March 26, 1929. E. B. CARNS 1,706,996

BEAM OR GIRDER

Filed March 31, 1927

Fig. 1.

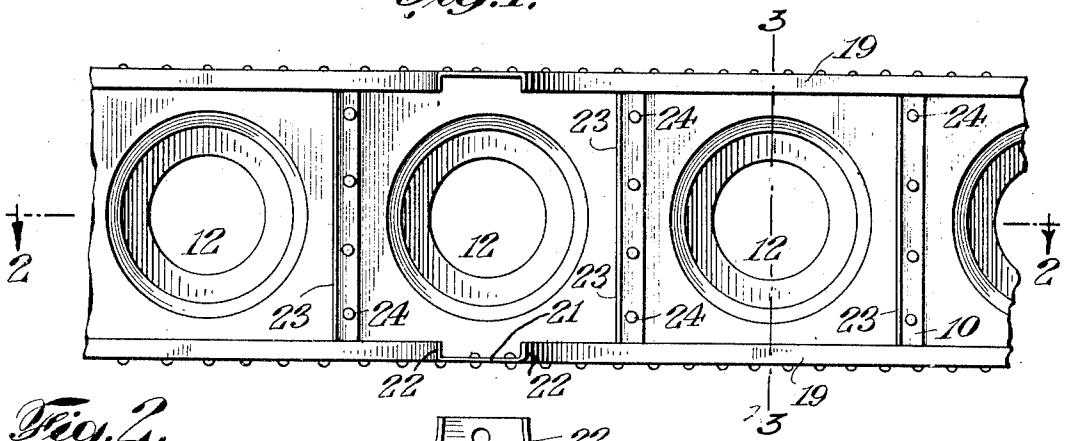
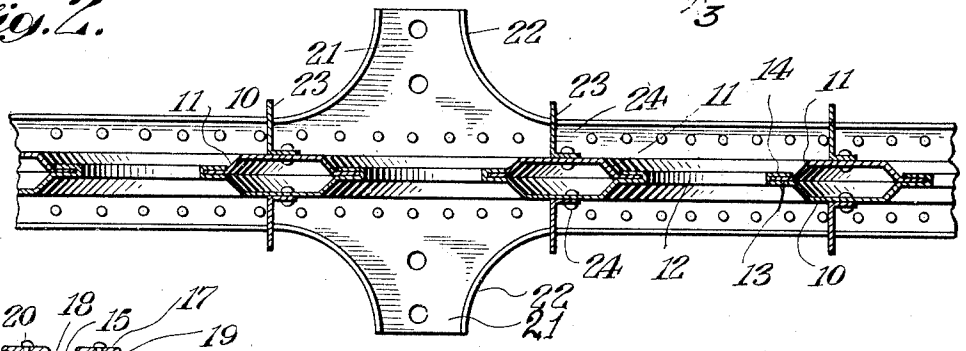


Fig. 2.



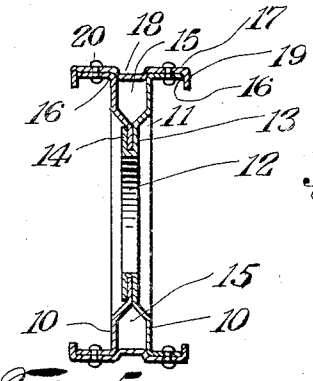


Fig. 3.

Fig. 4.

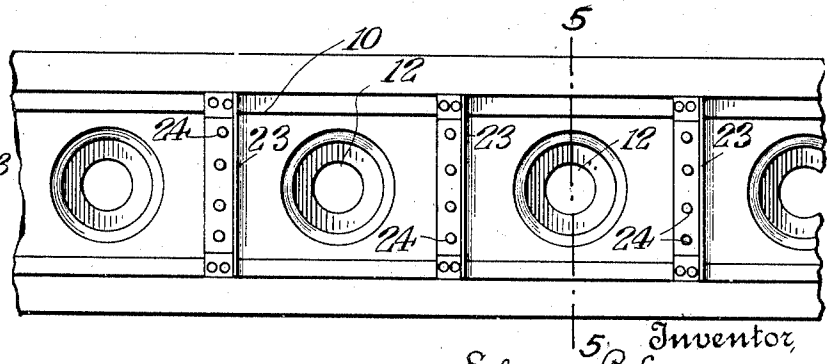
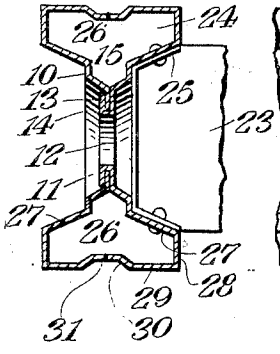


Fig. 5.



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Patented Mar. 26, 1929. 1,706,996

UNITED STATES PATENT OFFICE.

EDMUND B. CARNS, OF NEW YORK, N. Y.

BEAM OR GIRDER.

Application filed March 31, 1927. Serial No. 179,990.

My invention relates to improvements in beams or girders and is primarily intended to produce a light, strong beam which is peculiarly adapted for use as a wing beam for aircraft, but which can be used as a beam or girder for other purposes.

My invention is intended to produce a beam or girder of sheet metal which, because of its peculiar formation and the disposition of its parts, is strong and because of its material and shape is also very light in proportion to its strength. This is essential in aircraft construction and is desirable for most purposes.

My invention is further intended to produce a beam or girder from opposed sheet metal plates, which are disposed in a manner to get the utmost strength, which are fastened together in a way to conserve lightness and increase strength, and which have widened head portions which may be disposed, if desired, so as to give the beam or girder, as a whole, the contour of an I-beam.

In carrying out these ideas, I preferably arrange meeting sheets which are in turn spaced from each other but which meet along the middle portions of the beam and which are provided with perforations or holes to lighten the structure, with the part of one sheet crimped through the hole of the opposed sheet in a way to compensate for the lightening by reason of the holes.

Reference is to be had to the accompanying drawings in which similar reference characters represent the corresponding parts in all views.

Fig. 1 is a broken side elevation of the beam or girder showing my improvements;

Fig. 2 is a longitudinal section on the line 2—2 of Fig. 1;

Fig. 3 is a cross section on the line 3—3 of Fig. 1;

Fig. 4 is a broken side elevation of a slight modification of the structure; and

Fig. 5 is a cross section on the line 5—5 of Fig. 4.

The body of the beam or girder is made up of opposed sheets or plates 10, which are in parallel relation, and meeting at intervals along the body of the beam. To this end the plates are crimped or bent inward as shown at 11, at necessary or desirable intervals, and holes 12 are made through the sheets to lighten the beam. The holes occur within the crimped parts 11 and the metal of one plate is left flat, as shown at 13, around the hole through it, while the hole through the opposed sheet is punched through in a way to leave sufficient metal to form a flange 14, which can be crimped over upon the part 13 and further fastened, if desired, by welding or otherwise. Thus, it will be seen, that the crimping of the sheets as at 11 serves in itself to stiffen each sheet and that as each hole through the sheets is reinforced by a flange wall 14, the sheets are not especially weakened although greatly lightened by perforating.

Near the upper and lower edge portions of the beam, that is, above and below the perforations 12, the plates are spaced as shown at 15 in Fig. 3, and at the edges of the plates they are bent outward to form flanges 16, giving the head contour desired. In one form of the structure shown in Figs. 1 to 3, the adjacent flanges 16 are covered by a cap 17 which is riveted or otherwise firmly secured thereto and the cap is centrally corrugated as at 18, so as to fit or seat between the plates 10 while the side flanges 19 of the cap overlap the edges of the flanges 17 and, if desired, these flanges 19 can be crimped inward upon the sheet. The caps are riveted in place in the example shown, as illustrated at 20, and it will be seen that the corrugations 18 in each cap serves to stiffen the cap, while at the same time it seats between the plates 10 and serves to stiffen the plates and in a measure relieves the strain on the fastenings between the parts 16 and 17. The caps 17 also serve to give the necessary finish and strength, as well as shape, to the beam, and it will be seen that if the flanges 19 are not crimped inward, they will serve the purpose of stiffening the caps and also opportunity to make connection with other parts of the structure, if desired.

The caps 17 can be provided, if desired, at necessary points with laterally extending gussets 21 and these may be made on one or both caps 17, as desired. These gussets are laterally extended so that the gusset on one side will aline with that on the other side, and they flare outwardly to conserve strength and are preferably flanged as at 22, this flange forming a continuation of the flange 19. Thus, it gives to the gusset a channel form facilitating its attachment to another part and stiffening the gusset. One application of the gusset shown is to enable the beam to seat conveniently against a transverse spar, if desired, but the gusset can be used for making any connection with other

parts of the structure, and the gussets are preferably, although not necessarily, integral with the caps 17. It will be noted that the gussets are in the same planes as the plates 17, and the flanges 22 are continuations of the flanges 19. This makes a smooth, strong, simple construction and permits a good job in connecting the beam or girder with other parts of a structure. As a further means of stiffening the beam or gusset and for providing a means to connect with braces or the like, I arrange at desired points and at opposite sides of the beam angles 23 which can be perforated, if desired and which have their seat flanges riveted, as shown at 24, to the body of the beam but they can be otherwise fastened. As these angles extend transversely across the beam girder and fit snugly behind the head portions or flanges thereon, they serve to greatly stiffen the beam, do not add very much to its weight and afford a convenient means for connecting with braces, drift rods or the like.

In Figs. 4 and 5, I have shown a slight modification of the structure, or at least another form of head for the I-beam, and in this case the heads 26 of the beam are hollow. The plates 10 which form them are flared outward as at 27, then bend parallel with the beam body as at 28, again turn inward as at 29 at right angles to the body of the beam, are depressed near the center of the head as at 30, and meet edge to edge as at 31 where the meeting parts can be united by butt-welding, or in any convenient or preferred way. In this structure the angles 23 have their attaching flanges shaped as at 25 to abut with the inclined parts 27 of the heads 26 and thus they serve to stiffen and support the heads.

From the foregoing description, it will be seen that I have produced a beam or girder which can be made of sheet metal or metallic plates and these can be pressed or stamped with facility to the desired shape. It will also be noticed that the metal is shaped and disposed so as to give to the structure, as a whole, great lightness and also desirable strength. Such a beam has a wide application, can be used to advantage in aircraft, can be easily and economically shaped and handled and is adapted for many uses.

It will be noticed that the crimped and eyelet like connection between the plates 10 serves as an internal brace for the beam and that the angles 23 serve as external braces and supports for the head parts of the beam.

I claim:

1. A beam or girder in the form of an I-beam having a web of spaced sheet metal parts with inturned abutting portions at intervals the metal sheets being spread at their edges to form head portions, caps with inturned flanges on the head portions of the beams, and channel gussets extending laterally from the caps with their flat surfaces in the planes of the caps, and with their flanges forming extensions of the cap flanges.

2. A beam or girder in the form of an I beam having a web of spaced sheet metal parts with inturned abutting portions at intervals, said inturned parts being perforated and fastened together around the periphery of the perforations, the outer edges of the webs being flanged to form heads, caps with inturned flanges on the head portions of the beams, and channel gussets extending laterally from the caps with the flat surfaces in the planes of the caps, and with flanges forming extensions of the cap flanges.

3. A beam or girder in the form of an I beam, having a web of spaced sheet metal parts with inturned abutting portions at intervals, said inturned parts being perforated and fastened together around the periphery of the perforations, the outer edges of said web members being outturned to form head flanges, caps with inturned flanges embracing the flanges on each edge of the beam, said caps being inturned centrally to fit between the spaced web plates, and channel gussets extending laterally from the caps, with the flat surface in the planes of the caps and with the flanges forming extensions of the cap flanges.

4. A beam or girder in the form of an I beam having a web of spaced sheet metal parts with inturned abutting portions at intervals, the metal sheets being spread at their edges to form head portions, caps with inturned flanges on the head portions of the beams, said caps being centrally channeled to fit between and brace the spaced web plates, and channel gussets extending laterally from the caps, with the flat surfaces in the planes of the caps and with the flanges forming extensions of the cap flanges.

In testimony whereof, I have signed my name to this specification this 28th day of March, 1927.

EDMUND B. CARNS.