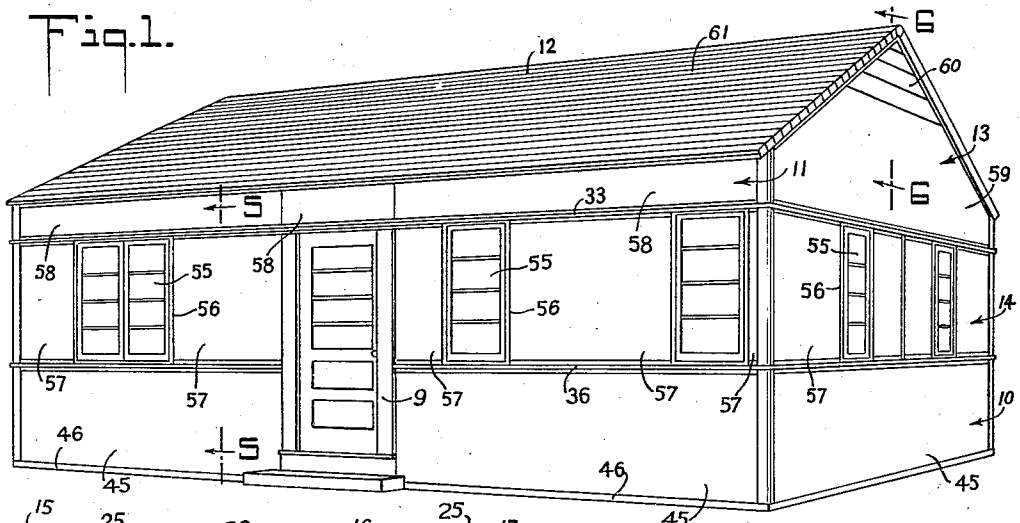
Oct. 3, 1944. R. L. DAVISON 2,359,304

BUILDING CONSTRUCTION

Filed May 15, 1941 3 Sheets-Sheet 1

Fig. 1.



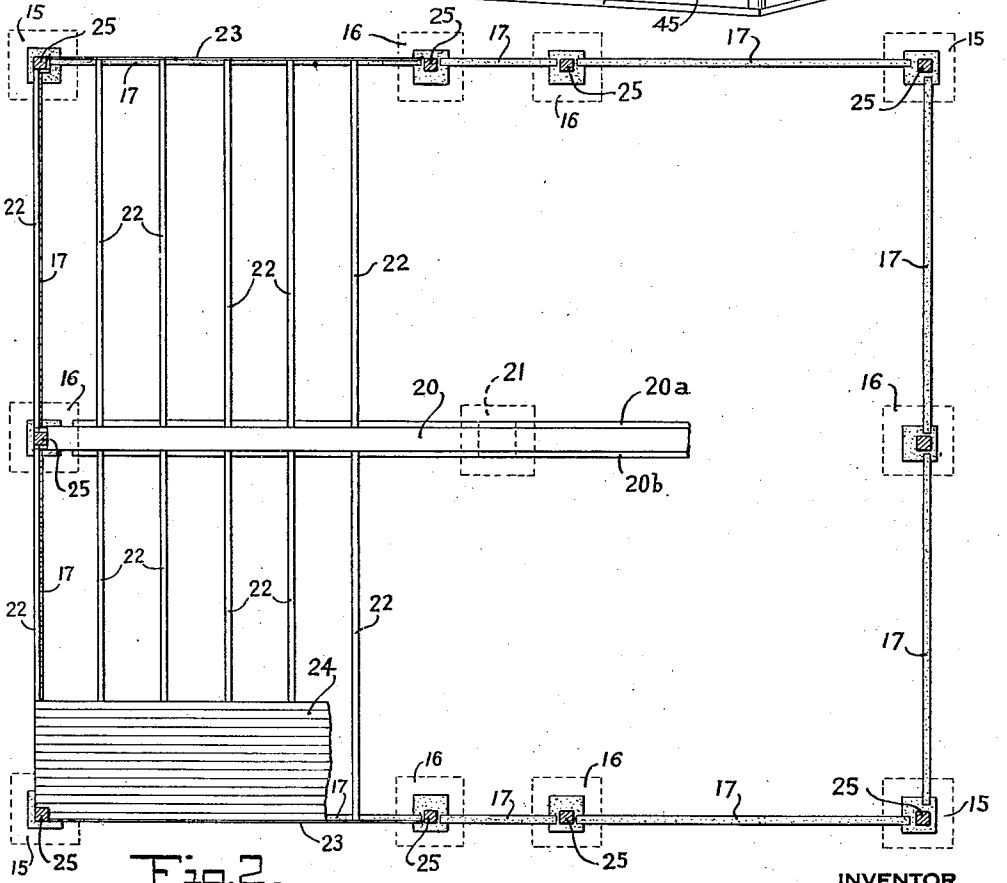


Fig. 2.

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Oct. 3, 1944. R. L. DAVISON 2,359,304

BUILDING CONSTRUCTION

Filed May 15, 1941 3 Sheets-Sheet 2

Fig. 3.

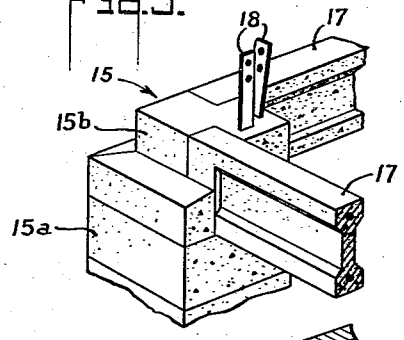


Fig. 4.

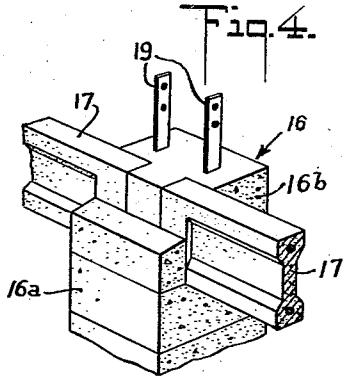


Fig. 5.

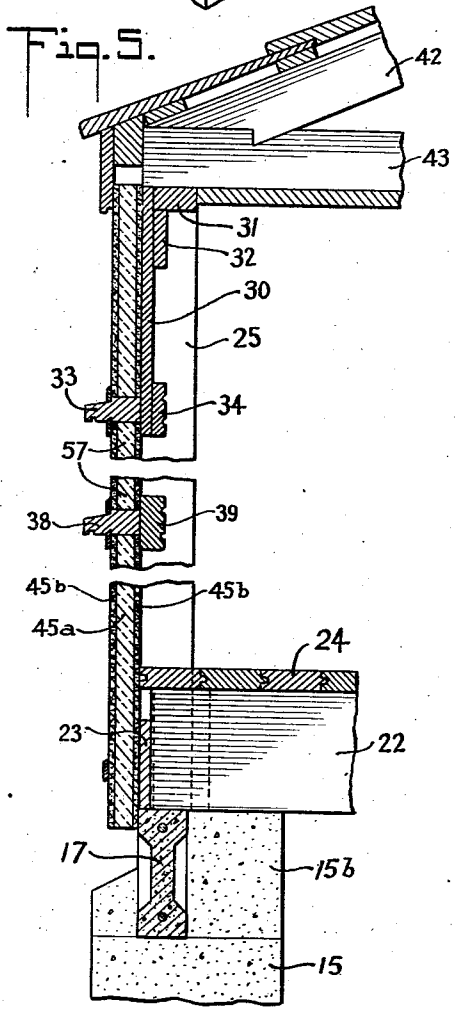
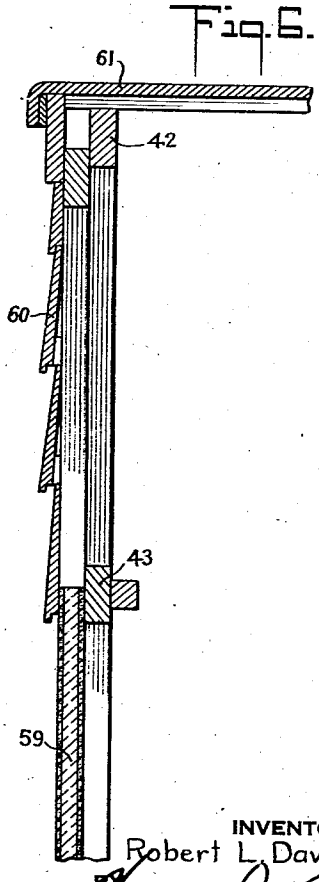


Fig. 6.



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Oct. 3, 1944. R. L. DAVISON 2,359,304

BUILDING CONSTRUCTION

Filed May 15, 1941 3 Sheets-Sheet 3

Fig. 7

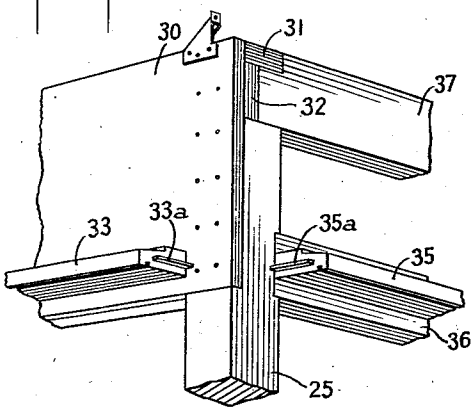


Fig. 10.

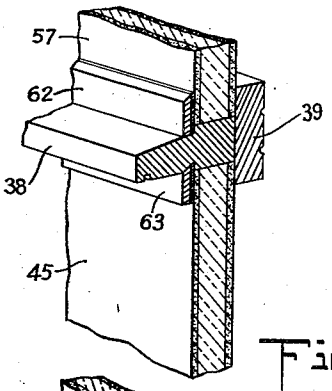


Fig. 8.

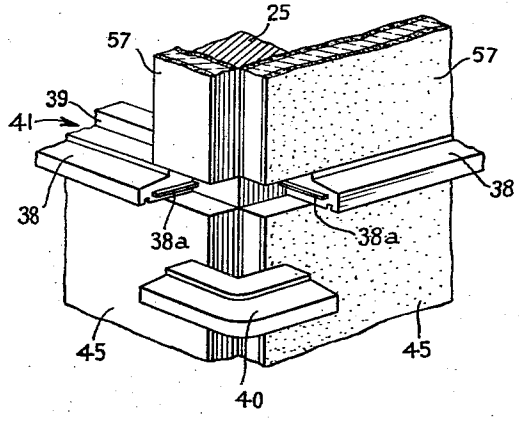


Fig. 11.

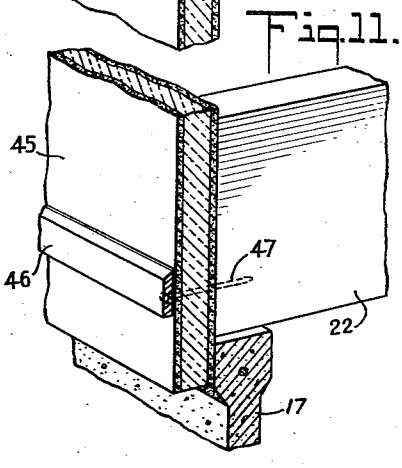


Fig. 9.

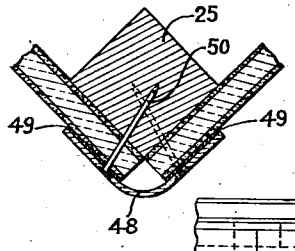
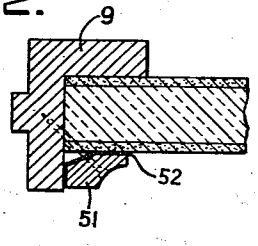


Fig. 12.



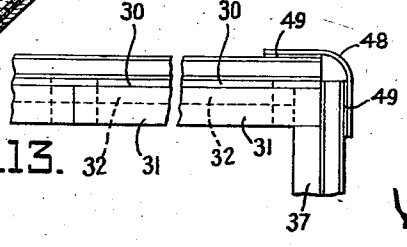


Fig. 13. 32 31 32 31

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UNITED STATES PATENT OFFICE

2,359,304

BUILDING CONSTRUCTION

Robert L. Davison, New York, N. Y., assignor to John B. Pierce Foundation, New York, N. Y., a corporation of New York

Application May 15, 1941, Serial No. 393,498

4 Claims. (Cl. 20—2)

This invention relates to building construction, and has particular reference to types of building construction wherein panels are employed as structural elements in the wall structure.

An object of the invention is to provide building construction of a simplified nature which is structurally sound, comfortably insulated, and relatively easily erected.

An object is to provide adequate wall insulation in building construction with a minimum of spacial encumbrances and expense, and to provide such wall insulation in such manner as to derive structural strengthening benefits therefrom.

A further object is to provide an effective combination between panels which are employed primarily for their structural strength, and composite panels which are employed primarily for their insulating values and only secondarily for structural reasons.

As is fully set forth in U. S. Patent No. 2,235,811, issued March 25, 1941, to the herein applicant, and entitled Panel wall structural unit and building construction, panel units are now used in wall construction as deep beams or girders extending between relatively widely spaced column uprights, or posts, and serving to receive and distribute, in themselves, floor and/or roof loads.

Pursuant to the present invention, the lower floor of the building is supported directly by the foundation, while the upper floor, and/or the roof, is supported by an upper course, and/or courses, of structural panels, extending between and secured to relatively widely spaced column uprights, or posts, which are anchored to the foundation. The wall structure is further made up of panels, composite in nature, forming a lower course. These composite panels are employed chiefly for their insulating value, since they are relatively thick, and comprise insulating material which is reinforced and weather-resistantly faced. It has been found that, while it is not advantageous, in most instances, to employ such composite panels as deep beams or girders, they do provide sufficient structural connection of the relatively widely spaced column uprights, or posts, adjacent their lower ends, to effectively reinforce the building against substantially horizontal stresses, such as wind pressures. And, by facing the upper course of structural panels with similar composite panels, it has been found that important insulation is added, strength of the building is increased, and the resulting exterior appearance is enhanced in architectural appeal.

A feature of the invention resides in the preferred type of foundation wherein beams extend between foundation piers, and define a continuous foundation upon which the floor structure is supported.

A further feature resides in the means employed for weather-sealing the joints of the building construction.

Further features and objects of the invention will be apparent from the following detailed description and the accompanying drawings.

In the drawings:

Fig. 1 represents a perspective view, from the front, of a dwelling house embodying a preferred form of building construction pursuant to the invention;

Fig. 2, a horizontal section through the building of Fig. 1 taken at floor level and presenting a plan view of the floor construction as it rests upon the foundation; portions of the flooring and portions of the floor construction as a whole are broken away to reveal otherwise hidden parts;

Fig. 3, an enlarged perspective view of a fragmentary detail comprising one of the corner foundation piers together with intersecting foundation beams and embedded anchor support for a column upright, or post;

Fig. 4, a view similar to Fig. 3 but illustrating one of the foundation piers intermediate those at the corners;

Fig. 5, an enlarged and condensed vertical section taken on the line 5—5, Fig. 1;

Fig. 6, an enlarged vertical section taken on the line 6—6, Fig. 1;

Fig. 7, an enlarged perspective view of a fragmentary detail at the upper end of the front right-hand corner of the building of Fig. 1 with certain facing panels, as well as the roof structure, removed;

Fig. 8, a view similar to that of Fig. 7 but taken at the lower intermediate portion of the front right-hand corner of the building of Fig. 1 with window structure and weather-sealing strips removed and with an insert corner portion of the lower sill element shown in a removed position;

Fig. 9, an enlarged view in horizontal section of a fragmentary detail showing how weather-sealing strips finish off and protect intersecting composite panels at one of the corner posts;

Fig. 10, an enlarged view in perspective, partly in vertical section, of a fragmentary detail com-

prising an upper and a lower composite panel unit tying in with a horizontal sill element, the resulting joinders being weather-sealed pursuant to the invention;

Fig. 11, an enlarged perspective, partly in vertical section, of a fragmentary detail comprising the lower part of a composite panel of the lower course tying in with the floor construction and with a foundation beam;

Fig. 12, an enlarged view in horizontal section illustrating another instance of the use of a weather-sealing strip pursuant to the invention; and

Fig. 13, an enlarged fragmentary view in horizontal section taken on the line 13—13, Fig. 1.

The specific embodiment illustrated in Fig. 1 is a one-story dwelling house with gable sloping roof. It should be realized, however, that considerable latitude of construction is possible within the broad structural principles set forth. The invention resides primarily in the wall structure. Any desired type of floor construction, and any desired type of roof construction, whether it be sloping or flat, may be employed. Furthermore, the invention is not restricted to a one-story construction. A multi-story building may be erected according to the broad structural principles here disclosed.

The dwelling house of Fig. 1 comprises a lower course 10 of panels, and an upper course 11 of panels. The lower course 10 extends completely around the building just above the foundation line. The upper course 11 comprehends both the front and the back of the building, but does not extend around the gable ends thereof. The component panels of the upper course 11 are utilized as girders for supporting the roof structure 12. The gable ends, indicated at 13, comprise gable end frames, and panels component thereto. An intermediate window-providing course 14 extends, horizontally, completely around the building, and, vertically, from the lower course 10 to the upper course 11, and to the gable ends 13, thus completing the walls of the building. A door-way indicated generally 9, is provided at a suitable location in the wall structure, being advantageously intermediate one of the longitudinal side walls, and extending through the lower course 10 and the intermediate course 14.

The foundation of the building is preferably provided, pursuant to the invention, by spaced piers interconnected by beams. Other types of foundations may, however, be employed. The foundation piers, with interconnecting beams of a type found particularly advantageous, are illustrated in detail in Figs. 3 and 4. The corner piers are here indicated 15, respectively, and those piers intermediate the corner piers 15 are here indicated 16, respectively. The interconnecting beams, irrespective of length, are designated 17, respectively.

Foundation piers 15 and 16 are preferably built-up of pre-cast hollow concrete blocks, designated 15*a* and 16*a*, respectively. The interconnecting beams 17 are preferably pre-cast reinforced concrete I-beams, all of identical formation regardless of length. The beams 17 are set into place between mutually adjacent piers with their ends resting on the tops of said mutually adjacent piers. Suitable forms (not shown) are provided at the tops of the respective piers, and concrete is cast on the job for securely uniting the respective beams 17 with the respective piers 15 and 16. The resulting cast-on-the-job concrete formations are designated generally 15*b* and 16*b*, respectively. Sets of anchor straps 18 and 19, preferably strap iron or steel, are embedded in the concrete formations 15*b* and 16*b*, respectively, during the casting operation for providing anchorage for column uprights, or posts, 25, component to the wall structure of the building.

The resulting foundation is firm and strong, and provides adequate bearing surfaces for the floor and wall structures of the building, as well as adequate anchorage for the skeleton framework.

The floor construction may be of any desired type. It has been found advantageous, however, see Fig. 2, to employ a central longitudinal girder 20, which is supported at its ends on two opposite piers 16, and, adjacent its mid-portion, on a similar concrete pier 21. The girder 20 is preferably wood having secured to its sides supporting flange pieces 20*a* and 20*b*, respectively, upon which rest ends of the respective floor joists 22. The other ends of the respective floor joists 22 rest upon the pre-cast concrete I-beams 17, as illustrated. The joists at the two opposite ends of the building rest entirely on their corresponding concrete beams 17, and plates, designated 23, respectively, are secured transversely along the terminal ends of the intermediate joists 22. Flooring 24 is applied over the joists in conventional manner.

The posts, 25, as explained above, are secured to their respective foundation piers by means of either the set of anchor straps 18 or the set 19. They rest on their respective foundation piers in a vertically upright position, and, like the foundation piers, are relatively widely spaced apart, defining, in general, the peripheral configuration of the building. They form basic elements of the structural framework of the building, and serve to transmit second floor and/or roof loads directly to the foundation piers.

The posts 25 are interconnected and tied into a rigid framework by horizontally extending elements which preferably fit into, and are secured within, notches cut in the respective posts, as will be explained hereinafter.

While the posts 25 serve to transmit second story and/or the roof loads to the foundation piers, such loads are distributed directly to the posts by panels of some rigid, substantially homogeneous material, preferably plywood, which function in the manner of deep beams or girders. Such panels are advantageously supplied complete with appurtenant ledger, and other related structural elements, in the form of prefabricated panel structural units 30, and provide upper horizontally extending interconnecting elements, mentioned above.

The appurtenant elements of a panel structural unit 30 comprise, in the illustrated instance, a longitudinal, load-receiving, ledger 31 secured to the inside face of the panel proper, as, for instance, by gluing; a longitudinal supporting piece, 32, secured to the inside face of the panel proper, at a location immediately below and contiguous to the longitudinal ledger 31, also desirably by gluing; a longitudinal sill element 33, secured to the outside face of the panel proper, at a location adjacent the lower marginal edge thereof, also, desirably, by gluing; and, finally, a longitudinal finish strip 34, secured to the inside face of the panel proper, adjacent the lower marginal edge thereof, also desirably by gluing.

While the load-receiving and load-distributing panel unit 30 is here incorporated in a prefabri-

cated unit, it should be understood that the various appurtenant elements may be applied thereto in the field in any suitable manner.

The two upper appurtenant elements component to the panel structural unit **30** preferably extend flush with the ends of the panel proper, while the two lower appurtenant elements extend short of the ends of the panel proper. The end portions of the posts **25** are notched in a manner appropriate for receiving the component parts of the panel structural units **30** so that the outside faces thereof will lie flush with the outside faces of the respective posts. The manner in which the panel structural units **30** tie in with the respective posts **25** is illustrated in detail in Fig. 13. It is there seen that the ends of the ledger **31** rest on top of the respective posts **25**, while the panels proper and the supporting pieces **32** fit into appropriately notched portions of the posts.

The drip sill elements **33** and the longitudinal finish strips **34** are not notched into the posts, see Fig. 7, but lie substantially flush with the lateral faces thereof.

It should be remembered that the panel structural units **30** are placed only along the longitudinal side walls of the building, and not along the gable end walls thereof. Accordingly, sill elements **35**, still referring to Fig. 7, are secured by gluing, or other appropriate means, to respective lower girts **36**, which extend between and are fitted, at their ends, into the respective posts **25** of the gable end walls. Corresponding upper girts **37** are, also, fitted, at their ends, into the upper portions of the respective posts **25**.

As is seen from Fig. 7, gaps are left between the ends of the respective sill elements **33** and/or the respective sill elements **35** at the respective posts **25**. These are filled in with suitable sill insert pieces similar to those mentioned hereinafter with reference to the lower sill of the building, and illustrated particularly in Fig. 8. The ends of the respective sill elements are provided with tongues, see **33***a* and **35***a*, which coordinate with similar grooves provided in the still insert pieces. Thus, a continuous horizontal drip sill is provided peripherally of the building and at the top of the intermediate course **14**.

Lower sill elements **38**, corresponding to the upper sill elements **33** and **35** are secured by gluing, or other suitable means, to longitudinal finish strips **39**, and the so-assembled sill uints are positioned between the respective posts **25** at a lower intermediate location, considered with respect to the heights of the posts **25**, for defining the top of the lower course **10** and the bottom of intermediate course **14**. Both the sill elements **38** and the finish strips **39** may be fitted into notches appropriately provided in their respective posts **25**, and sill insert pieces, as at **40**, Fig. 8, are fitted into the gaps left at the posts, the sill insert pieces being provided with grooves corresponding to tongues **38***a*, **38***a* of the respective sill elements.

The sill elements **38** and **40** extend continuously about the periphery of the building, except for doorways, and provide a continuous horizontal lower drip sill. Also, in conjunction with the respective finish strips **39**, they provide seats as at **41**, Fig. 8, for filler panels and window frames of the intermediate course **14**, as well as similar seats for panels of the lower course **10**.

The roof construction may be of any suitable well known type. As here illustrated fragmentarily, see Fig. 5, it comprises rafters **42** and ceiling joists **43** joined together to provide respective prefabricated gable-formed truss units which can be installed in place in a minimum of time. The important thing is that the roof construction rests upon the ledgers **31** of the panel structural units **30** so that such panel structural units may support and distribute the roof loads in the manner of deep beams or girders.

The lower wall course **10** is provided by composite insulation-providing panels designated **45**, respectively. These panels may be what is known commercially as "Cemesto" board, wherein an inner thickness **45***a* of cellular board material, such as commercial "Celotex," is laminated between outer thicknesses **45***b*, **45***b* of asbestos cement board. The inner lamination **45***a* of cellular board material is of considerable thickness relative to the laminations **45***b*, **45***b* of asbestos cement board, and provides adequate insulation for the building. The outer asbestos cement laminations **45***b*, **45***b* provide weather-resistant facings of such rigidity and strength as effectively render the composite panel capable of performing a structural function in addition to merely "curtaining" the space between respective posts.

These composite panels **45** of the lower wall course **10** fit, at their upper edge portions, into the seats provided by the respective lower sills **38** and finish strips **39**, and fit flush against the edges of the flooring **24**, against the respective floor joists **22**, or plates **23**, according to whether the panels **45** are in the front, rear, or side walls of the building and against the respective foundation beams **17**, see especially Fig. 5.

The ends of the composite panels **45** contiguous with the outer faces of the respective posts **25**, may be secured to the posts **25** by nailing, or other type of securement. Batten strips **46**, see especially Fig. 11, are applied longitudinally of the composite panels **45**, being advantageously nailed to the respective joists **22**, as indicated at **47**. As illustrated, the composite panels **45** may extend somewhat below the top level of the foundation, so that the batten strips **46** are approximately at earth level, see Fig. 1.

The joinders between the ends of the composite panels **45** are finished off and made weathertight by means of special weather-sealing strip means of novel construction. Such of those weather-sealing strip means as are adapted for application to the corners of the building are illustrated in detail in Figs. 9 and 13. They comprise batten strips **48** of angular configuration adapted to fit about the corners of the building, and cloth tape **49**, **49**, impregnated with a tacky water-proofing compound, which may be asphalt or a composition of various water-proofing constituents, applied, preferably by the use of heat and pressure, to the inside faces of the legs of the batten strips. The weather-sealing strips may be secured in place by nails, as at **50**, Fig. 9, driven through the legs of the batten **48** into the composite panels **45** and posts **25**.

Similar weather-sealing strip means may be employed where the composite panels join with the door frame **9**, see Fig. 12. There, the batten strip **51** has an impregnated cloth strip **52** secured about the faces thereof which are contiguous to the panel and the door frame when the batten strip is secured in place.

The intermediate course **14** usually comprises a plurality of windows **55**, appropriately secured in window frames **56**, and a plurality of filler panels **57**. The filler panels **57** are preferably of the same composite, insulating type as the composite panels **45** of the lower wall course **10**, and are secured in place and weather-sealed in substantially the same manner as are the com-

posite panels 45. The windows and window frames, as well as the filler panels, may be arranged as desired to form an attractive looking exterior, as well as an efficiently lighted interior.

The upper wall course 11 is completed by the application, to the outside faces of the panel structural units 30 of composite insulating panels 58, similar to the composite panels 45. These may be secured in any suitable manner, as by gluing or nailing or otherwise, to the ends of the panel structural units 30 secured to the posts 25.

Composite panels 59 are applied to the lower and upper girts 36 and 37, respectively, and to the end roof trusses, for completing the gable end walls 13. Pre-formed louvre-type units 60 of siding boards, or other suitable material, are provided adjacent the ridge of the roof for ventilation purposes.

Roofing 61 of any desired type is applied in well-known manner to the roof construction, aforedescribed, to complete the roof of the building.

Weather-sealing strips of the type aforedescribed are applied at all exposed joints, the strips 62 and 63, Fig. 10, being applied immediately above and immediately below the lower sill elements.

The panels 45 effectively brace the entire building against wind pressures, as do likewise, but to a less important extent, the composite panels 58 and 59 of the upper wall course 11, and of the gable ends 13, respectively. Such composite panels, also, effectively insulate the building against heat and cold.

Whereas this invention is described with respect to a particular embodiment thereof, it should be clearly understood that many changes may be made in the particular embodiment, and many other embodiments may be constructed by those skilled in the art without departing from the spirit and generic purview of the invention as set forth herein and in the claims that follow.

I claim:

1. In wall construction, an aligned series of relatively widely spaced posts; deep panel structural units extending between said widely spaced posts, in end-to-end alignment adjacent the upper ends thereof; the said deep panel structural units each comprising a panel proper, fitting and secured at its ends in notches provided in the outer faces of mutually adjacent posts, so that it lies substantially flush with said outer faces of the mutually adjacent posts, a longitudinal ledger piece secured to the inner face of said panel proper adjacent the upper margin thereof, and resting, at its ends, on the top ends of said mutually adjacent posts and a longitudinal supporting piece secured to the inner face of said panel proper immediately below and contiguous to said longitudinal ledger piece, and fitting, at its ends, in notches of said mutually adjacent posts; and facing panels secured over the outer faces of said deep panel structural units and said posts and secured to the latter.

2. In building construction, spaced foundation piers, interconnecting beams supported thereon and secured thereto, floor joists supported upon said interconnecting beams, continuous plate means extending along the ends of said joists and secured thereto, spaced upright posts secured to said foundation piers, and panels secured to adjacent upright posts and to the plate means and floor joists, said panels overlying the outer surface of said interconnecting beams and extending beneath the upper surface thereof.

3. Building construction comprising foundation means; a unitary structural framework including posts secured to and extending upwardly from said foundation means at widely spaced locations therealong defining the general peripheral configuration of the building, elongated, deep panel wall units extending between and secured to mutually adjacent posts adjacent the upper ends thereof only, tying said posts together and serving in the capacity of deep beams for receiving, and transmitting to the posts, roof loads, said deep panel wall units embodying ledger means intimately secured thereto along the respective upper margins thereof and extending into engagement with respectively adjacent posts, and said deep panel wall units being placed to receive load-imparting elements of the roof structure of the building; roof structure having load-imparting elements engaging and supported by said ledger means; and insulating, curtain wall structure enclosing the said structural framework and providing outer peripheral walls for said building construction, said curtain wall structure comprising panel wall units having a body of insulation material faced with relatively dense and hard weather-resistant panels, said panel wall units being secured to said structural framework so as to insulate and finish the walls of said building construction and to reinforce and strengthen said structural framework.

4. Building construction as recited in claim 3 wherein the deep panel wall units are inset into the outer faces of the posts against which they are secured so that their outer panel faces are flush with the said outer faces of the posts.

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