

Nov. 6, 1951

C. J. VOGEL

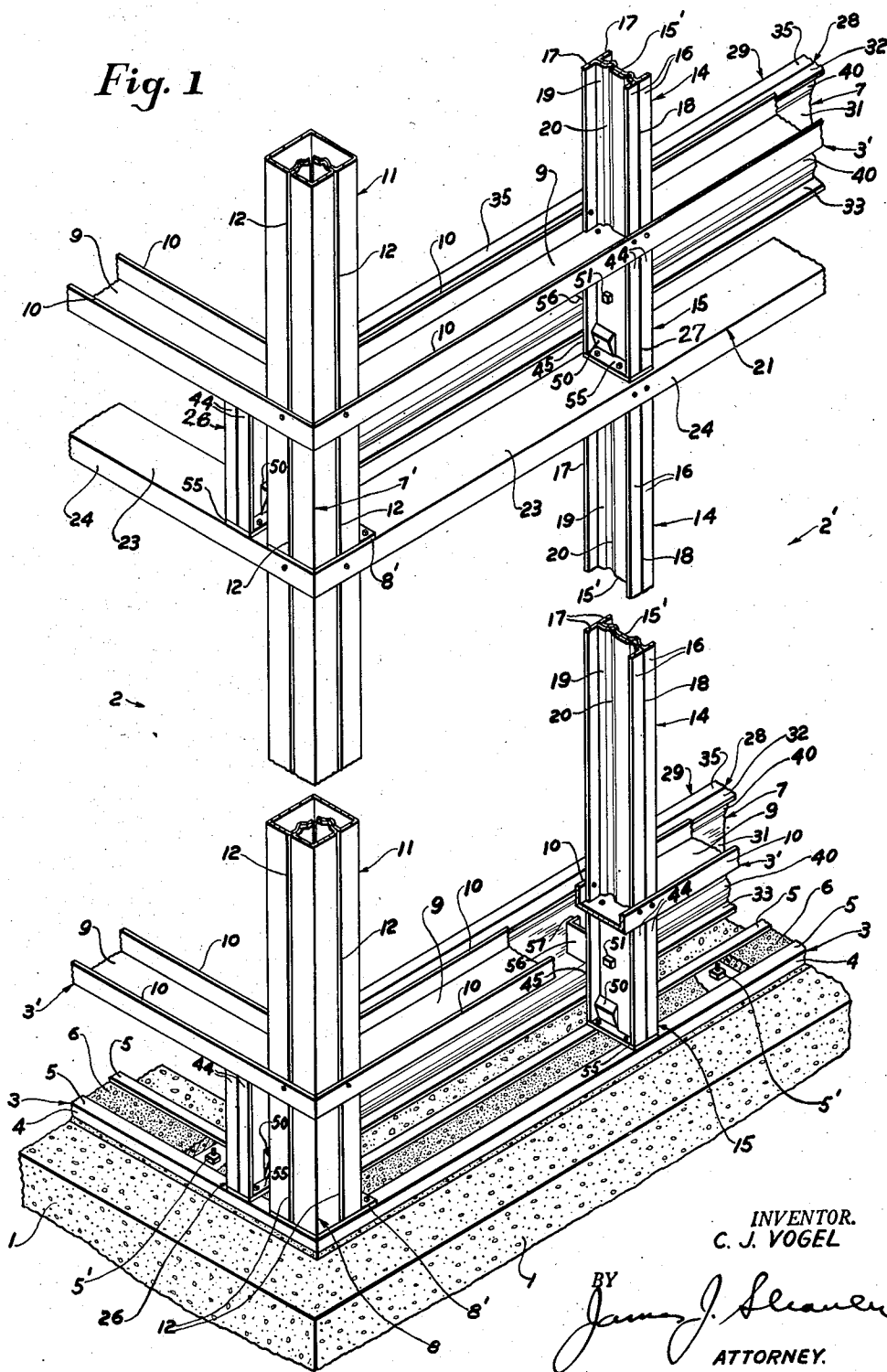
2,574,074

BUILDING CONSTRUCTION

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5 Sheets-Sheet 1

Fig. 1



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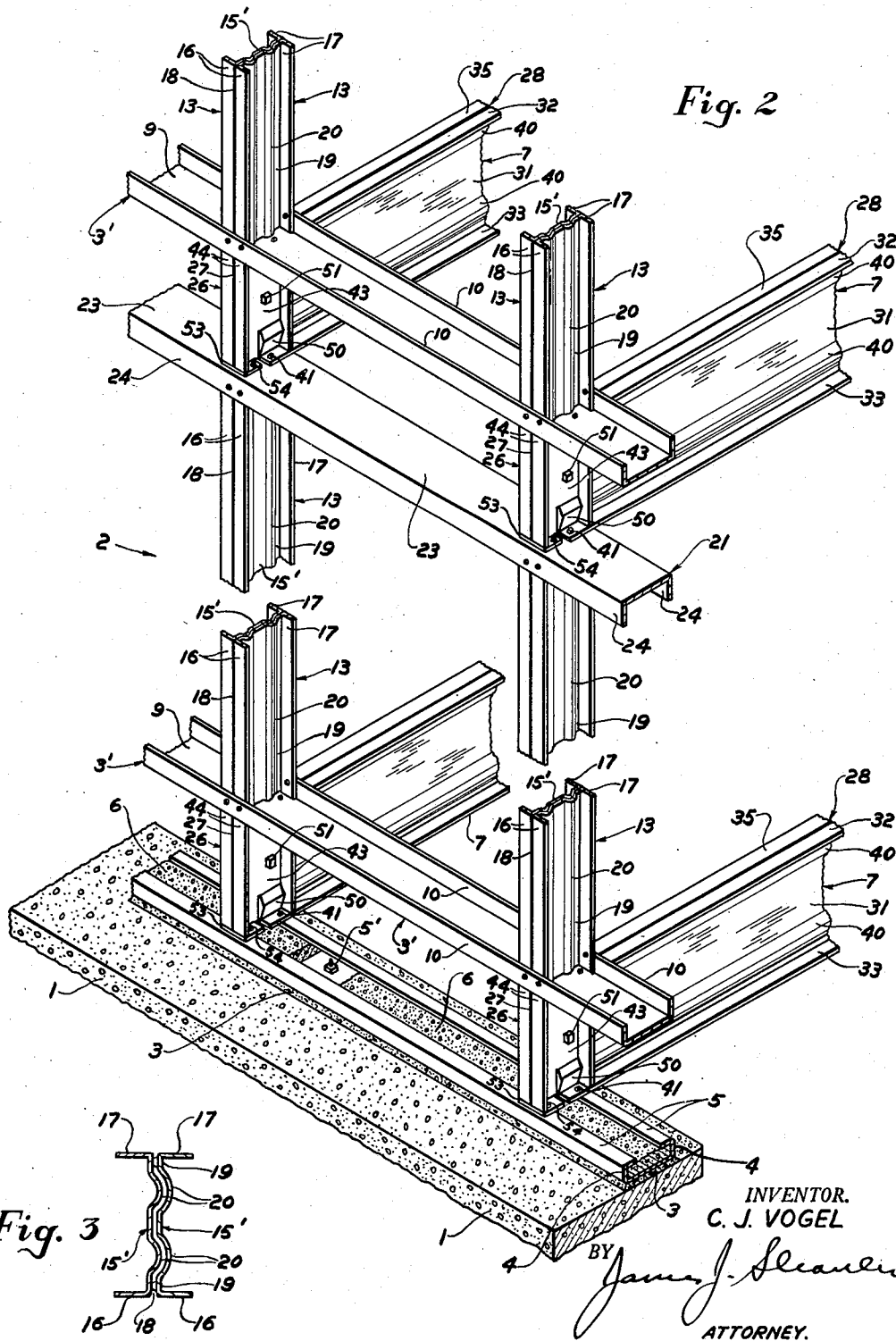
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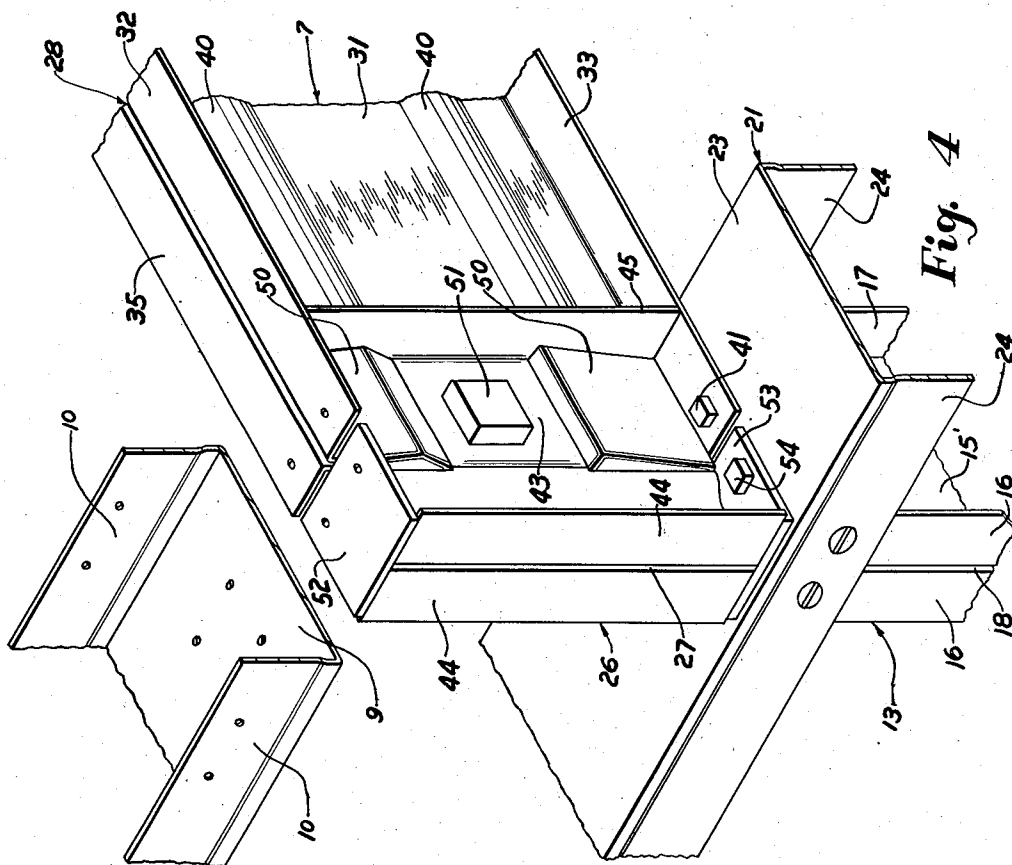


Fig. 4

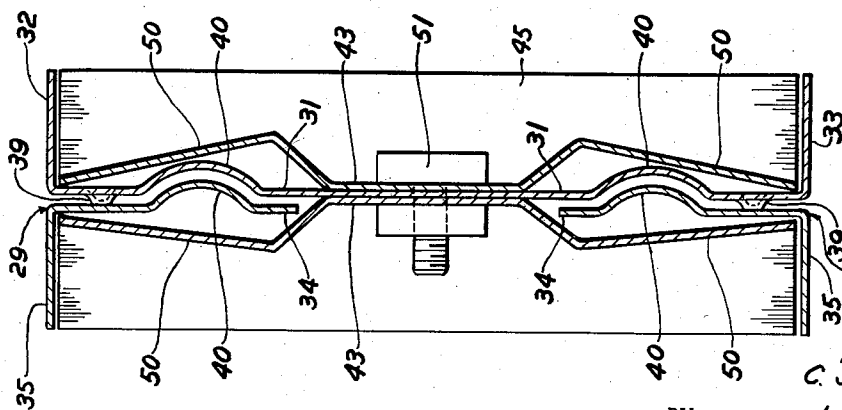


Fig. 7

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*Fig. 6*

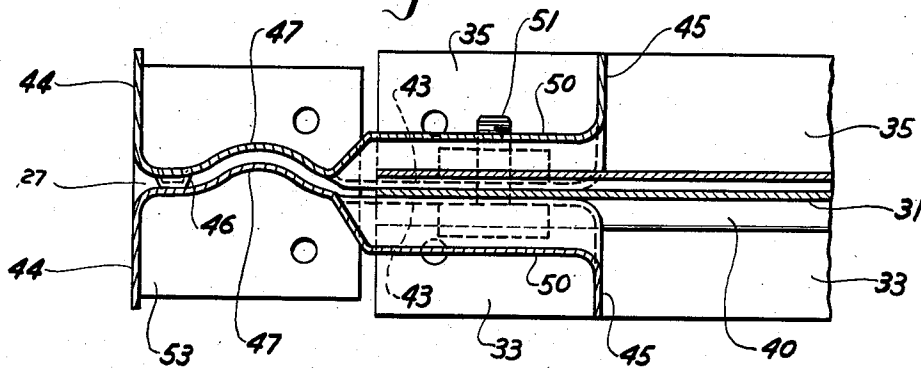
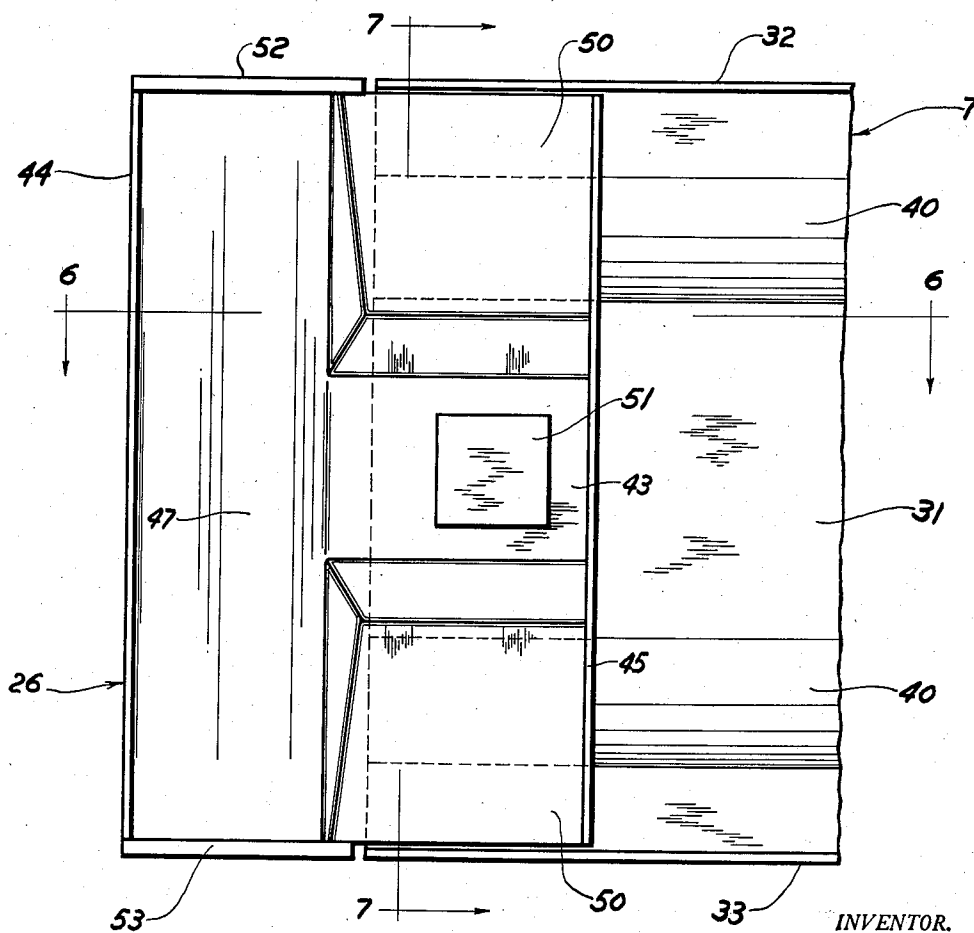


*Fig. 5*

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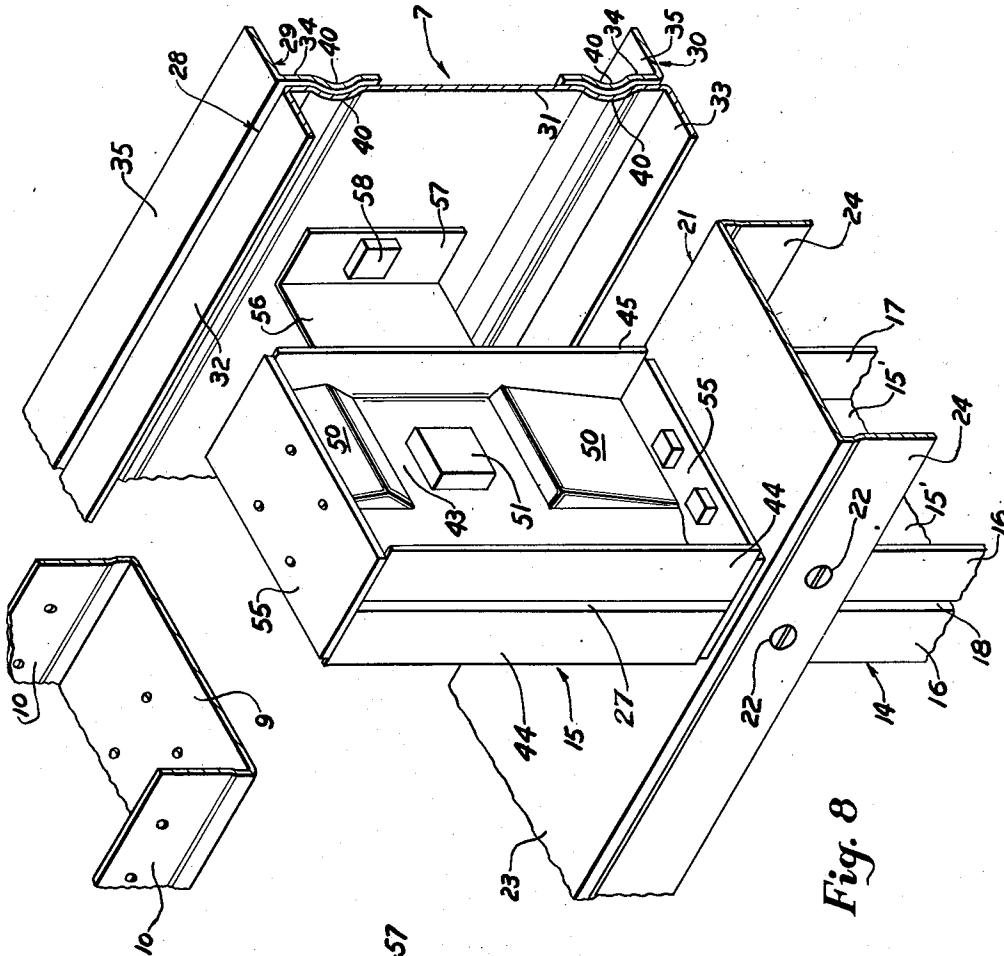
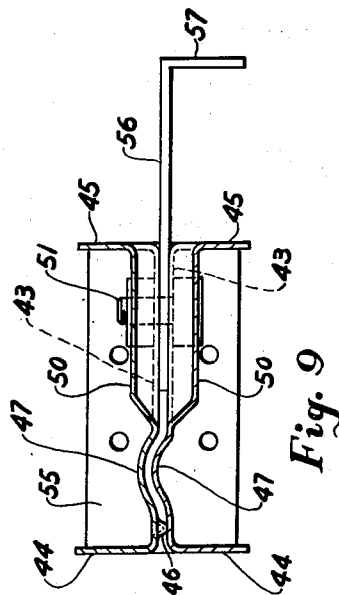
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BUILDING CONSTRUCTION

2,574,074

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5 Sheets-Sheet 5



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## UNITED STATES PATENT OFFICE

2,574,074

## BUILDING CONSTRUCTION

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Application November 28, 1945, Serial No. 631,342

7 Claims. (Cl. 189—1)

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This invention relates generally to building construction and more particularly to a nailable extension or filler member therefor.

In the construction of exterior walls in certain types of buildings, it is a general practice to employ, among other structure, vertically spaced horizontal frame members at the building foundation and at each floor thereabove to support floor and ceiling structure and also to tie together ends of the wall studs. Of these frame members, the lower of each story of a building are usually referred to as plates and the upper as caps. At each floor there is supported on a pair of the opposite caps, the ends of spaced floor joists respectively located at the studs and on which the plates rest, the floor joists extending transversely to the opposite side wall caps and plates and consequently parallel to the end wall caps and plates. It has also been the general practice, to provide short, so-called tail joists extending from the end wall caps and plates at the stud locations to the adjacent floor joists to give added support to the flooring. While this construction is generally accepted as preferred to certain types of buildings, it also presents a problem, particularly where exterior collateral material is to be secured to studs which have nail receiving and clinching grooves therein for the nails. The problem here is that in the wall areas between adjacent floors and ceilings or between the adjacent caps and plates, the studs and consequently the nailing grooves, are usually interrupted in the opposite joist supporting side walls by the presence of the ends of the joists and are interrupted in the end walls by the presence of the ends of the short so-called tail joists which usually connect the end caps and plates to the adjacent parallel floor joists and support the caps of each pair. Consequently, with the above arrangement either the nails must be omitted altogether in these areas where the nailing grooves are omitted or some other, more expensive and difficult to apply securing means must be used, either of which is, of course, objectionable.

Accordingly, it is an object of the present invention to provide a new and improved building framework in which the above mentioned objection is obviated without departing from the generally accepted framework construction with respect to loads, stresses, etc.

Another object of the invention is to provide a new and improved floor joist having novel extension structure of a character to provide vertical nailing grooves between the spaced pairs of

frame members without affecting the load supporting function of the floor joists.

Another object of the invention resides in the provision of a spacer or filler member of a character presenting an outwardly facing nailing groove to aid toward continuity of vertically extending nailing grooves in studs of the building.

A further object of the invention is to provide for use between a spaced cap and plate, a filler member of a character to increase the nailing groove area and also to eliminate need for the above mentioned so-called tail joists.

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

Figure 1 is a fragmentary, isometric exterior view of a corner of a building framework embodying features of the present invention;

Figure 2 is an isometric, fragmentary view of one of the building framework walls of Figure 1, intermediate the corners of the building;

Figure 3 is a cross sectional view of one of the building framework exterior wall studs;

Figure 4 is an enlarged fragmentary, isometric view of the building framework showing certain details of construction of the wall frame of Figure 2 and associated floor supporting structure;

Figure 5 is a side elevational view of a joist extension and filler member forming part of the building framework;

Figure 6 is a horizontal sectional view of the joist extension and filler member taken along the line 6—6 of Figure 5;

Figure 7 is a vertical sectional view of the joist extension and filler member taken along the line 7—7 of Figure 5;

Figure 8 is a fragmentary, isometric view of the building frame structure including a modified form of filler member used with the end frame members; and

Figure 9 is a cross sectional view of the modified form of filler member of Figure 8.

In the drawings, which show a preferred form of the invention, the numeral 1 designates generally a building foundation which is preferably constructed of concrete, as shown in Figure 1. A building framework, constructed on the foundation 1, is preferably of steel construction and includes the framework for exterior walls of the building, two of which are partially shown and designated generally by the numerals 2 and 2'. For convenience of description, the framework 2 is herein referred to as the side wall framework and the framework 2' as the end wall framework.

although these could be the frameworks of any two adjacent exterior walls of the building. The side and end wall frameworks each includes a pair of spaced, horizontal frame members at the foundation including a lower frame member or plate 3 and an upper frame member or plate 3' which are located at or adjacent the first floor of the building. The plate member 3, which is supported on the foundation 1, is of general channel-like cross section having upstanding side reinforcing flanges 4 preferably provided with upper intumed horizontal portions 5. A plurality of apertures is provided in the plate 3, in spaced relation longitudinally thereof to receive upstanding anchor bolts 5' which are partially imbedded in the concrete foundation and onto which nuts are threaded to draw the plate members 3 down toward the foundation 1. After the concrete foundation has hardened, a ribbon or bed of mortar 6 is preferably laid thereon for each wall framework to acquire level seating surfaces for the plate members 3 which are laid on the mortar strips before the mortar hardens and are leveled by the proper or careful drawing down of the anchor bolt nuts. After the channel-like plate members 3 are leveled, they are preferably filled with grout or similar cementitious material which will act in conjunction with the plate members 3 to provide a rigid beam, securing the framework and its concrete foundation together as a solid unitary structure.

As shown in Figures 1 and 2, the intumed, horizontal flange portions 5 of the plate members 3 provide seating surfaces on the inner flange portions of which rest end portions of spaced floor joists 7 which extend transversely to the side wall frame members 3 and therefore extend parallel to the end wall frame members 3. As shown, the end floor joists are located close to the pairs of end wall plate members 3, 3' to provide adequate support in this area for flooring (not shown). The upper plate members 3', seat on the upper surfaces of end portions of the joists 7 and also seat on upper ends of corner filler or post extension members 8, see Figure 1. These corner filler members 8 each preferably has a base plate 8' welded to the lower end thereof which plate rests on the horizontal flange portions 5, of the lower plate members 3, the base plate 8' being secured to the flange portions 5 such as by self-threading screws thus, serving also as corner splice plates.

The upper plate members 3' of the first floor each comprises a flat, elongated plate portion 9 having upturned side reinforcing flanges 10 between which the lower ends of corner posts or columns 11 seat on the base plate at each exterior corner of the building. These corner posts 11 align with the corner filler or post extension members 8 and are preferably of the same form in cross section. As shown, aligning apertures may be provided in the upper plate member flanges 10 and in the posts to receive self-threading screws for securing the parts together. Also the corner posts 11 and the filler members 8 are sectionally constructed to provide nailing grooves between internal spaced flanges thereof, the nailing grooves having vertically extending openings 12 in the outer post walls to receive nails for securing collateral material (not shown) to the framing. The side and end wall frame structures 2 and 2' further include a plurality of spaced studs 13 and 14 respectively which have their lower ends seating on the upper plate member 3' between the upturned flanges 10, the

flanges 10 and the studs 13 preferably having aligning apertures to receive self-threading screws to secure the parts together. Beneath and in alignment with each of the end wall studs 14 is provided a frame member in the form of a stud extension or filler member 15 which is hereinafter described in detail.

With particular reference to Figure 3, each of the studs 13, 14 is constructed preferably of a pair of channel members each having a web 15' provided with side reinforcing flanges 16, 17. The stud channel members are arranged so that their corresponding outer web surfaces are in relatively spaced, opposed relation with corresponding flanges thereof oppositely directed and in vertical co-planar relationship. When erected the studs 13, 14 are arranged so that the outer surfaces of one pair of co-planarly arranged flanges such as for example, flanges 16, face outwardly of the building and, of course, the outer surfaces of the other pair of stud flanges or flanges 17 will face inwardly of the building. These flanges 16, 17 provide good seating surfaces or support for exterior and interior collateral material (not shown) to be secured to the studs 13. The spaces between the pair of channel webs 15' of each stud provide vertical grooves 18 to receive securing elements, such as nails, for securing collateral material to the studs 13. The webs 15' of the stud channel members preferably are provided with spaced, outwardly extending hollow bosses 19 formed out of the webs 15' to space them apart and, at these hollow bosses 19, the channel-like members are preferably welded together. In addition, the webs 15', adjacent their flanges 16 and 17, are deformed, preferably having complementary sinuous portions 20 to deform and clinch nails driven into the grooves whereby to increase resistance to the withdrawing or working loose of the nails.

At the second floor of the building, the side and end wall frame structure 2 and 2' respectively include a lower horizontal extending frame member or cap 21 which may be of the same form and construction as the upper, first floor plate 3'. The lower second floor cap member 21 comprises an elongated plate portion 23 seating on the upper ends of the first floor studs 13, 14 and having downturned, side reinforcing flanges 24 between which the upper ends of the first floor studs 13, 14 extend to be secured thereto preferably by self-threading screws. Except for the lower plate members 3 of the first story, the framework for each story is duplicated and therefore in the drawings, like parts are designated by like numerals.

In order to retain the desired established structural building principles with respect to loads, stresses, etc., and yet provide for the nailing of exterior collateral material to the structure in the areas between adjacent floors and ceilings, I provide nailable frame members 26 in the form of stud extensions or filler members carried by and at opposite ends of the floor joists 7. These frame members 26 are so constructed and arranged as to present outwardly facing, vertically extending nailing grooves 27 in the areas adjacent floors which nailing grooves, preferably substantially align with the nailing grooves of the side wall studs 13, see Figure 2. The structure of the floor joists 7 each preferably comprises, a channel member 28 and a pair of angle members 29, 30 co-operating to provide a joist of general I-beam cross section. The channel member 28 includes an elongated web 31 which when the joist is in

position is in a vertical plane extending between the side wall frame members, the web 31 having an upper side reinforcing flange 32 and a lower side reinforcing flange 33 extending laterally from one side thereof. The angle members 29, 30 each include an elongated leg or web portion 34 secured to the web 31 and having an outturned flange 35 oppositely directed to and in co-planar relation with the upper and lower web flanges 33 thus providing good upper and lower seating surfaces for floor and ceiling structures (not shown). Like the stud construction, the floor joists may have extended portions or hollow bosses 39 formed out of the web 31 thereof to space the web 31 and leg portions of the angle members apart and these parts may be welded together at these bosses to provide a rigid three-part structure. Also, the webs 31 and the adjacent angle legs 36 are preferably distorted or are provided with substantially complementary sinuous web portions 40 adjacent their upper flanges and adjacent their lower flanges for similarly deforming and clinching nails driven into the nailing grooves to increase resistance to the withdrawing or working loose of the nails.

As shown in Figures 1 and 4, the floor joists 7 which are pre-cut are of a length preferably such that opposite ends thereof extend substantially to the longitudinal centers of the plate and cap members of the side wall structure 2. Apertures in the upper and lower floor joist flanges aligning respectively with apertures in the upper and lower plate members may be provided to receive bolts 41 to secure the floor joists rigidly to the outer frame members or these parts may be secured together by any other suitable means.

Referring now in detail to the frame members 26, these members each includes a pair of channel members having webs 43 with the corresponding surfaces thereof in spaced opposed relation and each having a pair of oppositely directed side reinforcing flanges 44, 45 respectively in co-planar relation. As is shown more clearly in Figure 4, each of the frame members 26 is arranged between the upper and lower plate members at each floor or between a plate and adjacent cap, respectively in end alignment with one of the floor joists 24 and in vertical alignment with the studs 13. Also, the frame member 26 is arranged to seat on one end thereof with the webs 43 in vertical planes and with the outer surfaces of the reinforcing flanges 44 disposed so that the opening of the nailing groove 35 faces outwardly, substantially in vertical alignment with the openings of the stud nailing grooves. Thus, the frame members 26 contribute substantially toward the continuity of the vertical nailing grooves of the side wall framework. Like the stud and floor joist construction, the frame member webs 43 may have extended portions or bosses 46 to space the webs the proper distance apart to frictionally receive nails, the webs 43 preferably being welded together at the bosses 46. Also adjacent the outwardly disposed flanges 44, the webs 43 are preferably formed to provide complementary sinuous portions 47 for deforming nails driven into the sinuous grooves whereby to increase resistance to the working loose of the nails.

Inner end portions of the frame member webs 43 are spaced apart sufficiently, as at 46, Figure 6, to receive therebetween in telescopic relation, the web 31 of the floor joists 7, the upper and lower flanges of the joist 7 fitting respectively over and under the top and bottom of the frame member 26. The width of the frame member 26, i. e.,

the distance between its outer flanges 44 and its inner flanges 45, is preferably the same as the distance between the corresponding flanges of the studs 13 and, as a matter of fact, the frame member 26 serves as a relatively short stud in addition to its functions as a nailing groove spacer member and as an end extension for the floor joist 7. In order to permit entrance of the floor joist web 31 between the webs 43 of the frame member 26 without interference between the parts, the frame member webs 43 at top and bottom thereof and adjacent the inner flanges 45 are provided with oppositely extending, offset dished portions 50 to clear the sinuous web portions 40 of the joist webs, see Figure 7. Between these upper and lower offset, dished portions 50, the frame member webs 43 and the floor joist web 31 are preferably secured together by a bolt and nut 51, the webs being provided with aligning apertures to receive the bolt. An upper supporting plate 52 and a lower supporting plate 53 are provided and secured to the upper outer end and lower outer end respectively of the frame members 26, these plates seating against the end edges and a portion of the end of the webs 43 not covered by the flanges of the joist 26. The plates 52, 53, provide additional supporting surface for contact with the lower and upper horizontal plates and caps respectively and are preferably welded to the end edges of the frame members 26. The frame members 26 may be secured to the upper and lower horizontal frame members respectively by bolts and nuts 54 or by any other suitable securing means.

The modified form of frame member 15, shown in Figures 1, 8 and 9, is adapted as previously mentioned for use along end walls of the building and since this frame member 15 may be structurally similar to the frame member 26, like parts have been herein given like numerals to avoid repetitious description. As shown, the frame member 15 is arranged to align, one with each of the end wall studs 14, and present outwardly, the opening or entrance 27 into the nailing groove. In this instance, the upper and lower end edges of the filler member 15 are covered by larger support plates 55 extending from the outer to the inner flange edges to provide good seating surfaces to engage the end wall horizontal plate and cap members. The supporting plates 55 may be welded or otherwise secured to the ends of the channel members and preferably these plates 55 and the plate 23 of the cap 21 are provided with aligning apertures to receive bolts for securing the parts together. Secured to the web 31 of the frame member 15 is one leg 56 of a plate-like tie member having a laterally bent end portion 57 for seating against the opposed web surface of the adjacent or end floor joist 7. The floor joist webs 36 and the bent end portions 57 of the tie member are preferably provided with aligning apertures to receive a bolt 58 on which a nut is screwed to secure the parts together. These end wall frame members 15, in addition to providing nailing groove extensions and functioning as supports, also eliminate the need for the previously mentioned tail joists. While the channel members of the frame members 15 and 26 are alike and interchangeable in the interest of mass production, it will be seen that if desired, the dished-out portions 50 may be omitted from the stud extensions 15.

From the foregoing description, it will be seen that, if desired, the joist 7 and its opposite end frame or extension structures 26 may be assem-

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bled at a plant and shipped as a complete assembly for erection as such at a building site. However, due to the construction of these floor joists 7, it is also possible and in some instances may be desirable to package and ship the center section and end extensions of the floor joists separately. The floor joists 7 can be conveniently assembled at the construction site on the ground for final erection as a unit or the joists may be assembled during the course of the construction of the building. In the latter case, for example, after erection of the building has progressed to the point where the lower horizontal plate members 3 have been secured together and to the lower studs 13, 14, the floor joists 7 may be laid in place and be secured by the bolts 41 to the frame member after which the frame or end extension members 26 may be shoved into place with the webs 43 thereof in telescopic relation with the web 31 of the joist proper or center section 7. The bolts 51 may then be applied and the nuts tightened down to rigidly secure the parts together, and nuts on the bolts 54 may be tightened for additionally securing the end extensions 26 to the lower horizontal plate members 3. While, as above pointed out, the joist extensions could be erected separately from their joist proper or center section 7 during the course of construction of the building, the first method is preferred since the pre-assembled joist carrying the extensions 26 at opposite ends thereof can be readily and quickly swung into place as a unitary structure. With the end wall caps 21 secured in place to the upper ends of the end wall studs 14, the frame members 15 may be positioned on the caps in spaced relation and preferably in alignment respectively with the studs 14 for best load distributing conditions. The upper horizontal plate members of the side and end walls respectively may be positioned on and secured to the frame members 7 and to the frame members 15 and be bolted rigidly thereof. The tie members 53, at the bent ends 57 thereof, are bolted to the web of the adjacent end floor joist 7 which tie member provides, in addition to a more rigid structure, for the proper aligning of the frame 15 with their respective studs.

Thus, it will be seen that I have provided a building framework having the desired structural parts and arrangement thereof with respect to building loads and yet one which permits the use of nails in the areas between adjacent floors and ceilings for the securing of exterior collateral material to the framework of the building. This is accomplished by the provision of floor joists, carrying frame or end extension members having nailing grooves and positioned in vertical alignment with the studs so that building loads are properly concentrated thereon. In addition to the nailable frame members or extensions serving as structural parts of the floor joists and exterior wall framing, they also function as spacers or fillers to which collateral material may be nailed. Also, this joist structure, as a unit, is easily swung into place and secured to the horizontal frame members.

I claim:

1. In building construction having a joist web including a laterally extending nail receiving and distorting means, an extension member for the joist web comprising, a web having a slot opening at one end to receive the joist web and having a sinuous slot at the other end to receive securing elements for securing material to the extension member, and recessed portions in the web

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of the extension member for clearance with the laterally extending nail receiving and distorting means.

2. A building element comprising, a pair of channel members secured together with the corresponding webs thereof in spaced relation to provide a nailing groove, the webs including laterally disposed means for distorting and clinching nails driven into the groove, a plate overlying and secured to adjacent ends of the channel members to increase the seating surface, a second plate overlying and secured to the other ends of the channel members to increase the seating surface, and a pair of spaced outwardly dished portions formed out of one of the webs and disposed respectively adjacent said first and said second plates.

3. A joist extension for use with a joist having a web and top and bottom laterally extending flanges, comprising a web and top and bottom laterally extending seating surface portions, the joist extension having an outwardly facing sinuous nailing groove for the attachment of material and the web of the joist extension including a portion adapted to extend along the joist web in overlapping relation therewith and to extend between the top and bottom joint flanges with the seating surface portions coplanar with the flanges of the joist, and attachment means for fastening the web portion of the joist extension to the joist web.

4. A joist extension for use with a joist having a web and top and bottom laterally extending flanges, comprising a pair of spaced webs and top and bottom laterally extending seating surface portions, the spaced webs of the joist extension defining an outwardly facing sinuous nailing slot at the end of the joist extension for the attachment of material and the spaced webs including portions adapted to extend along the joist web in telescoping relation therewith and to extend between the top and bottom joist flanges with the seating surface portions coplanar with the flanges of the joist, and attachment means for fastening the web portions of the joist extension to the joist web.

5. In a building frame structure, a lower stud having a substantially vertically extending nailing slot with an opening therein to facing one direction, a horizontal frame member supported by the stud, a second horizontal frame member substantially immediately above the first named frame member, an upper stud supported by the second named frame member in substantially vertical alignment with the lower stud, said upper stud having a substantially vertically extending nailing slot with an opening therein to facing in said one direction, a horizontal laterally extending floor joist having a web and upper and lower laterally extending flanges presenting upper and lower seating surfaces in coplanar arrangement, respectively, with the opposed upper and lower surfaces of the frame members, and a joist extension member having a web and upper and lower laterally extending flanges presenting upper and lower seating surfaces in coplanar relationship with the seating surfaces of the joist, said joist extension member being disposed between the frame members with the upper and lower seating surfaces engaging the opposed surfaces of the frame members and being disposed in vertical alignment with the upper and lower studs and presenting a sinuous nailing slot with an opening therein to facing in said one direction, and said joist ex-

tension member including a web portion extending along the joist web in overlapping relation therewith and extending between the upper and lower joist flanges, and means fastening the web portion of the joist extension member to the joist web.

6. In a building construction, a pair of vertically spaced apart horizontal frame members forming part of a wall and presenting upper and lower opposed surfaces, a laterally extending horizontal floor joist including a vertical web and upper and lower laterally extending flanges and having one end interposed between the frame members and extending part way thereacross with the upper and lower flanges engaging the upper and lower opposed surfaces, respectively, a joist extension having a web and upper and lower laterally extending seating surface portions and including an outwardly facing sinuous nailing groove for the attachment of material, the joist extension being positioned at one end of the joist and interposed between the frame members with the upper and lower seating surface portions engaging the upper and lower opposed surfaces, respectively, and with a portion of the web extending along the joist web in overlapping relationship therewith and extending between the top and bottom joist flanges, and attachment means fastening the portion of the joist extension to the joist web.

7. In a building construction, a pair of vertically spaced apart horizontal frame members forming part of a wall and presenting upper and lower opposed surfaces, a laterally extending horizontal floor joist including a vertical web and upper and lower laterally extending flanges and having one end interposed between

the frame members and extending part way thereacross with the upper and lower flanges engaging the upper and lower opposed surfaces, respectively, a joist extension having a pair of spaced web members providing an outwardly facing sinuous nailing groove therebetween and having upper and lower laterally extending seating surface portions, the joist extension being positioned at one end of the joist and being interposed between the frame members with the upper and lower seating surface portions engaging the upper and lower opposed surfaces, respectively, and with the web members extending along the joist web in telescoping relationship therewith and extending between the top and bottom joist flanges, and attachment means fastening the web members of the joist extension to the joist web.

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