July 11, 1950 W. B. McLEAN 2,514,607

TRUSS CONSTRUCTION

Filed Feb. 7, 1946 2 Sheets-Sheet 1

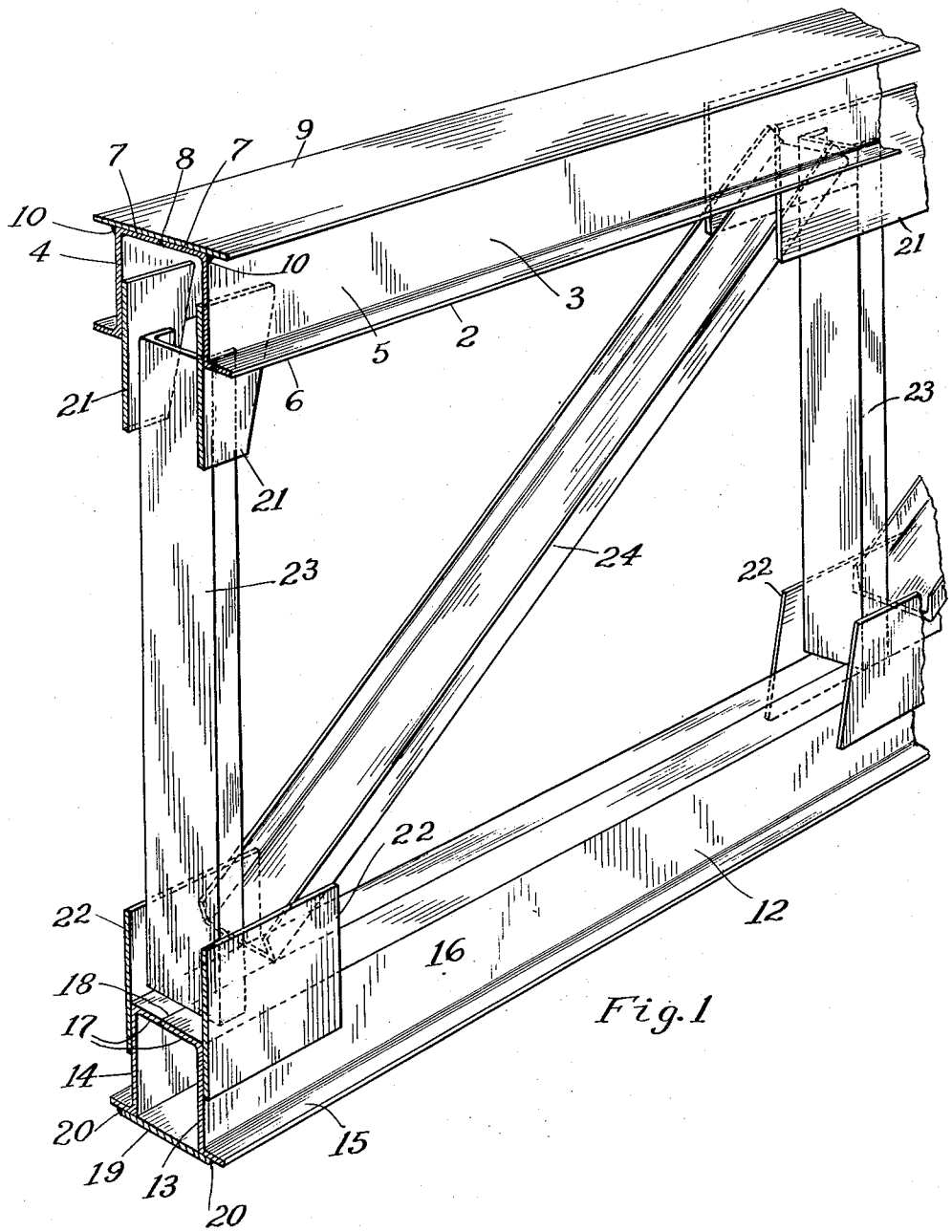


Fig. 1

INVENTOR
William B. McLean
by his attorneys
Christy, Parmelee, Strickland.

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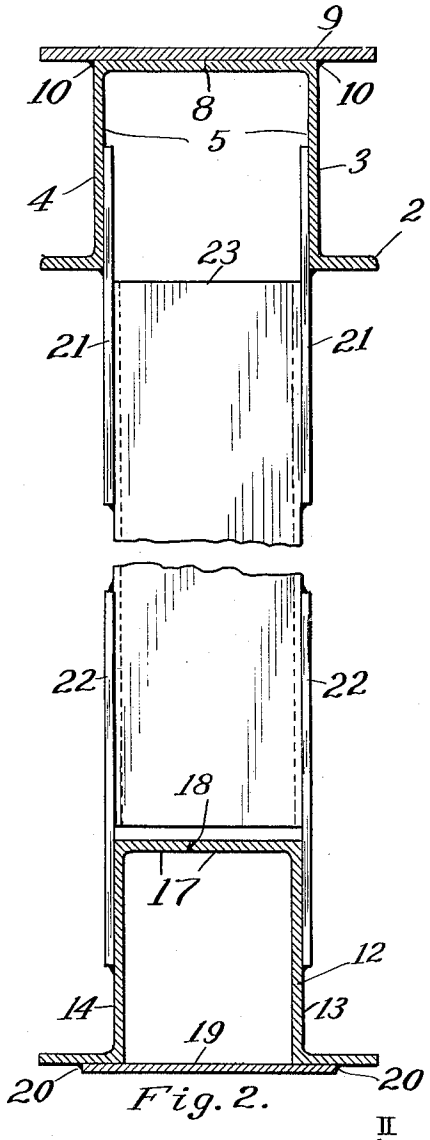


Fig. 2.

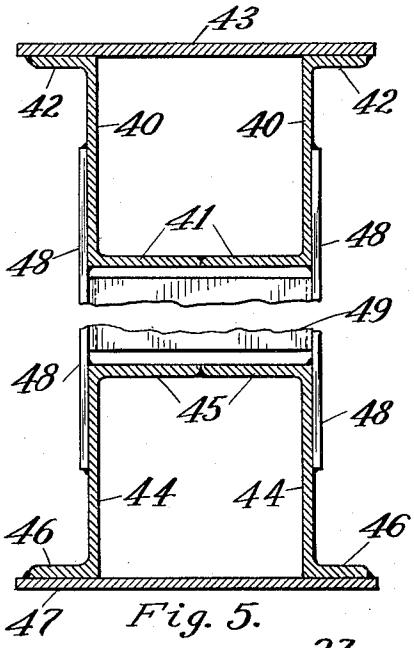


Fig. 5.

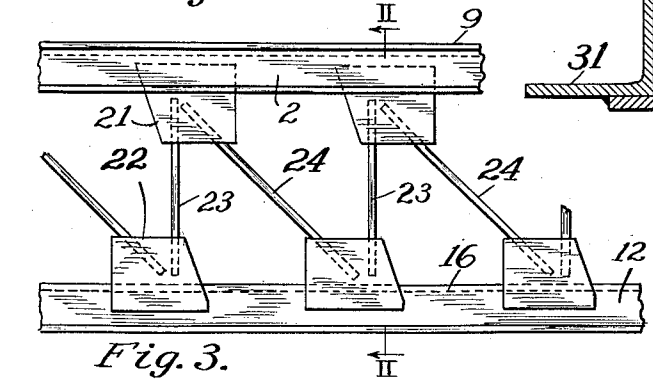


Fig. 3.

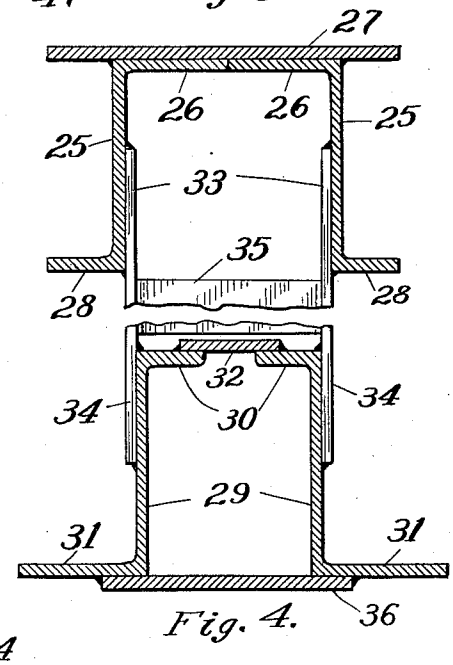


Fig. 4.

INVENTOR
William B. McLean
by his attorneys
Christy, Parmelee & Strickland.

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TRUSS CONSTRUCTION

William B. McLean, Coraopolis Heights, Pa., assignor to Dravo Corporation, Pittsburgh, Pa., a corporation of Pennsylvania

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4 Claims. (Cl. 189—37)

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This invention relates to metal truss construction for use in bridges, buildings, and other structures where strong trusses or girders are required, and relates particularly to a truss having chords fabricated from a plurality of metal sections.

It has heretofore been proposed to fabricate metal trusses from rolled metal sections of U-shape, or channel form, but such trusses present certain problems of assembly or upkeep. The present invention is based on the use of metal sections of Z-form in which there is a web with one flange extending laterally in one direction, and the other flange extending laterally in the other direction. This is not only has certain advantages from the standpoint of assembly, but for a given weight of metal, utilizes the metal more effectively.

My invention may be more fully understood by reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a portion of a truss constructed in accordance with this invention;

Fig. 2 is a transverse vertical section through such a truss, the view being on a somewhat larger scale than Fig. 1;

Fig. 3 is a side elevation on a smaller scale of a portion of the truss shown in either Figs. 1 or 2;

Fig. 4 is a view similar to Fig. 2, showing still another modification, particularly insofar as the construction of the bottom chord is concerned; and

Fig. 5 is a view similar to Fig. 3 of still another modification, differing from Figs. 1 and 2 particularly in respect to the construction of the top chord.

Referring first to the construction shown in Fig. 1, the truss comprises a top chord designated generally as 2, and formed of two structural members of Z-shaped section, these being designated 3 and 4. Each of the members 3 and 4 has a web 5 which is vertical, a bottom flange 6 which is turned laterally outwardly, and the top flange 7, which is turned inwardly. The flanges 7 of the two sections are brought together into abutting relation and are welded along the abutting edges as indicated at 8. This welding can be effected in the fabrication of the truss by an automatic welding machine, such as the submerged arc type, which requires accessibility of the joint for clearance for the machine.

The two Z-shaped sections thus joined together

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form an inverted U-shaped chord with outwardly extending flanges 6. The flat plate 9 is preferably welded to the top of this inverted U-shaped structure so as to cover both of the flanges 7 and overhang the webs of the two Z sections. The weld is made at each side along the outside of the vertical webs 5 of the sections as indicated at 10. These welds can also be made by a welding machine of the type suggested above, or a riveted construction employed if desired.

The bottom chord of the truss is designated generally as 12. It also is comprised of two Z sections designated 13 and 14. They are of like construction, having the bottom lateral flanges 15 thereof turned outwardly, having the webs 16 thereof vertical, and having the top flanges 17 turned inwardly into abutting relation and welded together along the seam 18. The bottom plate 19 is preferably welded to the bottom surfaces of the outwardly turned flanges 15, forming a hollow box-like chord. The seam 18 may be welded by a welding machine, and the welding of plate 19 to the bottom of the flanges 15 may be accomplished by a welding machine. The welds for securing the bottom plate 19 in place are at 20.

Gusset plates 21 are welded to the inner faces of the webs 5 of the upper sections 3 and 4 and project downwardly. Gusset plates 22 are welded to the outsides of the webs 16 of the lower Z sections 13 and 14 and project upwardly. The lower chord is slightly narrower than the upper chord so that the gusset plates 21 on the inside of the webs of the upper chord and the gusset plates 22 on the outside of the webs of the lower chord are in the same vertical plane. Vertical webs 23, preferably consisting of rolled structural sections of uniform width such as channels or beams, have their upper ends projecting between the upper gusset plates 21 and their lower ends projecting between the lower gusset plates 22. These vertical elements 23 are welded to the gusset plates. Also diagonal metal members 24 of like character have their upper ends extending between and welded to the upper gusset plates 21 and have their lower ends extending between and welded to the lower gusset plates 22. These diagonal members 24 are also of uniform width.

The general appearance of the truss is shown in Fig. 3, in which it will be seen that there are a succession of vertical and diagonal members connecting the upper and lower chords of the truss. Although welding has been indicated as the preferred means for connection of the gus-

sets and the various members comprising the truss, it is appreciated that riveting or other means for connection may be employed without departing from the scope of this invention.

The several gusset plates being positioned against the flat webs of the Z sections can be easily welded in place, and by reason of the construction, easy access for welding is provided. The location of one pair of gussets on the outside of the webs of the sections constituting one of the chords, and on the inside of the webs of the sections constituting the other chord with the different widths of the two chords so that the gusset plates along the top and bottom chords are in alignment, enables the uprights and diagonals to be of uniform width and avoids any necessity for cutting away or mutilating in any manner the rolled sections constituting either the top or bottom chords. The construction of the chords with a solid top formed by abutting the internal flanges prevents water or dirt from falling into the chord. The joining together of the two top flanges of these Z sections eliminates any need for expensive lacing across the tops or bottoms of the chords. The bottom flanges of the chord turn outward, giving a large radius of gyration in the lateral direction, and a correspondingly high lateral stiffness. This is of particular value for trusses which overhang a supporting tower, as for example in ore bridges, because the bottom chord is in compression, and a large radius of gyration permits higher unit stresses.

The interior of the top chord is very accessible for welding, painting and inspection, and in some instances the bottom plate 19 of the lower chord may be omitted, or contain hand-holes, to render it likewise very accessible for the performance of these operations. The top plate 9 and bottom plate 19 desirably increase stiffness, especially at the top of the truss where the plate 9, rigidly built into the truss, provides laterally extending flanges.

As will be most clearly shown in Fig. 2, all of the Z sections are of originally uniform dimensions, but the top flange 17 of one of the lower Z sections 14 has been cut away so as to secure a condition wherein the width of the lower chord is slightly less than that of the upper, this incidentally placing the weld 18 a little to one side of center.

In the construction shown in Fig. 4, the general arrangement is the same, but the Z sections have flanges which are wider along one edge than the other. In the upper chord, the sections are turned so that the wider flanges turn inwardly and abut, while in the lower chord, the Z sections are reversed with the narrower flanges turned inwardly and joined by a plate welded thereto. This enables all four Z sections to be uniform, without cutting away any of the flanges, and still enables the width of the lower chord to be narrower than the top one.

In this figure, the two Z sections forming the upper chord are designated 25. They have wide inturned flanges 26 at the top, butted together and welded, and 27 is a top plate that may be welded on. The sections 25 have outwardly turned narrower flanges 28. In the lower chord, the two Z sections are 29. They are the same as 25, but are inverted with respect to 25, so that the narrower flanges 30 are at the top and turn inwardly and the wide flanges 31 are at the bottom and turn outwardly. The top flanges of the lower chord sections are connected by a plate 32 welded thereto, the width of the inverted U-shaped chord so formed being narrower than the top chord, so that gusset plates 33 on the inner webs of the upper section are in the same plane as gusset plates 34 on the outside of the sections of the lower chords. The connecting members 35, either vertical or diagonal, are arranged and welded as in Figs. 1 to 3. There may be a bottom plate 36 welded to the bottom flanges 31 of the bottom chord sections 29.

The truss of Fig. 4 has all of the advantages of Figs. 1 to 3 in that all longitudinal welds may be done by an automatic welding machine; all gusset plates are flat and welded to flat surfaces, and the truss has the same structural advantages, and it is unnecessary to cut down the width of any flange.

In Fig. 5 the chords consist of the same type of U sections formed of oppositely faced Z members, and in this figure the chords are of identical width and the gusset plates are in the same plane, both the upper and lower ones being welded to the outsides of the webs. In this view the upper sections 40 have the in-turned flanges 41 at the lower edges and the out-turned flanges 42 at the top. A cover plate 43 may close the top of the U section so formed, and add strength to the truss. The Z sections of the bottom chord are reversed, to form an inverted U, with the webs 44 vertical, the in-turned flanges 45 at the top, and the out-turned flanges 46 at the bottom. There may be a bottom plate 47. The gussets, in all cases marked 48, are welded to the flat outsides of the webs, and the connecting struts are designated 49. The abutting inturned flanges of the sections are of course welded as hereinbefore described.

The several modifications illustrate certain preferred embodiments of my invention, but the parts may be also formed in other ways. The essential features of my invention embody the formation of upper and lower chords of Z sections providing outwardly and inwardly turned flanges and form chords of flanged U or inverted U cross section. In all cases, cross lacing of sections is unnecessary, and the trusses have the advantage both from a manufacturing and a structural standpoint hereinbefore noted.

I claim:

1. A truss construction characterized by its upper and lower chords each being formed of a pair of opposed Z sections with the webs thereof parallel and the inwardly turned flanges thereof rigidly connected, and flat gusset plates connected to the flat webs of the several Z sections, those on the top chord projecting down and those on the bottom chord extending up, the gusset plates and connecting members connected to the gusset plates of the upper and lower sections being in transversely arranged pairs with the distance transversely between all pairs of gusset plates being the same, the connecting members comprising structural sections connected to the faces of the gusset plates and of a width corresponding substantially to the transverse distance between the pairs of gusset plates, the gusset plates on one chord being on the inner faces of the webs of the Z sections and the gusset plates on the webs of the other chord being on the outer faces of the webs, the latter chord being transversely narrower than the former sufficient to keep the spacing between all pairs of gusset plates uniform.

2. A truss construction characterized by its

upper and lower chords each being formed of a pair of opposed Z sections with the webs thereof parallel and the inwardly turned flanges thereof rigidly connected, and flat gusset plates connected to the flat webs of the several Z sections, those on the top chord projecting down and those on the bottom chord extending up, the gusset plates and connecting members connected to the gusset plates of the upper and lower sections being in transversely arranged pairs with the distance transversely between all pairs of gusset plates being the same, the connecting members comprising structural sections connected to the faces of the gusset plates and of a width corresponding substantially to the transverse distance between the pairs of gusset plates, the gusset plates on one chord being on the inner faces of the webs of the Z sections and the gusset plates on the webs of the other chord being on the outer faces of the webs, the latter chord being transversely narrower than the former sufficient to keep the spacing between all pairs of gusset plates uniform, the Z sections of both chords having the inwardly turned flanges at the top thereof.

3. A truss construction characterized by its upper and lower chords each being formed of a pair of opposed Z sections with the webs thereof parallel and the inwardly turned flanges thereof rigidly connected, flat gusset plates connected to the flat webs of the several Z sections, those on the top chord projecting down and those on the bottom chord extending up, the gusset plates and connecting members connected to the gusset plates of the upper and lower sections being in transversely arranged pairs with the distance transversely between all pairs of gusset plates being the same, the connecting members comprising structural sections connected to the faces of the gusset plates and of a width corresponding substantially to the transverse distance between the pairs of gusset plates, the gusset plates on one chord being on the inner faces of the webs of the Z sections and the gusset plates on the webs of the other chord being on the outer faces of the webs, the latter chord being transversely narrower than the former sufficient to keep the spacing between all pairs of gusset plates uniform, the Z sections of both chords having the inwardly turned flanges at the top thereof, a reinforcing cover plate welded to the inwardly turned flanges of the top chord, and a cover plate welded to the bottom of the sections constituting the lower chord.

4. A truss construction characterized by its upper and lower chords each being formed of a pair of opposed Z sections with the webs thereof parallel and the inwardly turned flanges thereof rigidly connected, and flat gusset plates connected to the flat webs of the several Z sections, those on the top chord projecting down and those on the bottom chord extending up, the gusset plates and connecting members connected to the gusset plates of the upper and lower sections being in transversely arranged pairs with the distance transversely between all pairs of gusset plates being the same, the connecting members comprising structural sections connected to the faces of the gusset plates and of a width corresponding substantially to the transverse distance between the pairs of gusset plates, the gusset plates on one chord being on the inner faces of the webs of the Z sections and the gusset plates on the webs of the other chord being on the outer faces of the webs, the latter chord being transversely narrower than the former sufficient to keep the spacing between all pairs of gusset plates uniform, the Z sections of the upper chord having the inwardly turned flanges thereof at the top edges thereof.

WILLIAM B. McLEAN.

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