Jan. 6, 1931. W. A. BATES 1,788,145

EXPANDED METAL STRUCTURE

Filed Dec. 6, 1926 2 Sheets-Sheet 1

Fig. 1.

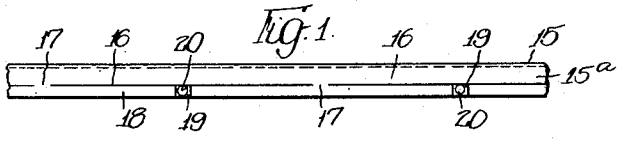


Fig. 2.

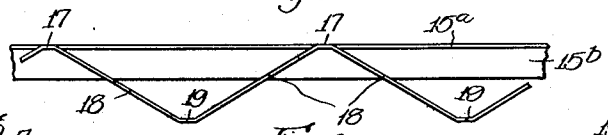


Fig. 3

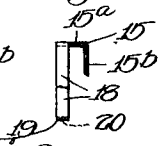


Fig. 4

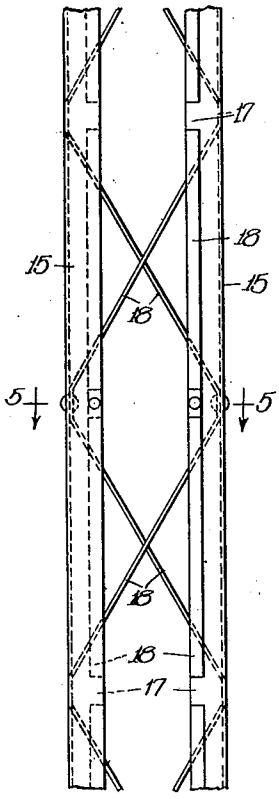


Fig. 6

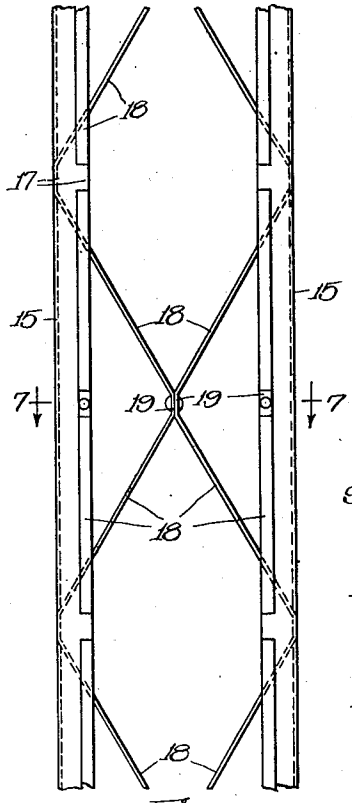


Fig. 8

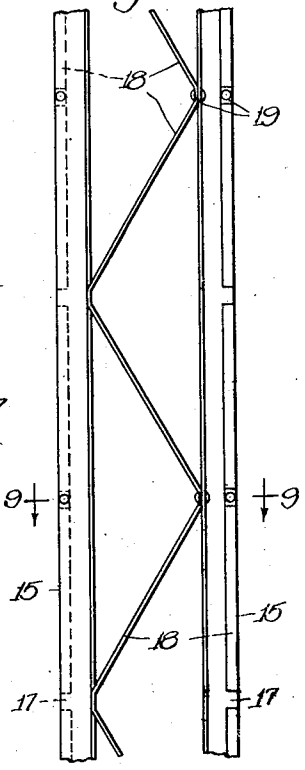


Fig. 5

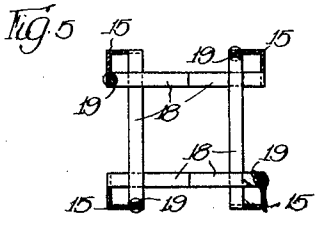


Fig. 7

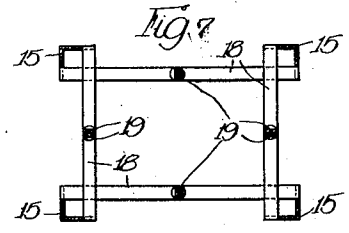
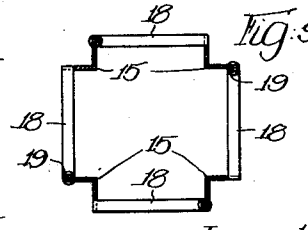


Fig. 9



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Jan. 6, 1931. W. A. BATES 1,788,145

EXPANDED METAL STRUCTURE

Filed Dec. 6, 1926 2 Sheets-Sheet 2

Fig. 10.

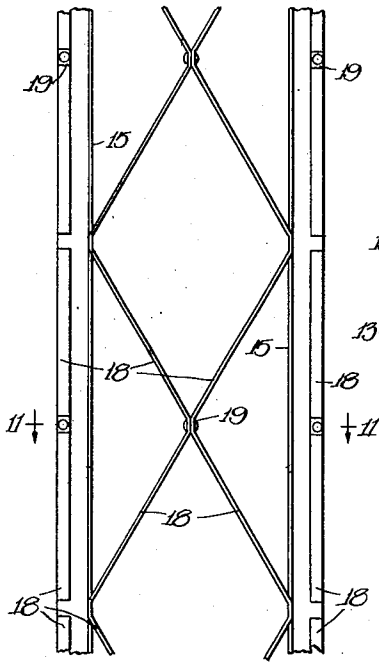


Fig. 12.

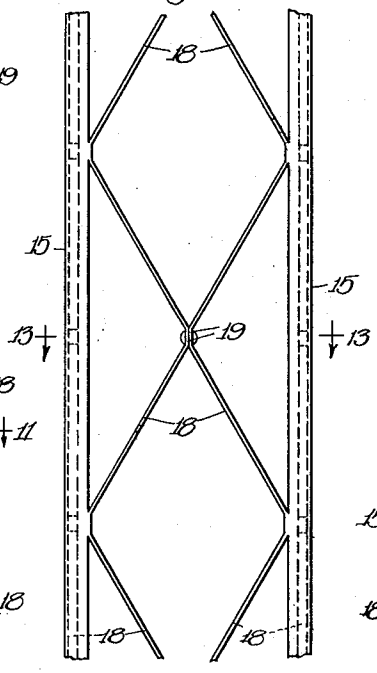


Fig. 19.

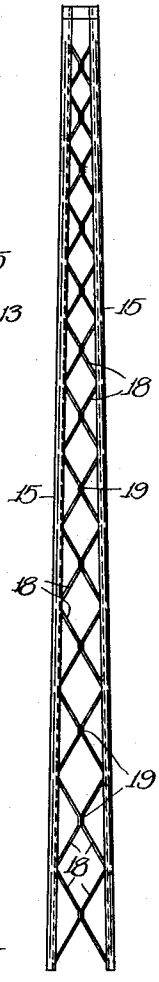


Fig. 18.

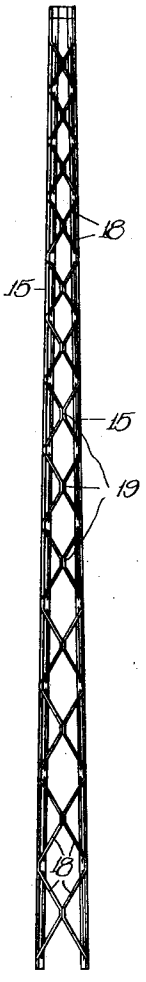


Fig. 11.

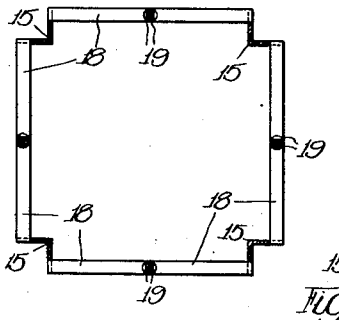


Fig. 13.

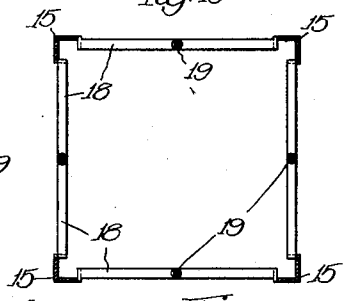


Fig. 14.

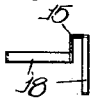


Fig. 15.

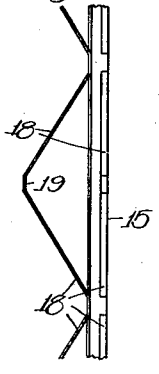


Fig. 16.

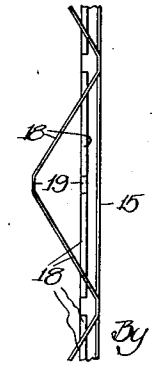
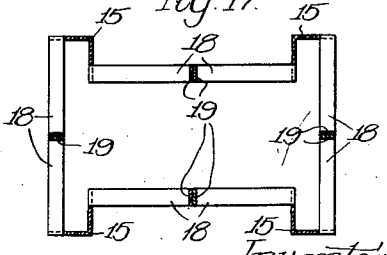


Fig. 17.



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Patented Jan. 6, 1931 1,788,145

UNITED STATES PATENT OFFICE

WALTER A. BATES, OF GARY, INDIANA, ASSIGNOR TO WALTER BATES STEEL CORPORATION, OF GARY, INDIANA, A CORPORATION OF DELAWARE

EXPANDED-METAL STRUCTURE

Application filed December 6, 1926. Serial No. 152,799.

The present invention relates to improvements in expanded metal structures.

An object of the present invention is to provide an expanded metal structure which may be manufactured at relatively small cost and which will have considerably greater strength than built up structures of the same weight.

A further object is to provide a structural steel member of relatively great strength which may be manufactured at small cost from ordinary commercial rolled steel shapes.

A further object is to provide an improved method of making structures such as those referred to above.

Further objects will appear as the description proceeds.

Referring to the drawings—

Figures 1, 2 and 3 are views in plan, side elevation and end elevation, respectively, of an angle which has been cut and stretched in accordance with the principles of the present invention;

Figures 4 and 5 illustrate in side elevation and end elevation, respectively, a column or girder made up of four members such as illustrated in Figures 1 to 3, inclusive, the amount of stretch being somewhat different, however;

Figures 6 and 7 show a side elevation and an end elevation, respectively, of another form of column or girder which may be manufactured from members such as are illustrated in Figures 1 to 3, except that both legs of each angle are cut and stretched;

Figures 8 and 9 show, respectively, side and end elevations of a structure similar to that shown in Figures 4 and 5, except that the angles are turned with the legs out instead of in, making a slightly larger structure in cross section, with no increase in weight;

Figures 10 and 11 illustrate in side and end elevation, respectively, a structure similar in some respects to the structure shown in Figures 8 and 9, except that both legs of each angle are cut and stretched.

Figures 12 and 13 are side and end elevations, respectively, of another type of column or girder which falls within the scope of the present invention, said Figures 12 and 13 showing shapes developed from the shapes shown in Figures 10 and 11.

Figure 14 is an end elevation of still another type of structure falling within the scope of the present invention;

Figures 15 and 16 are views in side elevation of the structure shown in Figure 14, Figures 15 and 16 showing views taken at right angles to one another;

Figure 17 is a pole section made up of shapes such as illustrated in Figures 14 to 16, inclusive; and

Figures 18 and 19 are front and side elevations of poles made up according to the structure shown in Figure 17.

The present invention has been illustrated in connection with a structural steel member which takes the form of an angle. As the description proceeds, however, it will be clear that the invention is not limited to angles, but is applicable to other commercial shapes as well.

Referring first to Figures 1 to 3, the numeral 15 indicates an angle having the flanges 15*a* and 15*b*, one of which legs (indicated by the numeral 15*a*) is provided with a pair of longitudinally extending cuts 16—16, the extremities of which are spaced apart by the uncut portions 17—17. The cuts 16—16 do not involve the removal of any metal. Not only is the metal cut as indicated by the numerals 16—16, but the edge portion of the flange is swedged or stretched to provide diagonals, indicated by the numerals 18—18, which diagonals 18—18 are symmetrically disposed relative to the uncut portions 17—17 between the cuts 16—16. Disposed symmetrically with relation to the diagonals 18—18 are the flat portions 19—19, each of which flat portions 19—19 is provided with a hole 20, whereby the angle swedged as shown in Figures 1, 2 and 3 may be riveted or otherwise secured to a similarly swedged angle to form part of a finished truss such as shown in Figures 4 and 5.

From an inspection of said Figures 4 and 5 it will be noted that four swedged members such as are shown in Figures 1 to 3 are connected together to form a truss or pole,

the portions 19—19 being riveted to the unswedged flange of an adjacent swedged member of like conformation. It will be noted that the structure shown in Figures 4 and 5 comprises a square or box-laced column or girder.

Referring now to Figures 6 and 7, it will be noted that both flanges of the angle member are cut and swedged in the manner illustrated in Figures 1 to 3, inclusive. Said swedged angle members are connected together at the regions 19—19 to form a box girder. According to the structure shown in Figures 6 and 7, one lacing comprising diagonals 18—18 and flat portion 19 of each leg passes through the other lacing of such leg. Depending upon the amount of stretch or expansion of the lacings, a perfectly square structure or one oblong in section may be had.

Referring now to the structure shown in Figures 8 and 9, it will be noted that the direction of the lacings for each individual angle are opposite to the direction of the lacings shown in Figures 1 to 3. Moreover, according to the structure shown in Figures 8 and 9, the angles are turned inwardly; or, expressed in other language, the legs are turned out instead of in, making a slightly larger structure in cross section than the structure shown in Figures 4 and 5 with no increase in weight.

Referring to Figures 10 and 11, it will be noted that both legs of the angle are cut and stretched, the direction of stretch being opposite to the direction illustrated in Figures 6 and 7.

The structure shown in Figures 12 and 13 comprises angles which have been cut and sheared in the same manner as the angles shown in Figures 10 and 11. According to Figures 12 and 13, however, the operation is carried a step further, and the lacings are swung at right angles. This will be obvious if the angle at the lower left-hand corner of Figure 11 be considered as having its right-hand lacing swung in a clockwise direction through an angle of 90° and its upwardly extending lacing swung in a counterclockwise direction through an angle of 90°. Under these conditions each angle will have the conformation of the angles shown in Figure 13.

Referring to Figures 14 to 19, it will be noted that one of the flanges has its lacing directed inwardly of the angle and the other of the flanges has its lacing directed outwardly of the angle; otherwise said angle is the same as that referred to in the preceding figures. Figure 17 illustrates how the angles shown in Figures 14, 15 and 16 may be connected together to form a pole or truss.

Figures 18 and 19, which are front and side elevations of the same structure, show that by varying the dimensions of the lacing from one end of the angle to the other, the dimensions of the resulting strut may be varied to produce a pole of tapering dimensions from bottom to top.

It will be noted that the lacings are disposed within a locus defined by an elongated polygonal or rectangular figure which may or may not taper throughout its length.

Though a number of modifications of the present invention have been illustrated, it will be understood that many others will occur to those skilled in the art. It is intended to cover all such modifications that fall within the scope of the appended claims.

What is claimed is—

1. A fabricated structure comprising a plurality of commercial shapes, each of said commercial shapes comprising a pair of flanges in right angular relationship with each other, one of the flanges of each of said shapes having a portion of the material thereof swedged to provide lacings, said lacings having flat portions normal to the plane of the other of said flanges and being connected at their two extremities to said one flange, said flat portions being disposed in contact with the next adjacent structural steel member, said lacings of said plurality of commercial shapes being disposed within the locus of an elongated rectangular frame.

2. A fabricated structure comprising a plurality of commercial shapes, each of said commercial shapes comprising an angular member having flanges adjacent to one another, one of the flanges of each of said commercial shapes having lacings swedged therefrom bounded by broken lines in alignment with one another, said lacings of each of said shapes being swedged from their corresponding flange in a direction normal to their corresponding flange, and each being connected at its two extremities to its corresponding flange, the lacings of each of said shapes being secured to the next adjacent shape to form said fabricated structure, said lacings being disposed within the locus of an elongated polygonal frame.

3. A fabricated structure comprising a plurality of commercial shapes, each of said shapes comprising a pair of flanges in angular relationship with each other, the edge portions of corresponding flanges of said shapes being swedged at right angles to said flanges to form lacings relative to said flanges, said lacing being of V-shaped conformation having their extremities secured to said flanges, said lacings of each of said shapes being secured to the next adjacent shape, said lacings being disposed within the locus defined by an elongated polygonal frame.

4. A fabricated structure comprising a plurality of commercial shapes, each of said commercial shapes comprising a pair of flanges in angular relationship with each

other, the edge portions of each of said flanges being swedged at right angles to said flanges to form lacings relative to said flanges, said lacings being of V-shaped conformation having their extremities secured to their corresponding flanges, the lacings of each of said shapes being secured to the next adjacent shape, said lacings being disposed within the locus defined by an elongated polygonal frame.

Signed at Chicago, Illinois, this 30th day of November, 1926.

WALTER A. BATES.