April 7, 1953 W. R. MILLIER 2,633,945

STRUCTURAL MEMBER

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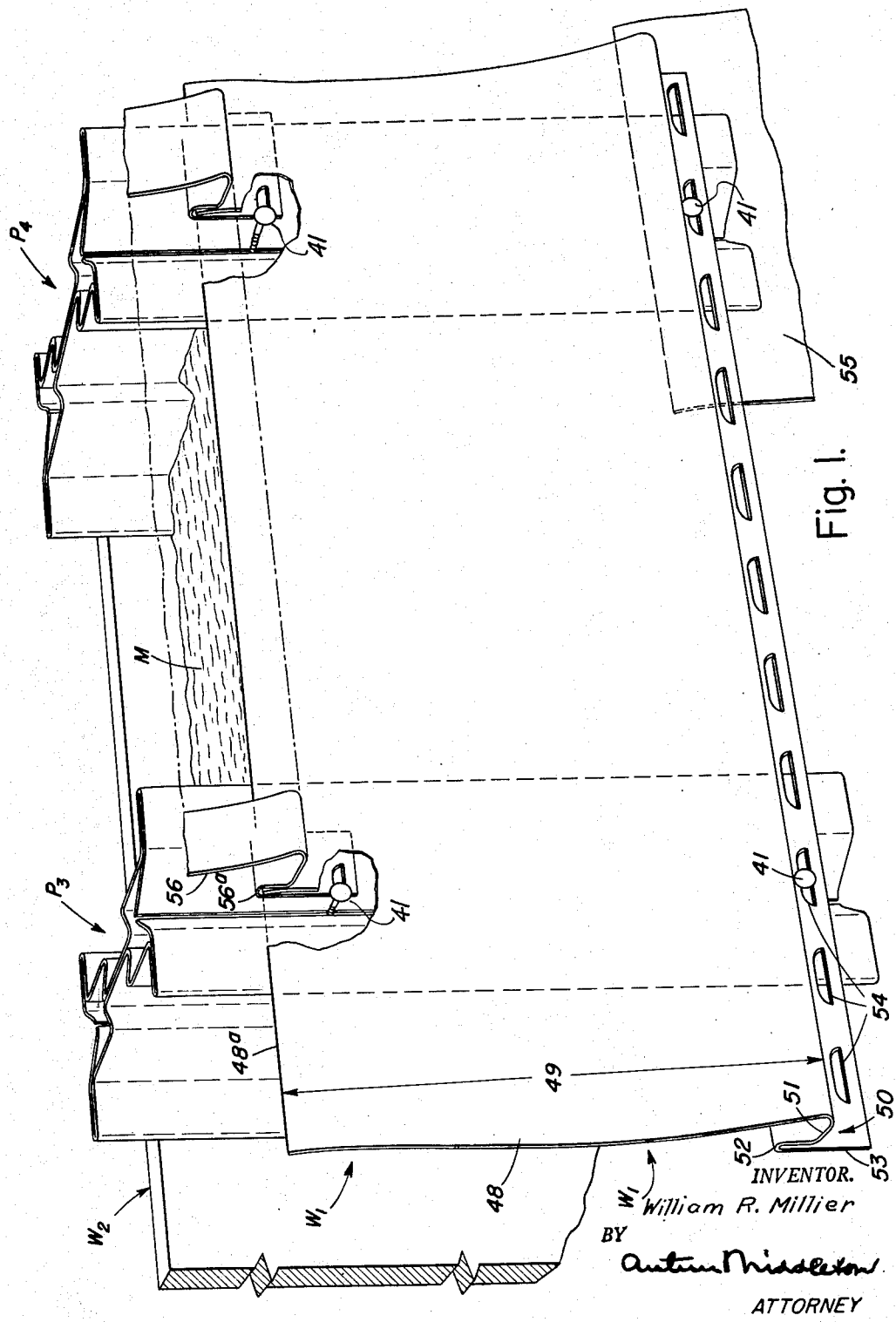

Fig. 1.

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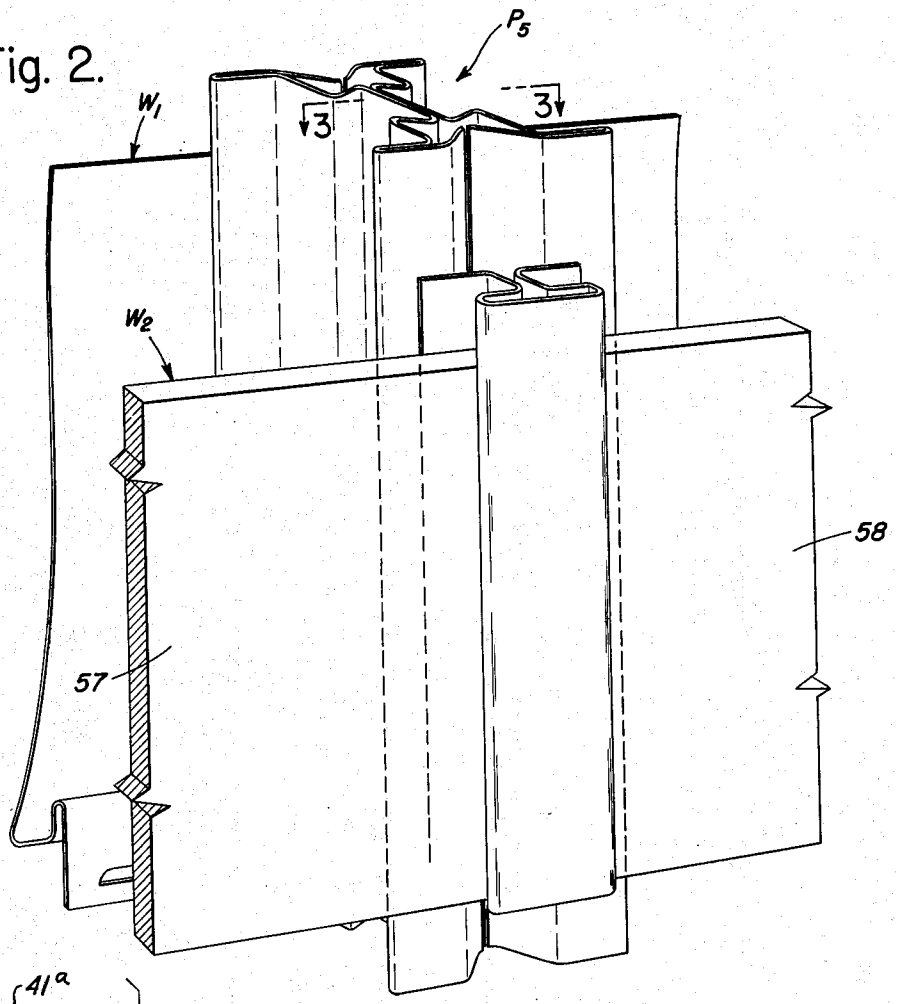
Fig. 2.



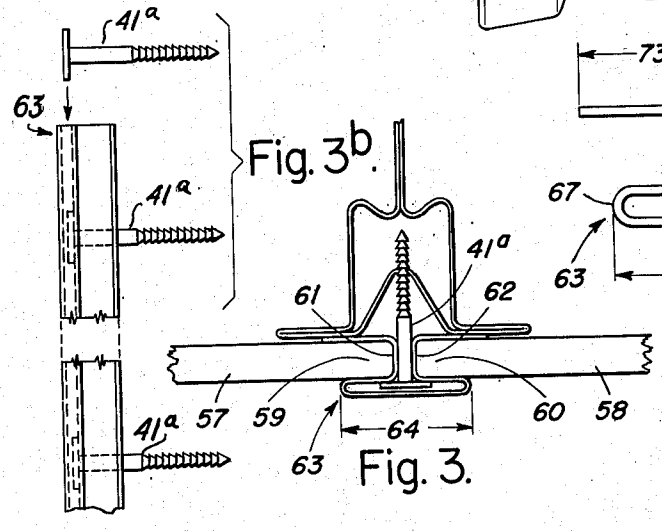


Fig. 3b.

Fig. 3.

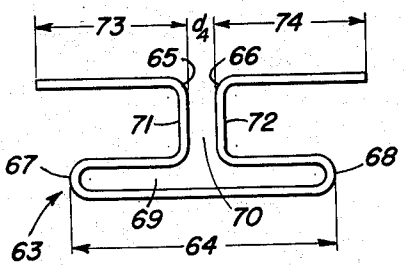


Fig. 3a.

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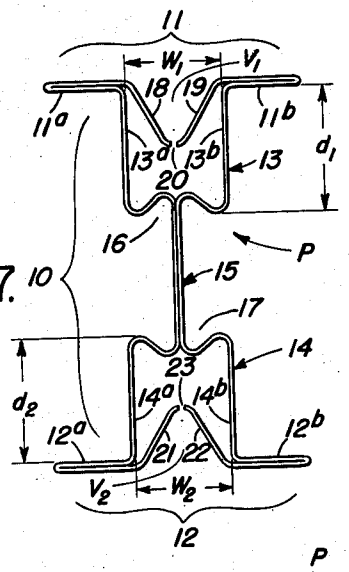

Fig. 7.

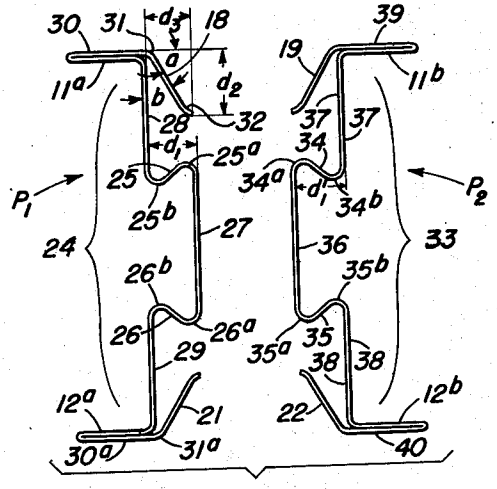

Fig. 6.

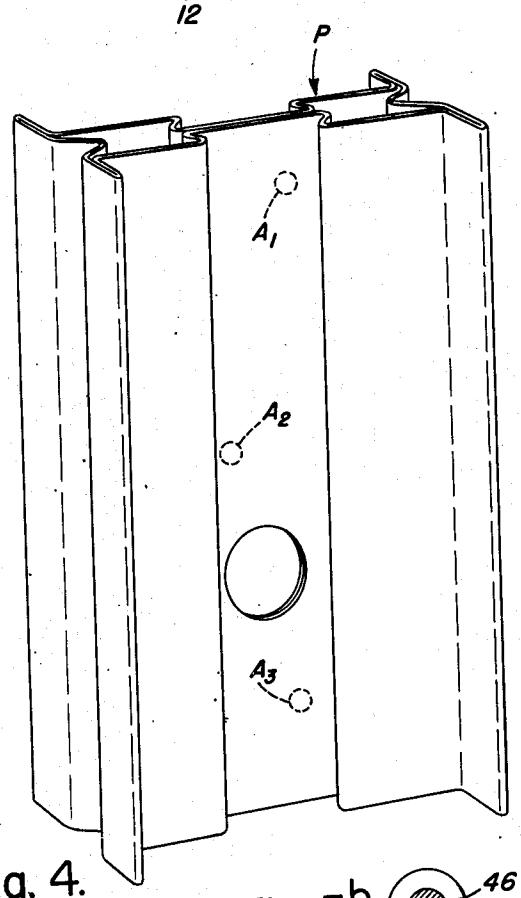

Fig. 4.

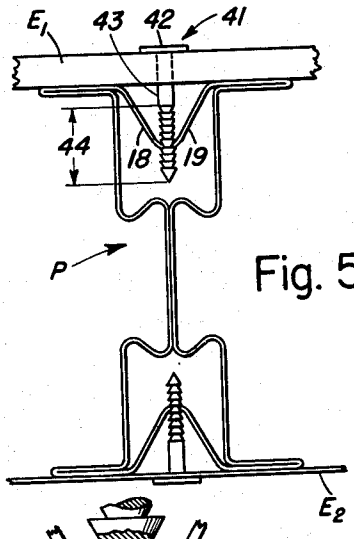

Fig. 5.

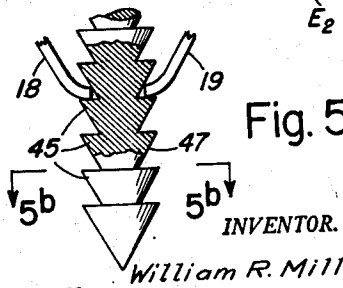

Fig. 5a

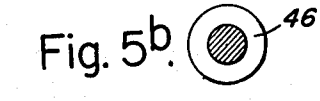

Fig. 5b.

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UNITED STATES PATENT OFFICE

2,633,945

STRUCTURAL MEMBER

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Application January 19, 1949, Serial No. 71,615

1 Claim. (Cl. 189—34)

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This invention relates to structural framework such as for houses, and more in particular it relates to prefabricated structural elements serving as vertical structural members or posts or studs that go into the assembly of such framework and to which there can be attached outer as well as inner wall-coverings to constitute hollow walls of a house. Insulating material may be placed in the hollow space between the inner and outer coverings.

It is among the objects to devise a vertical structural member or post which is hollow, light, and strong, having a roll-shaped profile of relatively thin gauge sheet metal, and which post lends itself to have fastened thereon at any selected point of its height wall-covering or sheeting or metal clapboard elements, in a manner whereby their attachment or fastening can be performed directly and rapidly.

According to one aspect although in no limiting sense, it is one of the objects to devise such a post that is highly adaptable and versatile with regard to the possibility of its structural combination with other elements of a prefabricated frame structure, and which can be rapidly and economically joined therewith. Hence, it is a more specific object to devise such a post that lends itself to the rapid and simple application thereto, as by snap-fastening, of an outer wall-covering composed of roll-shaped horizontally running metal clapboards which have edgewise interlocking relationship with one another and which are assembled in downward succession upon the supporting frame structure of which the post according to this invention may be made a basic element.

The profile of such metal clapboard is internally tensioned by resilient deflection when being fastened to the backing structure or supporting framework, the profile being such that the upper edge portion of such a clapboard interlocks with or engages in a recess or inverted groove formed by the lower end portion of a superjacent clapboard. That wall of this inverted groove which adjoins the wall structure constitutes or terminates in a downwardly extending vertical flange or edge portion having perforations for fastening the lower edge portion of the clapboard to the framework as by nailing. In assembling such clapboards upon the supporting structure the upper edge of a next following or next lower clapboard is inserted into the groove presented by the unit already emplaced, whereupon it too may have its lower edge portion or terminal flange fastened to the supporting structure, and so on.

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Another object is to provide a light and yet strong and concussion-resistant wall structure. Such a structure is provided by the vertical structural element or post of this invention which lends itself to have such metal clapboards rapidly and firmly applied thereto by means of snap-fastening.

These objects are attained by providing a composite metal profile of the general appearance of an I-shape in which a web- or body portion forms a solid although composite or double median wall portion, and hollow end portions from which latter extend flange portions representing the transverse portions or flanges of the I-shape. As a part of these transverse portions a pair of converging shanks extend into each hollow and by their convergence towards each other inwardly these shanks form a vortex or V-shape providing a mere crack-like opening at the bottom of the V-shape where the converging shanks adjoin each other. A snap-fastening element for holding the clapboards or the like can be forced into this crack at any selected point along the length or height of the post in a non-retractable or one-way fashion since the converging shanks have sufficient resilient yieldability to be slightly forced apart or spread by such penetration.

More specifically these objects are realized by a composite or total profile of roll-shaped elements which comprises a pair of identical component profiles firmly connected in a symmetrical or complementary fashion along a longitudinal plane of juncture which coincides with the longitudinal axis of the profile of the I-shape.

According to one feature such a component profile, that is one-half of the total profile of the post, is formed by roll-shaping from a longitudinal metal strip. Such a strip is roll-formed to constitute a web- or body portion having a longitudinal plane medial portion which substantially coincides with the longitudinal median plane of the post which in turn coincides with what is termed as the longitudinal axis of the I-shaped profile. The web portion of the component profile has outwardly offset end portions extending substantially parallel to the medial portion. From the end of each said web portion extends outwardly and at right angles a flange which has double wall thickness in that it is bent back upon itself and terminates in an inwardly inclined portion or shank that overhangs the inside of the adjacent offset portion of said web portion.

The total or composite profile of the post itself is formed by a face to face connection of the protruding medial web portions of the component

profiles. Therefore, respective pairs of said web portions thus associated constitute a hollow portion at each end of the I-shape. By the same token, that is by interconnection of the component profiles in this manner, pairs of inclined shanks or terminal portions of the component profiles become associated in a manner whereby the shanks of each pair converge towards each other and inwardly in constituting a V-shape or vortex within each respective end hollow of the I-shaped profile. Hence the vortex of the V-shape forms a narrow slot or potential slot-like opening where the free terminal edges of a pair of converging shanks adjoin each other. A snap-fastening member for holding the wall-covering can be forced in between the converging shanks at any selected point along the length or height of the post in a non-retractable or one-way fashion, as the shanks allow themselves to be slightly forced apart by such penetration. With the composite profile according to this invention this means of snap-fastening is applicable for both the outer as well as the inner wall-covering of the wall structure.

Other features reside in the manner of and means for combining the post or composite profile with the outside and the inside portions or coverings of the wall structure as by means of snap-fasteners or barbed nails. Some features lie in the provision of a vertical ledge member of special roll-formed profile for attaching inner wall panels to the posts.

In the drawings:

Fig. 1 is a perspective view of a wall portion viewed from the outside embodying the post or profile of this invention.

Fig. 2 is a perspective view of a wall portion similar to that of Fig. 1 although viewed from the inside and illustrating certain fastening means for the inside wall-covering.

Fig. 3 is a partial or top view of the wall portion of Fig. 2 taken on line 3—3 thereof, illustrating more clearly means for fastening the inner wall-covering.

Fig. 3*a* is an enlarged detail view of the profile of a ledge member for attaching inner wall panels to the posts.

Fig. 3*b* illustrates the manner of inserting the head portion of barbed nail or snap fastener into the ledge member from one end thereof.

Fig. 4 is a perspective view of the structural member or post per se.

Fig. 5 is the cross-section or total profile of the post illustrating the use of snap-fastening members at each end of that profile.

Fig. 5*a* is an enlarged partial detail view of a fastening nail for attaching elements to the posts.

Fig. 5*b* is a cross-section of the nail taken on line 5*b*—5*b* of Fig. 5*a*.

Fig. 6 shows the component portions or component profiles apart from each other.

Fig. 7 shows the component profiles of Fig. 6 joined together to constitute the total or composite profile.

The drawings show the structural member or post of the invention as embodied in a wall structure (see Figs. 1 and 2), and they also show the post itself detached from the structure (see Figs. 3 to 7) so that the shape and formation of its composite or total profile as well as the profiles of its component portions present themselves clearly.

Referring to Figs. 4 to 7 there will first be rendered a description and analysis of the structural member or post itself.

The post as whole or its composite or total profile is designated as P consisting of a pair of substantially identical component portions or profiles P_1 and P_2 joined with one another and disposed symmetrically with respect to each other. That is, the component profiles or portions P_1 and P_2 are fastened back-to-back to each other in some suitable manner, such as spot-welding. The component portions P_1 and P_2 join each other in a plane which is the longitudinal medial plane of the post P, in which plane also lies the longitudinal medial axis of the composite profile P which has the overall appearance of an I-shape.

The overall appearance of the total or composite profile P is that of an I-shape inasmuch as it has a body- or web portion 10 and transverse end portions or flange portions 11 and 12. The body portion 10 in turn comprises hollow end portions 13 and 14, and by the same token it has an intermediate constricted portion 15 forming with the hollow end portions a pair of dovetail-shaped recesses 16 and 17.

The hollow end portion 13 is defined by a pair of wall portions 13^a and 13^b which are parallel to each other as well as parallel to the intermediate web portion 15, and it is further defined by its depth d_1 and its width w_1. Similarly, the hollow portion 14 is defined by parallel wall portions 14^a and 14^b as well as by its depth d_2 and width w_2.

The transverse or flange portion 11 of the I-shape or composite profile comprises a pair of component flanges 11^a and 11^b extending in opposite directions, namely at right angles from the respective outer ends of the wall portions 13^a and 13^b. A pair of wing portions 18 and 19 in effect extend from the inner ends of the component flanges 11^a and 11^b to converge towards each other and into the hollow of the hollow end portion 13. Thus the wing portions 18 and 19 form a V-shape or vortex V_1 with their ends either touching each other or else forming between them a narrow gap or crack 20 at the bottom of the vortex.

Similarly, the transverse portion 12 of the I-shape or composite profile comprises a pair of component flanges 12^a and 12^b extending in opposite directions to each other, namely at right angles from the outer ends of the parallel wall portions 14^a and 14^b respectively. A pair of wing portions 21 and 22 in effect extend from the respective inner ends of the component flanges 12^a and 12^b and converge towards each other and into the hollow of end portion 14. Thus the wing portions 21 and 22 form a V-shape or vortex V_2, with their inner ends either touching each other or forming a narrow gap 23 at the bottom of the vortex.

Referring to Fig. 6 there will now be described in detail the roll-formed component profile P_1 which is identical to and joined with the other component profile P_2 to constitute the composite or total I-shaped profile P of the post.

The component profile or portion P_1 (see Fig. 6) comprises a body or web portion 24 and at each end thereof and extending at right angles therefrom a flange, namely the previously mentioned flanges 11^a and 12^a. The body portion 24 has a pair of symmetrically disposed offsets or double bends 25 and 26 whereby the body portion is subdivided to form a straight intermediate portion 27 and parallel thereto and spaced a distance d_1 therefrom straight end portions 28 and

29 co-planar with each other. The offset 25 constitutes an S-shaped or double bend comprising the single bends 25a and 25b. The offset 26 constitutes an S-shaped or double bend comprising the single bends 26a and 26b.

The flange 11a has double wall thickness, the additional wall thickness being represented by a bent-back portion 30 which in turn terminates in the previously mentioned wing portion 18 with which it merges by way of bend 31, the wing portion 18 being inclined against the flange 11a under an angle a and forming with the end portion 28 a complementary angle b. The wing portion 18 in turn is formed with a small terminal bend or lip 32 presenting a slight convexity towards the body portion 24. The wing portion 18 defines one half of the previously mentioned vortex or V-shape V_1 and its terminal point is defined by the distance d_2 indicating the depth of the V-shape, and by the distance d_3 which may be substantially equal to or slightly smaller than the distance d_1 in view of the provision of the crack 20 (see Fig. 7).

The flange 12a like flange 11a is of double wall thickness having a bent-over portion 30a terminating in and merging with previously mentioned wing portion 21, otherwise similar and symmetrical to the flange 11a and its wing portion 18.

Similarly, the companion component profile P_2 comprises a body- or web-portion 33 having at each end thereof and extending at right angles therefrom a flange, namely the previously mentioned component flanges 11b and 12b. The body portion 33 has a pair of symmetrically disposed offsets or double bends 34 and 35 whereby the web portion 33 is subdivided to form a straight intermediate portion 36 and parallel thereto and spaced a distance d_1' therefrom straight end portions 37 and 38 which latter are co-planar with each other. The offset 34 constitutes an S-shaped or double bend comprising the single bends 34a and 34b. The offset 35 constitutes an S-shaped or double bend comprising the single bends 35a and 35b.

The flange 11b of component profile P_2 has a bent-over portion 39 terminating in the previously mentioned wing portion 19 and is otherwise similar to and symmetrical with the flange 11a of component profile P_1.

Similarly the flange 12b of component profile P^2 has a bent-over portion 40 terminating in the previously mentioned wing portion 22 and is otherwise similar to and symmetrical with the flange 12a of component profile P_1.

The component profiles P_1 and P_2 are shown to be solidly interconnected back-to-back as exemplified by spot-welds A_1, A_2, and A_3 (see Fig. 4), although other connecting means, for example rivets, may be used.

The manner of attaching or fastening wall elements to a post or profile such as just described, is exemplified in Fig. 5. The attachment is effected by means of a special fastening element or what will herein be called a barbed nail 41 details of which are shown in Figs. 5a and 5b.

Such a barbed nail 41 can be driven into the post at any point along the length of the post and into either one of the hollow end portions or vortices V_1 and V_2 thereof. The barbed nail 41 has a flat head 42 and a stem 43 which latter has a barbed end portion 44. The barbed portion 44 of the nail in longitudinal section (see Fig. 5a) represents a saw-tooth-

shaped profile, each tooth representing what may be termed an annular barb 45. Indeed, such an annular barb 45 (see Fig. 5b) is defined by an annular base area 46 facing the head portion of the nail and extending in a plane transversely thereof, and by a trunco-conical face 47.

Therefore, in order to fasten a wall element E_1 or E_2 to a post or profile P (see Fig. 5), a barbed nail 41 may be driven through a nail hole of the wall element and into the respective hollow end portion or through the respective vortex of the profile as far as it will go. In this way the wing portions, for example 18 and 19 of vortex V_1, are forced apart due to a slight resilient deformation thereof, and the nail will lock itself non-retractably as the terminal lips of the wing portions close on it catching upon a base area 46 of a bard as shown in Fig. 5. In order that such a barbed nail might be removed it is necessary to spread or force the wing portions 18 and 19 sufficiently apart to allow for withdrawal of the nail, or else the head of the nail may be severed from the stem.

The perspective view of Fig. 1 presents an example of how the structural members or posts can be structurally combined with other wall portions to constitute a wall. This is a view upon the outside portion of the wall structure. In this example a pair of identical posts P_3 and P_4, each embodying the composite profile P_1 as above described, are shown as part of a wall structure which further comprises an outer wall portion or wall-covering W_1 in the form of known roll-formed wall elements which in their outer appearance simulate the familiar clapboards, and an inner wall portion or covering W_2 which may be in the nature of straight panels of some suitable material, both the outer and the inner wall portions being fastened to the posts P_3 and P_4 in a manner subsequently to be described.

A clapboard of the outer wall covering is designated as 48 and is shown to have a profile which comprises a substantially vertical body portion 49 even though of shallow inward curvature so as to outwardly present a shallow concavity whereby it is tensioned against the posts. At its lower end the clapboard is formed with an end portion 50 of general S-shaped configuration merging with the body portion 48. The S-shape of the lower end portion 50 may be said to comprise a first and wider U-shaped bend 51 and merging with this first bend a second although narrower bend 52 of inverted U-shape terminating in a vertical skirt portion 53 which extends downwardly beyond the first bend 51. The terminal skirt portion 53 has horizontal elongated perforations 54 serving as nail holes for the fastening nails indicated by the numeral 41 since they are identical to those described above in Fig. 5, for fastening the lower edge portion of the clapboards to the posts P_3 and P_4. The inverted narrow groove 52 serves to receive and to hold the top edge portion of a next lower clapboard 55 (only fractionally shown) and which in turn may have its lower end portion fastened in a similar manner to posts P_3 and P_4 as by barbed nails exemplified at 41. The clapboard 48 in turn has its top edge portion 48a held by a next higher clapboard indicated at 56 inasmuch as the top edge of clapboard 48 is inserted into the bottom groove 56a of clapboard 56. That is to say clapboards thus ex-

emplified can be emplaced and fastened to the posts P_3 and P_4 by successively emplacing one clapboard below the other; in other words, by inserting the top edge of a succeeding clapboard into the bottom groove of a clapboard already emplaced and fastened, and then in turn fastening the bottom edge portion of the clapboard being emplaced so that its lower edge groove can in turn serve for the reception of the top edge of a next following clapboard to be similarly emplaced and fastened as by barbed nails exemplified at 41.

The inner wall portion or wall-covering W_2 is shown to be in the nature of panelling, that is of individual panels or plates fastened to the posts P_3 and P_4 at the inner flange thereof. The manner of and means for its fastening are more specifically shown in Fig. 2 which presents a perspective view of the inside portion of the wall structure shown in Fig. 1, although presenting merely a single post P_5 and its associated wall portions, the post P_5 in its profile otherwise being similar to or identical with the posts P_3 and P_4 which in turn have the profile of post P described further above.

The inner wall portion or covering W_2 is shown to comprise individual plates or panels dimensioned to fit the center-to-center distance between a pair of posts. A pair of such panels adjoining one another and fractionally shown are designated by numerals 57 and 58. The vertical edge portions 59 and 60 of the respective plates are inserted into and held by vertical grooves 61 and 62 respectively of a vertical roll-formed special ledge member 63 which in turn is held to the post P_5 by means of barbed nails 41a which in fact are similar to or identical with the barbed nail 41 above described.

The cross-sectional profile of the vertical ledge member 63 (see Fig. 3a) comprises a plain intermediate outward facing body portion 64 merging with a pair of U-shaped end portions 65 and 66 which have their open ends directed away from each other. The U-shapes 65 and 66 merge with the body portion 64 by way of bends 67 and 68 respectively, so there results a profile of the ledge member providing a shallow hollow space 69 from which leads a passage 70 the width of which is defined by the distance d_4 provided between the bottoms 71 and 72 respectively of the two U-shaped end portions 65 and 66. The outer shanks 73 and 74 respectively of the U-shapes 65 and 66 present a pair of flanges which extend in opposite directions although in substantially the identical plane, and these flanges are adapted to be set against the outer flange portions of the post P_5 and to be thus held by such barbed nails as the one shown at 41a in Fig. 3. In preparation for the use of the ledge member when emplacing the inner wall panels, the required number of barbed nails 41a may be slid into the ledge member from one end thereof in the manner shown in Fig. 3b and, since sufficient frictional contact may be provided between the inserted head portions of the nails and the ledge member surrounding them, the ledge member may be handled and emplaced while the nails remain frictionally held and positioned at the desired points along the ledge member.

For example, in order to fasten inner panels of the inner wall portion W_2 one panel is first positioned so that one of its vertical edges will enter into and lodge in a vertical groove of a ledge member 63 already in place. Another ledge member, not shown in Fig. 3 but similar to the ledge member 63, is then applied to the opposite vertical edge of the panel being emplaced, and this second ledge member in turn is then emplaced by being fastened to the second or next post (not shown) by simply pressing the ledge member against the post so that the barbed nails will be forced into the post and lock themselves in the manner previously described.

The space between the outer wall portion W_1 represented by clapboards and the inner wall portion W_2 represented by wall panels may be filled with any suitable insulating material as indicated at M in Fig. 1.

This specification is a continuation-in-part of my application Serial No. 674,817, filed June 6, 1946, now abandoned.

I claim:

A structural vertical stud member comprising a pair of similarly formed and interconnected roll-formed component profiles, each profile having a web portion comprising an intermediate portion and end portions on each side of the intermediate portion integral therewith and connected thereto by an S-shaped section, the end portions being co-planar with each other and parallel with the intermediate portion but offset therefrom by the S-shaped section, the intermediate portion with the S-shaped section forming a dovetail shape in cross-section, an outwardly directed flange member integral with and extending at right angles to each end portion, a portion of the flange member being bent backwardly over itself and overlying the same in parallel relationship, and an integral extension of the bent-over portion extending inwardly toward the intermediate portion and at an acute angle to each end portion, the extension extending inwardly a distance substantially equal to the extent of the S-shaped extension, the free end of each extension being formed with a curved lip presenting a slight convexity toward each S-shaped section, the rear face of the intermediate portion of each profile being interconnected to make the stud member with the end of each extension and lip being within a space provided by the offset of the adjacent end portions from the intermediate portions by the S-shaped sections, the extensions forming an inwardly tapering cavity within the space with the lips being closely adjacent each other defining a narrow slot, whereby when the stud member is emplaced in a building structure the cavity is facing the inner and outer walls thereof and the cavity is adapted to securely hold a barbed fastening element within the slot to retain the facing of the building upon the outer wall and the wall facing upon the inner wall.

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