

Nov. 17, 1942.

C. A. DAYTON

2,302,194

ARRANGEMENT FOR THE FRAMING OF WOODEN STRUCTURES

Filed July 2, 1940

4 Sheets-Sheet 1

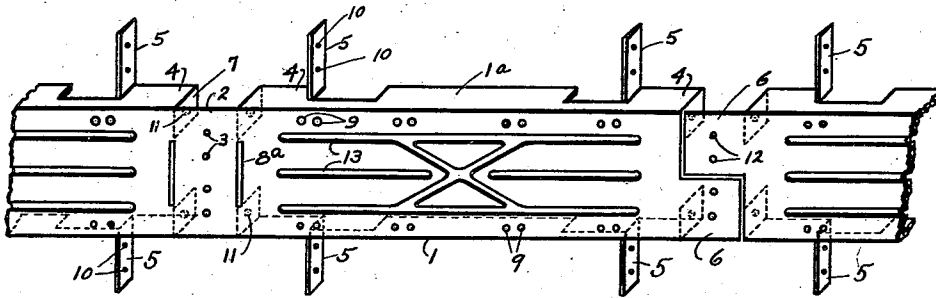


Fig. 1.

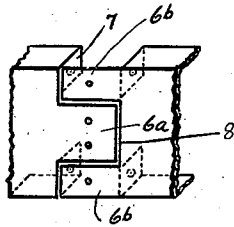


Fig. 2.

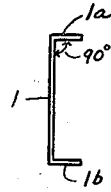


Fig. 3.

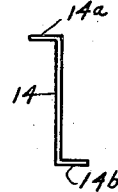


Fig. 4.

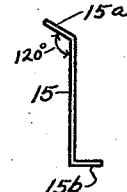


Fig. 5.

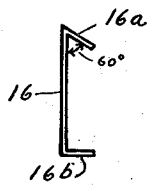


Fig. 6.

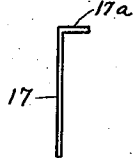


Fig. 7.

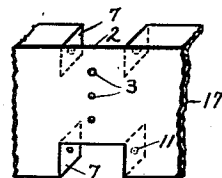


Fig. 8.

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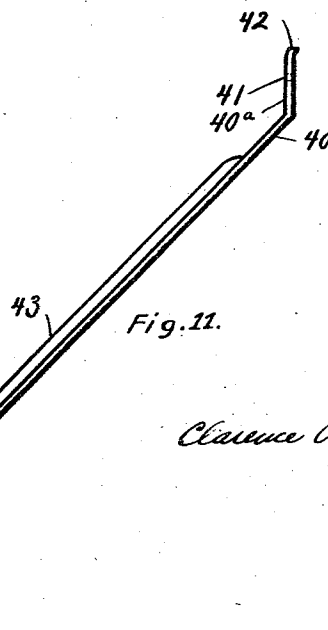
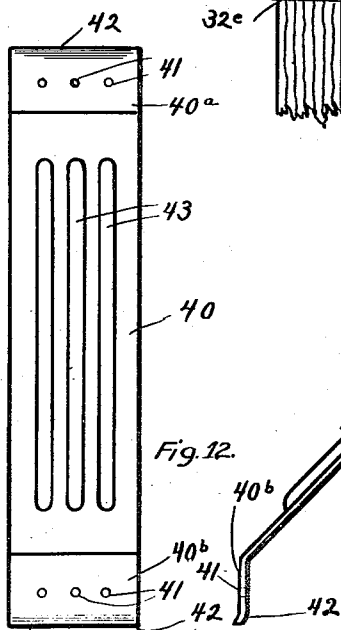
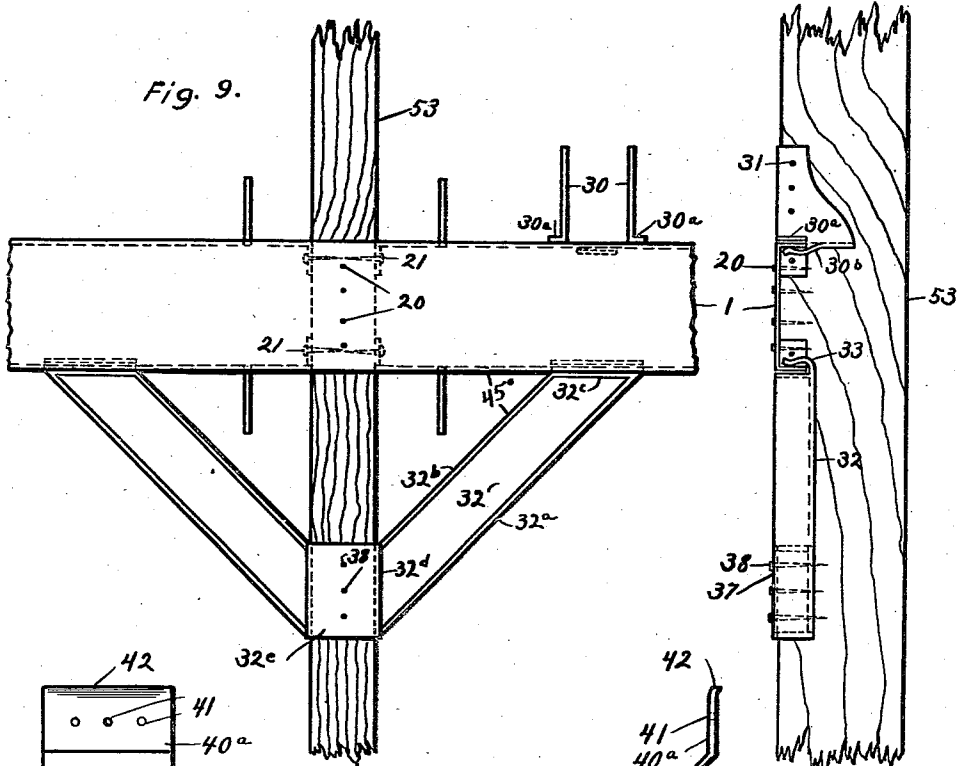
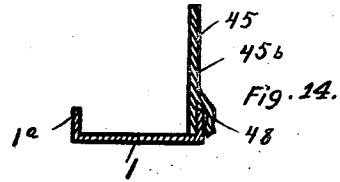
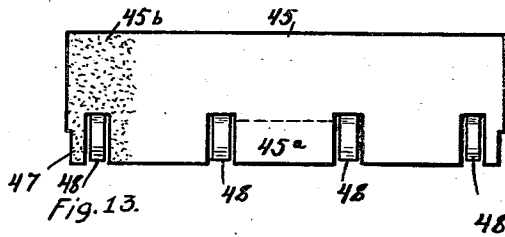


Fig. 10.

Fig. 11.

Fig. 12.

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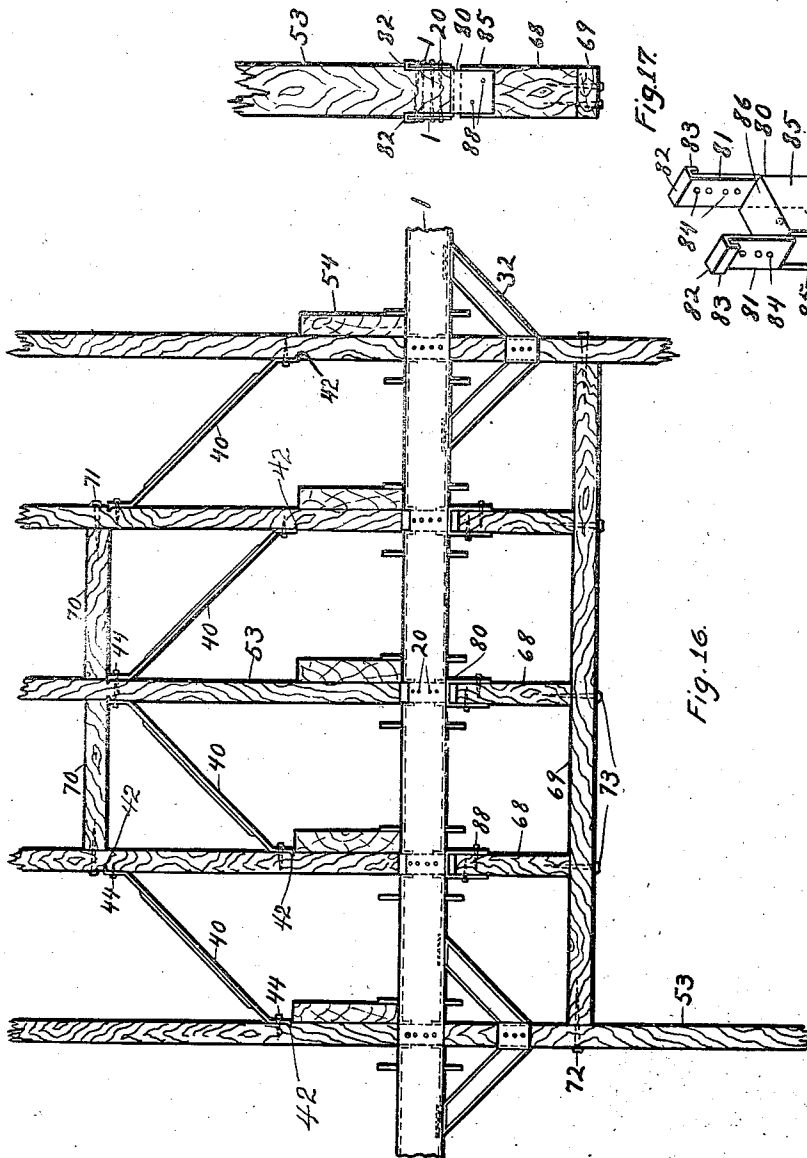


Fig. 16.

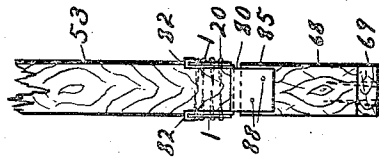


Fig. 17.

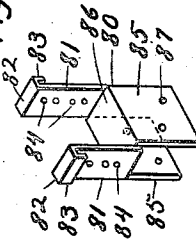


Fig. 15.

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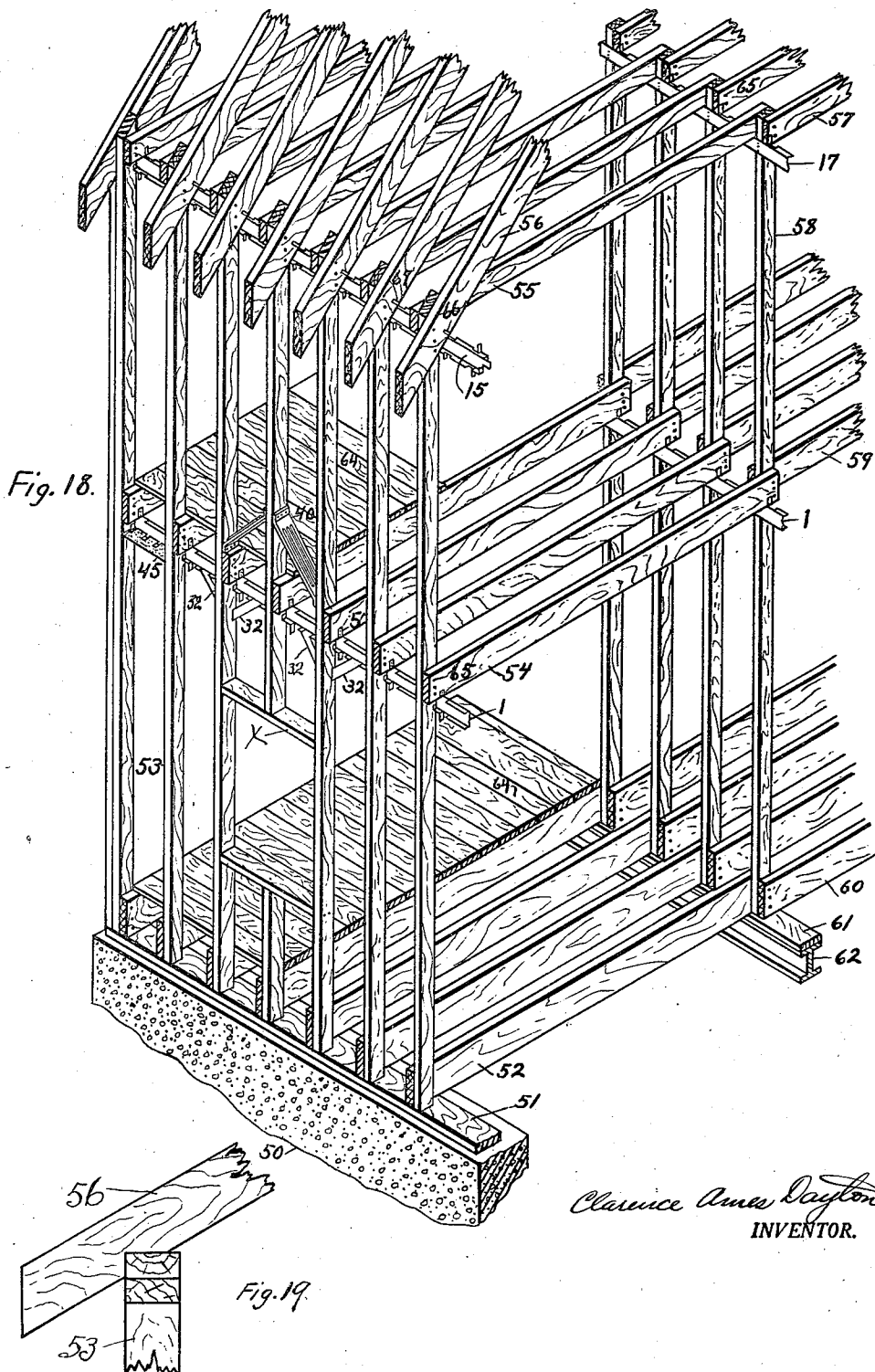
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UNITED STATES PATENT OFFICE

2,302,194

ARRANGEMENT FOR THE FRAMING OF
WOODEN STRUCTURES

Clarence Ames Dayton, Rock Island, Ill.

Application July 2, 1940, Serial No. 343,635

1 Claim. (Cl. 20—94)

My invention relates to an improved arrangement for the framing of wooden structures, particularly buildings, and more especially to the inclusion of a metallic member designed to arrange, support and hold wooden timbers or members in the proper coordinated positions for the economical erection of such wooden frame structures.

The present practice in the wooden building construction of supporting the floors, ceilings, and rafters from joists, beams and other cross-timbers set on capped studding results in uneven shrinkage of the structure due to the difference in the shrinkage factors of timbers set end-to-end and edgewise; to the multiplicity of bearing surfaces; to the factor known as the personal equation—which varies with individuals employed in the erecting process and practically assures a non-uniformity of contact intensity, since the method of anchoring or joining said timbers is by use of nails, spikes, screws, or other driven or screwed devices the holding power of which depends on the manner, method, and care of application by the individual builders. It also relates to the factor that when two timbers are joined, particularly, by nailing, the holding power of the nails is greater when the nails are driven at right angles to the surfaces of contact between the timbers than when driven inclined to the surfaces of contact. The lateral resistance of nails when driven parallel to the fibers of the timber is only $\frac{1}{2}$ or less of that when driven perpendicular to the fibers. The combination of these factors causes cracking of plastered walls, interferes with the smooth operation of doors and windows being a common cause for the distortion of door and window frames and reduces the ability of the structure to withstand strains and stresses due to wind, live floor and roof loads, earth shocks and other vibratory elements.

Bearing these inherent characteristics of wooden buildings and their methods of construction in mind, it is the principal object of my invention to provide a metallic member or unit which spaces the studs, supports the joists and rafters in their proper relationship to the studs, facilitates the erection of these elements of the structure; increases the stability of the structure as a whole; eliminates the cutting of notches or sawkerfs in studding or recesses in the studding for the introduction of horizontal ribbands in certain forms of construction, which weaken the studding due to lessening the cross-sectional area of the studs at the places where cut; decreases the tendency for non-uniform shrinkage due to the fact that the floor, ceiling and rafter systems are

supported by full building height studding wherever possible, reduces the quantity of timber required and lessens the labor needed for erection. All this is accomplished without any radical departure from current methods of wooden building construction.

The main objectives of my invention are accomplished by the employment of metallic members in the form of a channel, Z, angle, L, or modification of these forms which provide a plurality of spaced recesses for the engagement of studs, these spaced recesses to be made any desired standard or special spacing; a plurality of seats and guides, adjacent to the spaced recesses, to receive and support in position the joists, rafters or other cross-timbers comprising the supports for floors, ceilings, roof or other parts of the structure, which together with the use of certain appurtenances secures benefits in economy of construction not possible by other means or devices for framing wooden structures. These appurtenances include a V-bracket, a U-clip, a U-hanger, a stretched-Z brace, and a clip-on insulated plate. The V-bracket is designed to afford additional support and stiffness to the principal spacer support member, where openings are spanned, without the necessity for the double studding and header methods usually employed in the present conventional method of framing around openings. The U-clip is attached to the flange of the joist supporting and holding stud-spacing unit where it is desired to introduce an additional joist to support a partition or other superimposed extra load on the floor system. The U-hanger is used in conjunction with two channel sections, between which it hangs with its hands resting on the channels. It is inserted in the stud spacer recess and used to support a stud over an opening or other gap in the framing arrangement. The elongated-Z brace is employed in conjunction with the V-bracket to transfer the principal reaction of a suspended wooden member to an adjacent fixed member in such fashion as to cause it to be firmly held in position without harmful movement under load. It is also used in locations where it is desired to transfer stress as from one unit or member of a structure to another; to increase the resistance to stress; and to otherwise increase the strength, rigidity, and ability of the structure to resist imposed forces tending to distort, strain, or otherwise impair the efficiency of the framing. The clip-on insulated plate is for the purpose of creating a fire-stop just below the floor level by attaching it to the lower flange of the joist supporting stringer. This

plate is so designed as to almost completely fill the space between the studs and the outside and inside walls thus preventing or retarding fire from getting beyond the stop plate.

The present types of framing systems used in erecting wooden buildings are well known. Platform framing is the type most generally employed, except where brick veneer and stucco exteriors are desired. These exterior treatments require balloon framing. My invention is used in erecting a modified type of balloon frame which eliminates the box-sill and the double top plate or cap on the studs for the rafters to rest on. An examination of Figure 18 of my drawings will disclose the essential features as well as advantages to be secured by use of my invention in erecting the wooden building frame. It will be noted that with the use of my spacer-stringer the timbers are positioned so that they are fastened together by nailing across the grain and at right angles to the surfaces of contact between said timbers. In the platform frame most of the nailing is either parallel to the grain or inclined to the surfaces of contact. For instance, the nails holding the top plates or caps to the studs and the joist header to the joists are driven through these pieces into the ends of the studs or joints as the case may be. These methods of nailing are to be avoided, if the best and strongest frame is desired. Further, nails driven inclined to contact surfaces tend to split the timbers and thus destroy their holding power. Also, longer and larger nails are necessary because of the greater distance to be driven. The longer and larger the nail to be driven, the more time and effort is required to drive it.

If, in certain cases, it is desired to keep floor joists in line, the use of a double set of spacer-stringers (one on each side of the studs of interior walls and partitions) will permit the joists to be abutted on one side of the studding instead of having them one on each side of the studding.

Therefore, this invention provides a metal or other structural member for improving, protecting, strengthening, and expediting the erection of the framed parts of wooden buildings. The exact means of accomplishing these ends are best observed by referring to the drawings forming a part hereof and described as follows:

Figure 1 is a perspective detail view of my spacer unit, including lap type of end connection;

Figure 2 is a perspective, detail view of a tongue and U-type of end connection;

Figure 3 is an end elevational view of the channel type of spacer unit;

Figure 4 is a similar view of the Z-type of spacer unit;

Figure 5 is a similar view of the modified Z-type of spacer unit;

Figure 6 is a similar view of the modified channel-type of spacer unit;

Figure 7 is a similar view of the angle-type of spacer unit;

Figure 8 is a perspective, detail view of the intermediate spacer guide for the angle type of spacer unit;

Figure 9 is an elevational view of the V-bracket which gives additional support to the spacer unit adjacent to openings in the structure frame and end view of the U-clip for spacing and holding joists and beams intermediate the studding;

Figure 10 is a side view of the V-bracket and the U-clip showing method of attachment to spacer unit;

Figure 11 is a side view of the elongated-Z brace showing anchor-edge ends;

Figure 12 is a front view of the elongated-Z brace;

Figure 13 is a plan view of the clip-on insulated plate used as a fire stop;

Figure 14 is an end view showing method of attaching clip-on insulated plate to spacer unit;

Figure 15 is a perspective detail view of a U-hanger;

Figure 16 is a detail view showing the application of the spacer-stringer unit, U-hanger, V-bracket, and elongated-Z brace, a spacer-stringer unit being used on each side of the studs and each additionally supported on either end of the spanned opening by the V-bracket, as shown;

Figure 17 is an elevational view of a portion of the face of the studding showing in detail the application of the U-hanger;

Figure 18 is a perspective view showing the general application of the spacer support unit and the adjacent appurtenances; and

Figure 19 shows a form of rafter and cap plate construction.

The principal advantages which I claim for my invention are the elimination of a large amount of the measuring, cutting, and fitting of the parts comprising the average building framed of wood. Reducing such items will save material, will lessen labor time, and will result in speedier erection of the frame, which, at the same time, will be stronger because the studs are full wall height and the floor system is tied into the wall in such a manner that the entire frame tends to be an integrated unit rather than being composed of several independently framed units resting one upon the other.

One of the advantages which I claim for my invention is its use in framing a structure where the floors of the rooms are at different levels, or it is desired to cantilever any part of the structure. The placing of a floor at practically any level on the studs is facilitated to a degree not possible with any other method now in existence.

Another advantage is that the quantity of nails is reduced since a shorter and often a smaller nail can be used with equal or greater capacity due to the fact that the thickness of the metal unit, through holes in which the nails to hold the unit to the studs are driven into the wood member, is but a fraction of the wooden member it replaces. With the use of a shorter and smaller nail, less time and effort are required to drive it, which reduces the labor cost as well as the material cost.

Another advantage is that since the frame of the structure tends to act as a unit under my method of framing, it is not necessary to lay the sub-flooring diagonally as is generally done in current building practice and neither is it necessary to sheath the exterior of the frame diagonally in order to anchor the second story to the first story as should always be done in the type of construction employing the Western or Platform type of frame.

Another big advantage is that by bending the flanges of the channel, Z and angle sections against the web part, there are no projections into the interior wall space to interfere with the installation of heating or ventilating pipes or ducts. Electrical conduits, laundry chutes, etc., can be installed more easily. Also the wall and floor systems are not weakened as would be the case in other methods of framing which requires the

omission or cutting of an essential tie plate upon which the structure depends for strength.

Still another advantage is that with the trend of air-conditioning toward the circulation of air through the walls and floor systems the use of my invention will facilitate the incorporation of such an air-conditioning scheme into the building plan.

Another advantage is that where the walls are insulated by the use of insulating blankets, etc., which fit into or fill the spaces between the studs, there need be no gaps at the floor levels such as usually occur in framing systems known as the "platform" or "western" frame and the "braced" frame.

The method of framing which my invention facilitates is definitely more shock-resisting and when used in regions subject to extremely violent windstorms or earthquakes, the use of diagonal sheathing of the exterior walls and sub-floors will further strengthen the frame unit against distortion or collapse under such conditions.

The present trend toward the pre-fabricated type of dwellings which is constructed in a factory and shipped to the building site ready for speedy erection has, to a considerable extent, been brought about by the high labor cost for the dwelling built wholly from raw materials at the site. It is an order to aid both the man who desires to build at a reasonable cost and the mechanic who does the work, that I assert and contend that my invention will usefully serve both parties and offset to a considerable degree the inroads being made by the pre-fabricated type of structure, since my invention will reduce both the material and labor required to secure a wood-framed structure superior to that built under present methods of framing.

Another advantage for my invention is its use in the construction of temporary buildings, scaffolding, form work, or wherever economy of labor and material, without sacrificing strength, ease of dismantling and re-use is a prime requisite.

By the proper designing there can be incorporated into the frame plan a bridge-like truss to support the framework above openings which will eliminate largely the shortcomings of the flat-arch currently in use with its poor and irregular contacts between composing members with the consequence that when loaded, settlement and readjustments occur to offset the stresses and strains imposed thereby. This condition is reflected in the cracks appearing in the wall plaster over the corners of windows and doors and often, also, in the ceiling plaster in the proximity of these openings.

In carrying out my invention, I provide a metal member or stringer 1 (Figure 1), preferably in the form of a channel, although for certain applications it may be in the form of a Z 14 (Figure 4) or an angle 17 (Figure 7) or any of the modifications of these forms indicated or suggested in the light of my disclosures. As shown in Figure 16, the studding is equidistantly spaced, preferably on 16-inch centers, the usual standard spacing for studs, or at any other standard or special spacing desired, and that such studding is positioned in spaced vertical recesses indicated by the reference character 2 in the stringer 1 shown in Figure 1. The stringer 1 may be fabricated in any desired length—usually a multiple of the specified stud spacing with the ends made as at 6. Stringer 1 in such form is particularly suited for use since it is symmetrical about the longitudinal central line of the web, except for the ends 6. The stringer is stronger when 5 is

not cut the full width of the flange. The grooves 13 depressed in the web add stiffness and thus allow the use of lighter metal for forming stringer 1 without sacrifice of strength which makes for economy of material and ease of handling due to the reduction in weight of long sections. End connection 6a—6b Figure 2 is designed especially for stringers to be used in erecting load-bearing partitions since 6a will slip through slot 8 where the partition adjoins the outside wall. Stud thrust plate 7 is formed by cutting the flange 1a, 1b, 14a, 14b, 15a, or the flange and web in the case of 17, at the centerline and along the web at the designated stud spacing interval and bending each section of the flange thus freed into position as shown in Figures 1, 2, or 8. The recess thus formed for receiving the stud will be called a stud recess. In cases where extra stiffness is required 7 may be spot welded or continuously welded to web 1 where they adjoin. Slot 8a is cut through web 1 in such manner as to insure that where tongue 6a is inserted in slot that it will just clear the stud in recess 2. Stringer 1 will be made either with or without slots 8a and grooves 13. Stringers 1 with ends 6 can intersect at right angles at the ends thereof.

Stringers 15 and 17 are for special applications involving framing timbers intersecting at other than at right angles to the studding. See Figure 18. Stringer 15 is used for supporting attic floor joists 55 and roof rafters 56. For using stringer 15 in this manner seat 4 for joists is either fabricated at the plant or bent on the job (with special tools furnished) to be at right angles to face 15. The balance of flange 15a except for joist seat 4 is either fabricated at the plant or bent on the job to the proper angle to receive the rafter which is spotted in place by nailing 66 through holes 10 in rafter restrainer 5. The rafter is firmly anchored to the stud by nailing 67. My method of construction eliminates the cutting or notching of the rafter to provide for proper seating on the cap plate used in the usual type of framing. (See Figure 19.)

Spacer-stringer 17 Figure 7 is a lighter and cheaper type of unit for use in locations which do not justify the sturdier channel stringer 1 or Z stringer 14. All of the features of stringer 1, so far as they are applicable, will be incorporated in stringer 17.

The spacer-stringers are fastened to studs 53 by nails 20 driven through holes 3 or 12. If additional anchorage is desired to resist forces acting transversely, nails 21 are driven through holes 11 in stud thrust plates 7 into studs 53. (See Figures 1 and 9.)

Holes 9 in the spacer-stringers are for anchor wires for metal lath and other purposes. If desired for special installations the surface of the stringers can be treated or have anchor clips attached so that plaster and other types of wall treatments will adhere.

In the various figures indicating applications of units of my invention, I have not attempted to draw in all the features shown on the detail drawings of the units. All of the units comprising my invention are so designed that they can be pressed, stamped or fabricated from single sheets of material.

The U-clip 30 is held to 1a between its spring clip part 30b and flanges 30a which keep the U-clip from tilting. By nailing through holes 31 into the joist, the joist is prevented from slipping

endwise until the framing is completed and the flooring laid.

The V-bracket 32 is held to flange 1b between spring clip 33 and flange 32c. V-bracket 32 is nailed to stud 53 by nails 38 through holes 37. V-bracket 32 is formed from a single sheet of metal. Flanges 32a and 32b are welded at their intersection with 32d. Flange 32c is a continuation of 32a which is bent around to meet 32b as indicated and welded to 32b and to the web of 32.

The Z-brace 40 is designed to transfer loads from one stud to another as illustrated in Figures 16 and 18. It can also be used in stiffening the house framing shown in Figure 18 by using it between the studs near the corners of the house as the cut-in braces in the braced-frame type of construction. The brace is so designed that when parts 40a are fastened by nailing 44 through holes 41 into studs 53 the anchor-edge ends 42 are forced into the studs, so that the load from the stud, as in Figure 18, is transferred through the brace to the studs on either side. The grooves or ribs 43 in the Z-brace 40 are to increase the stiffness and reduce the likelihood of piece 40 bending or collapsing under load.

The clip-on insulated plate 45 is attached to flange 1b of stringer 1 and thus creates a fire stop by closing the space between the studs and the inside and outside walls. The sheet metal plate is made as shown with recesses 47 to receive stud thrust plate 7. Section 45a will be made so as to be removable from plate 45 in the event it is desired to install plate 45 on a length of stringer 1 where V-bracket 32 is already attached to 1b by 33. Section 45a of 45 is just slightly longer than spring clip 33 so that by removing 45a clip-on insulated plate 45 will fit around 33 and 32c without interference. 45b is an insulating coat of asbestos fibers or other fireproof insulating material glued to 45.

The U-hanger 80 is used in conjunction with double stringers 1 spanning long openings as illustrated in Figure 16. U-hanger 80 is designed to fit into stud recess 2 of stringer 1 as shown in Figures 16 and 17. Holes 84 are placed so that when U-hanger 80 is in position they line up opposite holes 3 in stringer 1 thus permitting the end of stud 53 to be anchored against slipping out from between sides 81. In order that the alignment of the studs 53 will not be disturbed when U-hanger 80 is used, the hanger is designed so that the overall dimension between the outside faces of 81 is the same as the width of the stud 53. This method requires that each side of the stud be notched sufficiently where it sets into the U-part of 80 so as to maintain the prescribed stud alignment. The short pieces of studding 68 are for supporting the exterior sheeting and the interior lathing, plaster-board, etc. Spreader pieces 70 are used to assist in preventing flexure of the studs under load thus shifting the burden of support to the out-

side Z-brace 40 in Figure 16 which transmit the loads to the full stud.

With reference to Figure 18 it will be noted that spacer-stringers 1 are used to space studs 53 and 58 and support floor joists 54 at the second floor. The V-brackets 32 are used to support the stringer 1 on either side of opening X for windows and Z-braces 40 are used to assure transfer of load on stud over opening to the studs on either side. This application should only be used for a single stud. If two or more studs are required to be supported over an opening in the framing plan, then the arrangement detailed in Figure 16 or a modification thereof may be used. The application of spacer-stringer 15 to space studs and to support rafters 56 is also shown in Figure 18. Note also the use of spacer-stringer 17 at the third floor interior partition where the loading will be less than elsewhere in the structure.

Each appurtenance contributes to the full utilization of the stringer unit. The unit could be made with many of the appurtenances incorporated as a part of the unit but it would not be as economical to manufacture or use, i. e., the clip-on insulated plate, Figure 13, might be made a part of the lower flange of the stringer unit. The V-bracket and the U-clip might also be attached to the stringer unit. A double-type stringer unit incorporating the features of the U-hanger could also be made. The only appurtenance which could not conceivably be made in combination with and as a part of the stringer unit is the Z-brace, Figure 12. This latter appurtenance is essential when the stringer unit is supporting the floor and wall systems over openings in the wall framing.

Figures 16 and 18 show how I employ the Z-brace in the wall system rather than in the floor system.

While the forms of the invention herein shown and described are to be taken as the preferred embodiments of the same, it is nevertheless to be understood that minor changes may be made therein without departing from the spirit and scope of the invention as claimed.

I claim:

In a building construction having vertical studding and horizontal rafters, a channel-shaped stringer having upper and lower edge flanges for connecting the rafters to the studding, inwardly directed pairs of spaced guide flanges struck out from the said upper and lower edge flanges providing openings in the upper and lower edge flanges for receiving said studding, outwardly directed flanges struck out from the upper and lower edge flanges of the stringer at opposite sides of the stringer and equi-distantly spaced from said inwardly struck-out guide flanges a distance substantially equal to the width of the rafters whereby the outwardly struck-out flanges may be connected to the rafters to form a rigid connection.

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