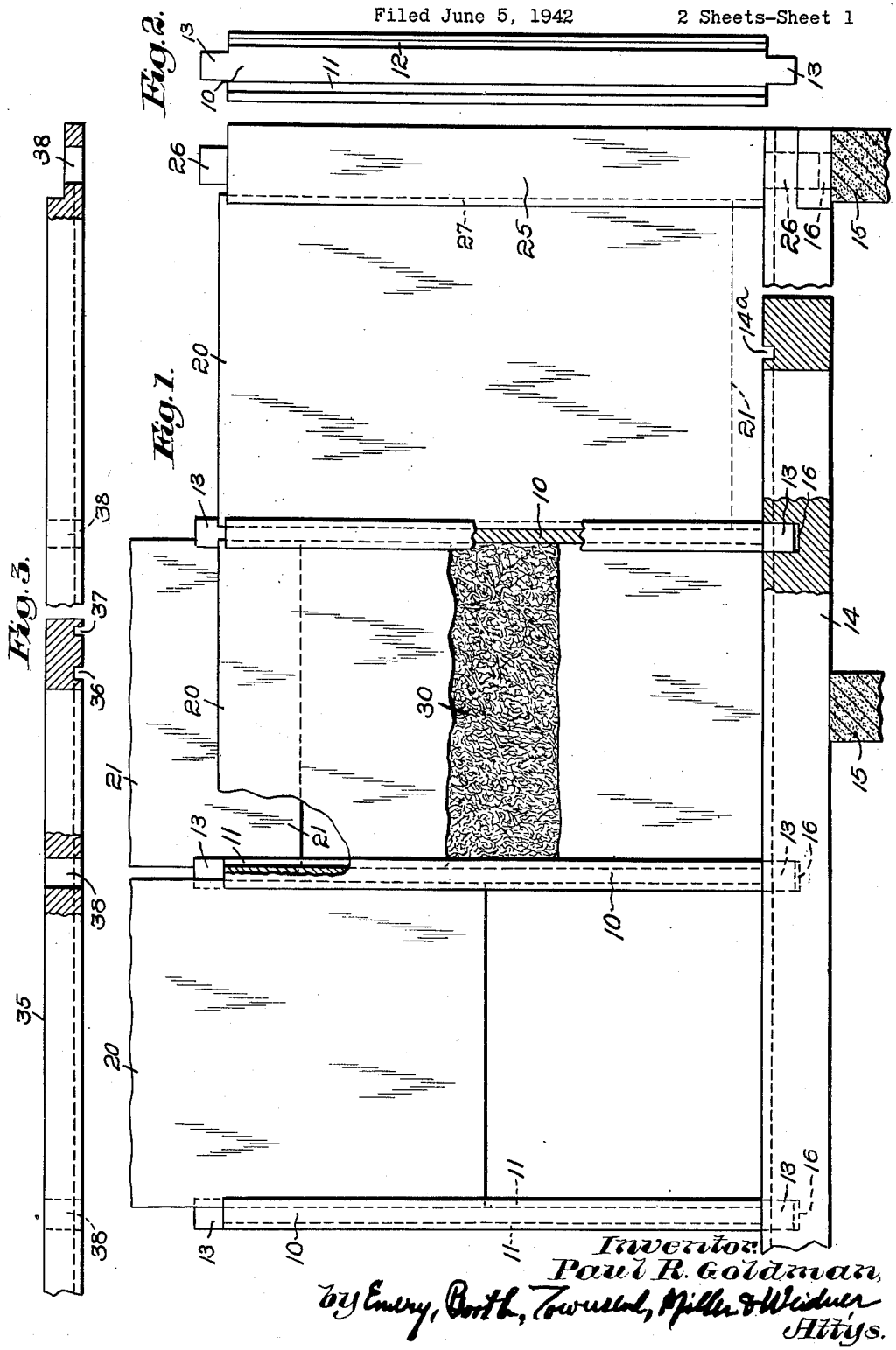
July 31, 1945. P. R. GOLDMAN 2,380,834

WOODEN BUILDING CONSTRUCTION

Filed June 5, 1942 2 Sheets-Sheet 1



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WOODEN BUILDING CONSTRUCTION

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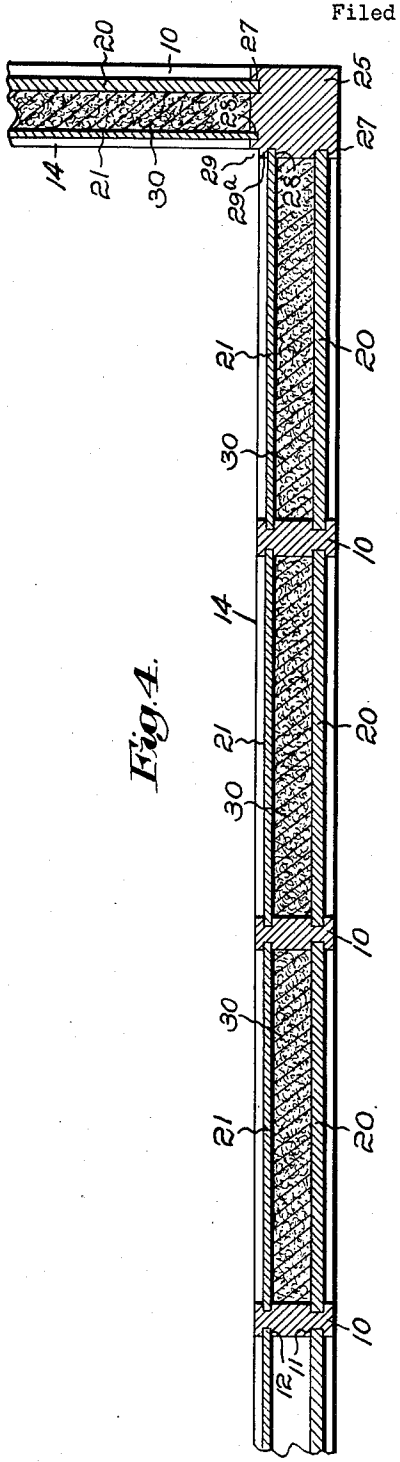


Fig. 4.

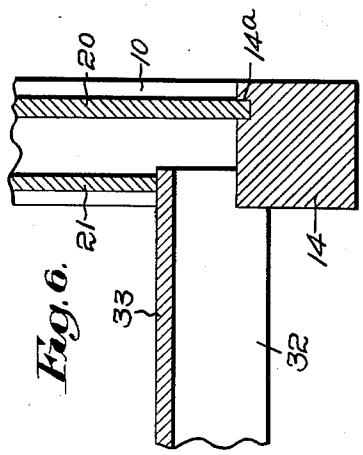


Fig. 6.

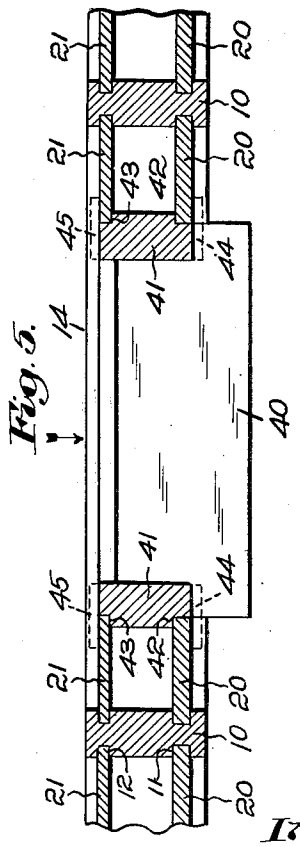


Fig. 5.

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WOODEN BUILDING CONSTRUCTION

Paul R. Goldman, Andover, Mass.

Application June 5, 1942, Serial No. 445,862

1 Claim. (Cl. 20—4)

My present invention relates to building construction, more particularly for buildings wholly or mainly of wood or wood compositions and substitutes such as the various types of so-called wall-board. The invention aims to provide for mass production of such buildings, through the medium of certain novel preformed structural elements specially adapted for easy and rapid interfitting assembly at the building site, with a minimum of skilled labor. The knocked-down prefabricated elements in accordance with the invention may be shipped in lots of any size convenient for the form of transportation available and are deliverable directly to the point of building erection in readiness for quick assembly into completed wall and building structures of any selected design, providing a wide range of variation as to location of wall openings such as those for windows and doors.

In the accompanying drawings illustrating by way of example one embodiment of the invention, including the novel means for practicing the method thereof:

Fig. 1 is an elevation of a portion of a building wall in process of assembling, with parts broken away or sectioned to illustrate more clearly the construction method involved;

Fig. 2 shows one of the supports or studs of Fig. 1, in side elevation;

Fig. 3 shows in elevation a top plate adapted for use with the wall structure of Fig. 1;

Fig. 4 is a horizontal sectional view of a wall such as that of Fig. 1;

Fig. 5 is a horizontal section similar to a portion of Fig. 4 but upon a larger scale and illustrating the structure and manner of installation of a window frame or other opening enclosure; and

Fig. 6 is a vertical section, upon a similar scale as Fig. 5, of the lower portion of a wall such as that of Fig. 1, including adjacent flooring.

As noted in the foregoing statement an important object of the invention is the provision of novelly preformed building elements adapted for easy shipment to any building site, where they may quickly be assembled by a mere interfitting operation so as to present an immediate complete wall structure for the building. One of these elements is a special stud such as designated generally by the numeral 10 and one of which is shown separately in Fig. 2, in side elevation. These studs 10 are formed of timber cut to the length appropriate for the particular building wall. They may have the usual 2 x 4 cross section but preferably the dimension of their wide faces is somewhat increased relative to that of the narrower faces, as for example 2 x 5.

Along the two opposite wide faces of these studs 10 I provide one or more longitudinal grooves 11, 12 extending from end to end of the individual studs and having a substantial depth, desirably at least about ⅜ to ½ inch in a 2-inch stud such as mentioned by way of example. These grooves or slots 11, 12 are of a width to receive with a sliding fit the wall panelling or panel units to be referred to. Where two or more such panelling units are to be set in spaced relation to form a hollow wall structure, such as shown, the panelling at the outer and the inner wall faces may be of the same thickness or otherwise, depending on the type of building and the geographical area where it is to be located. For the purposes of illustration I have here represented the outer panelling as somewhat thicker than that for the inner face of the wall, as appropriate for the cooler or more northerly sections of this country. Accordingly, as best seen in Fig. 2, the outer rabbet formation or groove 11 is made correspondingly wider than the other or inner groove 12.

In the construction of the building wall of the invention the studs 10 are distributed along the course of the wall, where they are held in the desired spaced relation. A simple and convenient means for this purpose comprises tenons 13, 13 at the respective ends of the studs, these preferably being of similar size and shape so that the studs are reversible end for end. The studs are erected upon a wall sill 14 which rests on any suitable foundation such as the concrete or other pillars 15. The top face of the sill 14 is appropriately mortised as at 16, 16 for seating reception of the bottom tenons 13.

The spacing of the studs in any given wall structure depends on the width selected for the panel units, as to which there is considerable latitude. A convenient panel width, for the average building of the dwelling type is 4 feet or thereabouts.

As herein illustrated the wall structure comprises spaced panel units between adjacent studs, including outer panels or units 20 and cooperating inner panel units 21. While these panels 20 and 21 may be of any preferred or available wallboard material, including the various composition boards now on the market, I have found plywood to be particularly suited for the purpose. The thickness or number of plies for such panelling may be selected as appropriate for the given

circumstances. Where a relatively heavy outer panelling is desired, the outer panels 20 may for example be ½ in. or ⅝ in. ply-wood in combination with ⅜ in. inner panels 21. As noted, however, other thicknesses may be employed, and the inner and the outer panelling elements may be the same in that respect.

At the corners or other angles of the wall I provide a special corner stud or post 25 such as a 4 x 4 timber cut to similar length as the studs 10 and desirably similarly formed with end tenons such as 26, 26, Fig. 1. Two angularly adjacent longitudinal faces of these corner posts 25 are provided with parallel spaced longitudinal grooves 27, 28 correspondingly spaced at the respective post faces as the grooves 11, 12 of the studs 10, and of the corresponding width. As best seen in Fig. 4, the corner portion of the posts 25 at the juncture of their grooved faces may be recessed longitudinally as at 29 to give the effect of an interior corner finish or moulding 29a between the adjacent angularly related inner panel members 21.

The described panel units 20 and 21 are initially fabricated or are pre-cut to length and width as appropriate for the given wall structure, as to the height of wall and the spacing between stud centers. If for instance it is desired to use panelling of 4 ft. width, with 2 x 5 studs having grooves of ½ in. depth, the studs 10 and corner elements 25 will be set on centers spaced 4 ft. 1 in. or slightly greater, to insure an easy sliding fit between the panels and studs. Or the stud center spacing may be selected as desired, as 4 ft., 3 ft. 6 in. or otherwise, the panels then being made of the appropriate lesser width, by about 1 in., to conform to the stud channeling 11, 12, 27, 28. These prefabricated wall elements, including the regular and corner studs 10 and 25 and the panels 20, 21 are adapted to be assembled into a wall structure by a mere interfitting procedure, as will be readily apparent from a consideration of Fig. 1 and a comparison thereof with the other views.

Assuming a sill such as the member 14 to be in position, the wall erection may be started at any point or simultaneously at a number of points along the course of the wall. Any two or more adjacent studs 10, or a corner post 25 and one or more adjacent studs 10 may be set up in place as represented in Fig. 1, with their bottom tenons 13 or 26 seated in the sill mortises 16 already provided for the purpose. The panelling is then interfitted with the studs, by engaging the opposite vertical edges of the individual panel units 20 and 21 in the corresponding oppositely disposed grooves 11, 12 of the studs and 27, 28 of the posts. It will generally be found more convenient first to position the outer panels 20, for one or more of the inter-stud spaces. This may readily be accomplished by placing what is to be the bottom portion of the panel into the upper ends of the corresponding stud grooves 11, 11 and sliding or allowing the panel to drop down into place between the studs, the panel riding down along in and being guided by the stud grooving in this assembling operation. Another convenient procedure is to erect a corner post 25, or any intermediate stud 10, then insert the vertical edge of a panel 20 or 21 into the appropriate groove of the erected element, or similarly to position both the outer and the inner panels, and then set up and interfit the stud at the opposite vertical edges of such panelling. Still another method of assembly, applicable generally to the lighter or more flexible panel units is to flex or bow them between their vertical edges to the comparatively slight amount necessary to spring them into interfitted relation with the edge-receiving grooves of the uprights 10 and 25.

One important advantage of the hollow or double-wall structure such as herein disclosed is the facility with which insulation may be installed between the outer and inner wall members or panels 20 and 21, which space also is readily available for concealed positioning of piping, wiring and other conduits and usual building equipment. A convenient form of insulation is that of quilting or padding, of any preferred mineral or vegetable material available for the purpose, such as represented at 30 at the central panel area of Fig. 1. After installing the outer panel 20, as at the location just referred to, this insulating material 30 may be laid up flatwise against it and secured in any convenient manner as by tacking to the adjacent studs 10; or it may merely be inserted between the studs and temporarily held until the cooperating inner panel 21 is slid or sprung into assembled position where it will retain the insulation without further attachment.

In many installations it is found structurally sufficient merely to bring the bottom edge of the exterior panelling 20 down flush on the top face of the sill 14 or other wall base. If preferred however the sill element such as 14 may be grooved along its top face in conformity with the grooving 11, 12 of the studs 10 and 27, 28 of the corner posts 25. Or such bottom grooving may be provided only for the outer panels 20, as herein represented at 14a.

In the illustrated construction, wherein ease and speed of erection of the building is a primary consideration, it is contemplated that the inner panelling units 21 will stand upon the flooring, in some such manner as best seen in Fig. 6. Referring to said figure, the floor joists or beams 32 may be individually positioned in the usual manner with their outer ends on the wall sill, the flooring 33, including an under or rough floor and a top or finish floor, or merely a single flooring layer, being laid on the joists in the usual manner.

Generally, however, and in keeping with the purpose of prefabrication and quick assembly at the building site, the flooring will be supplied in preassembled sections, including the joists and the floor boards, ready to be laid in place upon the sills, girders or other supports. The joist 32 and flooring 33 of Fig. 6 may be regarded as representing an outer portion of such sectionalized flooring in which the floor boards have a length, as illustrated, to extend out beyond the vertical plane of the inner panelling 21, to receive the bottom edge of the latter. Or these inner panels 21 may set down onto the floor joists 32.

As above noted, the outer panels 20 extend down and rest on the top face of the sill 14, or set in the base groove 14a of the latter. Since both outer and inner panels preferably terminate at the same level along their top edges, as represented at the right-hand panel area of Fig. 1, the inner panels 21 are made shorter than the outer panels 20, by an extent corresponding to the vertical distance between the top face of the sill, or the bottom of the sill groove 14a where such is employed, and the level of the inner-panel-suporting portion of the joist and flooring sections.

After erecting assembly of the studs, posts and panels, the wall is finished off by the installa-

tion of a top plate **35**, Fig. 3, of a length corresponding to the number of panel areas along the given wall or wall portion. As seen at the sectioned portion of said Fig. 3, the underface of this top plate is appropriately grooved as at **36**, **37** for interfitting reception of the top edges of the wall panelling **20** and **21**. Likewise the top plate **35** is provided with mortises **38**, **38** to receive the top tenons **13**, **13**, etc. of the studs **10** and the top tenon **26** of any corner or end post **25**. It will be understood that the adjoining panel elements for any continuing wall portion will be installed before the top plate such as **35** for any given length of the wall structure is set in place. If one or more additional floors are to be erected upon a wall such as described in connection with Fig. 1, the upper face of the top plate **35** may be grooved similarly as at its under face or as at the top face of the sill **14**, or in the case of a one story or one story and attic building, the ceiling beams or the attic floor beams and the ridge rafters may be installed in the customary manner directly on the top plate such as **35**.

Another feature of particular importance in accordance with the prefabricated and interfitting wall construction of my invention resides in the installation and arrangement of windows, doors or other wall openings. By reason of the non-sectionalized but interfitting built-in-place character of my wall elements, any such openings may be located at whatever points they may be desired along the wall. Thus with a given supply of the studs, posts and panels, a wide range of variation is available as to the window and door arrangement.

Assume for example that a quantity of the individual studs, posts and panels are at hand for constructing at the selected location a rectangular building 24 by 28 feet, or 6 by 7 panel units in depth and length. Windows and doors may be placed at any or all of the twenty-six panel positions, six at either end of the building and seven each at the front and rear. All that need be determined in advance is the total number of windows and of doors for the given building; these may then be arranged along the walls to suit the circumstances and dictates of the particular case. Or where more than one building is to be erected at a given territory, or in the same general neighborhood, even the total numbers of windows and doors may be varied between individual buildings, within the limits of the total material supply available for the entire plurality of buildings. This makes for wide latitude of architectural design and pleasing variation in structural arrangement among the individual buildings, such as those of the numerous industrial and war housing projects now contemplated.

In ordinary wooden building construction special positioning and supporting members for window and door frames are built into place as the framework of the building is put up. The studding customarily is set on 18 in. or 24 in. centers. At each window or other opening at least one stud must be cut away. The remaining short lengths of stud above and below the window opening have to be braced and supported by cross members, generally of similar 2 x 4 material as the studs. And unless the required opening happens to have the proper width and to be so located as to bring its vertical sides at two studs, such sides of the opening must also be defined by 2 x 4 studding, for which still other bracing members may be needed. Once such wall-aperture framing has been built in to the wall framework considerable waste of material and labor is involved in making any substantial change in the location of the opening.

In contrast with such usual construction, my invention makes possible the locating, arrangement and rearrangement of window and door openings on the job, as the given wall is assembled; or the panelling units may readily be shifted about even after assemblage, with the beneficial results as above noted.

Referring now to Fig. 5 in this connection, the latter is a horizontal section through a wall structure of the invention, corresponding for example to any unit panel area of Fig. 4, on a somewhat larger scale. The section is taken at a horizontal level cutting through the wall opening anywhere above its bottom edge. Two adjacent studs **10**, **10** are seen in section, defining a panel unit area between them, together with the adjacent side portions of the outer and inner panels **20** and **21** at the opposite sides of said area.

The wall opening to be provided at any selected panel unit area, as that between said studs **10** of Fig. 5, and whether for a window or for a door, is defined or located and outlined solely by the panel units **20** and **21** themselves. These outer and inner panels **20**, **21** simply have registering openings cut in them, of the proper size to receive the window frame or the door frame as the case may be and to position and support such frame by means of the opening bordering portions of the panels themselves.

The frames to be thus installed may be similar to those customary for wood construction, being of the selected size and form, generally rectangular, and comprising a bottom cross member or sill **40**, the two side uprights **41**, **41** and a top piece, not shown, together forming the usual type of box-like window or door frame.

The two vertical side members **41** of these window or door frames however are provided with special channelling or groove formations for cooperation with the wall panels. As herein illustrated in Fig. 5 they are longitudinally recessed at the exterior and the interior corner portions of their outer side faces, as indicated at **42** and **43**. The recess **42** which is to come in line with the outer panel **20** is dimensioned to fit such panel. Similarly the corner recessing **43** at the inner portion of the frame sides **41** is dimensioned to fit the inner panel **21**. If desired, one or both horizontal members of the frames may be similarly channelled for interfitting engagement with corresponding portions of the respective panels. For door openings the panels may be cut out fully to their bottom edges, so that the door frame will set directly upon the foundation sill.

To install a window frame or door frame at any selected location between adjacent studs **10**, or between a stud **10** and an adjacent corner post **25**, it is merely necessary to select the properly apertured outer and inner panels **20** and **21**. The panel openings may but cut at the mill and these frame-receiving panels shipped in fully prefabricated condition, or regular panels **20** and **21** may be cut out on the building job. At the desired inter-stud location an apertured outer panel **20** is slidingly or otherwise interfitted into the stud or post grooving. The window or door frame is then thrust into position in the panel aperture, generally from the interior face of the wall

toward the outside as indicated by the arrow in Fig. 5, the outer corner grooving 42 of the frame sides being fitted to the vertical edges of the outer panel opening. Any insulating material may then be put in place at the inner face of the outer panel 20. The inner panel 21 is then interfitted into the grooving 12 of the studs and 43 of the frame sides either by bowing and springing the panel into place, or by sliding it down from the top of the studs, springing its bottom portion toward the interior of the building sufficiently to clear the door or window frame. Said recessed inner corner portions 43 of the frame sides permit this inner panel 21 to assume its interfitted position about the frame, as represented in Fig. 5, as the panel opening comes into registry with the frame, the latter then being positioned and firmly supported by both the outer and the inner panel units 20 and 21.

Following such installation of a window or door frame the usual casing strips, such as represented in dotted line at 44, 45 may be applied over the joints between the frame and the frame-receiving portions of the panels.

From the above description in connection with Fig. 5 it will be apparent that a window or door frame may be disposed at any desired location along the course of the wall, and that such location may be altered at any time merely by substituting apertured panels in lieu of plain ones, and vice versa. Even after complete erection of a wall structure, shifting about of the location of openings may be effected with little difficulty, it generally being found practicable to withdraw an entire apertured wall section, including the window or door frame and the associated outer and inner panels 20 and 21 as an assembled unit and to reinsert them at some other location between two studs or a stud and a corner post.

An interfitted wall structure of prefabricated matching individual stud, post, panel, sill and plate elements such as herein disclosed, adapted for convenient shipment to the place of erection in non-sectionalized fully knocked-down form may in accordance with the method of the invention be assembled substantially without the use of the usual fastening means of a more or less permanent nature, such as nails, screws, angle brackets and the like. Accordingly such wall structure may readily be taken down and reshipped for further erection wherever there is a demand for housing. Thus while the resulting wall structure is rugged and weatherproof, suitable for permanent erection in any locality, it has the further distinct advantage, in connection with the system and method of the invention, of the capacity to be knocked-down and reassembled with little or no marring or injury to the constituent parts. Hence it is economically compatible with building of the prospective more temporary character for which there is presently such widespread requirement.

It will be understood that my invention, either as to means or method, is not limited to the exemplary embodiment or steps herein illustrated or described, and I set forth its scope in my following claim.

I claim:

The method of building wall construction for portable or prefabricated buildings which comprises longitudinally grooving the opposite side faces of studs along similarly spaced parallel lines, erecting the studs along the course of a wall, assembling outer and inner plywood wall panels of an integrally continuous width conforming to the spacing between the inner portions of opposed grooves of each two adjacent studs, aperturing pairs of outer and inner panels to form registering window and door recesses respectively, erecting wall panels by slidably interfitting the side edges of the non-apertured outer and inner panels and of one apertured panel of each pair thereof into the corresponding outer and inner stud grooves to provide a double-panelled wall at non-apertured areas, vertically channeling window and door frames at their respective vertical corner portions inserting the window and door frames respectively into the recesses of the erected single apertured panels and interfitting with such frames and the corresponding studs similar apertured panels to complete a double-panelled wall structure thereat wherein the window frames are positioned and supported wholly directly by the aperture-bordering portions of the corresponding panels and the door frames are similarly positioned at their sides and top, installing insulating material in the inter-panel spaces, and covering said spaces and longitudinally interconnecting the studs and panels along their top portions.

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