking means to the non-locking position, the tongue is retracted from the respective groove and upon movement of the locking means to the locking position, the tongue is released so that the resilient means urges the tongue into the groove.

6. A building member having two opposite elongated side edge surfaces, an elongated opening in a first one of the edge surfaces extending substantially coextensive of the surface, an elongated retractable tongue positioned in the opening extending substantially coextensive thereof, resilient means urging the retractable tongue be-

ing movable outwardly of the member to engage in a tongue receiving groove of another building element, a tongue receiving groove extending along the second one of the edge surfaces to receive such a retractable tongue of another building element, locking means laterally positioned in the member from the tongue and engageable with cooperable keeper means on another building element, keeper means at the second one of the edge surfaces laterally positioned from the groove for engagement by such locking means on another building element, and manually operable means operatively connected to the retractable tongue and to the first named locking means for retracting the tongue and operating the first named locking means to a non-locking position and for moving the tongue outwardly and operating the first named locking means to the locking position whereby a plurality of such building members can be connected together side by side.

7. The building member claimed in claim 6 in which the manually operable means includes lost motion means connecting the retractable tongue and locking means.

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