

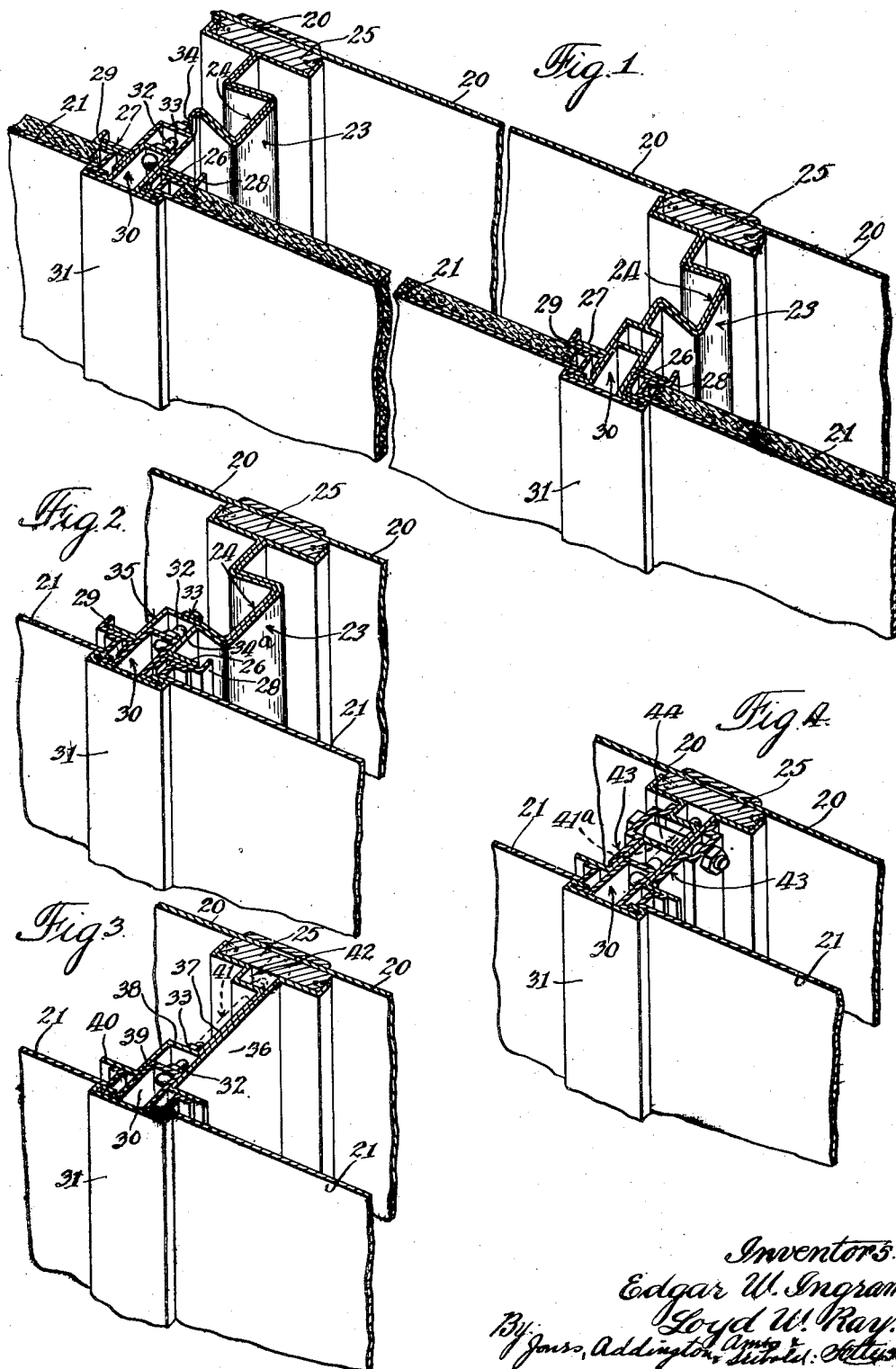
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E. W. INGRAM ET AL
METAL BUILDING STRUCTURE

2,169,388

Filed March 25, 1935

2 Sheets-Sheet 1



Inventors:
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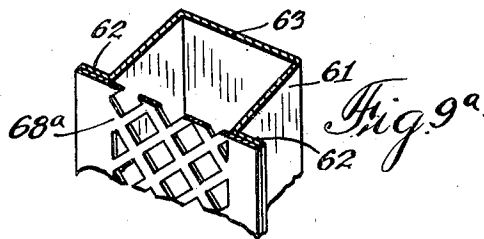
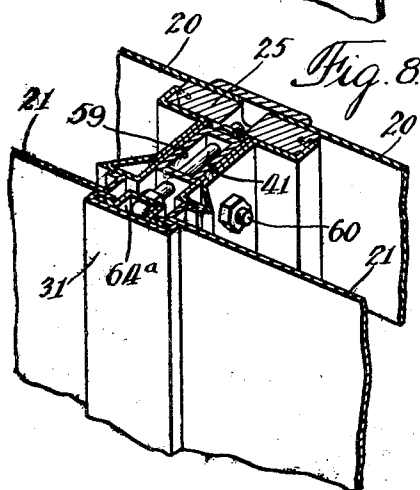
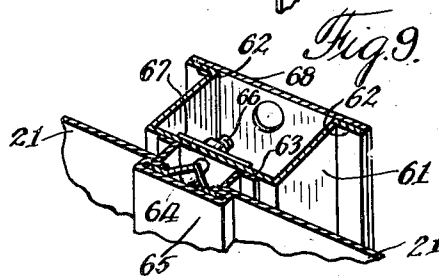
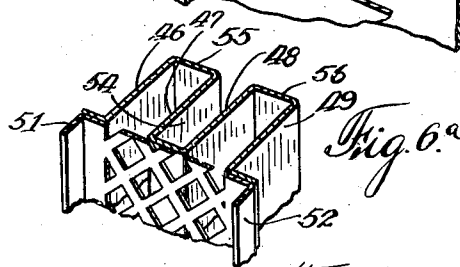
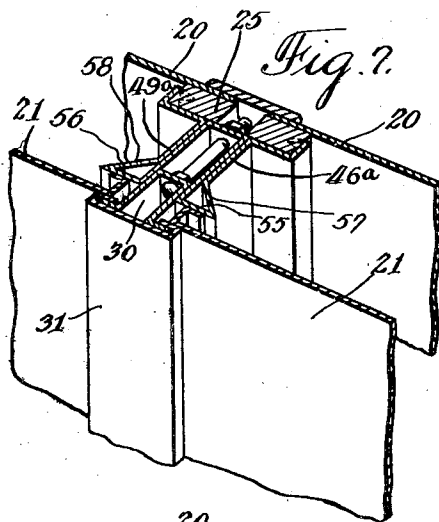
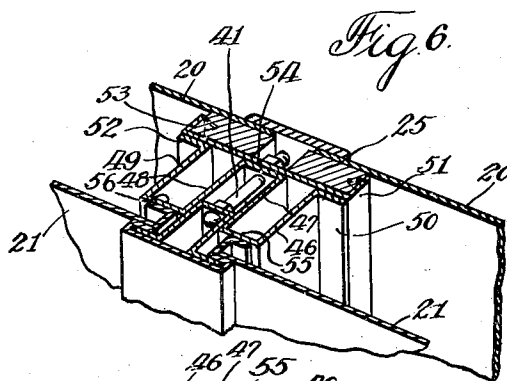
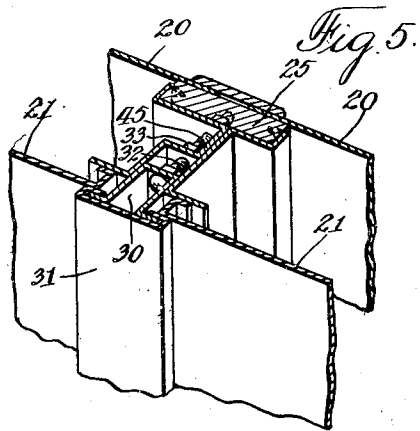
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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METAL BUILDING STRUCTURE

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6 Claims. (Cl. 189—34)

This invention relates primarily to metal building constructions of the type whereof the elemental parts may be pre-fabricated, conveniently transported to the desired location and there assembled and erected into the building without special cutting or fitting or the use of special tools, and with ordinary skilled labor. While such structures may be permanent in character and must be built therefor, it is frequently desirable that they be removed and possibly used elsewhere. Accordingly, this invention contemplates such construction that the same may be readily disassembled and the parts removed to storage or to another location and there again erected.

More particularly this invention relates to the wall construction of such buildings, and especially to the studding and associated parts, and hence it is deemed sufficient in the following to illustrate and describe only such parts as are more directly involved.

The studding or similar structural elements of this type are made of drawn or rolled sheet metal strips, usually formed by the drawing operation into half-stud sections having central web portions and edge flange portions which upon being bolted or welded together back to back at their web portions form the complete studding. The wall facings, usually of panel construction, are secured to the flange portions of these studdings after the latter have been suitably embodied in the framework of the building.

The general objects of the invention are to improve such wall constructions, to improve the studding in their manufacture and handling, to increase ease of assembly and disassembly, and to provide forms adaptable to different uses, whereby to meet the demands for such structures and fulfill the requirements as to efficiency, space and cost.

Other objects and advantages will appear from the description and claims to follow in connection with the accompanying drawings, which illustrate, by way of example, several embodiments of the invention, and in which—

Fig. 1 is a fragmentary perspective view, partly in horizontal section, of a wall structure embodying one form of the invention;

Fig. 2 is a similar view of a different form as to certain features;

Fig. 3 is a similar view of another form;

Fig. 4 is a corresponding view of still another form and showing a studding of lesser width and adapting the same for narrower constructions;

Fig. 5 is a similar view of still lesser width of

studding, which may be used for specially narrow widths of wall construction;

Fig. 6 is a fragmentary sectional view in perspective of a wall construction in which the studding has a one-piece web portion;

Fig. 6a is a similar view of the studding alone but showing a latticed plate instead of a solid plate across the back of the studding;

Fig. 7 is a fragmentary perspective view of a wall section showing a form of one-piece studding therein;

Fig. 8 is a similar view of another form of wall section;

Fig. 9 is a similar view of still another form;

Fig. 9a is a view showing a studding similar to that of Fig. 9 but in which a latticed plate is used instead of a solid plate; and

Fig. 10 is a detail perspective view of a different form of key which may be used in the clamping or key strip.

In these drawings, Fig. 1 shows a fragment or section of a vertical wall of a building embodying the invention, two only of the studding being shown, which extend vertically the height of the wall or to the extent desired and to the opposite edges of which the inside wall panels 20 and the outside wall panels 21 are suitably secured. These panels may be of porcelain-enamelled metal or other desired material, preferably in the form of sheets of standardized size, shape and configuration, so as to be interchangeable, and the outside panels may be lined with a layer of sound-deadening material which may also act as a heat insulation.

The studding themselves comprise what may be termed male and female half-stud sections having means, such, for example, as interlocking tenon and groove, keystone or dovetail construction, extending preferably throughout the length of their webs for attaching the two halves together without bolts or welding, thus permitting their assembly on the job, if desired, without the use of special tools or devices. Thus, as shown in Fig. 1, the webs of the studding, which are of sheet metal, are bent longitudinally to form the interlocking dovetailed groove and tenon or keystone portions 23 and 24, fitting one within the other, to secure the two half-sections of the stud together, this being done preferably at the point of installation by slipping the two together endwise, no welding or bolts or other securing devices being necessary. The inner edges of these sections are bent outwardly from the web and then parallel with the web to form a longitudinal recess for the nailing or furring strip 25,

which is preferably thicker than the edge flanges of the stud, to insulate, isolate and separate the extreme edges of the flanges from the inside face of the panels 20. The nailing or furring strip 25 is secured in its channel by screws, nails, prongs or any other suitable means.

The outer edges of the studding sections are bent outwardly to form the clamping or key strip channel between them and the outwardly extending flanges 26 and 27. Z-bars 28 and 29 to strengthen the stud may be secured to said flanges, their inner ends forming continuations of the sides of the clamping or key recess. The in-turned edges of the outer wall panels 21 lie against these Z-bars, if used, and are clamped thereagainst by the clamping member or key. This clamping member or key consists of the U-bent sheet metal strip 30 and the finishing strip 31, if used, overlying the open side of the U-member with its edges overlapping inwardly the outer edge flanges of the U-member. Such finishing strip may be omitted if desired, the key strip itself being relied on for clamping the panels in position.

Clamping or key bolts 32 at intervals throughout the length of the studding extend through the bottom of the U clamping member 30, with a locking nut outside thereof, or are otherwise secured to the U-member, and thence through the bottom of the clamping strip recess of the studding web members, with a locking washer and a tightening nut 33 on the end of the bolt, the said end of the bolt and its nut and washer being located in a suitable recess 34 cut or formed in the web members of the studding.

By assembling the parts as shown and tightening the nuts 33 the outer panels 21 are rigidly clamped to the studding and the whole tightly clamped together to form a satisfactory structure, yet with sufficient clearance for expansion and contraction. After this is done the inner wall panels 20 may be applied and the whole formed into a strong, rigid construction. The inner wall face panels 20, which may be of any desired material but as here shown are of sheet metal, may be secured by screws or nails at their edges to the face of the nailing or furring strip 25 or in any desired way, the said edges being covered, if desired, by a suitable trim or finishing strip which is secured in position in any desired way.

In the form shown in Fig. 2, the construction is the same as in Fig. 1, except that the webs of the two half-sections of the stud merge into the clamping or key recess at the root of the dovetail or keystone portions at one side thereof, whereby it is not necessary to cut out portions of the webs to accommodate the clamping or adjusting nuts and bolts of the clamping or key strip, and more room is provided for the workmen to adjust the same.

Thus, as shown in Fig. 2, the member forming the outer or forward dovetail portion of the web is bent directly into the side 34* of the clamping strip recess; and the inner or male web member is extended to form the bottom of the recess and then outwardly, as at 35, to form the other side of the clamping strip recess. The clamping or adjusting bolts 32 then pass through holes in the bottom of the recess so formed, with the nuts on the inside, with ample room for adjusting the same. The center line or plane of the clamping recess is in line with the webs on the opposite side of the dovetails, as in Fig. 1, and the construction and operation are otherwise the same.

In the form shown in Fig. 3, wherein the general construction and operation are the same as in the other figures, the two stud half-sections 36 and 37 are spot-welded, bolted or otherwise secured together, but the web of one, 36, is straight or flat while the web of the other, 37, is offset or bent to form the bottom and one side of the clamping or key strip recess, and also, if desired, the recess in the bottom of the nailing or furring strip channel formed at the opposite edge of the studding. This renders unnecessary the cutting of a hole in the web of the complete studding or otherwise forming the same to accommodate the bolts and nuts of the clamping or key strip and makes the same more accessible to the workmen.

Thus, as shown, the half-section 36 is bent at its inner edge to form a portion of the bottom and one edge of the nailing or furring strip recess or channel, while the opposite edge of the half-section forms, without bending, one side of the clamping or key strip recess or channel and its extreme edge is bent at right angles to form a seat for the inwardly bent edge of the outer wall panel 21.

The other half-section 37 of the studding is bent at its outer edge to form the bottom 38 of the clamping or key strip recess or channel, and then, as at 39, to form the other side of said recess or channel, and again as at 40 to form a seat or rest for the edge of another wall panel 21. The clamping or key strip, such as 30, fits into the channel thus formed and is adjusted in position by the bolt 32 passing through the bottom of the channel and nut 33, as in the case of Fig. 2.

However, this clamping or adjusting bolt may be longer, as indicated by the dotted lines 41, and extend to and through the bottom of the recess or channel 42 in the bottom of the nailing or furring strip channel or recess, where a nut is provided therefor and which may be operated as by a suitable socket wrench to adjust the clamping strip. By having the adjusting nut accessible from the inside of the building in this manner, the outside panels may be removed and replaced without removing or disturbing the inside panels, suitable provision being made therefor, as, for instance, by providing the nailing strips with holes for the wrench in line with said bolts, installing the inside panels with a separation between adjacent edges over the nailing strips or with notched edges in alignment with the bolts and then by applying a suitable finishing strip to the joints between edges of the panels.

Fig. 4 shows a form of construction substantially the same as that of Fig. 3, except that the contacting web portions, which are welded or bolted together, are considerably narrower, which permits a complete studding of much narrower width in overall dimensions than is usual and adapts the same for use in types of buildings where such thinner walls are desired. This is clearly seen in the drawing, Figure 4, and detailed description is deemed unnecessary.

In situations where it may be desired to use this stud as a half-stud and extra strength is required and the same must be assembled at the time and place of erection, it is so formed as to give bearing surfaces on both sides for reinforcing bars 43, one on each side of the studding. That on the one side rests against the flat face of the web and the bar on the other side bears at its edges against the sides of the respective

recesses or channels formed by that half-stud member. Bolts, such as at 44, extend at intervals through suitable holes in these reinforcing bars and the contacting web portions of the stud sections to clamp them all together, thereby forming a stiff, strong and rugged construction. In such arrangement the longer key tightening bolt, such as 41^a, would preferably be used, suitable holes being formed in the nailing strip 25 opposite the ends of the bolts to provide access to the tightening nuts.

In the form shown in Fig. 5, the web portion of the complete studding, as at 45, is still further shortened or narrowed, and no recess or channel for the threaded end and nut of the clamping or key adjusting bolt is provided, which still further reduces the over-all width of the studding and the consequent thickness of the wall. As shown in full lines, the adjusting bolt 32 and nut 33 may terminate at the bottom of the clamping or key strip recess or channel and the clamping nut be adjusted from that point, or, as shown in dotted lines, the bolt may be extended through an aperture in the bottom of the furring or nailing strip recess or channel and the nut placed inside the said recess or channel. In this case, as in the forms where the longer bolt is used, a suitable hole is cut in the furring or nailing strip to receive the bolt end and nut and through which the nut can be operated by a suitable wrench without removing said strip or disturbing the inside panels.

Referring to Fig. 6, the web portion of the studding is made of a single sheet of metal, preferably drawn through suitable dies of the proper configuration to produce the four preferably separated legs or web members 46, 47, 48 and 49. The edges of the outer legs or webs 46 and 49 are outwardly bent, as at 50 and 52, to form, together with the transverse portion 54 between and joining the inside legs 47 and 48, a seat for the nailing strip channel formed of a plate welded or otherwise secured thereto and having the edge flanges 51 and 53 and forming the channel for the nailing or furring strip 25 to which the inside wall panels 20 are attached. The inside legs 47 and 48 form the channel for the clamping or key strip 30, having the finishing or trim strip 31 overlying and extending around the out-turned edges of the member 30.

The portions 55 and 56 of the stud member joining the legs 46, 47, and 48, 49, form seats for the in-turned edges of the outside panels 21, between which seats and the clamping strip or key the edges of the panels 21 are firmly clamped when the clamping strip or key is drawn inward tightly.

The clamping or adjusting bolts 41 at intervals throughout the length of the stud are passed through apertures in the bottom of the key strip, a locking nut or washer on the bolt being tightened against the outside face or welded in position so that the key strip may be pushed outwardly or drawn inwardly by said bolt. The other end of the bolt 41 passes through the member 54 and channel plate and receives a nut by which the key strip may be tightened or adjusted.

The nailing or furring strip 25 is provided with suitable holes to accommodate the ends and nuts of bolts 41. The inside panels 20 at their vertical edges are separated slightly so that the clamping nuts are accessible therebetween and the same are covered by a suitable trim strip removably secured in position in any usual or desired manner, as in the other figures.

Fig. 6a shows the same construction as Fig. 6 except that the plate forming the nailing strip channel is latticed, as shown, instead of being solid, as in Fig. 6.

The web being made of one piece of metal and the outer legs forming braces for the clamping ledges which receive the outer panels, the stud is especially strong and may be of small dimensions, and thus is particularly adaptable to the small and cheaper types of buildings.

Referring to Fig. 7, the stud here shown is also formed of a single sheet of material drawn, bent or otherwise formed with the four leg or web portions, but the outer legs, 46a and 49a, are bent inwardly so as to be in contact with the adjacent inner legs and they may be spot-welded or bolted together for greater strength and stiffness.

From the outer edges of the seat portions 55 and 56 for the in-turned edges of the outside sheet metal panels 21, the diagonal portions 57 and 58 of the outer leg members extend angularly to the straight web portions of the corresponding legs, and form supporting braces for the outer edges of the seats and assist in producing a rigid and strong stud structure. Otherwise the structure, arrangement and operation are substantially the same as in Fig. 6 and the other figures.

By making the studding in this form comparatively light sheet material may be used, which is correspondingly cheap and more easily and less expensively worked, and at the same time a very strong and rigid structure is obtained. The dimensions of this form may be small, such as adapt it for use in thin wall constructions.

Fig. 8 shows a form similar to that of Fig. 7 but in which half-stud sections, otherwise the same as in Fig. 7, are used with a reinforcing member between them which is bolted or welded to such half-sections. This reinforcing member 59, also of metal, is rectangular in cross-section, and the key clamping bolts 41, similar to those of Fig. 7, pass through its ends, as viewed in cross-section, the clamping nuts and washers seating on the outside of the inner and/or narrow side of the said member. Transverse bolts 60 may extend through the webs of the half-stud sections and reinforcing member 59 to secure all the parts of the stud together, or they may be suitably spot-welded together.

This reinforced type of stud may be used advantageously with studs of the type of Fig. 7 where, as sometimes is necessary, half-studs must be used. They are then bolted all together upon erection.

Fig. 9 shows a studding structure for use particularly in small and cheaper type buildings, where no inside trim is required. In this form the stud 61 is drawn in the form of a shallow rectangle, the rear or inner side being closed by a plate or strip 68, which may be solid or latticed as at 68^a in Fig. 9a, secured to the out-turned flanges 62. The reverse or inner side 63 serves as a seat for the outside panel edges. The latter are clamped to the said face 63 of the stud 61 by a shallow type clamping member comprising a key strip 64 and a trim strip 65 having in-turned edges embracing the edges of the key strip. The clamping bolts 66 pass through the key strip, their heads being covered by the finishing strips, and thence through holes in the face 63 of the stud and through holes in the washer plate or strip 67. The adjusting nut engages it on the inner side of the latter strip 67 and when tightened thereagainst tightly draws the clamp-

ing strip against the edges of the panels to secure them in position. Suitable holes are provided in strip 88 to give access to these adjusting nuts. The key strip 84 may have a central U-shaped depression, as in Fig. 10, at 84a, and also in Fig. 8, instead of the shallow V-shape, as in Fig. 9. These key strips of the shallow V and U shapes can be used with any type channel in any stud.

The space between the outer panels or their linings and the inner panels in all these forms is preferably filled with some insulating material, such, for example, as that known as rock wool.

Various other forms and combinations may be made, all within the scope of the appended claims.

We claim:

1. A metal stud comprising two continuous sheet metal members having their web portions in back-to-back engagement and their edge portions forming channels for wall panel securing means, the engaging portions of said webs adjacent one of said channels being at one side of the medial plane of the latter and leaving an empty space in said medial plane, and panel clamping means operable along the line of said medial plane and projecting into said space, whereby the said webs do not interfere with the operation of said means.

2. A metal studding construction comprising two continuous sheet metal members having their web portions in back-to-back engagement and edge portions forming a channel for wall panel securing means, the web of one of said members being substantially flat and that of the other being bent to form the bottom and a side of the said channel, and panel clamping means extending through the said bottom at the side of said webs.

3. A metal studding construction comprising two continuous sheet metal members having their web portions, in back-to-back engagement and their edge portions forming channels for wall panel securing means, the web of one of said

members being flat and the other bent at its edges to form the bottom and a side of the channels at the edges of the studding, whereby the medial plane of said channels is at one side of the said webs, and panel clamping bolts extending across from one channel to the opposite on said plane and operable from said opposite channel.

4. A metal studding of limited width comprising two sheet metal sections, the web of one section being substantially flat, the web of the other having a comparatively narrow portion in engagement with the web of the first and bent beyond said portion to form the bottom and a side of the sections at the opposite edges of the studding, panel clamping bolts extending across the studding at one side of the engaging web portions, longitudinal reinforcing strips bridging transversely the engaging web portions, and transverse bolts extending through said reinforcing strips and webs to clamp the whole rigidly together.

5. A metal stud comprising sheet metal strips having narrow web interlocking portions formed at one side of the medial plane of said studding and leaving an empty space in said medial plane, the said strips being bent at right angles adjacent one edge of the interlocking portions to form a channel for a furring strip, one of said metal strips at the opposite side of the interlocking portions being bent to form a channel for a panel clamping key strip, and key clamping bolts passing through the key and channel and to one side of the web and projecting into said space.

6. A metal stud for buildings comprising two continuous sheet metal members having web portions in securing engagement and their edge portions forming channels for wall panel securing means, the engagement-securing portions of said webs being positioned to have an empty space in the medial plane of the studding, and panel clamping means accessible in said space for clamping operation.

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