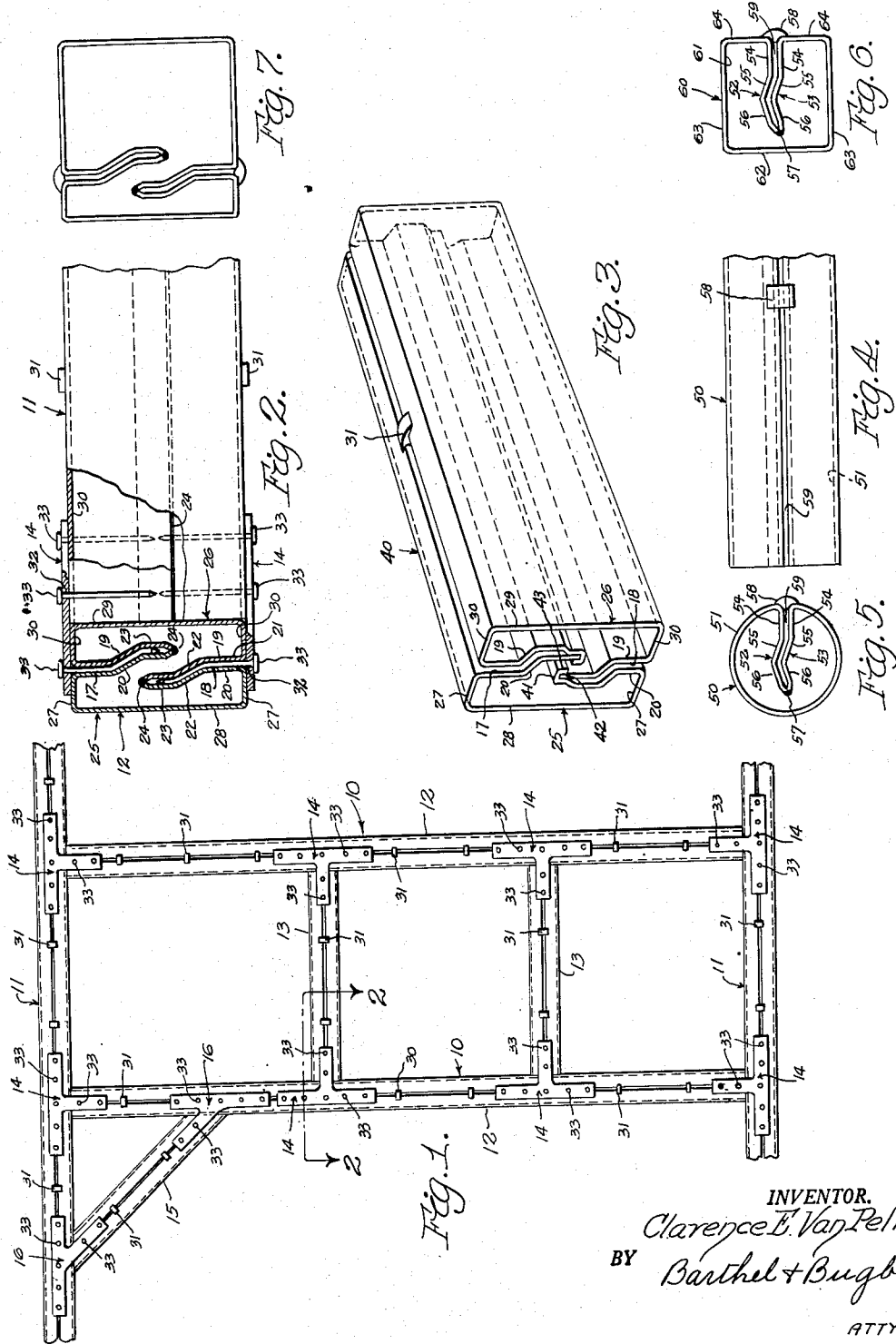


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STRUCTURAL ELEMENT

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STRUCTURAL ELEMENT

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1 Claim. (Cl. 189—34)

1

This invention relates to building structures and structural elements.

One object of this invention is to provide a building structure which is built up of sheet metal structural members having provision for receiving nails or similar fasteners by which the metal members are held together, thereby eliminating the need for riveting, welding or bolting the structural members together and consequently eliminating the need for the skilled labor ordinarily required for erecting a building structure from metal structural members, such as structural steel.

Another object is to provide a building structure of the foregoing type wherein the various structural metal members are held together by connectors of T-shaped, Y-shaped or V-shaped form, particularly where a window frame is to be provided in the building structure.

Another object is to provide a building structure composed of rolled sheet metal structural members having nail-receiving grooves or troughs of zig-zag cross-section extending into the interior of the members, the bottom portions of the grooves being preferably secured to one another by welding or crimping.

In the drawings:

Figure 1 is a side elevation of a portion of a building structure, made up of structural members, according to a preferred form of the invention;

Figure 2 is an enlarged fragmentary horizontal section taken along the line 2—2 in Figure 1;

Figure 3 is a perspective view of a portion of a structural member, according to a preferred form of the invention;

Figure 4 is a top plan view of a portion of a modified structural member according to the invention;

Figure 5 is a left-hand end elevation of the modified structural members shown in Figure 4;

Figure 6 is an end elevation of a further modified structural member according to the invention; and

Figure 7 is an end elevation of a still further modified structural member, as employed for a wider stud where greater strength is required or a wider space is to be filled.

Referring to the drawings in detail, Figure 1 shows a portion or unit of a building structure

2

generally designated 10 according to a preferred form of the invention as including spaced horizontal members or joists 11 and spaced vertical members or studs 12. The studs 12 are shown as interconnected by upper and lower cross-members 13 which, for example, form a window frame in cooperation with the studs 12. The studs 12, joists 11 and cross-members 13 are held together by connectors 14 as described below. Where it is necessary to brace the structural members obliquely or diagonally, such as by oblique braces or knee members 15 (one only being shown), the latter are connected to the joists 11 and studs 12 by connectors 16 of approximately Y-shaped or V-shaped form, as also described below. While the portion 10 has been described as vertical and forming a portion of the sidewall framework of a building, it is obvious that the same portion may be mounted horizontally to form the floor, ceiling or roof framework.

The joists 11 and studs 12 are of similar form (Figures 2 and 3) and consist of hollow beams of approximately rectangular cross-section with inwardly-extending nail-receiving grooves or troughs 17 and 18 directed inwardly from opposite sides of the member 11 or 12. The opposite side walls 19 and 20 of the grooves or troughs 17 and 18 are of zig-zag cross-section so that their inner portions avoid conflicting with one another, although starting from opposite sides of the structural member and approximately in alignment with one another in their outer portions 21. To provide this result, the intermediate portions 22 of the side walls 18 and 19 are inclined relatively to the outer portions 21, the inner portions 23 being bent back parallel with the outer portions 21. The inner edges of the side walls 19 and 20 are inclined toward one another and secured to one another by welding as at 24.

To form the structural members 11, 12, 13 or 15, half members 25 and 26 of generally similar configuration are formed by rolling elongated strips of metal between forming rolls in a conventional rolling mill (not shown). In this manner, the side portions 27 of each member are rolled upward from the connecting portion or base portion 28 so as to form a channel-like member, the side wall portions 19 and 20 of the nail-receiving grooves or troughs 17 and 18 being rolled into position approximately parallel to one

another yet slightly off-set to avoid interference. The half member 26 is formed in a similar manner in a rolling mill, together with its base portion 29 and side portions 30, the groove side wall portions 19 being formed by bending the free edges toward one another in an off-set manner similar to the formation of the portions 20.

The half members 25 and 26 are then assembled by placing them side by side, as shown in Figure 2, so that their groove side walls 19 and 20 lie alongside one another, whereupon their inner meeting edges are welded or otherwise secured to one another as at 24. In order to secure the half members 25 and 26 additionally to one another, the gap between their side portions 27 and 30 is bridged at intervals by welded bridge members 31. The joining of the side walls 19 and 20 in one of the grooves 17 or 18 may optionally be facilitated by spreading the side walls 19 and 20 of the other groove apart while the weld 24 is being made on one set of side walls. The weld 24 is preferably continuous along the inner edge.

In order to erect a building structure 10, the necessary structural members such as the joists 11 and studs 12 are placed in their proper relative positions, preferably on a horizontal surface such as the ground, and the connectors 14 or 16 placed in their necessary positions (Figure 1). The connectors 14 are of T-shaped sheet metal and the connectors 16 of approximately Y-shaped or V-shaped sheet metal. Both are perforated at intervals as at 32 in order to receive nails or similar fasteners 33. The nail holes 32 of the connectors 14 or 16 are lined up with the mouths of the grooves 17 or 18, whereupon nails 33 are inserted in the holes 32 and hammered into the grooves or troughs 17 or 18 by the use of ordinary hammers. In this manner an unskilled workman or a workman skilled only in the erection of wooden structures, such as a carpenter, can easily build up the structures 10 in sub-assemblies which may then be raised vertically and joined with other units similarly made by means of similar connectors 14.

In order to form a window frame, a pair of cross members 13 of similar construction to the studs 12 and joists 11 are mounted between the studs 12 and nailed into position by nails 33 inserted through the holes 32 in the manner previously described. If knee braces 15 are required, these are similarly inserted at their proper places by means of the Y-shaped or V-shaped connectors 16 and nailed into place in a manner similar to that described previously in connection with the T-shaped connectors 14.

The erection of the building framework thus proceeds in the foregoing manner as each unit or structure 10 is completed and raised or hoisted into position and secured by connectors 14 or 16. The siding on the outside of the building or wall board on the inside may then be nailed into position by means of nails hammered through the siding or boards, the points of the nails entering the grooves or troughs 17 or 18. In each case, as the nail passes into the groove or trough, it is bent laterally when it reaches the oblique portions 22 (Figure 2) and then is further bent when it reaches the portions 23 parallel to the outer portions 21. This zig-zag bending of the nails 33 prevents their being withdrawn accidentally or by the application of ordinary force. The various structural members of the building

by the employment of the methods and construction of the present invention.

The modified structural member generally designated 40 shown in Figure 3 is in most respects similar to the structural member 11 shown in Figures 1 and 2, and similar parts are similarly designated. Instead of the welded connection 24 of the groove bottoms shown in Figure 2, however, in the modification of Figure 3 one of the side walls 19 or 20 is made of greater width than the other, so as to provide a bent-over portion 41. The latter is bent around the edge 42 of the opposite side wall 20 or 19 and its free edge portion 43 clinched against the edge portion 42 so as to firmly secure the parts together. The bridge members 31 are also welded at intervals along the mouth of the groove as in the case of the structural member 11 in order to tie the corresponding halves 25 and 26 together.

The modified structural member generally designated 50, shown in Figures 4 and 5 is of tubular construction wherein the main portion 51 is of circular or rather annular cross-section, the free edges being bent inward to form groove walls 52 and 53 of zig-zag cross-section. These consist of outer portions 54, obliquely bent intermediate portions 55 and reversely bent inner portions 56, the inner edges of which are secured to one another as by welding continuously along their junction 57. Bridge members 58 are also welded in position at intervals along the mouth of the groove or trough 59 in order to tie the groove walls 52 and 53 together.

The modified structural element 60 shown in Figure 6 is somewhat similar to the structural member 50, similar parts of the groove walls 52 and 53 being designated with similar reference numerals. In the modified structural member 60 however, the main portion 61 is of rectangular cross-section with a bottom or main wall 62, side walls 63 and top walls 64, the free edges of which form the groove walls 52 and 53. The modified structural member of Figure 6 is used in the same manner as the structural members 11 and 50 previously described.

The modified structural member generally designated 70 shown in Figure 7 is generally similar to the structural member 11 shown in Figure 2, except that it is provided with wider sides 71 from which the nailing grooves or troughs extend inward. The structural member 70 is therefore of approximately square cross-section and is accordingly of greater strength and will fill a wider space than the structural member 11 which is of elongated or rectangular cross-section. The installation and use of the structural member 70 is similar to that set forth in connection with the previously described forms of the invention.

What I claim is:

60 A hollow fabricated frame member comprising an elongated sheet metal tubular structure of approximately rectangular cross-section, said structure including a pair of elongated channel members disposed in spaced parallel relationship 65 with their channels and flanges facing one another, the inner edges of the opposing flanges terminating short of one another with a gap between each pair of opposing flanges, a nail-receiving trough having opposite side walls integral with said inner edges and spanning each gap, said trough extending into the interior of said structure from said inner edges of said spaced opposing channel flanges, said trough 70 having spaced opposite side walls of zigzag cross-section, said trough side walls having spaced 75

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5

substantially parallel outer portions, spaced substantially parallel intermediate portions inclined at obtuse angles to said outer portions, and spaced substantially parallel inner portions disposed at obtuse angles to said intermediate portions and disposed approximately parallel to said outer portions, said inner portions having inner edges secured to one another, said inner portions being spaced laterally apart from one another and offset laterally relatively to their respective outer portions.

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