July 28, 1959 J. PETTER 2,896,273

COLLAPSIBLE PRE-FABRICATED BUILDING

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FIG. 2.

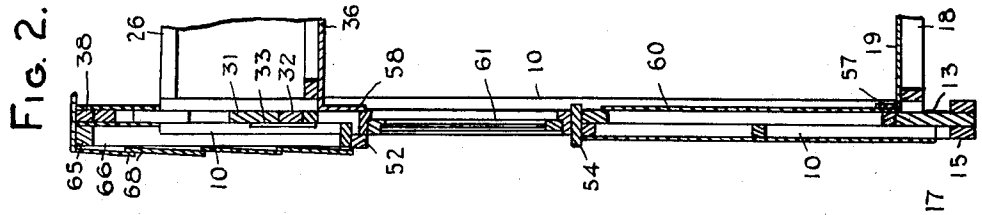


FIG. 1.

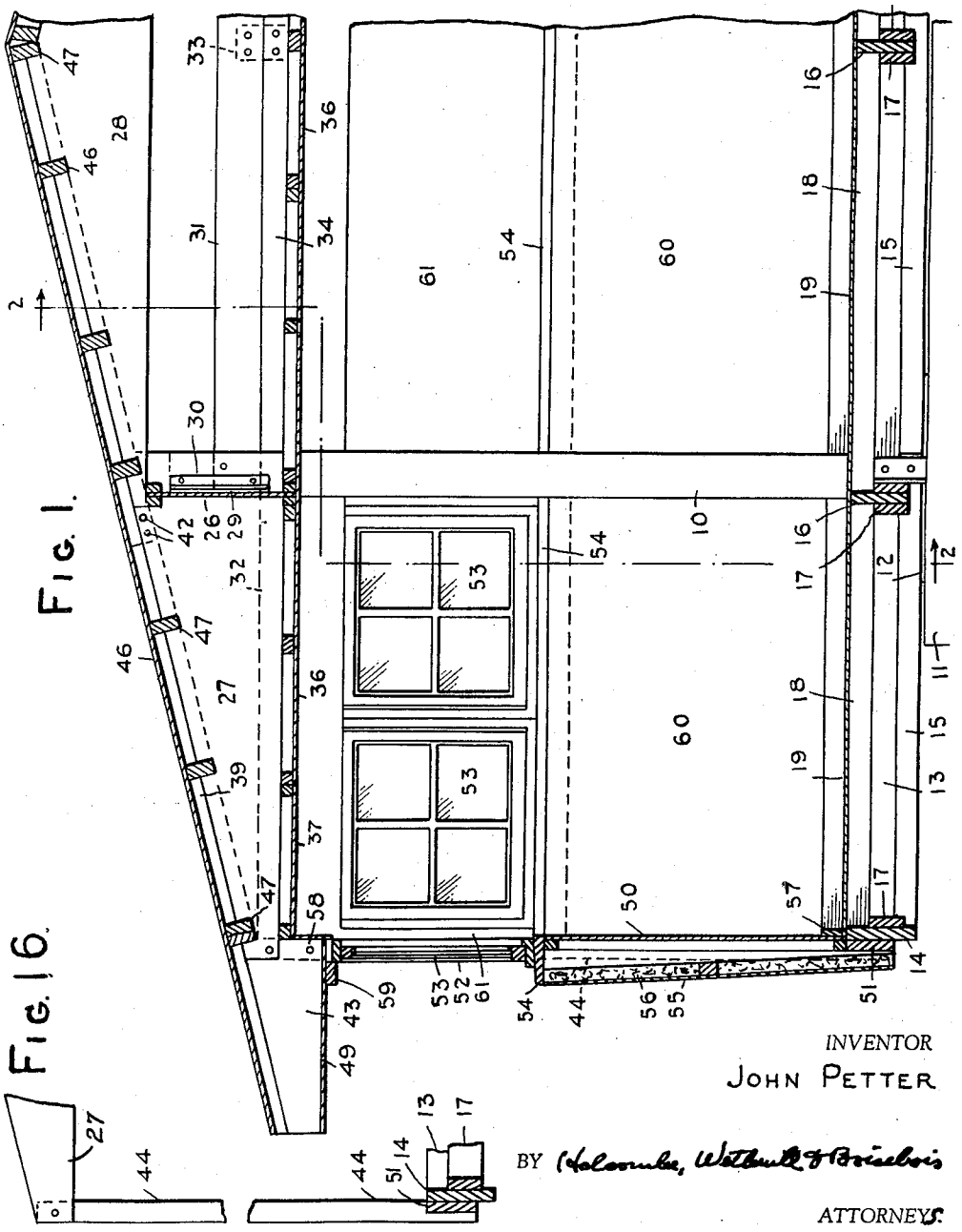


FIG. 16.

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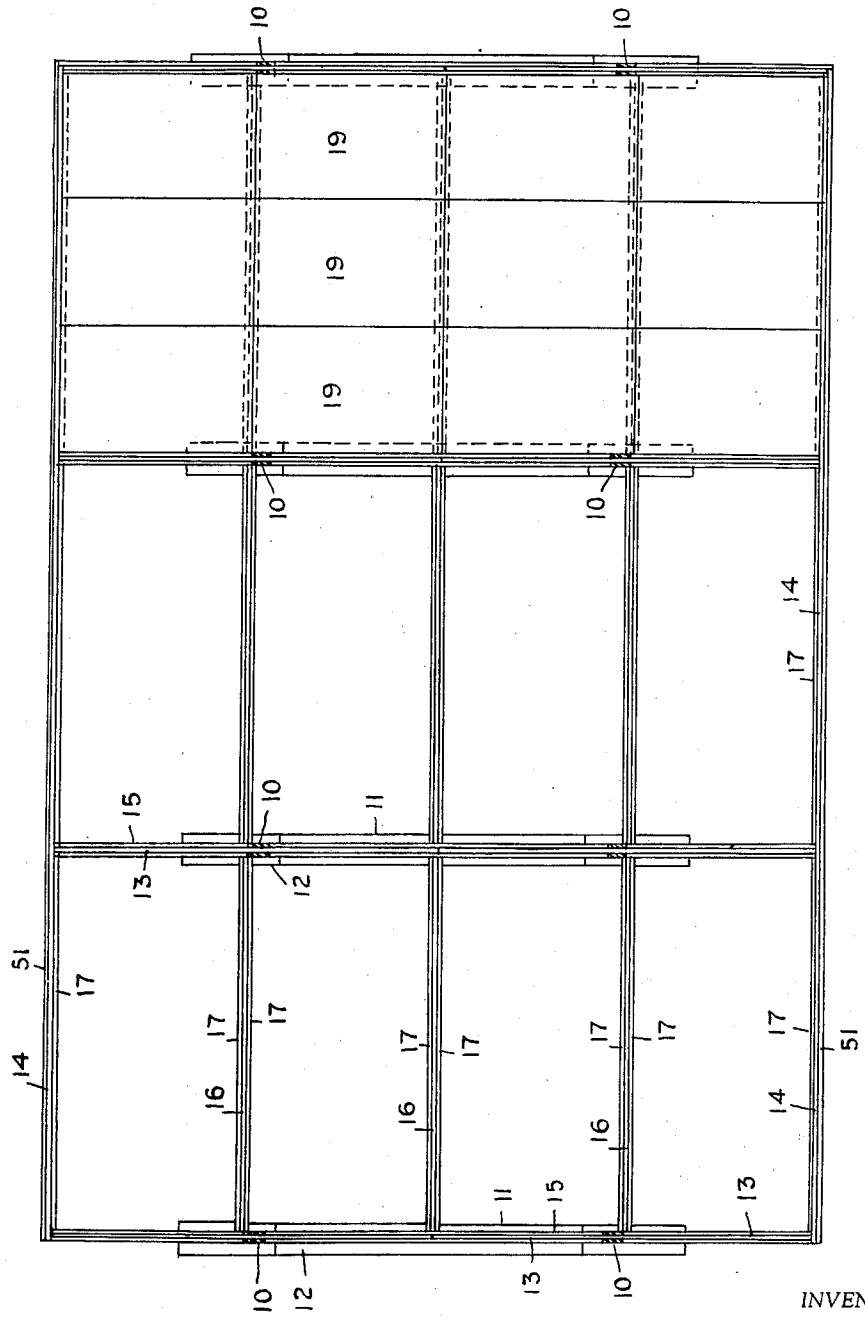
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COLLAPSIBLE PRE-FABRICATED BUILDING

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FIG. 3.



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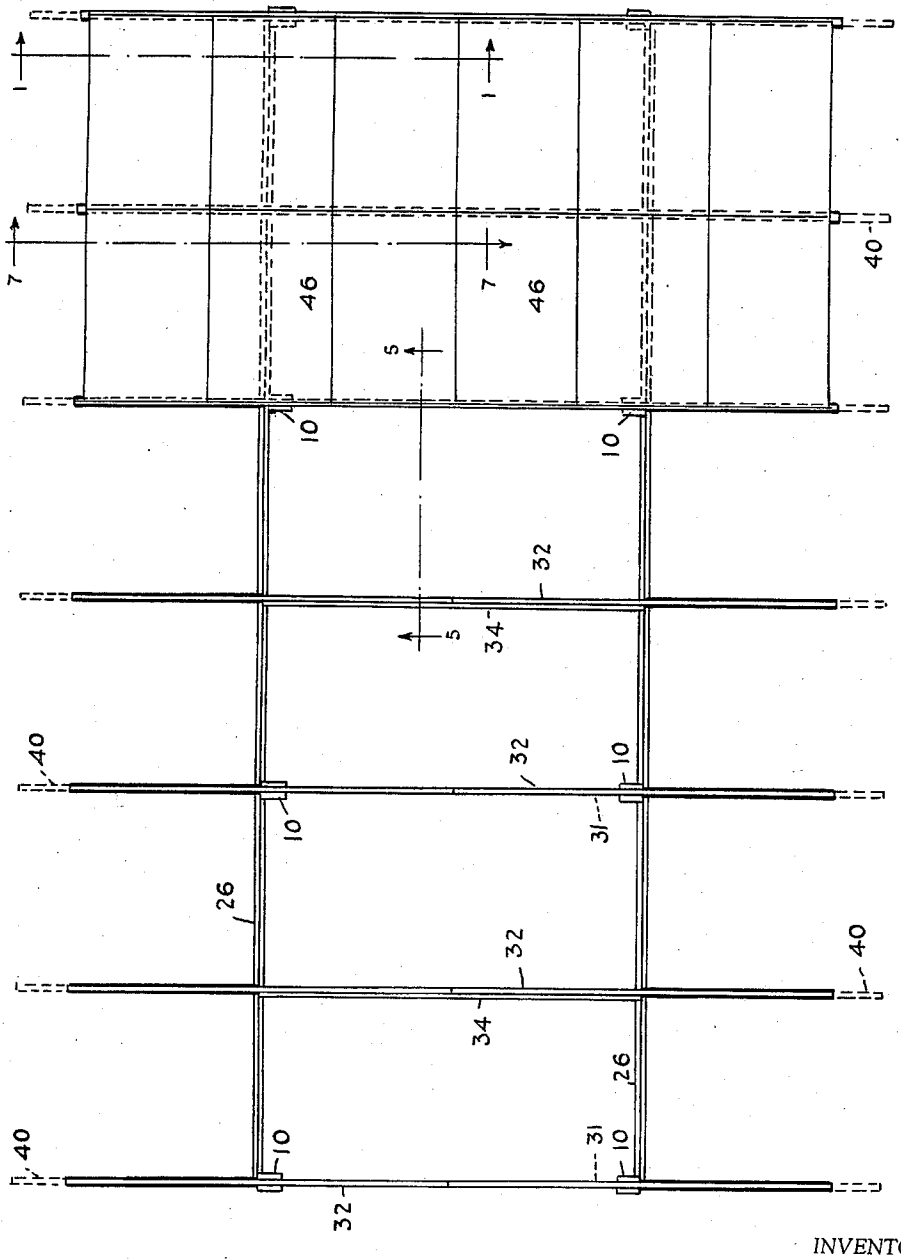


FIG. 4.

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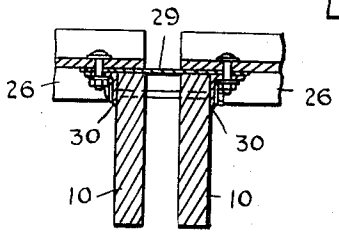
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COLLAPSIBLE PRE-FABRICATED BUILDING

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FIG. 12.



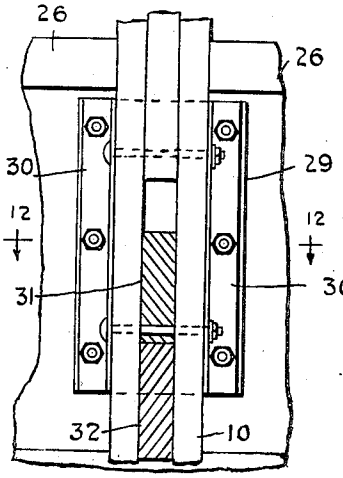


FIG. 13.

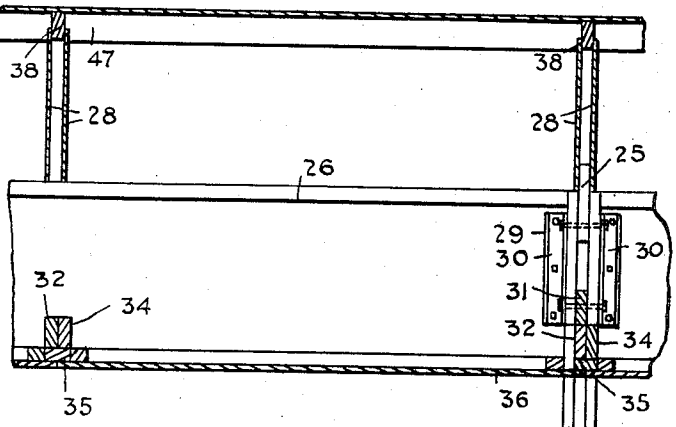


FIG. 5.

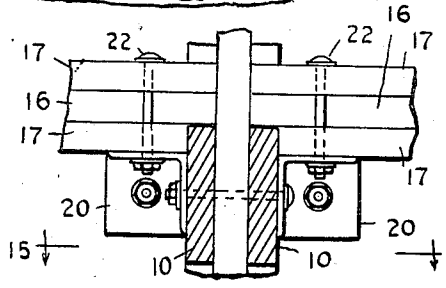


FIG. 14.

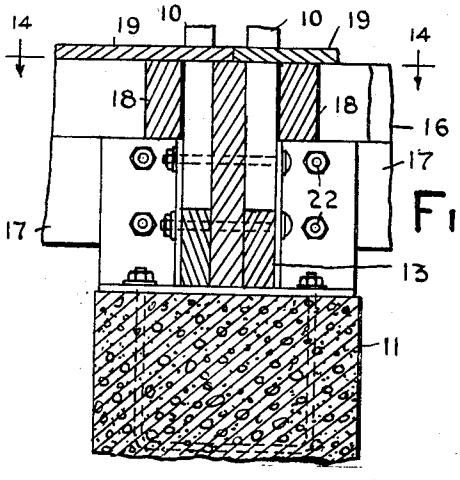
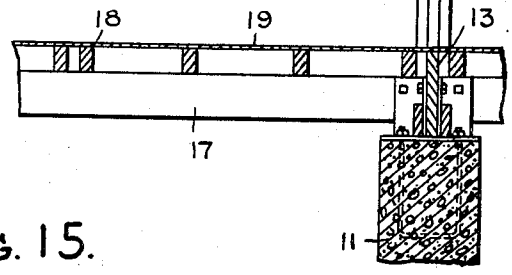


FIG. 15.



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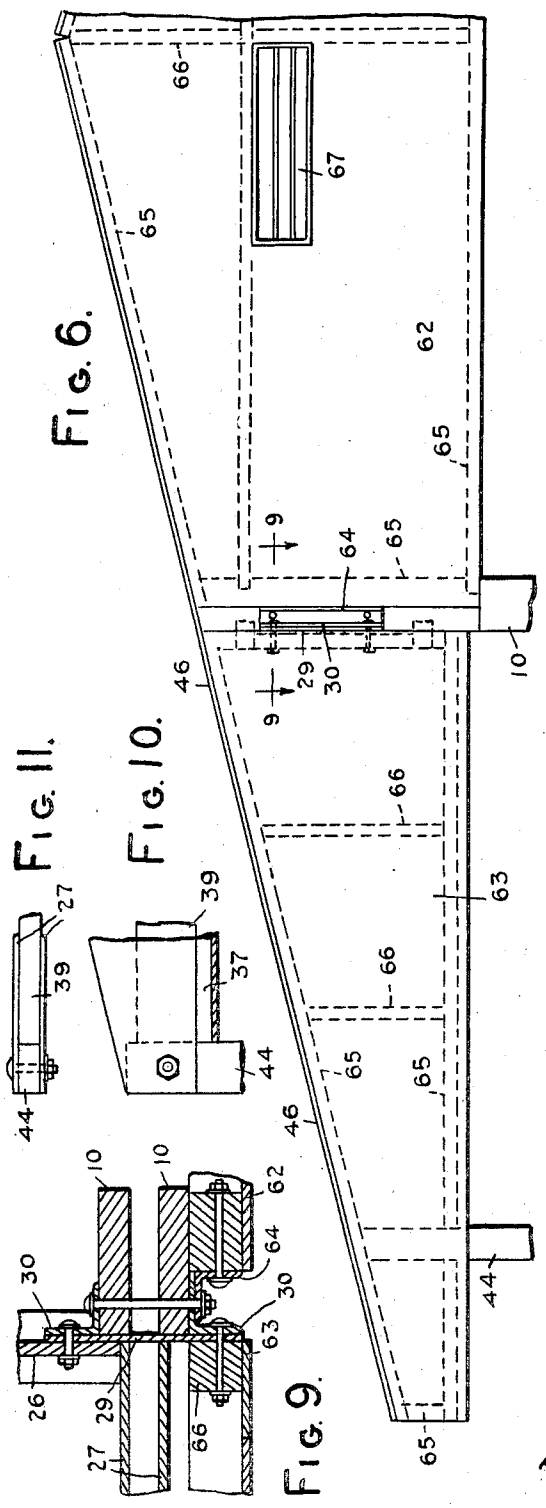


FIG. 6.

FIG. 11.

FIG. 10.

FIG. 9.

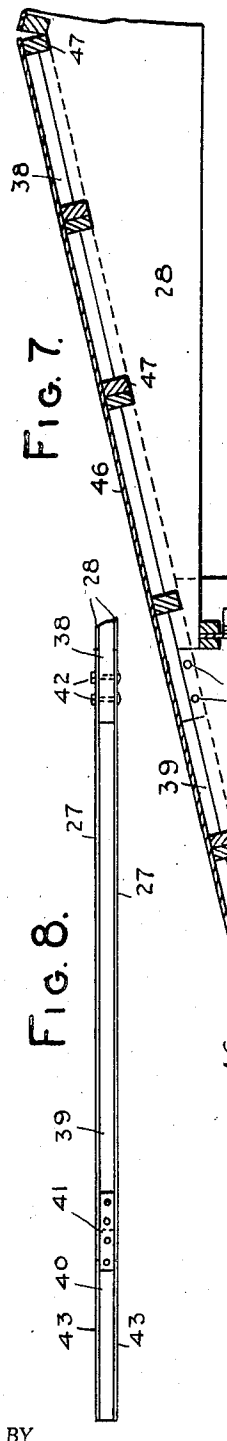


FIG. 8.

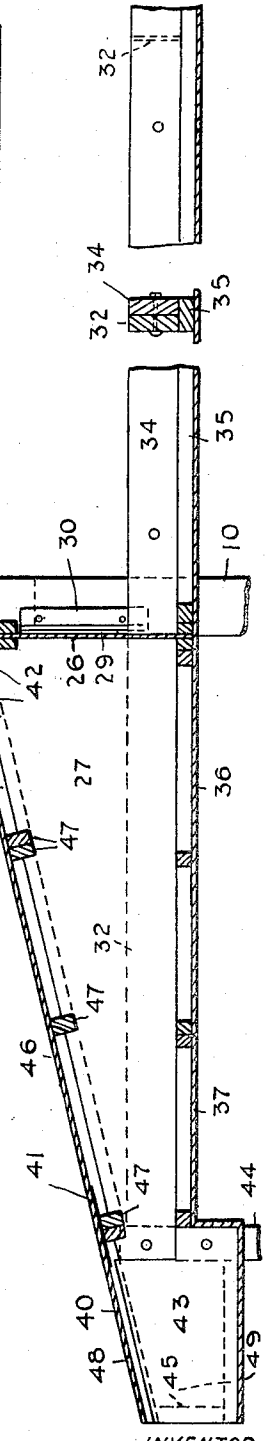


FIG. 7.

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United States Patent Office

2,896,273

Patented July 28, 1959

2,896,273

COLLAPSIBLE PRE-FABRICATED BUILDING

John Petter, Arlington, Va.

Application March 11, 1954, Serial No. 415,539

9 Claims. (Cl. 20—2)

This invention relates to pre-fabricated buildings comprising a self-supporting frame which is made of wood in short lengths for assembling and bolting together at the location and floor, wall and roof panels made principally of plywood and adapted to be bolted or nailed to the frame, the whole forming a light but substantial structure which may be readily transported in knocked-down condition by a truck and erected at the desired site by hand.

The invention aims to do away with expensive foundation walls and excavation by supporting the frame on piers wholly inside the building and which preferably are formed as concrete footings or slabs sunk in shallow trenches or laid on the ground under the building, depending on the location and character of the soil. For shore structures and locations subject to floods it is sufficient to drive sheet piling around these interior piers to protect the foundation from undermining and prevent the structure from being washed away.

Other aims and objects of the invention are to connect and brace the parts of the frame to resist earthquakes and wind storms, to provide for interchangeable window and door panels, and to facilitate the setting of partitions and replacement of panels which become damaged from any cause.

The details of construction and the advantages of the invention as embodied in a preferred design will further appear from the following description of the structure shown in the accompanying drawings wherein:

Figure 1 is a vertical transverse section of one-half portion of a single storey building suitable for a warm climate; the section being taken on the line 1—1 in Figure 4;

Figure 2 is a vertical cross section of the same on the line 2—2 in Figure 1;

Figure 3 is a plan view of the ground floor of said building showing the columns in cross-section, some of the floor panels being removed to disclose the floor beams and foundation piers;

Figure 4 is a plan view of the roof showing some of the roof panels removed to disclose the posts, I-beams and some of the transverse members of the framing which supports the roof and walls.

Fig. 5 is a longitudinal vertical cross-section on the lines 5—5 in Fig. 4, through a part of the building showing a post, floor and roof beams and two fin supports for the roof covering;

Fig. 6 is an outside end elevation of half of one gable portion of the building, and

Fig. 7 is a part inside elevation and part vertical transverse cross-section of half the other gable portion of the building, the section being taken on the line 7—7 in Fig. 4;

Fig. 8 is a plan view of a wing fin, eaves support and portion of a peak roof panel support;

Fig. 9 is a horizontal cross-section of the joint at the end of the building between a column, end panel and wing support;

Fig. 10 is a detail side elevation of the joint between a wing support and side wall hanger;

Fig. 11 is a plan view of the same;

Fig. 12 is a horizontal cross-section of a post at a joint connection with the ends of two aligning I-girders, on the line 12—12 in Fig. 13;

Fig. 13 is an enlarged cross-section of a portion of Fig. 5 adjacent to a post;

Fig. 14 is a horizontal cross-section of a post at a joint connection with two aligning floor beams, on the line 14—14 in Fig. 15;

Fig. 15 is a vertical cross-section of the same on the line 15—15 of Fig. 14;

Fig. 16 is a detail of the side framing at the lower end of a side wall hanger.

The structure shown in the drawings as illustrating the invention is one storey in height, built in sections or bents consisting of girders and posts arranged crosswise over the tops of spaced piers and supporting the floor beams and roof framework upon which the floors, side walls and roof panels rest. The outer ends of the girders and roof supports extend beyond the piers and columns or posts which support them and carry the side walls, which have no direct supports from the ground. This cantilever construction permits all but the piers at the ends of the building to be located well within the area covered by the building where they are protected to a large extent from the weather and from extremes of heat and cold.

Referring to Figs. 1 to 4, the posts 10 are arranged in pairs supported on piers or footings 11 extending crosswise of the building, there being one pair of posts for each bent of the supporting frames. The piers are capped with metal plates 12 or a layer of neat cement or other suitable material upon which the cantilever girders 13 are bedded to bring them up to the desired elevation in level alignment from end to end of the building. Anchor bolts may be used to secure the foundation plates 12 in place. The girders 13 pass between the sections of the posts 10 and are secured to sill plates 14 at their outer ends while their inner ends abut and they are stiffened by the flange members 15 which are secured along their lower edges to support the ends of the floor beams 16, which floor beams likewise have flange members 17 secured along their lower edges to support the marginal members 18 of the floor panels 19, which run crosswise of the building, as shown in Fig. 3. Angles 20 are bolted to the posts 10 and the bolts 21 which secure them to the posts also secure the girders 13 between the two sections of the posts, as shown in Figs. 14 and 15. These angles 20 are also bolted to the floor beams 16 by the bolts 22 and help to secure the flange members 17 to their sides, forming a rigid connection between the posts, girders and beams where they rest upon the foundation plates.

Midway between the bottom and top and at the upper ends of the posts 10 stiffener blocks 25 are nailed between the two sections (see Fig. 5) to maintain them parallel and at the proper distance apart, and the upper ends of the posts are secured to deep plywood I-beams 26 running lengthwise of the building, and to crosswise extending wing fin members 27 and aligning peak fin members 28 which serve as transverse beams or trusses to support the upper portions of the walls and the roof. The upper blocks 25 extend between the two side members of the peak fins 28.

The I-beams are preferably formed of plywood webs and wooden flange strips along their upper and lower margins, and they extend from one column to the next, being connected to each other by metal plates 29 and to the posts 10 by metal angles 30. The upper ends of the transversely aligned pair of posts at each bent of the structure are connected by cross-beams 31, which also

serve as ties for holding down the inner ends of the wing cantilever bars 32 which extend from the eaves to the center line of the building at each bent and are secured together at their inner ends by metal plates 33 to which they are bolted, as shown in Figs. 1 and 2. The intermediate cantilever bars 32 (see Fig. 7) are also stiffened across the space between the posts by means of side beams 34 to which they are bolted. The ceiling strips 35, to the undersides of which strips the ceiling panels 36 are secured by means of metal clips, as is common practice, are nailed to the lower edges of the bars 32 and beams 34. The ceiling panels 37 along the sides of the building are one-half the width of the typical panels 36 and are loosely supported at three edges and overlap at their inner marginal supports for ready removal to give access to the space between the ceiling and roof.

Each wing fin and peak fin is nailed at its upper edge to a spacing and roof supporting rafter member fitting between the side members or webs of the fins and composed of three sections, 38, 39 and 40, the ridge section 38 extending from the peak of the roof to beyond the line of posts, the intermediate section 39 extending from the outer end of the ridge section to short of the outer ends of the wing fins 27, and the eaves section 40 extending from the outer ends of the intermediate section 39 to the eaves line, as shown in Fig. 7. These rafter sections may be connected together by metal plates 41 or by bolts 42 extending through the adjacent fin members, as illustrated in Figs. 7 and 8. The projecting eaves rafters 40 are nailed to the side members or webs of the eaves fins 43, which in turn are bolted to the side wall supports 44, and their lower and outer edges are nailed to filler blocks 45, thereby forming overhanging hollow outriggers or brackets for supporting the eaves.

The roof panels 46 rest directly on these rafters 38, 39, 40 and on the upper edges of the fins 28, 27 and 43, being nailed to the rafters at both ends, and each panel is also nailed to stiffening bars 47 at their edges and midline. The roof panels are all the same standard lengths and widths except for the rows along the eaves, which panels 48 are made of narrow width to suit the overhang, as shown in Figs. 7 and 8. Eaves cornice sheets 49 are nailed to the under sides of the eaves brackets. Tar paper, roofing composition or other waterproof sheet or plastic material may be applied over the entire roof panels or over the joints only, as desired.

The side wall panels are made in lower and upper sections and are fitted between and secured to the side wall supports 44. The lower sections 50 rest at their bottom edges upon horizontal supports 51 which are secured to the side sill plates 14 at the proper height for this purpose, as shown in Figs. 1 and 16. Some of the upper side wall panels 52 may have windows 53, but all preferably have sills 54 which rest upon the lower tier of the panels, and any suitable exterior finish 55 may be added as may be desired, that illustrated including insulation 56 between the inner and outer walls of the panel. Base molding 57 and ceiling molding 58 may be applied after the panels are in place to finish the interior and close cracks or openings that may occur around the margins of the panels. The gaps between the upper edges of the side wall panels and the eaves is closed by strips 59.

The ends of the building are closed by suitable wall panels made in lower and upper sections 60, 61, some of which may be provided with windows or doors, as desired, in accordance with existing construction methods. In the illustrative design shown in Figs. 1 and 2 these panels are secured between the sides of the end rows of posts 10 and between these posts and the corner side wall supports 44. At the corners of the building metal angle strips or other flashing means (not shown) are used to cover the joints between the side and end wall panels as is well understood in the knock down building art.

The gable ends are closed by exterior panels 62, 63, fitted beneath the projecting ends of the roof slabs and bolted to the posts 10 and corner wall hangers 44 outside of the fins 43 by angle brackets 30, 64, as shown in Figs. 6 and 9. These end panels are shaped to fill the space between the roof panels 46 and lower face 49 of the overhanging eaves construction, and to overlap the upper ends of the end panels 61. They are constructed of sheets of wall board or other suitable material which are stiffened by edge frame strips 65 around their margins connected by intermediate cross frame strips 66, as shown in Fig. 6. Louvres 67 may be provided in some of these panels; and any desired exterior finish may be applied as illustrated by the clapboards 68 shown in Fig. 2.

My invention has important advantages in constructing buildings of the portable knockdown type in addition to the saving in time and cost of the foundations. The roof and roof supports being entirely independent of the walls permits omission of some or all of the outer walls for warm climates; it also enables the partitions to be placed wherever desired, and they can be made in a factory and slid into position after the roof is erected, but before the outside walls are placed; and erection of the roof before the walls and floors provides cover of the workmen when building the floors, installing the partitions and erecting the walls. Also, the use of horizontal exterior panels results in smaller, lighter panels and greater standardization than heretofore.

The foundation and framing being entirely inside of the outside walls of the building permits extending its size in any direction, and several building units can be placed together end to end or side by said to suit the floor area desired.

Furthermore, the cantilever floor and roof systems embody novel features of design composed of comparatively light structural members suited to the "built-it-yourself" type of construction. For example, plywood is used for the tension members in the roof cantilevers and I-beams; and the fin type of cantilever reduces the usual transverse bending due to the overhanging load by substituting a mechanical couple having direct tension and compression members of comparatively light weight.

Also, the method of placing the roof panels running lengthwise of the building parallel with the ridge and supported at their ends on the main and intermediate cantilevers, enables lighter panels to be used because the slight sag that may result at the middle of the span of adjacent panels runs down the slope of the roof and can be tolerated as it tends to promote flow-off of water falling thereon rather than to obstruct it.

Obviously, the illustrative building structure described herein is susceptible of modification to suit different locations and requirements, and I do not restrict my claim of invention to the specific details of construction as shown, but what I claim is as follows:

1. A pre-fabricated wooden building frame comprising two rows of longitudinally aligned posts arranged in transversely aligned pairs and a series of parallel transversely arranged roof supports bridging the space between said longitudinally aligned rows, said roof supports being supported at their ends on the tops of transversely aligned pairs of posts, said roof supports each consisting of two parallel web members arranged on edge with spacing and roof supporting strips secured between said web members and extending lengthwise thereof following the slope of the roof, and at least one series of transversely arranged roof and eaves supports aligning with said roof supports and each consisting of two parallel overhanging web members arranged on edge with a spacing and roof supporting strip secured between the upper edges of said overhanging web members in alignment with and secured to one of said roof supporting spacing strips.

2. A pre-fabricated wooden building frame as set forth in claim 1 wherein the spacing and roof supporting strips project at their upper edges above the upper edges of the web members between which they are secured.

3. A pre-fabricated wooden building frame as set forth in claim 1 having transversely arranged eaves brackets in alignment with at least some of said roof and eaves supports, each of said eaves brackets comprising two parallel members arranged on edge with their upper edges sloping outwards and downwards in conformity with the slope of the roof and at least one spacing strip secured between said parallel members along their upper edges, said spacing strip aligning with the adjacent spacing and roof supporting strip, and means for securing said aligning spacing and roof supporting strips together to tie said brackets to said roof and eaves supports.

4. A pre-fabricated wooden building frame as set forth in claim 1 including longitudinally aligned girders consisting of vertical web sheets stiffened by flange strips along each edge and secured to the posts of each longitudinal row, and transverse roof supports intermediate said posts consisting of parallel web members arranged on edge and supported at their ends on said girders, said parallel members being connected by spacing and roof supporting strips secured between their upper edges and conforming to the slope of the roof, in combination with transversely arranged roof and eaves supports in alignment with said intermediate roof supports and secured thereto and to said girders, each such eaves support consisting of two parallel overhanging web members arranged on edge with a spacing and roof supporting strip secured between their upper edges in alignment with and secured to said roof supporting strips.

5. A prefabricated knock down cantilever roof truss for a building having a roof sloping both ways from a ridge at its peak and comprising transversely aligned interior posts, said truss consisting essentially of two principal side members which, when erected, are arranged in transverse alignment means to connect said principal side members to said posts between their ends permitting them to overhang the spaces between said posts and the outer sides of said building, opposed sheet material fins secured on opposite sides of said principal side members and having their top edges conforming to the slope of the roof, a cross beam bridging the space between said posts and adapted to be secured thereto for connecting said principal side members and posts upon erection, and a peak roof support having two main supporting members of sheet material arranged on edge and provided with connections at their ends to the top edges of said fins, the top edges of said peak roof support conforming to the slope of the roof on each side, and said peak roof support having oppositely sloping spacing and roof supporting strips secured between and projecting above the upper edges of said main supporting members stiffening them laterally, whereby said aligned principal members, fins, cross beam, peak roof support main supporting members, strips and connections form a self-supporting structure upon erection on said posts.

6. A building of the prefabricated knockdown type having two parallel rows of supporting columns spaced inside of its side walls, transverse supporting members comprising pairs of aligning cantilever beams projecting outwards from said rows of columns and overhanging the spaces on the outer sides of said rows, cross members connecting said beams at their inner ends bridging the space between said rows of columns, said cantilever beams and cross members being supported at said rows and the outer ends of said beams being self-supported, inclined roof supporting members arranged in transverse alignment with said rows of columns projecting outwards therefrom and connected at their inner ends by tie members bridging the space between said rows, connections between said cantilever beams and roof supporting members at their outer ends, said roof-supporting members and tie members being in vertical alignment with said cantilever beams and connecting cross members and forming therewith a cantilever truss assembly supported intermediate its ends at said columns and self-supported at its outer ends, and means at the outer ends of said cantilever truss assembly for anchoring said ends, respectively, to the side walls of said prefabricated building to form therewith a roof structure having lateral stability.

7. A building as set forth in claim 6 wherein the inclined roof supporting members are provided with aligning eaves supports projecting beyond the side walls and supported from the upper ends of the columns by said cantilever truss assemblies.

8. A light weight roof supporting cantilever truss for a building of the prefabricated knockdown type having a pair of interior posts, said truss comprising a pair of crosswise aligning cantilever beams abutting at their inner ends and supported between their inner and outer ends on said posts at points below the tops thereof, a crosswise tie beam connecting said posts above said cantilever beams and contacting the inner end portions of the latter to resist upward movement thereof due to downward pressure on their outer end portions, and a pair of roof supporting members made of stiffened sheet material and secured at their lower edges to each outer end portion of said cantilever beams, said roof supporting members having their upper edges sloping to conform to the angle of the roof and crosstied together at their upper corners, thereby forming a cantilever truss for supporting the roof outwards from said columns to near the eaves.

9. A light weight roof supporting structure as set forth in claim 8 provided with a peak roof supporting member made of stiffened sheet material and supported at its ends from the upper ends of said posts, said peak roof supporting member having its upper edge sloping both ways from the middle to conform to the angle of the roof on each slope and to align with the upper edges of the cantilever supported roof supporting members, said peak roof supporting member and cantilever supported roof supporting members being rigidly connected at their abutting ends whereby said peak roof supporting member serves as a crosstie to support the upper corners of said cantilever supported roof supporting members and assist in carrying the load on the overhanging portions of the roof.

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