Oct. 13, 1925. 1,556,589

V. E. CLARK ET AL

METAL WING SPAR

Filed March 13, 1922 2 Sheets-Sheet 1

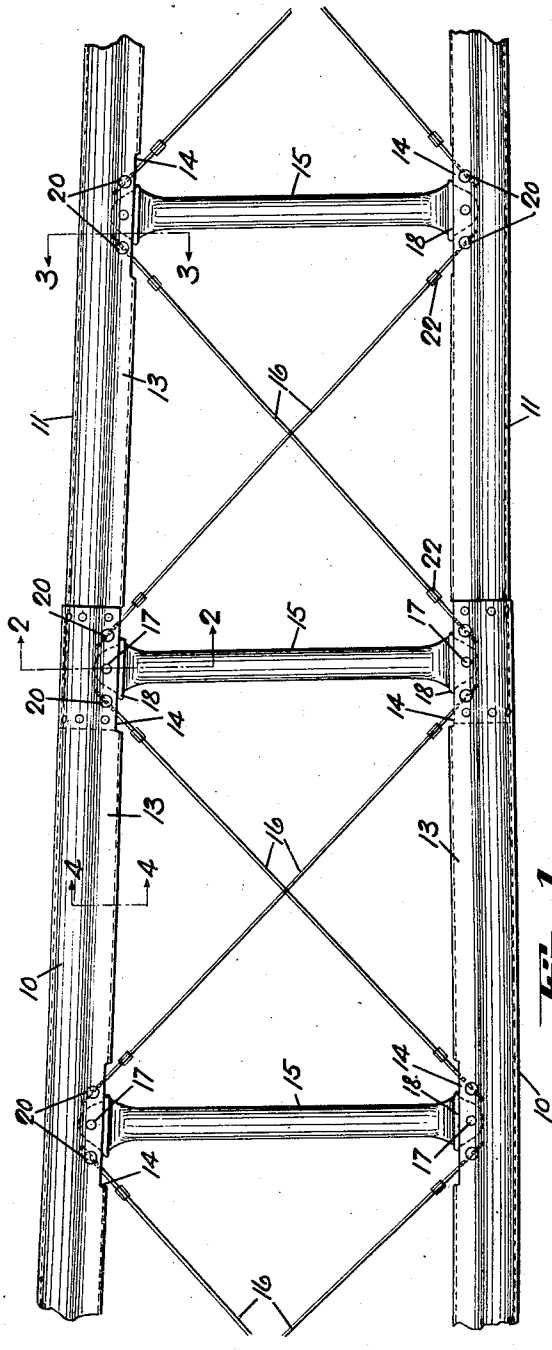


Fig. 1.

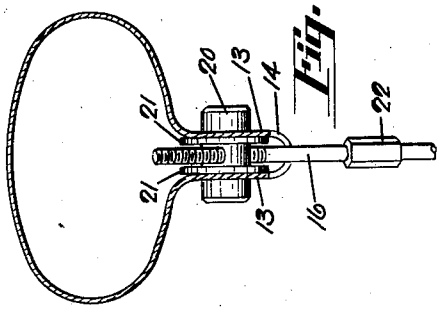


Fig. 3.

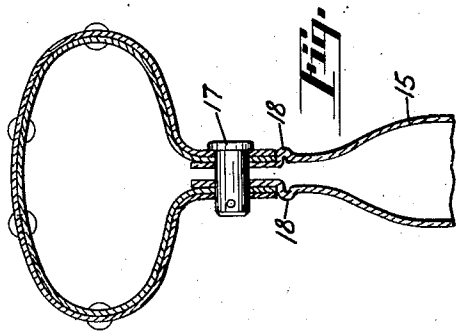


Fig. 2.

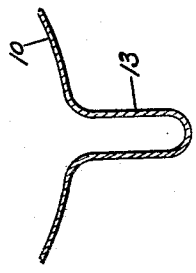


Fig. 4.

Witness.
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METAL WING SPAR

Filed March 13, 1922 2 Sheets-Sheet 2

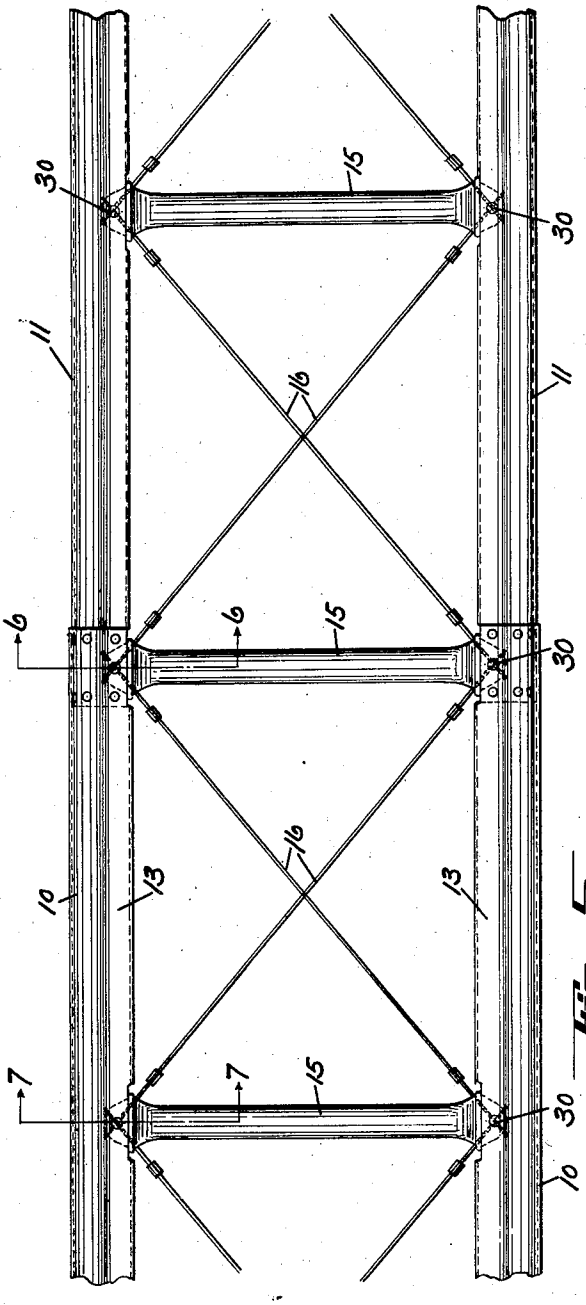


Fig. 5.

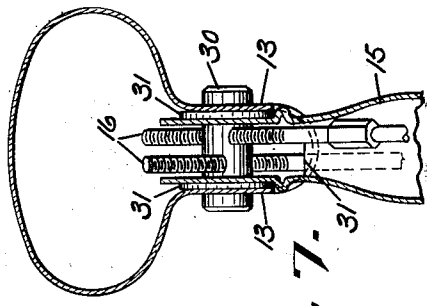


Fig. 7.

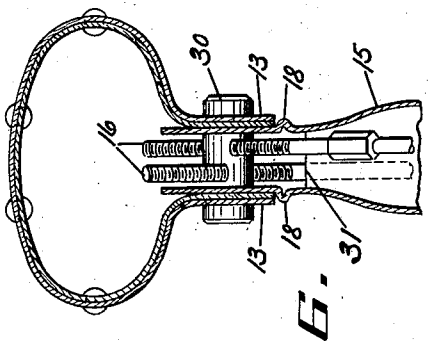


Fig. 6.

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Patented Oct. 13, 1925. 1,556,589

UNITED STATES PATENT OFFICE.

VIRGINIUS E. CLARK AND KENNETH M. LANE, OF DAYTON, OHIO, ASSIGNORS TO DAYTON-WRIGHT COMPANY, OF DAYTON, OHIO, A CORPORATION OF DELAWARE.

METAL WING SPAR.

Application filed March 13, 1922. Serial No. 543,166.

To all whom it may concern:

Be it known that we, VIRGINIUS E. CLARK and KENNETH M. LANE, citizens of the United States of America, residing at Dayton, county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Metal Wing Spars, of which the following is a full, clear, and exact description.

This invention relates to improvements in metal construction and more particularly to an improved construction of spar, or other metal frame member for use in the building of airplanes, an object of the invention being to provide a spar which will embody the maximum of strength and at the same time be as light in weight as is possible consistent with its use.

A further object is to provide a spar having its longitudinal tension and compression members composed of round tubing which is deformed to the desired shape and later heat treated to greatly increase its strength. The invention is further characterized by the fact that all the parts of the spar may be of heat treated material, that is, it is not necessary in the assembly of the spar to further deform or heat up any of the parts, and hence high strength heat treated material may be used throughout.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred forms of embodiments of the present invention are clearly shown.

In the drawings:

Fig. 1 is a side elevation of a portion of a tapered spar and showing a splice in the longitudinal members.

Fig. 2 is a transverse section on line 2—2 of Fig. 1.

Fig. 3 is a transverse section on line 3—3 of Fig. 1.

Fig. 4 is a section on line 4—4 of Fig. 1.

Fig. 5 is a side elevation of a modified form of spar.

Fig. 6 is a transverse section through the splice in the longitudinal members on line 6—6 of Fig. 5.

Fig. 7 is a section on line 7—7 of Fig. 5.

Throughout the several views similar reference characters refer to similar parts.

In Fig. 1 numeral 10 indicates the main top and bottom longitudinal members of the spar towards the larger end of the portion of the spar shown, while 11 indicates the smaller longitudinal members which nest into the members 10 at the splice and are riveted thereto as best shown in Fig. 2. The longitudinal members 10 and 11 are preferably formed by taking a round seamless tube and rolling a flattened portion or flange 13 (see Fig. 4) therein. The outer edge of this flange 13 is then cut away as shown at 14 at spaced intervals along the length of the longitudinal members to permit of easy attachment of the struts 15 and diagonal tie members 16 thereto. The struts 15 are preferably formed of steel tubes which have their ends flattened out sufficiently to pass through the slots 14 cut in the edges of flanges 13 and are pinned to the longitudinal members by means of pins 17 which pass entirely through the flange 13. Preferably these struts 15 are also provided with an upset shoulder 18 against which the edges of flange 13 abut (see Fig. 2).

The cross wires 16 also pass through the slots 14 as shown, and are threaded upon the trunnion pins 20 (see Fig. 3). The pins 20 extend through both walls of flange 13 and preferably have washers 21 thereon to retain the wires 16 approximately on the center line of the longitudinal members. The wires 16 are oppositely threaded at the two ends and hence may be inserted and have their tension adjusted at any time by turning the entire wire by applying a wrench upon the hexagonal or squared portions 22. The wires 16 may be locked after the proper adjustment of their tension by binding the two wires together where they cross.

This invention is especially adapted for use in internally braced wings which have a tapered thickness from the point of support out to the tip. The depth of the spar may be easily tapered by shortening the struts 15 and of course the corresponding lengths of the diagonal tie members 16. The section of the longitudinal members is also preferably reduced at intervals along the spar length, and at each reduction or splice point the smaller section is made to fit snugly inside of the larger section as shown in Fig. 2. The thickness of the flange 13 is made large

enough in the larger section to envelop the flange of the smaller section. As the thickness of the flange 13 increases the ends of the struts 15 may be made correspondingly thicker, or, if desired, the struts 15 may all have ends of the same dimensions and the increased distance between the walls of the flange 13 be filled in with washers similar to washers 21 shown in Fig. 3.

In Figs. 5, 6 and 7, we have shown a modification wherein all the parts may be approximately the same as in the modification just described with the exception that the two diagonal wires 16 and the strut 15 are all held by a single trunnion pin 30. In this modification the flattened portion 13 of the longitudinal members is made much thicker, that is, sufficiently thick for the two wires 16 to cross each other in their respective threaded holes in the trunnion pin 30 interiorly of the flattened end of strut 15 (see Figs. 6 and 7). The struts 15 in this modification have the metal cut away at their flattened ends as shown at 31 to permit the wires 16 to pass to the trunnion pin 30. The splice in the longitudinal members may be made in a manner similar to that in the modification of Figs. 1 to 4. In Fig. 7, we have shown washers 32 filling in the space between the strut 15 and the walls of the flattened portion 13 up above the point where the splice is made in the longitudinal member 10. If desired, instead of using the washer 32 the end of the strut could be made sufficiently thick to completely fill the space between the walls 13.

An important feature of this invention is the fact that all parts of the spar may be constructed of heat treated steel since the longitudinal members and vertical struts 15 are first formed to the desired shape and then heat treated, and since the struts 15 and tie wires 16 are connected by means of pins instead of rivets.

While the forms of mechanism herein shown and described constitute preferred forms of embodiment of the invention, it is to be understood that other forms might be adapted, all coming within the scope of the claims which follow.

What we claim is as follows:

1. A metal spar comprising: tubular longitudinal tension and compression members, struts and diagonal tie members extending therebetween, said tension and compression members each having a flattened portion and cut away at the edge of said flattened portion at spaced points to permit the struts and tie members to extend within said flattened portion for connection thereto.

2. A metal spar comprising: tubular longitudinal tension and compression members, struts and diagonal tie members extending therebetween, said tension and compression members each having a flattened portion and cut away at the edge of said flattened portion at spaced points to permit the struts and tie members to extend within said flattened portion, and having pins extending through the flattened portion for connecting the struts and tie members thereto.

3. A metal truss having deformed seamless tubular longitudinal tension and compression members and intermediate bracing, each of the tubular longitudinal members having a flattened portion extending in the plane of the intermediate bracing to permit easy attachment thereto of the intermediate bracing.

4. The method of forming longitudinal tension and compression members for wing spar trusses which comprises, deforming a round tube to give it a flattened flange like portion at one side thereof, and next cutting away the edge of this flange at spaced intervals to form recesses therein for the insertion thereinto and the attachment of the intermediate bracing of the truss.

5. A built up metal spar including: flange members, and intermediate bracing including struts and diagonal tie members, said struts being pivoted to said flange members, and said diagonal members being screw threaded to transverse pins in said flange members.

In testimony whereof we hereto affix our signatures.

VIRGINIUS E. CLARK.
KENNETH M. LANE.