

July 10, 1923.

1,461,538

A. McKENZIE

SHEET METAL BUILDING

Original Filed May 15, 1918 5 Sheets-Sheet 1

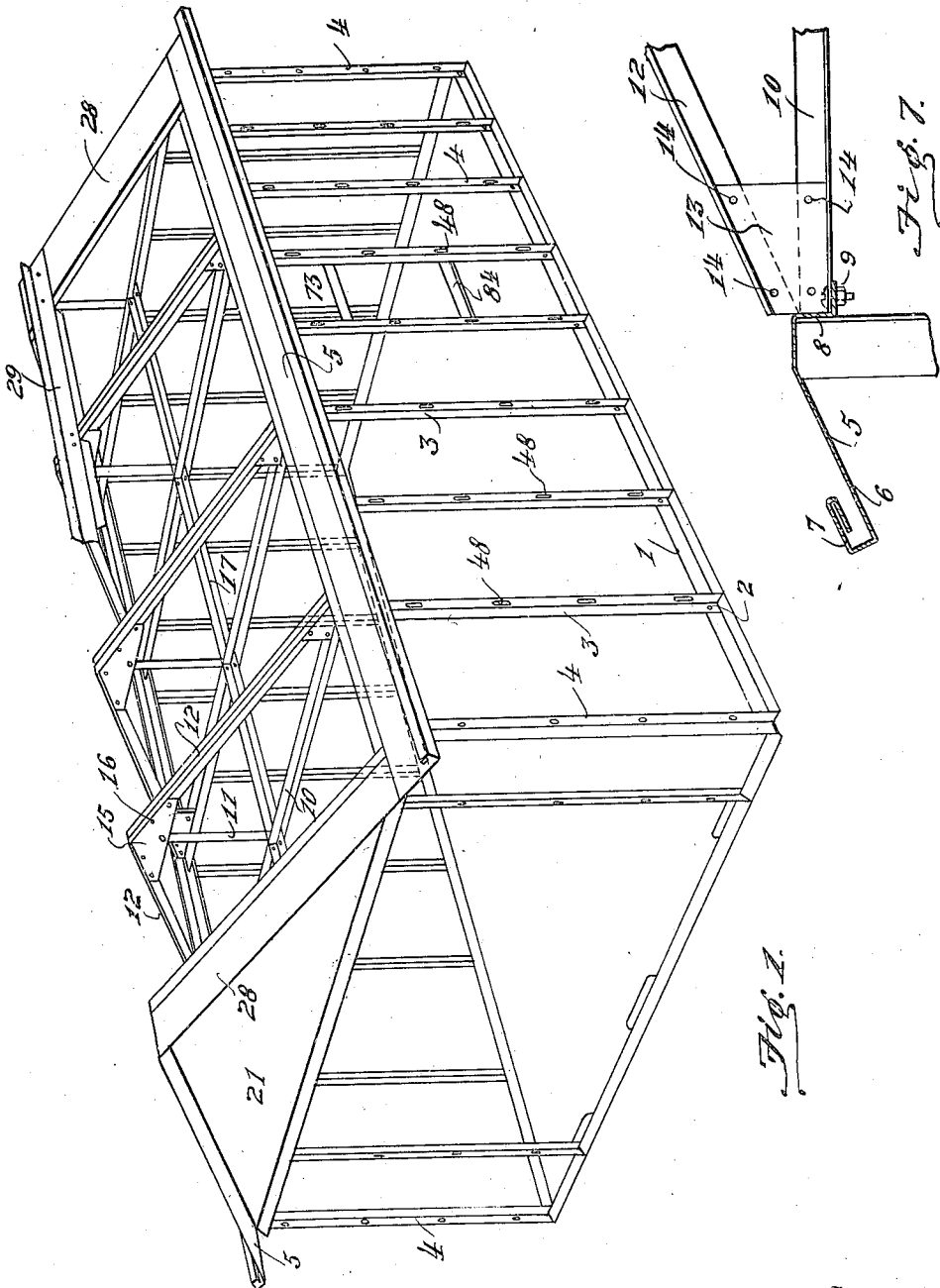


Fig. 1.

Fig. 7.

Inventor

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By

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July 10, 1923.

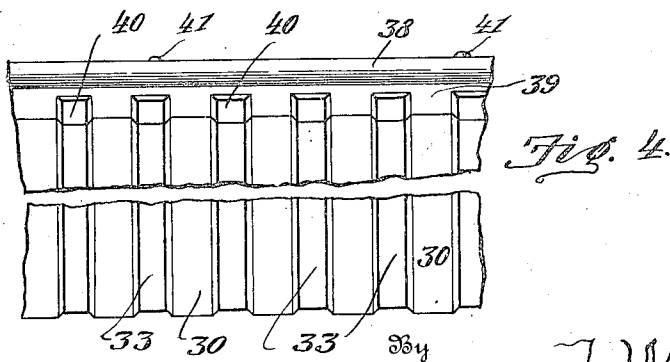
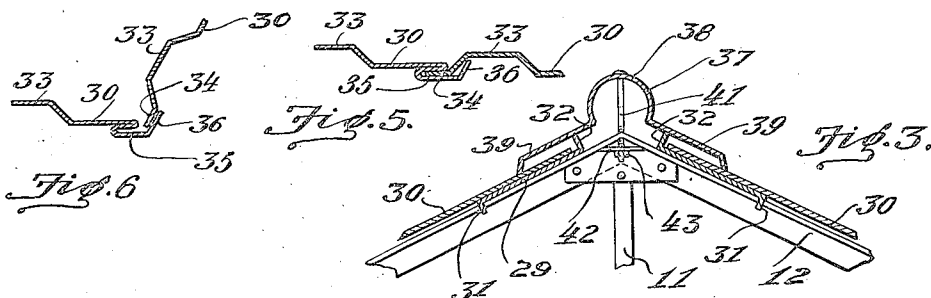
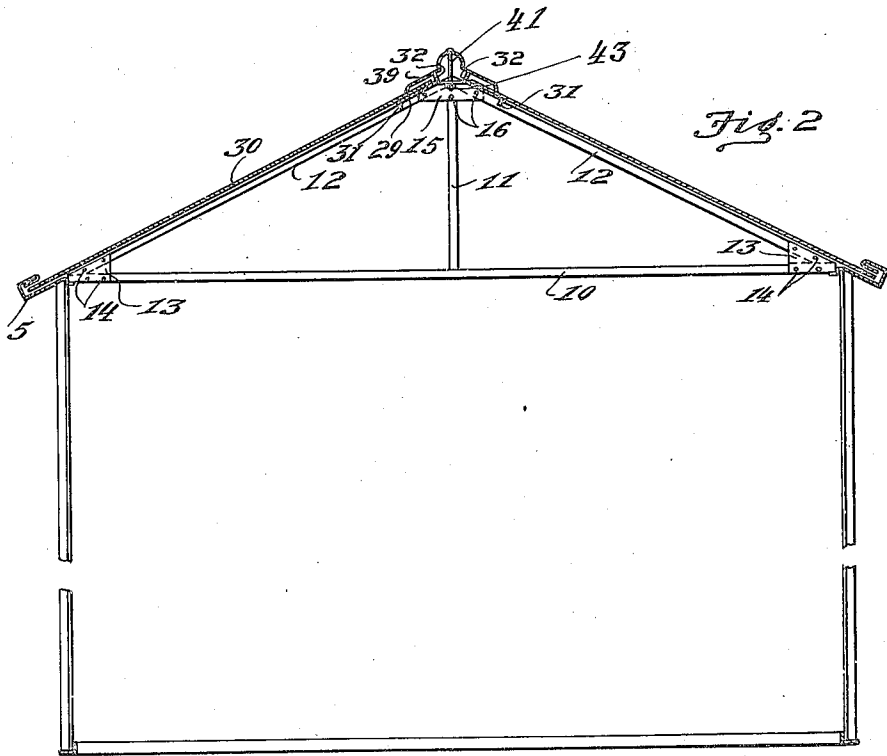
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5 Sheets—Sheet 2



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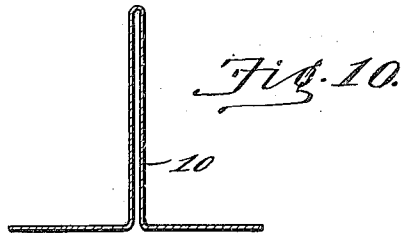
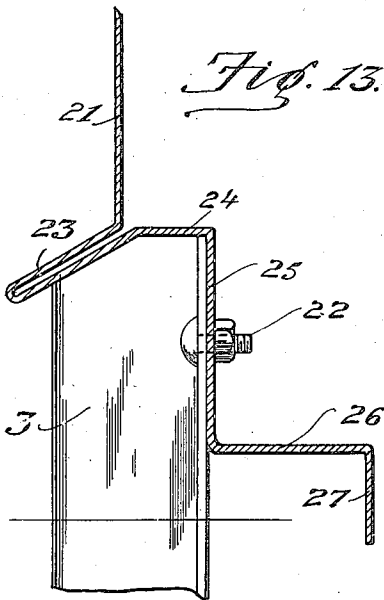
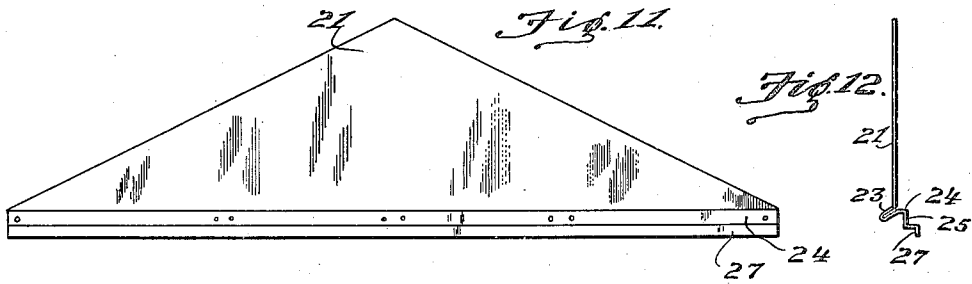
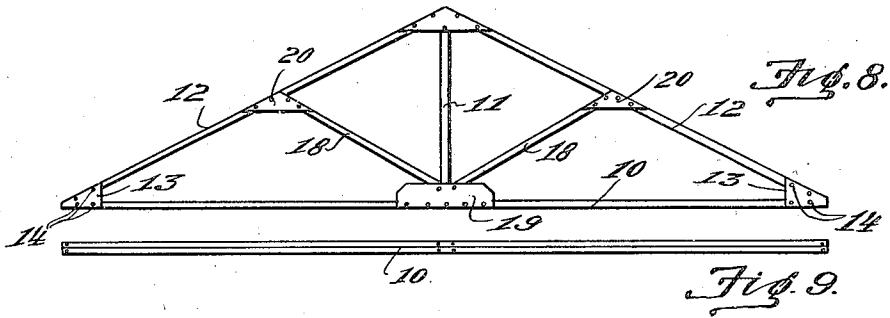
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5 Sheets-Sheet 3



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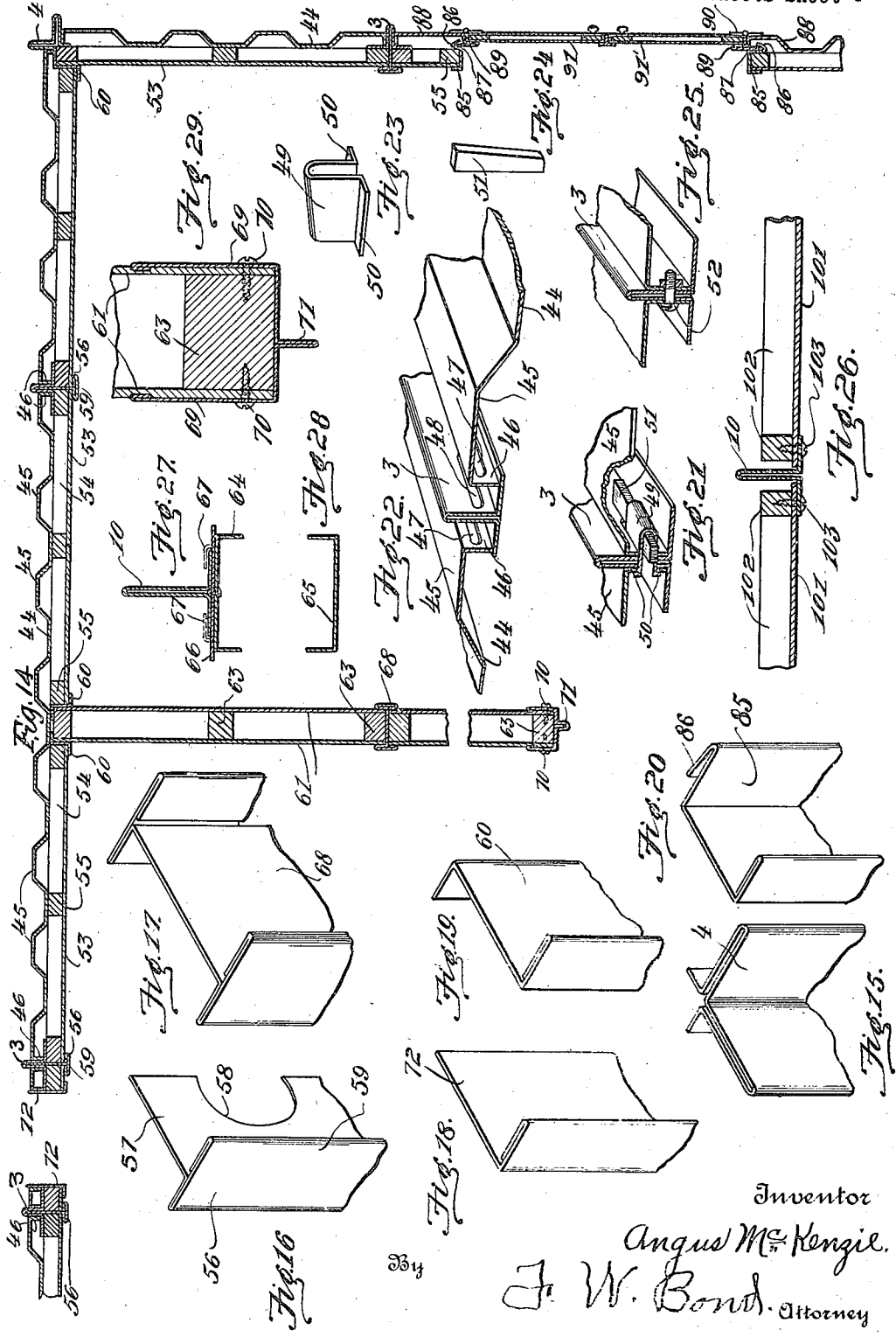
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5 Sheets-Sheet 4



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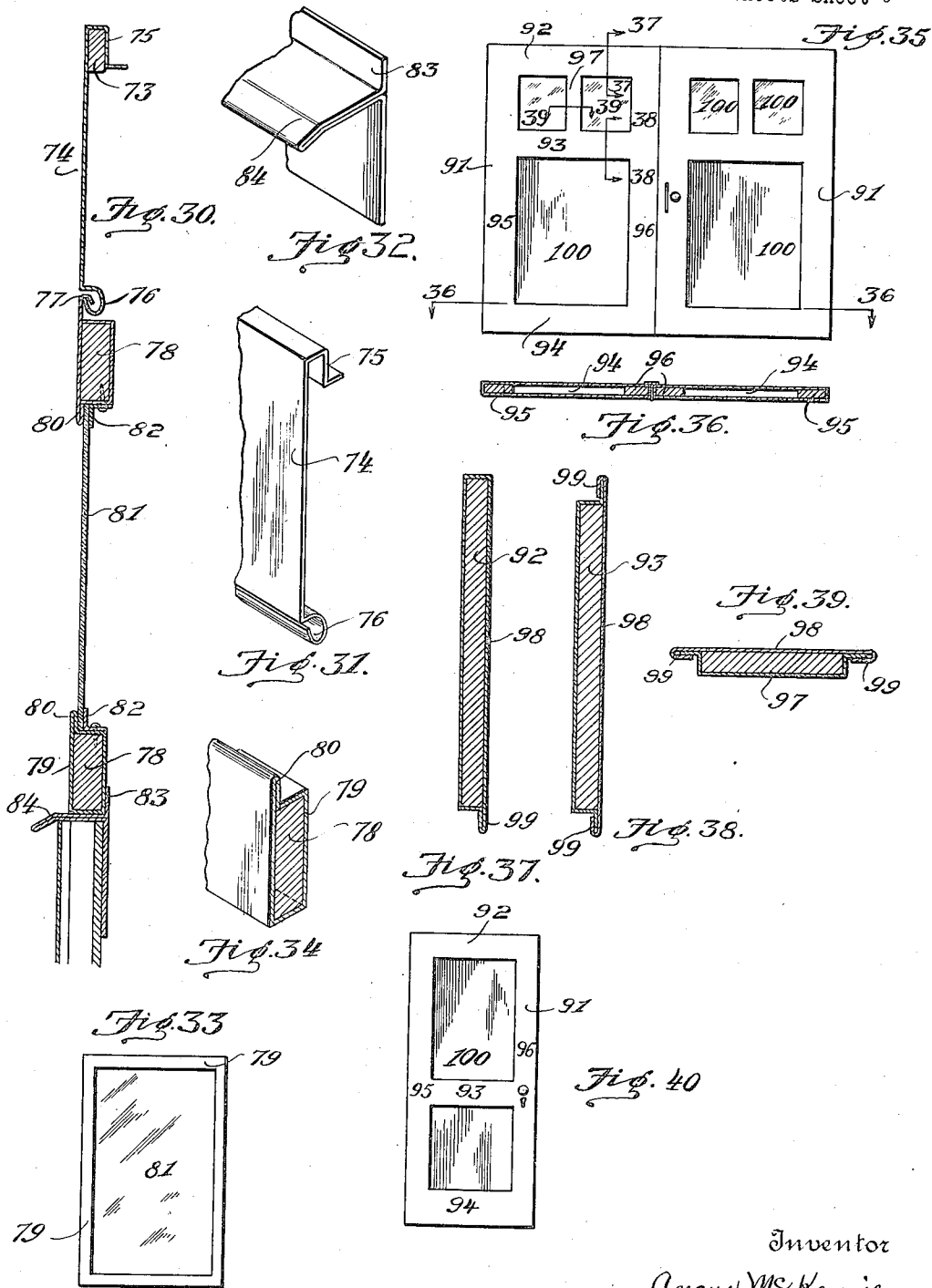
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SHEET METAL BUILDING

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5 Sheets-Sheet 5



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364

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# UNITED STATES PATENT OFFICE.

ANGUS MCKENZIE, OF CANTON, OHIO, ASSIGNOR TO UNITED ALLOY STEEL CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

## SHEET-METAL BUILDING.

Application filed May 15, 1918, Serial No. 234,790. Renewed December 13, 1922.

To all whom it may concern:

Be it known that I, ANGUS MCKENZIE, a subject of the King of Great Britain, residing at Canton, in the county of Stark and State of Ohio, have invented a new and useful Sheet-Metal Building, of which the following is a specification.

The present invention relates to improved construction of sheet metal buildings and has more especially reference to a building of this character which is easily and readily assembled.

The object of the present invention is to provide a double walled metallic building, such that the construction and arrangement being such that the frame, wall plates, roofing plates and other parts employed in the construction of the house are readily assembled into a complete rigid structure.

A further object is the provision of a building of this character wherein the side walls may be connected to the frame by use of special keys or wedges which may be inserted into place and locked without any special implements or tools.

With these objects in view the invention consists in the novel construction and arrangement of parts, hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size and minor details of construction may be made within the scope of the appended claims, without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings:

Figure 1 is a perspective view of the frame of the building.

Fig. 2 is a transverse vertical section through the frame work showing the roof sheets, ridge and eaves in place.

Fig. 3 is an enlarged sectional view showing the ridge and portion of the roof sheets.

Fig. 4 is an elevation showing the assembly of the ridge and roof sheets.

Fig. 5 is a section through a joint of the roof sheets.

Fig. 6 is a similar view showing the means of assembling the roof sheets.

Fig. 7 is a section showing the eave.

Fig. 8 is an elevation of the truss construction.

Fig. 9 is a plan view of the same.

Fig. 10 is a section on an enlarged scale through one of the truss members.

Fig. 11 is an elevation of one of the gables.

Fig. 12 is an edge view of the same.

Fig. 13 is a section showing the means of attaching the gable to the stud.

Fig. 14 is a sectional plan view of a portion of a building constructed in accordance with my invention.

Fig. 15 is a perspective view of a portion of a corner stud.

Fig. 16 is a perspective view of a portion of a side wall clip.

Fig. 17 is a similar view of a portion of a partition clip.

Fig. 18 is a perspective view of a portion of a window clip.

Fig. 19 is a perspective view of a portion of a corner inside wall clip.

Fig. 20 is a perspective view of a portion of a door clip.

Fig. 21 is a perspective view partly in section, showing the means of attaching the outer side wall sheets to a stud.

Fig. 22 is a similar view showing the side wall sheets in position to be assembled.

Fig. 23 is a detail perspective view of the attaching key.

Fig. 24 is a detail perspective view of the wedge.

Fig. 25 shows a modified method of attaching the side wall sheets to a stud.

Fig. 26 is a sectional detail view through a portion of the ceiling.

Fig. 27 is a sectional view showing the means of attaching the upper partition channel to a truss.

Fig. 28 is a sectional view of the lower partition channel.

Fig. 29 is a horizontal sectional view of the partition door strike.

Fig. 30 is a vertical sectional view through a swinging window.

Fig. 31 is a perspective view of a portion of the overhead frame for the swinging window.

Fig. 32 is a similar view of the sill.

Fig. 33 is an elevation of the swinging window.

Fig. 34 is a perspective view partly in section of a portion of the window frame.

Fig. 35 is an elevation of the double door.

Fig. 36 is a section on the line 36—36,

Fig. 35.

Fig. 37 is a section on the line 37—37,

Fig. 35.

Fig. 38 is a section on the line 38—38,

Fig. 35.

Fig. 39 is a section on the line 39—39

Fig. 35.

Fig. 40 is an elevation of the single door.

Similar numerals of reference indicate corresponding parts throughout the several figures of the drawings:

Referring more especially to the construction illustrated in the accompanying drawings, the numeral 1 indicates the rectangular base which may be of any suitable dimensions required for the building to be erected and is composed of angle irons suitably connected together in any well known manner and placed in position as best shown in Fig. 1 of the drawings. Connected to the angle irons by means of rivets or bolts 2 and suitably spaced are the side studs 3 and corner studs 4, the side studs being of cross sectional U-shaped and preferably constructed as best shown in Fig. 22 while the corner studs are of the form best shown in Fig. 15. The eaves 5 are mounted upon the upper extremities of the studs and are preferably of the form shown in Fig. 7 comprising the outwardly and downwardly disposed portion 6 conforming to the angle of the roof and provided with the channel 7 along its lower edge and with the downwardly disposed portion 8 arranged to lie against the inner edges of the studding and having an inturned horizontally disposed flange 9, to which the trusses are connected as will be later described.

Located between the eaves and supported upon the flanges 9 are spaced trusses each of which comprises the tie bar 10 of T-shape in cross section as best shown in Fig. 10, a center brace 11 and the rafters 12 which are also of T-shape and of substantially the same form in cross section as the side studding and tie-bars, these rafters being connected to the tie bars by means of plates 13 which are riveted or otherwise connected as indicated at 14, to the tie-bars and rafters and to the center brace 11 by means of a plate 15 suitable rivets 16 being provided. A longitudinal center tie-bar 17 connects the tie-bars 10 as shown in Fig. 1.

For buildings of larger dimensions the truss may be reinforced by struts 18 connected to a plate 19 carried by the tie-bar and to plates 20 carried by the rafters. A gable 21 of the form shown in Fig. 11 is connected to the studding at each end of the building by means of bolts 22 or their

equivalents. These gables are formed of sheet metal and preferably shaped in cross section as best shown in Fig. 13, an outwardly and downwardly inclined U-shaped portion 23 being provided along the lower edge thereof and a horizontally disposed portion 24 being formed at the extremity of the U-shaped portion and arranged to rest upon the top of the studding. The downwardly disposed attaching flange 25 is provided along the inner edge of the portion 24 and arranged to abut the inner faces of the studding and to be attached thereto by means of the bolts 22. An inwardly disposed flange 26 is provided at the lower extremity of the attaching flange 25 and provided with a downwardly turned strengthening flange 27, said flange 26 being for the purpose of receiving the adjacent truss.

Cornice plates or sheets 28 are attached to the rafters of each end truss and extend over the gables 11. Connected to the rafters near the upper extremities thereof by means of bolts or rivets are the sub-ridges 29, between which and the eaves 5 the roofing sheets 30 are supported, each sub-ridge comprising a flat strip having a downwardly turned strengthening flange 31 along its lower edge and an up-turned flange 32 along its upper edge, the roofing sheets being received between the flanges 32 and the U-shaped gutters of the eaves. The roofing sheets are of the construction best shown in Figs. 4, 5 and 6 provided with spaced ribs or corrugations 33. The adjacent sheets of roofing are connected together as shown in Figs. 5 and 6, one edge of each roofing sheet being provided with a straight flange 34 while the other edge of each sheet is provided with the U-shaped channel 35 having an up-turned angle flange 36 along its edge. The adjacent sheets of roofing may be placed together either by sliding the flange 34 into the channel 35 as shown in Fig. 6 or by sliding the flange longitudinally into the channel from one end of the channel, the sheets assuming the position shown in Fig. 5 when connected. For the purpose of holding the roofing sheets in position the ridge 37 is provided, which ridge comprises the semi-tubular portion 38 and the downwardly and outwardly disposed flange portions 39, said flange portions having pockets 40 formed therein for the purpose of receiving the corrugations or ribs 33 in the roofing sheets. The ridge 37 is clamped tightly upon the sheets by means of bolts 41, which pass through the tubular portion 38 of the ridge and through plates 42 carried by the trusses, a nut 43 being provided upon each of said bolts.

The side sheets 44 are of sheet metal and formed with vertical spaced ribs 45 for the purpose of strengthening said sheets and also to present a pleasing appearance. An

in-turned right angular flange 46 is formed at each side edge of the side sheets and said flanges are provided at intervals with elongated slots 47 arranged to register with the spaced slots 48 formed in the studding. A tapered U-shaped attaching key 49, provided with out-turned flanges 50, is inserted through the slots 47 and 48 and a wedge 51 inserted therein as shown in Fig. 21. If desired the side sheets may be connected to the studs by means of bolts 52 passed there-through as shown in Fig. 25. The side sheets are attached to the corner studs in the same manner in which they are attached to the side studs.

Inside walls are provided upon the interior of the building and comprise sheets 53 of building board or steel which are reinforced by frames composed of horizontal and vertical strips 54 and 55 respectively, preferably formed of wood. These inside walls are connected to the studding by means of the attaching clips 56 which are T-shaped in cross section and arranged to extend between adjacent edges of two sections of inside wall and into the U-shaped channel of the studding, the web 57 being provided with cut-out portions 58 arranged to accommodate the keys 49 and wedges 51. These webs are held tightly in place by means of the wedge and key, the head 59 of the clip clamping the inside wall sections tightly against the studding.

Corner clips 60 are provided for connecting adjacent edges of the inside wall sections at a corner of the building or for connecting the partition sections to the side wall sections as shown in Fig. 14. In order to divide the interior of the building into rooms partition walls are provided which may be located at any desired point within the building and comprises the spaced sheets of building board or steel 61 mounted upon a frame of horizontal and vertical strips of wood 62 and 63 respectively, these partitions being connected to the inside wall sections by means of the corner clips 60 and mounted in suitable upper and lower channels 64 and 65 respectively, the channel 64 being provided with a strip 66 which is riveted or otherwise connected along its upper face, the edges of which are arranged to be turned back over the flange of one of the tie-bars 10 of a truss as shown in Fig. 27 or if the partition is to be located longitudinally of the building, this strip may be attached to the longitudinal tie-bar in the same manner. The channel 65 which receives the lower edge of the partition wall is arranged to be located upon the floor and may be attached thereto in any suitable and well known manner. Adjacent sections of partitions are connected together by means of an H-shaped clip 68 which is of suitable dimensions to snugly fit over the edges of

the partition walls. Where it is desired to provide a door upon a partition wall a suitable door strike such as best shown in Fig. 29 is provided, this door strike comprising the channel shaped portion 69 arranged to be placed over one vertical edge of a partition section and connected thereto by means of screws or their equivalents 70 and provided with a vertical rib 71 against which the door is arranged to strike. It will be understood that door strikes of this character are provided upon the partition walls at each side of a door way.

Where it is desired to provide windows within the walls of the building L-shaped clips 72 are connected to the walls and a horizontal bar 73 is connected between adjacent studding and arranged to receive the over-head 74 which carries the window, said overhead being provided at its upper edge with a channel 75, said channel being arranged to be located over the rod 73 while the lower edge of said overhead is provided with a semi-tubular portion 76, which receives the hooked edge 77 formed upon the upper edge of the window frame, said window frame being composed of wooden strips 78 covered with metal sheets 79, said metal sheets having a rib 80 formed therein, which acts as a stop for the glass panel 81 which is held in place within the window by means of angular clips 82 or their equivalents. The window is arranged to swing upon the semi-tubular portion 76 of the overhead and its inward movement is limited by means of the strike plate 83 formed upon the sill 84 which is formed of sheet metal and is connected between adjacent studs. If desired any suitable form of a sliding window may be provided instead of the swinging window above described.

For the purpose of attaching doors upon the outer wall of the building the channel shaped strips 85, are provided, said strips being arranged to be attached to the vertical frame members 55 of the inner walls and provided with the narrow channel 86 adapted to receive the in-turned extremity 87 of the side wall section 88 which is made especially for door size and is provided with a door strike 89. The doors are hingedly connected to the side wall sections 88 by means of suitable hinges 90. Either double doors 91 or single doors 91' may be attached in the same manner. The top, middle and bottom rails 92, 93 and 94 respectively, as well as the hanging and swinging stiles 95 and 96 respectively and the munnions 97 are formed of wood and are covered with metal sheets 98 having beads 99 formed around their inner edges. Metal panels 100 are provided within the rails.

If desired, the ceiling may be finished in the same manner as the inside walls, sections of ceiling being formed of builder board or



5 sheets of steel 101 which are mounted upon wooden frames 102 and arranged to be supported upon the flanges of the truss, tie-bars 10 or the longitudinal tie-bar 17 by means of screws or their equivalents 103, the interior of the building being thus finished completely either with the building board or steel sheets as desired.

10 By the construction above described a metallic building is provided which may be easily and quickly erected or torn down and it may be built of any desired size and the interior partitioned in any desired manner. The entire building having double walls 15 which give the interior as well as the exterior of the building a finished appearance and make the building tenantable under varying weather conditions. It will also be seen that the size of the building may be 20 easily or quickly altered by adding or taking away units after the building has been erected and in use.

I claim:—

25 1. In a knock down building of the character described, the combination with a plurality of spaced studs, of a plurality of similar sheets forming the walls of the building, each sheet being of a width to extend from one stud to the next adjacent stud, flanges 30 formed along the edges of said sheets and arranged to engage said studs, said flanges and studs provided at intervals with apertures arranged to register with each other, U-shaped keys located through said apertures and provided with stops at their free 35 extremities and wedges passed through said keys to hold said sheets in fixed engagement with said studs.

40 2. In a knock down building of the character described, the combination with a plurality of spaced U-shaped studs, of a plurality of similar sheets forming the walls of the outside of the building, each sheet being of a width to extend from one stud to the 45 next adjacent stud, flanges upon the edges of the sheets arranged to engage the studs, sheets forming inside walls of the building and of a width to extend from one stud to the next adjacent stud, T-shaped clips extending 50 between the edges of adjacent inside sheets and into the channels of the studs, U-shaped keys located through said apertures and provided with stops at their free extremities and wedges passed through said 55 keys to hold said sheets in fixed engagement with said studs, and to clamp said clips within said studs, said clips provided with cut-out portions to receive said keys.

60 3. In a knock-down building of the character described, the combination with a plurality of spaced studs of a plurality of similar sheets forming the walls of the building, each sheet being of a width to extend from one stud to the next adjacent stud, flanges 65 formed along the edges of said sheets and arranged to engage said studs, said flanges and studs provided at intervals with apertures arranged to register with each other, U-shaped keys located through said apertures and provided with stops at their free 70 extremities and means for retaining said U-shaped keys in place.

75 4. In a knock-down building of the character described, the combination with a plurality of spaced studs, of a plurality of similar sheets forming the outside walls of the building, each sheet being of a width to extend from one stud to the next adjacent stud, sheets forming inside walls of said building 80 and of a width to extend from one stud to the next adjacent stud, T-shaped clips located between the edges of adjacent inside sheets and U-shaped keys for attaching said outer sheets and said clips to the studs.

85 5. In a knock-down building of the character described, the combination with a plurality of spaced U-shaped studs, of a plurality of similar sheets forming the outside walls of the building, each sheet being of a width to extend from one stud to the next 90 adjacent stud, sheets forming inside walls of the building and of a width to extend from one stud to the next adjacent stud, headed clips extending between the edges of adjacent inside sheets and into the channels of 95 the studs and U-shaped keys for attaching said outer sheets and said clips to the studs.

100 6. In a knock down building of the character described, the combination with an angle iron base, of studs mounted upon said base, a plurality of similar sheets forming 105 the outer walls of the building, each sheet being of a width to extend from one stud to the next adjacent stud, a plurality of similar sheets forming the inner walls of the building, reinforcing frames provided upon said inner sheets, trusses carried at the upper 110 extremities of said studs, an inverted channel member connected to one of said trusses, a channel member connected to the base beneath said truss and a partition wall carried between said channels.

In testimony that I claim the above, I have hereunto subscribed my name.

ANGUS McKENZIE.