May 14, 1957 A. T. TYREE 2,792,086

WALL AND STUD CONSTRUCTION

Filed July 1, 1952 5 Sheets-Sheet 1

Fig. 1

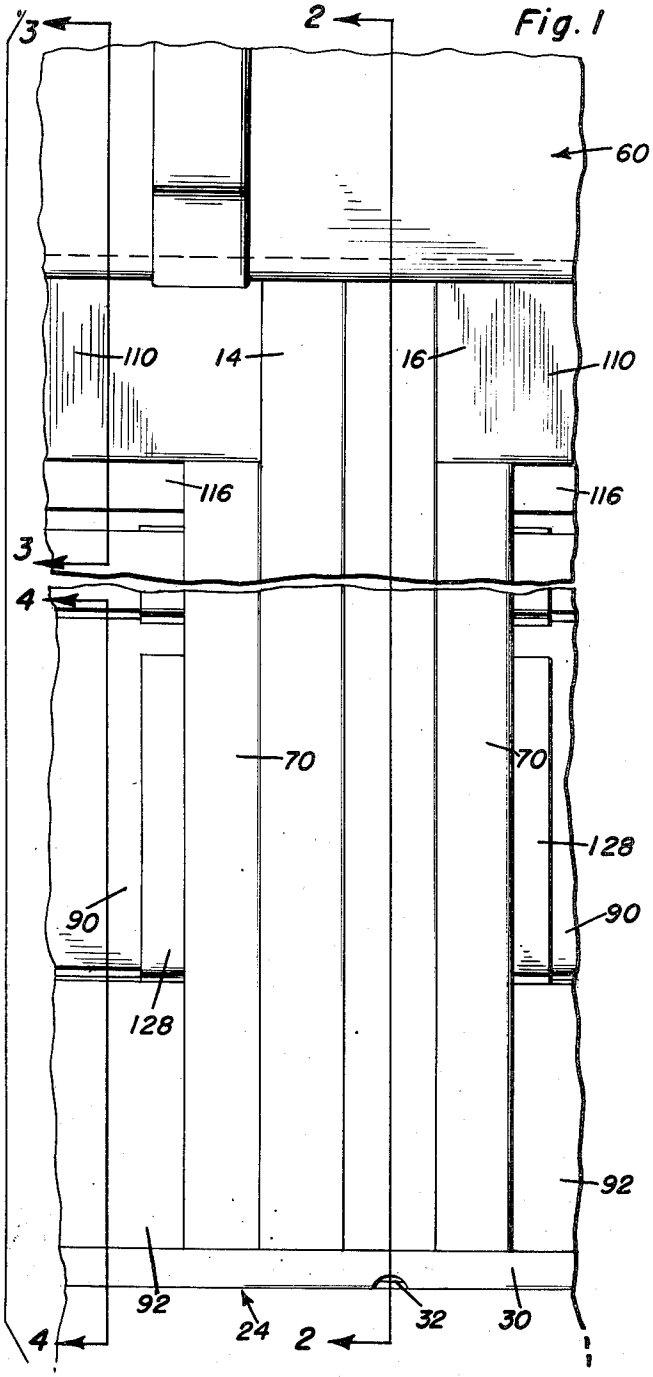
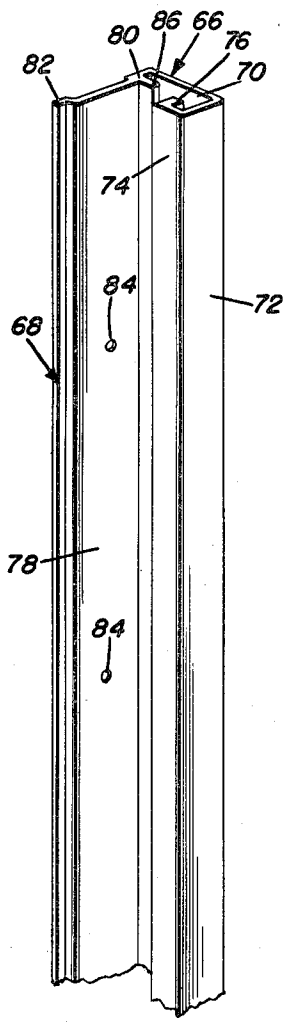


Fig. 9



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May 14, 1957 A. T. TYREE 2,792,086

WALL AND STUD CONSTRUCTION

Filed July 1, 1952 5 Sheets-Sheet 2

Fig. 2

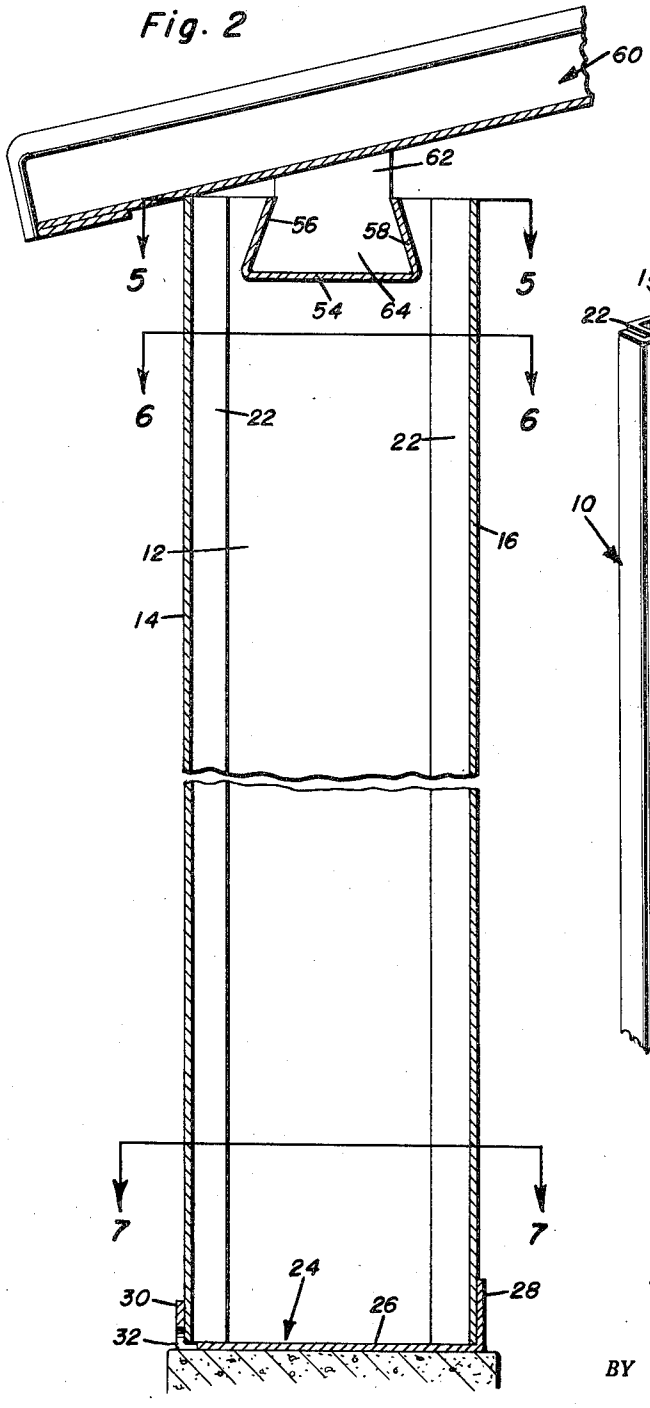
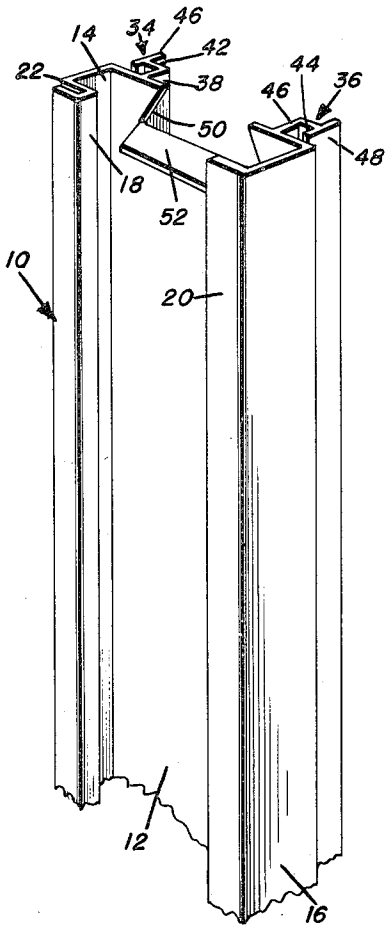


Fig. 8



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May 14, 1957 A. T. TYREE 2,792,086

WALL AND STUD CONSTRUCTION

Filed July 1, 1952 5 Sheets-Sheet 3

Fig. 3

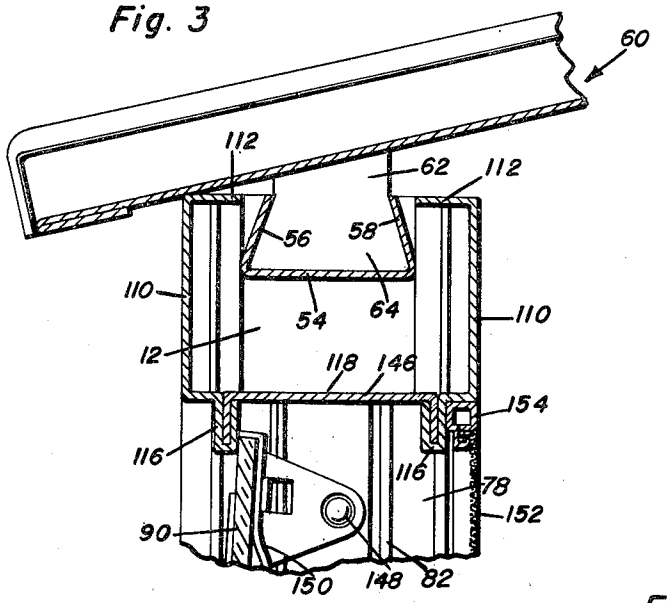


Fig. 10

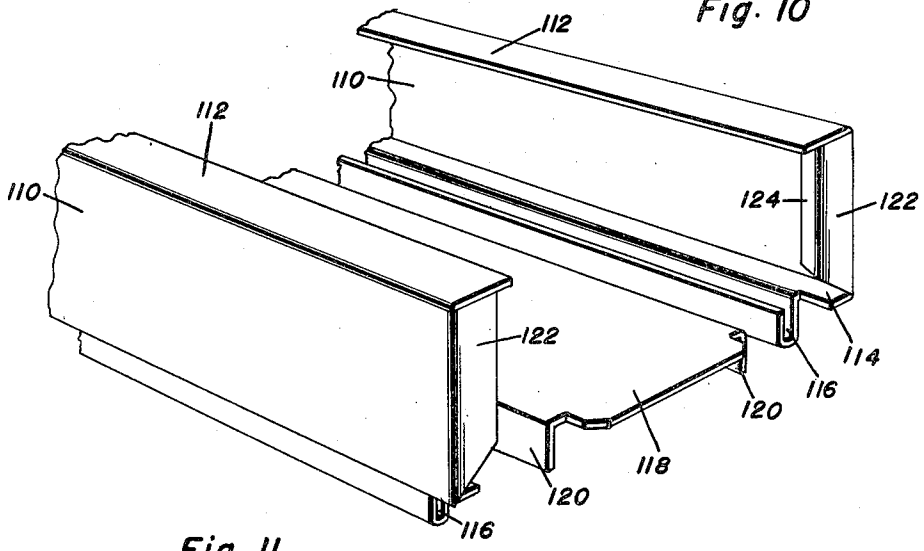
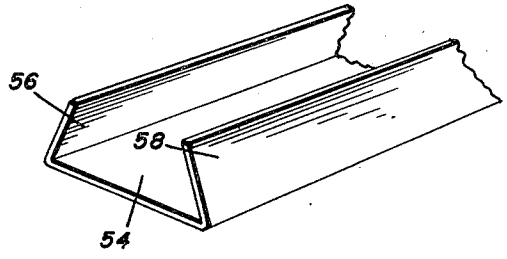


Fig. 11



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May 14, 1957 A. T. TYREE 2,792,086

WALL AND STUD CONSTRUCTION

Filed July 1, 1952 5 Sheets-Sheet 4

Fig. 4

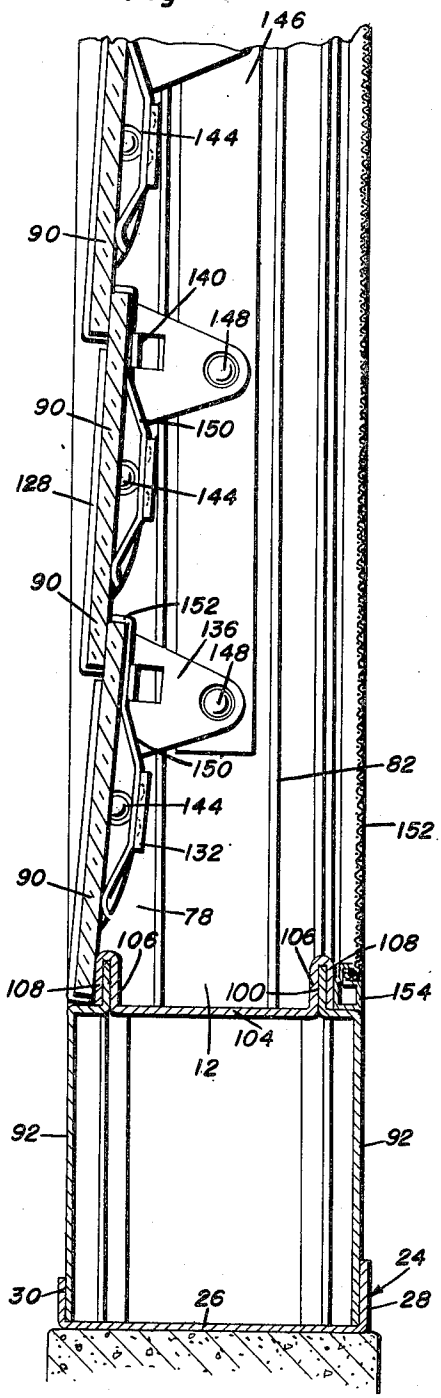


Fig. 12

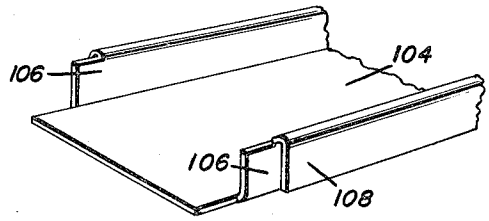


Fig. 13

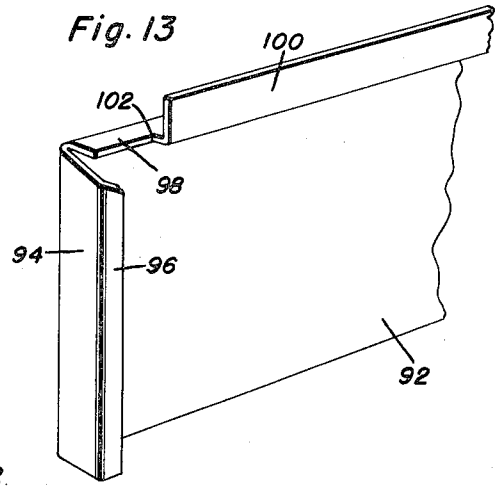
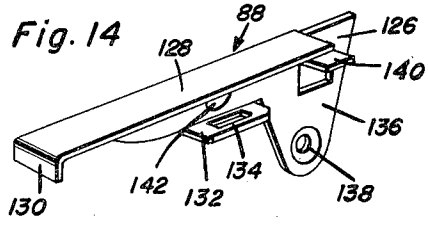


Fig. 14



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May 14, 1957 A. T. TYREE 2,792,086

WALL AND STUD CONSTRUCTION

Filed July 1, 1952 5 Sheets-Sheet 5

Fig. 5

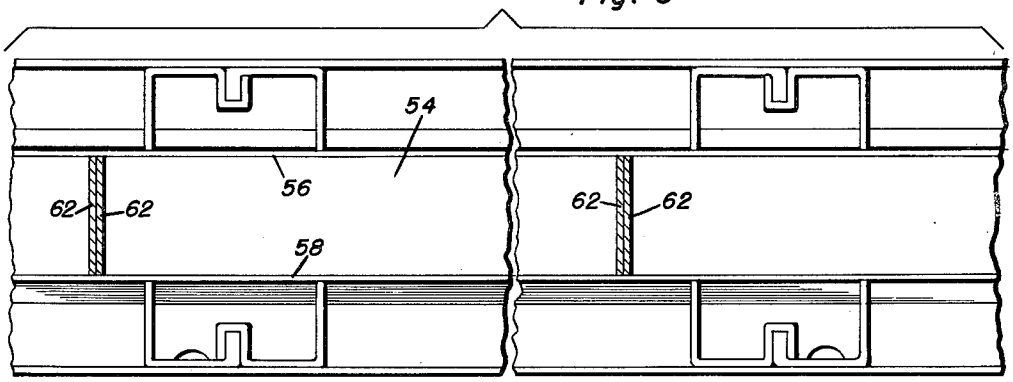


Fig. 6

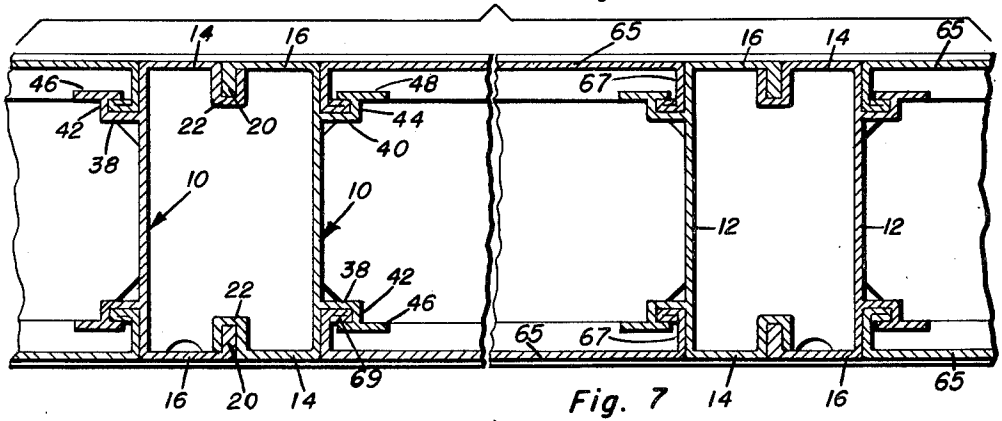
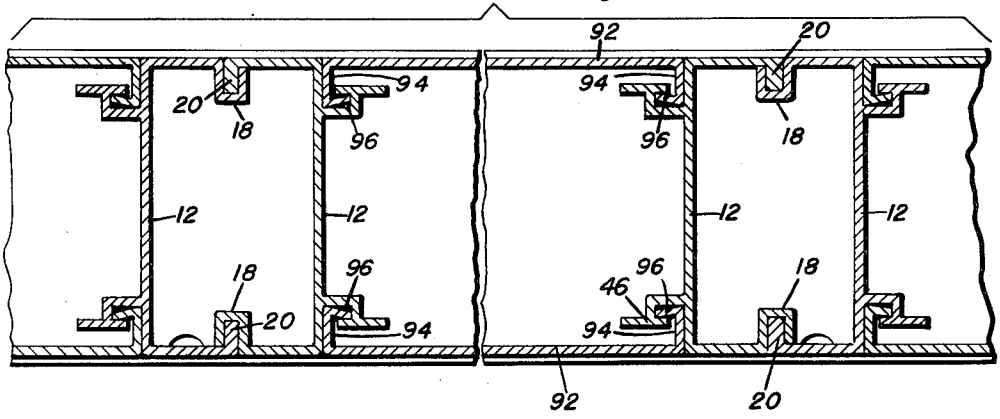


Fig. 7



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United States Patent Office 2,792,086 Patented May 14, 1957

2,792,086

WALL AND STUD CONSTRUCTION

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Application July 1, 1952, Serial No. 296,540

7 Claims. (Cl. 189—34)

This invention comprises novel and useful improvements in a wall and stud construction and more specifically pertains to a novel construction of parts and fastening means for securing together the various elements employed in a prefabricated sheet metal structure and particularly in a wall structure and stud construction for the same.

The principal object of this invention is to provide an improved wall and stud construction for prefabricated sheet metal structures.

A further and more specific object of the invention is to provide an improved prefabricated sheet metal structure in which the various parts may be assembled by sliding interlocking engagements to form a rigid and sturdy construction without the use of rivets, bolts or the like.

A further object of the invention is to provide a readily assembeld and disassembled prefabricated sheet metal construction which will facilitate and enable the construction of prefabricated sheet metal structures and particular wall structures of the same in a variety of manners and arrangements and with a relatively few standard structural elements.

A very important specific object of the invention is to provide an improved wall stud specifically adapted for interlocking engagement with the other elements of a wall structure to facilitate the erection and the disassembly of prefabricated sheet metal buildings and the like.

A further additional object of the invention is to provide a prefabricated wall structure in which a means for anchoring a roof structure to the wall structure is employed to impart rigidity to the elements of the wall structure.

A still further object of the invention is to provide an improved wall opening closure such as a louver, window shutters or the like which may be readily assembled as a component of the wall structure in a prefabricated sheet metal house.

These, together with various ancillary features and objects of the invention, which will later become apparent as the following description proceeds, are attained by the present invention, a preferred embodiment of which has been illustrated, by way of example only, in the accompanying drawings, wherein:

Figure 1 is a fragmentary front elevational view of a wall structure incorporating therein the principles of this invention, parts being broken away;

Figure 2 is a vertical transverse sectional view through the wall structure, taken substantially upon the plane indicated by the section line 2—2 of Figure 1, and showing the manner in which a roof structure is secured to and supported by the wall structure;

Figure 3 is a vertical transverse sectional view taken substantially upon the plane indicated by the section line 3—3 of Figure 1, and showing the manner in which the upper portion of a louver or shutter assembly is installed in the wall structure;

Figure 4 is a vertical transverse sectional view taken substantially upon the plane indicated by the section line 4—4 of Figure 1, and showing the manner in which the lower portion of a louver or shutter assembly is installed in the wall structure;

Figure 5 is a horizontal sectional view taken substantially upon the plane indicated by the section line 5—5 of Figure 2 and showing the arrangement whereby the roof assembly is anchored to the wall structure;

Figure 6 is a horizontal sectional view, taken substantially upon the plane indicated by the section line 6—6 of Figure 2, showing a middle portion of the wall stud and panel construction;

Figure 7 is a horizontal sectional view taken substantially upon the plane indicated by the section line 7—7 of Figure 2 and showing the lower portion of the wall stud and panel construction;

Figure 8 is a perspective view, a part being broken away, of one of the wall studs in accordance with this invention;

Figure 9 is a perspective view a part being broken away, of a side rail of the shutter and louver assembly;

Figure 10 is a fragmentary exploded perspective view of certain elements forming the roof anchoring assembly of the wall construction and the top cap of the louver construction;

Figure 11 is a perspective view of a portion of a roof anchoring channel forming a part of the wall structure;

Figure 12 is a perspective view of a portion of a structural element forming the stool of the shutter or louver assembly;

Figure 13 is a perspective view of a portion of a wall panel beneath the shutter or louver assembly; and

Figure 14 is a perspective view of one of the louver or shutter clips forming a part of the louver assembly of this invention.

Reference is now made more specifically to the accompanying drawings, wherein like numerals designate similar parts throughout the various views.

In forming a wall structure of a prefabricated sheet metal building or other construction in accordance with this invention, use is made of a relatively few standardized and interchangeable structural elements having an improved and simplified detachable interlocking engagement with each other in order to facilitate their assembly in different arrangements into a substantially rigid and durable construction. These elements include a wall stud shown in Figure 8, window or louver side rails comprising connectors and which are adapted to detachably engage the studs, the side rails being shown in Figure 9; lower inner and outer wall panels shown in Figure 13 adapted to be disposed between and connected to adjacent studs; upper inner and outer wall panels shown in Figure 10 and adapted to be connected between and secured to adjacent studs; a cap and a stool shown respectively in Figures 10 and 12 and forming a part of a louver construction shown in Figures 3 and 4; together with an anchor channel assembly shown in Figure 11 and adapted to connect a roof structure to the wall structure and to secure the upper ends of the wall studs in alignment, together with a sill construction receiving the lower ends of the studs and the lower wall panels.

Reference is made first to the wall stud construction shown in Figure 8 for a detailed explanation and understanding of this element forming an essential part of this invention. This stud 10 which may conveniently comprise an aluminum die extrusion or casting consists of a flat elongated web portion 12 having upon its vertical marginal edges a pair of parallel side walls 14 and 16 which extend from one side of the web. Upon their vertical edges which are remote from the web, these side walls are provided with inturned locking flanges 18 and 20 which are complementary to each other so that a pair

of studs can be interlocked with each other by having the flange **20** of one stud interlocked with the flange **18** of the adjacent stud for longitudinal sliding engagement relative to each other. Thus, the flange **20** may consist of a single tongue or rib which is adapted to be slidably received within the U-shaped longitudinal locking channel **22** of the complementary locking flange **18**.

In order to understand the method of assembling or disassembling a pair of wall studs in interlocking relation with each other, attention is directed to Figures 5–7. From these figures, it will be seen when properly positioned, the pair of studs **10** when positioned in a vertical position may be moved laterally with respect to each other to cause the locking flange **20** of one stud to slide into and be received in the locking channel **22** of the locking flange **18** of the other stud. Thus, lateral movement of a stud in one direction with respect to the other stud will cause locking engagement of the locking flanges, and further movement in that direction is prevented by such engagement; while disengagement of the studs can be effected only by lateral movement in the opposite direction. However, once the studs have been interlocked or engaged in the manner shown in Figures 5–7, one of the studs may be slid longitudinally or vertically with respect to the other stud until the lower ends of the two studs are disposed in the same plane, and are received within a sill channel member **24**, see Figures 2 and 4, which serve to prevent lateral displacement of the two studs relative to each other. When once the lower ends of the interlocked studs are received in the sill **24**, and rest upon the bottom wall **26** of a channel member constituting the sill, the studs are prevented from lateral movement which might disengage or release the same by virtue of the parallel vertically extending side walls **28** and **30** of the sill. Consequently, the studs can only be released by lifting the same up above the side walls, whereupon the studs are free to move laterally with respect to each other to cause disengagement of their locking flanges.

At this point it may be noted that the side wall **28** of the channel sill **26** constitutes the inside wall of the sill and extends to a greater vertical height than does the outside wall **30**. This prevents any possibility of moisture or rain working its way through the sill from the exterior to the interior of the building. In addition, suitable drain vents **32** may be provided on the outer wall **30** adjacent the base thereof to facilitate drainage from the sill structure. As so far described, it will be apparent that the studs may be moved longitudinally within the sill member although lateral displacement of the studs with respect to each other and in a direction transversely of the sill is prevented by the engagement of the side walls of the latter. However, longitudinal movement of the studs along the sill relative to each other is prevented by the panel members and other elements interposed between the studs and secured thereto to form a rigid assembly, as set forth hereinafter, whereby the studs and associated elements are firmly united and secured in fixed relation. The weight of the structure will usually be sufficient to hold the same in the sill and prevent displacement of the wall structure from the sills, which displacement might permit disengagement of the various elements of the wall structure. If desired, however, it is evident that a pin, bolt or the like may be employed in the sill for the corner element of the wall structure to thereby lock the entire series of wall components into a rigid interlocked assembly.

Referring again now to the stud of Figure 8, it will be seen that the opposite side of the web portion **12** from that which contains the side walls **14** and **16** is provided with a pair of anchor flanges indicated generally by the numerals **34** and **36**. These anchor flanges are composed of a pair of flanges **38** and **40** which are disposed parallel to each other and are perpendicular to the web **12**, are spaced inwardly from the side walls **14** and **16**, and extend preferably throughout the entire length or substantially the entire length of the stud **10**. Upon their edges which are remote from the flange **12**, these anchor flanges **38** and **40** have a pair of outturned flanges **42** and **44** which are disposed in alignment with each other, that is in the same plane which is parallel to the web **12**, and which at their outer edges also terminate inwardly of the side walls **14** and **16**. These outer edges are provided with perpendicularly disposed vertical plates **46** and **48**, which are disposed inwardly of the side walls **14** and **16** but are parallel thereto and have edges terminating in spaced relation to the web **12**.

Although the stud members **10** may very economically and conveniently be made in the form of die extrusions or the like, it is obvious that the same may also be manufactured in other manners and may even be assembled from separately formed components which are secured together to form the complete stud as illustrated and described hereinbefore. Also, in some instances, the locking flanges **18** and **20**, and/or the anchor flanges **38** and **40** and/or the cooperating engaging flanges of the wall elements to be secured to the studs may extend throughout only a part of or desired portions of the longitudinal or vertical extent of the studs **10**.

The studs **10** possess a still further feature of construction which enables the same to support and to be rigidly secured to the roof structure of a prefabricated structure. For this purpose, a notch is provided in the upper end of the web **12**, this notch having a pair of vertically extending side walls **50** which are downwardly divergent, to thus provide a dove-tail notch in the web, the material cut away by this notch being folded or bent horizontally to provide a bracket or lug **52** extending horizontally from the bottom edge of the notch and to constitute a shelf or support for a purpose to be subsequently set forth.

Reference is now made to Figure 11 in conjunction with Figureh 2 and 5, wherein it will be seen that there is provided an anchor channel member having a web portion **54** with upwardly converging side walls **56** and **58**, which have their upper edges terminating in laterally spaced relation to each other. The web **54** is of approximately the same width as the bottom edge of the notch and the inclination of the side walls of the anchor channel member is substantially the same as the inclination of the edges **50** of the notch. Consequently, the channel member can be slid longitudinally of the wall structure into a series of aligned notches of a plurality of aligned studs **10**. When so inserted and positioned, it will be seen that the channel member will rest upon the bottom edges of the notches and upon the outturned integral horizontal flanges or lugs **52** for support thereby. In turn, the channel member will serve as a key to prevent lateral or vertical displacement of the various studs and consequently will stabilize and maintain in alignment the upper ends of the wall studs. This channel member will be thus inserted longitudinally of a line or row of wall studs. A roof structure, indicated generally by the numeral **60** is provided with a plurality of fasteners **62**, see Figure 3, in conjunction with Figure 2, whose bottom portions **64** are spaced cross-sectionally of the same area and shape as the space within the channel member. Consequently the fasteners are slidable longitudinally of the channel member but are retained therein against lateral displacement. The construction of these fasteners **62** and their engagement in the channel member as well as the attachment to the roof structure **60** has been set forth in detail and is claimed in my co-pending application for "Roof Assembly and Anchor Construction, Serial No. 291,500, filed June 3, 1952, now Patent No. 2,697,407, patented December 21, 1954, and since the same in itself forms no part of the present invention, a further explanation of the same herein appears to be unnecessary.

At this point, it will be noted that the channel sills

24 maintain the bottom edges of the stud and associated wall structure in alignment, and the anchor channels serve the same function and purpose at the upper ends of the wall structure, as well as constituting a means for securely fastening the roof structure thereto.

Normally a pair of the studs **10** are secured together by their locking flanges, as shown in Figures 1, 5–7, and suitable panel members **65**, see Figure 6, are disposed therebetween to make up the wall section. With the studs spaced an appropriate distance apart, a panel may be disposed between each joint stud unit, of any desired construction. Reference will be made more specifically to the panel construction hereinafter. Between certain of the studs, in lieu of the panels **65**, wall openings such as windows, louvers or the like are inserted as desired. These opening coverings may conveniently be of a construction disclosed in Figures 3, 4, 9, 10, 12–14. This opening covering, illustrated herein as a louver assembly, includes a pair of side rails, one of which is illustrated in Figure 9. Each side rail consists of a locking flange indicated generally by the numeral **66** together with a vertical flange **68** integrally joined thereto in a perpendicular manner upon a longitudinal edge of the same. As in the case of the studs, the side rails may consist of aluminum die extrusions or castings.

The locking flange **66** includes an elongated flat plate or web **70** which on the opposite edge to which the vertical flange **68** is secured is provided with a perpendicular marginal side wall **72** which on its outer edge has an inturned flange **74** disposed parallel to and overlying the web **70**. This flange **74** in turn is provided with a marginal inturned rib **76** disposed parallel to the flange **72**.

The vertical flange **68** also includes a flat web portion **78** which has offset marginal rib portions **80** and **82**, the former integrally connecting the vertical webs **78** to the flange **80**. At suitable longitudinally spaced positions, the web **78** is provided with apertures **84** for a purpose which will be subsequently set forth.

The vertical flange **68** adjacent the junction of the web **78** with the flange **80** is provided with a perpendicularly disposed rib **86** which extends inwardly toward the rib **76**.

The locking flange **66** is adapted to interlock one of the anchor flanges of the stud **10** so that a pair of the side rails connected to a pair of adjacent stud units will be positioned in vertical and opposed parallel relation with respect to each other to define a wall opening therebetween. A plurality of louver or shutter clips indicated generally by the numeral **88**, see Figures 4 and 14, are pivotally mounted upon the vertical flange **78** by means of rivets or bolts extending through the apertures **84**. A plurality of shutters or louvers in the form of slats **90**, as shown in Figure 4, are carried by pairs of clips and are movable between open and closed positions as will be apparent from the drawings. Further details of this louver or shutter construction will be more specifically referred to hereinafter.

Below the louver construction there are provided inner and outer lower wall panels. The inner and outer panels are of identical construction, being shown in detail in Figure 13 and in assembled relation in Figures 4 and 7. Each of these lower panels comprises a flat sheet **92** having its two opposite vertical edges provided with perpendicular side walls **94** which upon their vertical edge remote from the sheet **92** are provided with inturned vertical flanges **96**. The upper edge of each of these panels is provided with a horizontally inturned top wall **98** having an upturned vertical flange **100** rising from the inner free edge of the same. The wall **98** and the flange **100** are notched as at **102**.

The inner and outer panels **92** are disposed below the wall opening, louver or shutter and between adjacent wall stud members, with the side walls **94** abutting against the web portions of the studs, and with the inturned flanges **96** engaged between the anchoring flanges **40** and **48** and **46** and **38**.

A window sill or stool, of a construction shown in Figure 12 is mounted upon the inner and outer lower panels of the wall. This stool consists of a horizontal plate or web **104** having vertical side walls **106** whose upper edges are outturned to provide depending flanges **108** which are spaced from the walls **106**. Channels are thus formed between the flanges **106** and **108** and these channels rest over and embrace the upturned flanges **100** on the top walls **98** of the lower panels. The sills or stools thus serve to secure together the inside and outside lower panels of the walls as will be readily apparent from Figure 4. A top or cap structure for the louver unit is provided. This structure is shown best in Figures 3 and 10, and the same includes a pair of similar inner and outer upper wall panels having vertical flat sheet-like portions **110** with inturned horizontal top walls **112** at their upper edges, and inturned flat bottom walls or flanges **114** at their lower edges. At their inner edges, the bottom walls or flanges **114** have channel members **116** extending longitudinally thereof and which are displaced inwardly from the lower edges of the panel sides or sheets **110**.

A cap or header member consisting of a flat sheet **118** is provided with marginal longitudinally extending downturned side walls or flanges **120**. These flanges are received in the channels **116** as shown in Figure 3 and serve to secure the upper ends of the inner and outer upper panels together in a rigid assembly.

It should be noted that the upper inner and outer panels have their vertical members **110** provided at their ends with inturned vertical flanges **122**. These flanges in turn are provided with inturned vertically extending ribs **124**. The flanges **122** and ribs **124** interlockingly engage the locking flanges of the studs.

It will now be apparent that the upper inner and outer panels with their head or cap piece together with the inner and outer lower panels with the sill or stool, and the opening closure including the side rails and the shutters or louvers secured thereto are readily assembled and detachably secured in a wall section between studs thereof.

It will of course be readily understood that in place of the louver or shutter construction hereinbefore described, I may employ inner and outer wall panels **65** having the same interlocking engagement with the interlocking flanges of the studs to form the inner and outer wall panels, it being understood that these inner and outer wall panels **65** will replace not only the louver assembly but also the top and bottom inner and outer panels which are employed therewith. Thus, as shown in Figure 6, the panels **65** have longitudinal marginal side walls **67** with inturned flanges **69**.

Referring now once again to the louver assembly, attention is directed primarily to Figures 4 and 14. From these figures it will be seen that the louvers include a plurality of the clips **88** previously mentioned, each of which may conveniently be of pressed sheet metal, consisting of a plate **126** having a longitudinally extending marginal perpendicularly disposed flange **128** on one edge thereof, the end of this flange being downturned as **130**. Likewise, struck up from the plate **126** is a lug **132** which is disposed parallel to and underlies the flange **128**, this lug having a longitudinal slot or aperture **134** therein. Adjacent the opposite end of the clip from the flange **130**, the plate **126** is provided with an enlarged ear **136** which is provided with a countersunk aperture **138**. Also upon the ear **136** there is provided a lug **140** which may consist of an upwardly struck portion of the ear, extending laterally therefrom and in parallel spaced relationship to the underside of the longitudinal flange **138**, for a purpose which will be hereinafter set forth. Intermediate its ends, the plate **136** is provided with an aperture **142**. Suitable rivets or other fasteners **144**, see

Figure 11, are inserted in the apertures **142** and **84** of the side rails **68** whereby the clips are pivoted to the vertical surfaces **78** of the side rails. A shutter control bar **146** is provided which by means of rivets or other pivot members **148**, extending through the countersunk apertures **138**, serves to connect all of the ears **136** whereby all of the clips may be pivoted in unison from the closed position shown in Figure 4 to an open position. It will be understood that the two control bars **146** are each slidably received in the space between adjacent vertical flanges **78** of the side rails **68** on the inside and outside walls of the opening.

Any desired suitable actuating means may be connected to the bars **146**, in accordance with conventional practice for actuating the same to move the slat supporting clips to their open or closed positions.

The plurality of slats **90**, which may be of any suitable material, and may be opaque or translucent as desired, are retained upon the clips by means of leaf spring members **150**, these members at their mid-portions resting upon the lugs **132**, and having their ends pressing against the slats **90**, which in turn are thus pressed against the underside of the flange **128**, one end of the slat resting against the flange **130**, the other end resting upon the supporting portion **140**, with the end of the spring **150** having an upturned flange end **152** for embracing the edge of the slat which is remote from the portion **130**. It will thus be seen that the slats are resiliently held in position in the clips for manipulation thereby.

The arrangement is such that when the slats are in their closed position, the lowermost slat will rest against the upstanding channel member **106** to form a substantially water-tight seal therewith as shown in the lower portion of Figure 4, with the edges of the slats overlying each other as shown in Figure 4.

The recess base in the opposite side of the window opening assembly, as shown in Figure 4, may receive a window screen or the like **152** having a marginal rim **154** which may be press fitted into frictional engagement with the framing of the wall window opening as shown in Figure 4. It will thus be apparent that both sides of the window opening will be flush with the exterior of the wall structure, as clearly shown in Figure 4.

From the foregoing, the construction and operation of the device will be readily understood and further explanation is believed to be unnecessary. However, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the appended claims.

Having described the invention, what is claimed as new is:

1. A prefabricated composite metallic wall structure consisting of a pair of one piece elongated metallic channel members each having a flat central web and a pair of flat, parallel side walls perpendicular thereto and extending from the longitudinal edges of said web, complementary locking flanges extending longitudinally of the side walls, disposed perpendicular thereof from their longitudinal edges and being inturned and in parallel overlying relation to said web, one of said locking flanges being U-shaped and forming a locking channel receiving the other flange of a complementary channel member whereby said pair of channel members are interlocked with each other to form a composite stud, anchor flanges extending longitudinally of each web and on the opposite side thereof from said side walls to provide thereby anchor means on opposite sides of said composite stud, for engagement by other components of a wall structure, a flat sheet metal wall panel extending from said stud, means fastening said panel to the adjacent anchor flanges of said composite stud for securing said panel thereto for sliding movement.

2. A metallic wall structure comprising a pair of composite metallic studs each consisting of a pair of elongated channel members having a central web with a pair of side walls extending longitudinally thereof and projecting perpendicularly from the longitudinal edges of said web, each channel member having on the opposite side of its web from its side walls a pair of longitudinally extending anchor flanges engaged by components of a wall construction, the side walls of each of said pair of elongated channel members having complementary locking flanges whereby the complementary locking flanges of said pair of channel members are engaged with relative longitudinal and lateral sliding movement, a sill consisting of a channel member receiving the lower ends of said composite studs and preventing relative lateral movement of the pair of elongated channel members of each composite stud.

3. The combination of claim 2 including lower inner and outer flat sheet metal wall panels extending between said studs, means fastening said panels to the adjacent anchor flanges of said composite studs for securing said panels thereto for sliding movement.

4. The combination of claim 3 including a flat sheet metal window stool having locking flanges on opposite edges, said inner and outer wall panels having inwardly offset upstanding flanges supporting and engaged by said locking flanges, an opening closure disposed between said studs and resting upon said stool.

5. The combination of claim 4 including upper flat, sheet metal inner and outer wall panels disposed between said studs and having fastening means slidably secured to said anchor flanges, a cap plate disposed between said upper panels and overlying said window closure, said cap plate and upper panels having complementary interengaging flanges and channels.

6. The combination of claim 5 wherein said interengaging flanges and channels are dependent from said cap member and from said upper panels.

7. The combination of claim 2 including lower inner and outer wall panels extending between said studs, means securing said panels to the anchor flanges of said studs for vertical sliding movement, a window stool resting upon and embracing the upper portions of said inner and outer wall panels and disposed between said studs, an opening closure disposed between said studs and resting upon said stool, upper inner and outer wall panels disposed between said studs, a cap plate directly secured to said upper inner and outer panels and overlying said opening closure.

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