

Oct. 29, 1929.

W. S. CONNELL

1,733,778

METAL STUD AND JOIST

Filed April 14, 1927

2 Sheets-Sheet 1

Fig. 1.

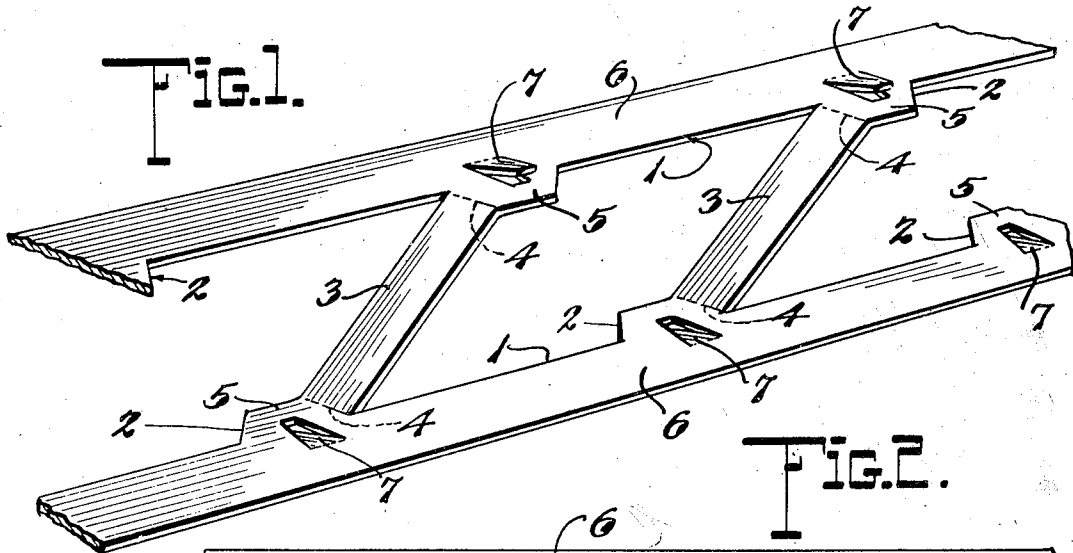


Fig. 2.

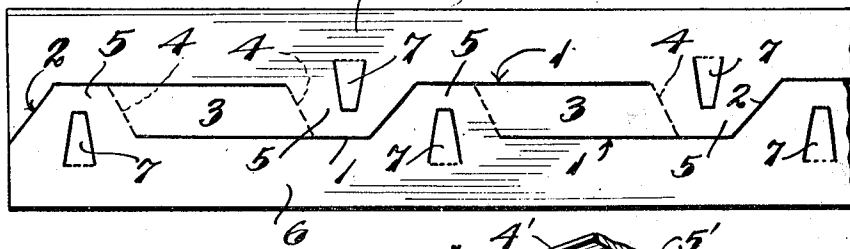


Fig. 3.

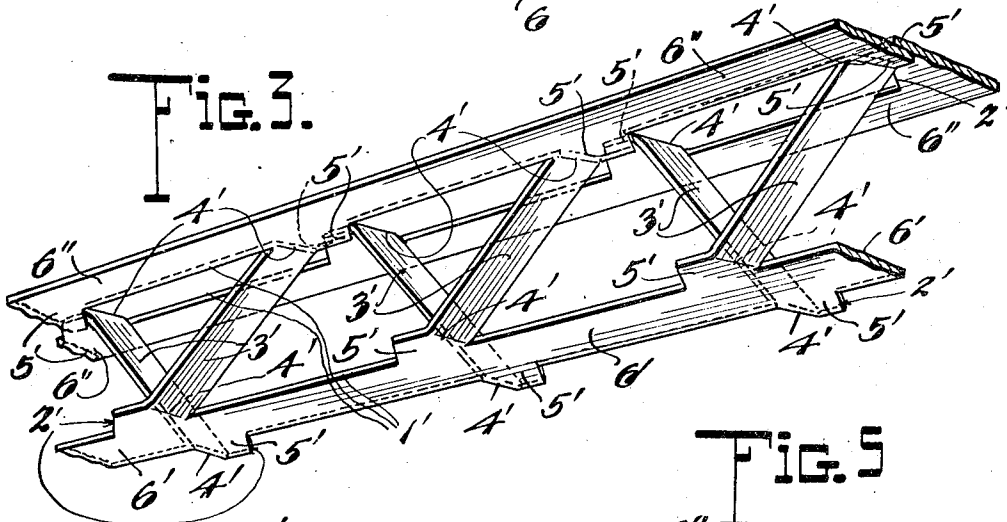
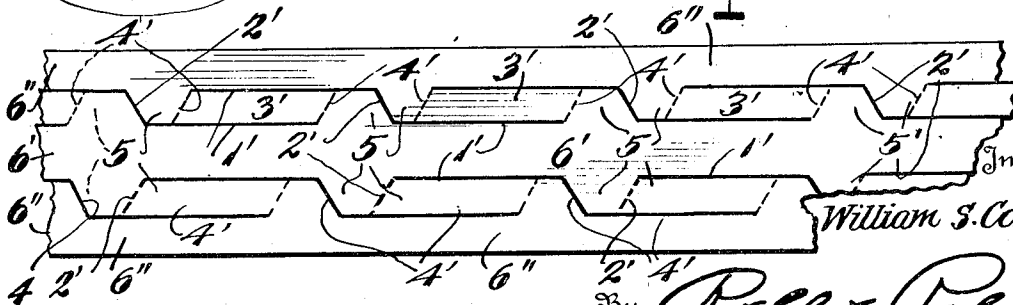


Fig. 5



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2 Sheets-Sheet 2

Fig. 4.

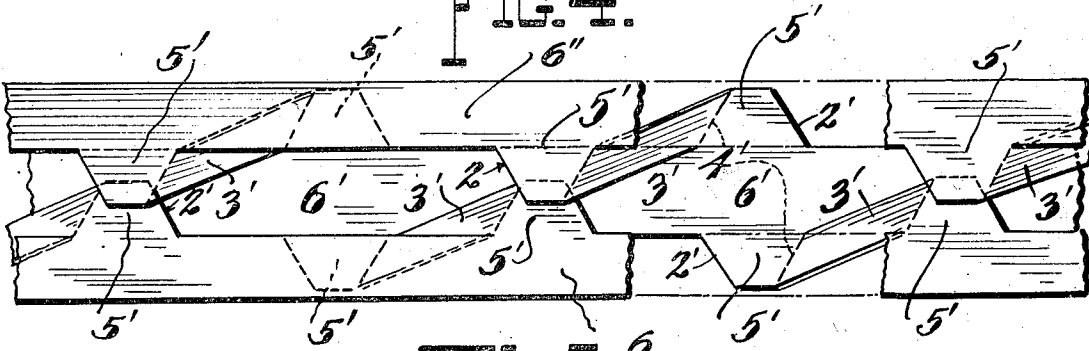


Fig. 5.

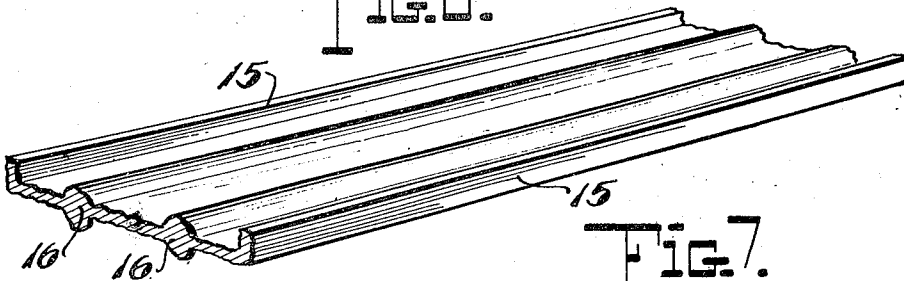


Fig. 7.

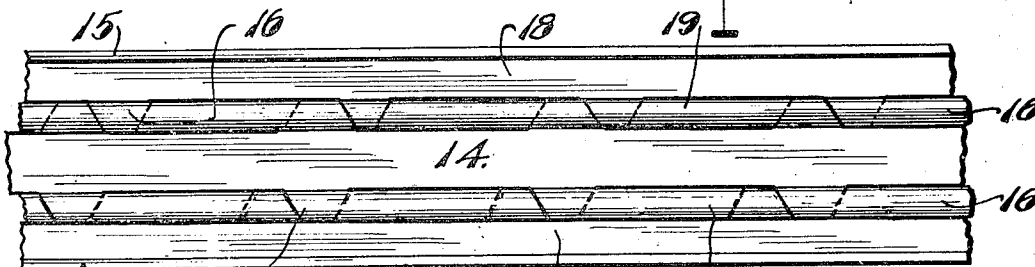


Fig. 8.

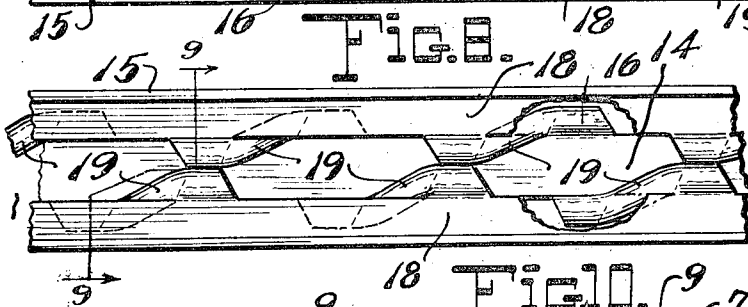


Fig. 9.

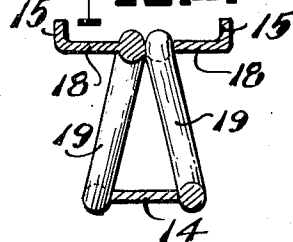
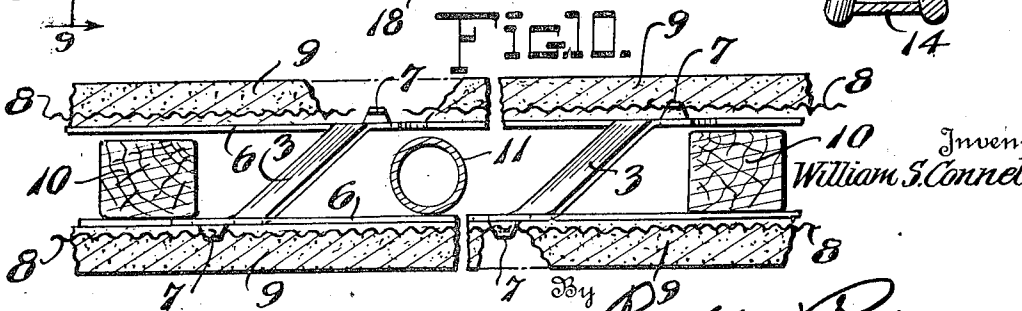


Fig. 10.



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METAL STUD AND JOIST

Application filed April 14, 1927. Serial No. 183,733.

This invention relates to improvements in structural shapes and more particularly to such as are produced by the expansion of an initially formed and slitted blank. The object in view is the production of bars and beams of maximum stress carrying capacity from blanks of minimum bulk.

A more detailed object is the coordinating of the stress carrying or resisting parts for enabling unitary action with its attendant increased capacity as compared with independent action of independent parts.

In carrying out the invention, a channel, flat or other well known commercial shape, rolled or otherwise produced, is appropriately slit and expanded to produce spaced chords and connecting struts, or if the finished structure is looked upon as an I-beam, channel beam, L-beam or the like, the parts will be flange members, (chords), and a web member (struts), the web member being made up of an open-work of connecting strips.

In the accompanying drawings:

Figure 1 is a perspective view of an embodiment of the invention incorporating one of the simplest forms thereof.

Figure 2 is a top plan view of the parts as seen in Figure 1 but in the form of a blank immediately after the shearing or slitting operation and before the bending or expanding action.

Figure 3 is a view similar to Figure 1 of a slight modification of the features of the construction seen in Figure 1.

Figure 4 is a plan view of the construction shown in Figure 3, partly being broken away for disclosing parts beneath.

Figure 5 is a view similar to Figure 2 of the parts seen in Figure 3.

Figure 6 is a perspective view of a further modified embodiment in blank form and before slitting.

Figure 7 is a plan view of the blank as

shown in Figure 6 after slitting but before expanding.

Figure 8 is a plan view, partly broken away showing the blank of Figure 7 after it has been bent or expanded and abutting parts welded.

Figure 9 is a vertical sectional view on line 9-9 of Figure 8.

Figure 10 is an edge view of the embodiment seen in Figure 1 with fragments of wall finishing features assembled therewith.

The invention is susceptible of embodiment and demonstration in practically every imaginable commercial shape and the forms illustrated in the drawings therefore, have been selected only for purposes of clearly illustrating specific embodiments of the invention. A blank is utilized which may be a mere flat seen in the several figures of the drawings, or may have any special shape such as flanges, beads or the like, outstanding from and extending along or otherwise relative to a web, and the invention adapts itself without regard to such specialization in the shape, and enables use of such special shape to very substantial advantage.

One of the simplest expressions of the invention is seen in Figures 1 and 2 in which a flat is sheared or slitted at 1, 1 each slit being an exact duplicate of all others and extending longitudinally of the flat for a distance somewhat greater than the length of the strut to be produced and is then off-set at an angle indicated at 2 in Figure 1, and then extends lengthwise of the flat for the same distance as the first straight portion described. The off-set 2 causes one of the straight portions of the slit 1 to extend along the flat nearer one edge than the other and correspondingly the second straight portion extends along and parallel to the second edge nearer than the first. However, the matter of location of the several slits 1 is one of selection according to the width desired between a given straight portion of slit 1 and the adjacent edge of the flat.

By arranging the two straight portions of slit 1 which are off-set from each other by the inclined portion 2 spaced equidistant from the longitudinal median line of the flat, the width of the area of the flat from one straight portion to the nearest edge of the flat will be the same as the corresponding width relative to the other straight portion, but, of course, if for any reason, it is desired to have one of such widths greater than the other, it is only necessary to form the slit or shearing line 1 nearer one edge of the flat than the other. The slit 1 is repeated throughout the length of the flat while the flat is in its blank form, as seen in Figure 2, and when thus slitted or sheared, the strip of material between one of the straight portions of a given slit 1 and the opposing straight portion of the next slit 1, indicated at 3 in the drawing, forms a strip that is adapted to be bent at its ends which still remain integral with the web making up the flap. Each integral end of each strip 3 may be bent at any angle desired with respect to the main webbing of the flat, but preferably for reasons hereinafter mentioned each end of each strip 3, integral with the webbing of the flat, is bent and inclined as indicated at 4 by dotted lines in Figure 2 and seen at 4 in Figure 1. The inclination of the bending line 4 preferably corresponds substantially to and extends in the opposite direction from the inclination 2 of slit 1 so that when the strips 3 are folded along the bending line 4, an edge-wise outstanding tab 5 is left at each end of each strip 3, one extending from one section of the body portion of the flat and the other extending from the other section thereof. As soon as the several strips 3 have been bent as stated, the parts assume the position shown in Figure 1 and the webbing of the flat beyond the slits 1 become the flanges 6, 6 of the finished commercial shape, taking the strips or bars 3 to comprise the intervening or open-work web between the flanges 6. Thus, from the initial flat is produced a beam and by virtue of the inclination or angle of the bending or folding line 4, one of the flange members or chords 6 substantially overlies and extends substantially parallel to the other flange or chord member 6. Thus, it will be seen that by virtue of the inclination of the folding lines 4, the struts or web members 3 are set at an incline and the thickness of the finished beam is substantially only that of the distance from the straight edge of either chord 6 to the exposed edge of each of the several projections 5. Obviously the distance to which the chord members 6 are spaced apart may vary as desired by varying the inclination of the strut members 3, the greatest distance apart being attained when the strut members are brought to a position outstanding substantially at right angles to the planes of the faces of the original flat or the faces of the chords 6. The uses to which the commercial shape may be put are of

course, almost limitless and the adaptability to vary the relative spacing of the chord 6 enables employment of the finished commercial shape to produce for instance, a wall such as shown in Figure 8, either of extremely narrow or full width thickness, as may be desired. In this connection, it is noted that tabs 7 may be stamped from the webbing or matter comprising the chords 6 and such tabs are preferably stamped from within the areas of the projections 5, so as not to unnecessarily weaken the main bodies of the chords 6. Said tabs 7 serve effectively to provide anchorage for metal lathing 8 or other wall or floor, or other structural parts, to which may be applied the plaster or other finishing material 9, as seen in Figure 10. Between the chords 6 may be interposed nailing strips 10 or any other required parts such as water, gas, wiring and like conduits 11.

In Figures 3, 4 and 5 is seen a further embodiment of the invention in which the flat strip of metal herein referred to as a flat is formed with two series of successive shearing lines or slits 1', each being shaped and serving the purpose of the slits 1 as above described, and each being provided with the inclined intermediate section 2' leaving a middle strip or webbing 6' corresponding to one of the chords 6 and with lateral webbing pieces or strips 6'' each corresponding to the other chord 6 as above described. The slits 1' leave the strips 3' which are designed to be bent up to enable the parts to be expanded to the position seen in Figures 4 and 5. It will be observed that in reaching this position, each of the strips 3 is bent along the folding or bending line 4' at each end obliquely or at an angle to the longitudinal axis of the structure corresponding to the inclination of the inclined part 2' of slit 1' but in an opposite direction, thus leaving an edge-wise outstanding tab 5' at each end of each strip 3'. Since there is a strip 3' at each side of the middle web or chord 6', opposing outstanding tabs 5' occur. In thus bending the strips 3' along the lines 4', the chord members 6'' are brought to laterally spaced relation with respect to chord members 6' and the angle or oblique folding or bending of the strips 3' causes the chord members 6'' to approach each other edgewise until the tabs 5' lap and meet edgewise with the lines 2' contacting and the otherwise exposed ends of the tabs engaging the inner margins of the respective chords 6''. The commercial shape thus produced may be effectively used when assembled in this manner, or the parts may be substantially stabilized by having the contacting tabs 5' welded together as by electrical spot-welding or oxy-acetylene seaming or the like. When the parts have thus been welded together, the two chords 6'' become practically an integral flange of the structural shape, while the chord 6' forms the other flange, and the

strips or struts 3' comprise the intervening web so that substantially an I-beam is produced.

It will be obvious that a flat or other commercial shape may be formed with as many chord members as desired by the application of the invention thereto.

As further illustrating the adaptability of the invention to commercial flats, channels, or other well known commercial shapes, there is illustrated in Figures 6 to 9 the application of the invention to a channel 14 having marginal longitudinal flanges 15 and intermediate longitudinal beads 16, 16. The channel 14 is slit the same as the slitting of the flat seen in Figure 5 with the result that chords 17 and 18 are produced, connected by struts 19, 19 each rod-like in formation, incident to the utilization of the beads 16 as the strips making up the struts 19. It will be noted that the flanges of chord 18 remain the same as they were while in the commercial shape seen in Figure 8, and of course, any special configuration or stiffening web or other part, may be formed in the initial commercial shape taking the place of either Figure 2 or Figure 5, and the resulting completed structure, after the parts have been sheared and expanded will be modified to the extent of incorporation of such special features.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:—

1. A structural shape, comprising, chords and connecting struts formed from a single piece of material slit and expanded, the struts being bent or folded at the places of their connection with the chords at an angle other than a right angle to the longitudinal axis of the chord whereby one of the chords is caused to lie directly over another.

2. A structural shape, comprising, a strip of sheet material having a series of slits or shear lines each lapping the two adjacent for a portion of the length and being off-set at an intermediate place on an inclined line, and the material of the strip being expanded by the bending of the material between slits, whereby one of the chords is caused to lie directly over another.

3. A structural shape, comprising, a strip of sheet material having a series of slits or shear lines each lapping the two adjacent for a portion of the length and being offset at an intermediate place on an inclined line, and the material of the strip being expanded by the bending of the material between slits, each bending being oblique to the longitudinal axis of the strip, whereby one of the chords is caused to lie directly over another.

4. A structural shape, comprising, a strip of sheet material having a series of slits or shear lines each lapping the two adjacent for a portion of the length and being off-set at an intermediate place on an inclined line, and

the material of the strip being expanded by the bending of the material between slits, and the inclined off-set of each slit being similarly oblique in the opposite direction.

5. A blank for a structural shape, comprising a strip of material formed with a series of generally longitudinally extending slits each slit having a longitudinal portion lapping, a corresponding longitudinal portion of the next adjacent slit at one side and a corresponding longitudinal portion of the next adjacent slit at the other side, the two longitudinal portions of each slit being connected by an inclined portion of the slit, and the parts of the strip being adapted to be expanded for causing the material between slits to serve as struts while the parts of the strip of material engaged by the struts constitute chords, one of which lies directly over another.

6. A structural shape, comprising, a strip of material slit and expanded to produce a chord of a longitudinal intermediate portion of the strip and a chord of marginal portions thereof, said chords being connected by struts formed of strips released to be bent to the relatively expanded condition of the parts by the said slitting, the strips forming said struts being bent obliquely to the longitudinal axis of the structure and causing the marginal parts forming the second chord to lie closer to each other than when in the original blank.

7. A structural shape, comprising, a strip of material slit and expanded to produce a chord of a longitudinal intermediate portion of the strip and a chord of marginal portions thereof, said chords being connected by struts formed of strips released to be bent to the relatively expanded condition of the parts by the said slitting, the strips forming said struts being bent obliquely to the longitudinal axis of the structure and causing the marginal parts forming the second chord to lie closer to each other than when in the original blank, and said marginal portions being rigidly connected together.

8. A structural shape, comprising, a commercial shape of material sheared to provide relatively movable lateral strips, an intermediate strip, and strips connecting the lateral and intermediate strips being bent at their places of jointure with the lateral and intermediate strips on an incline and thereby causing the lateral strips to lie adjacent each other, said lateral strips being formed with outstanding marginal tabs, forming the termini of the connecting strips, each of said tabs having an inclined edge contacting with a similar edge of a similar tab of the other marginal strip.

9. A structural shape, comprising, a commercial shape of material sheared to provide relatively movable lateral strips, an intermediate strip, and strips connecting the

lateral and intermediate strips being bent at
their places of jointure with the lateral and
intermediate strips on an incline and thereby
causing the lateral strips to lie adjacent each
other, said lateral strips being formed with
5 outstanding marginal tabs forming the
termini of the connecting strips, each of said
tabs having an inclined edge contacting with
a similar edge of a similar tab of the other
10 marginal strip, and means connecting the
contacting edges of the tabs.

In testimony whereof I affix my signature.

WILLIAM S. CONNELL.

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