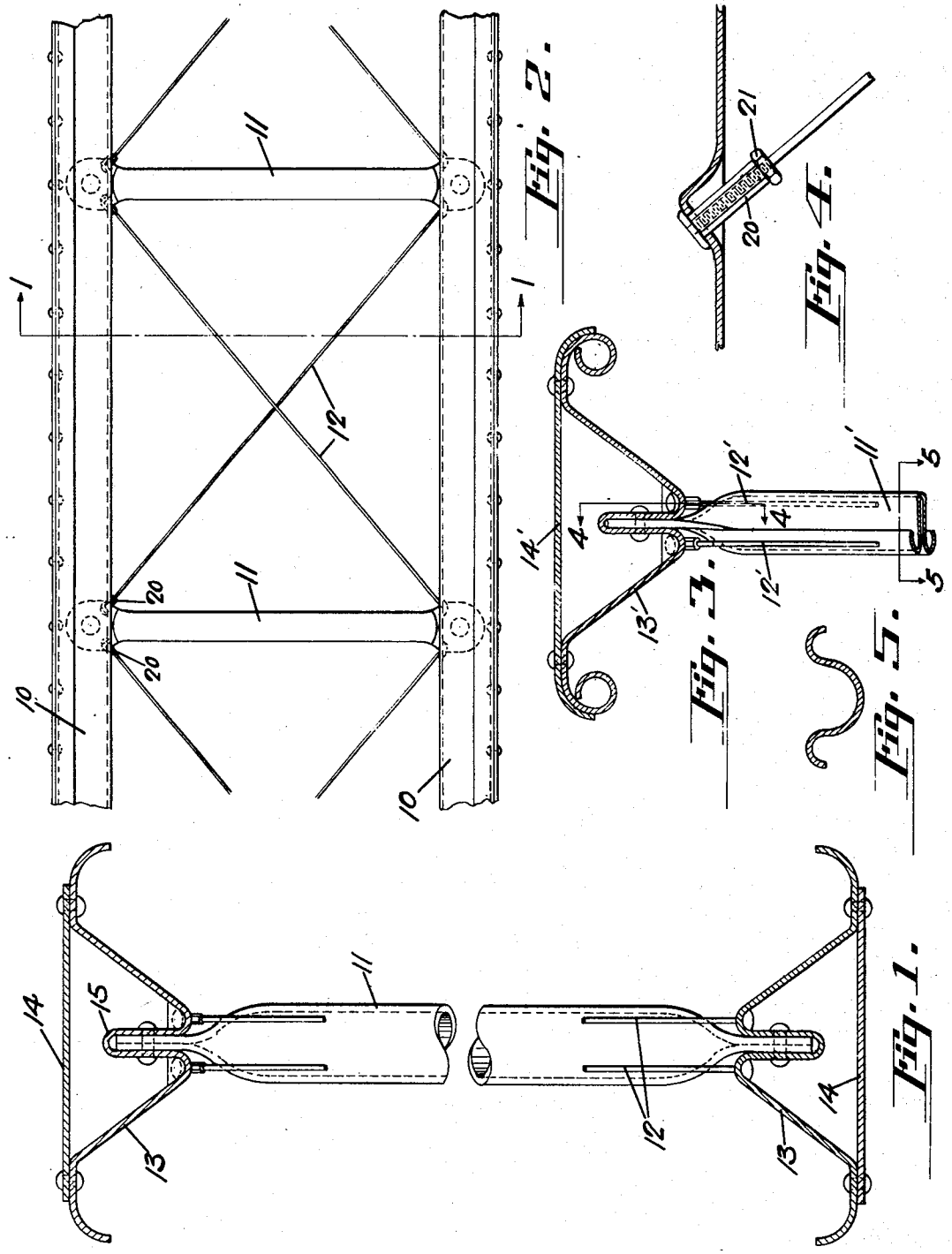
July 8, 1924. 1,500,235

V. E. CLARK

AIRPLANE WING SPAR

Filed Feb. 4, 1922



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UNITED STATES PATENT OFFICE.

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AIRPLANE-WING SPAR.

Application filed February 4, 1922. Serial No. 534,227.

To all whom it may concern:

Be it known that I, VIRGINIUS E. CLARK, a citizen of the United States of America, residing at Dayton, county of Montgomery, and State of Ohio, have invented certain new and useful Improvements in Airplane-Wing Spars (Docket #45), of which the following is a full, clear, and exact description.

This invention relates to an all metal truss of very light construction especially adapted for use as spars in internally braced airplane wings.

An object of this invention is to provide a truss suitable for airplane spars which is very strong for its weight, capable of easy adjustment of its diagonal brace members, and economical to manufacture.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein a preferred form of embodiment of the present invention is clearly shown.

In the drawing:

Fig. 1 is a transverse section of a wing spar built according to this invention, a part being broken out to indicate that the vertical struts may be of varying lengths.

Fig. 2 is a side elevation of a part of the spar shown in Fig. 1.

Fig. 3 is a transverse section showing a modification of several features of the spar, one of which being the single diagonal brace wires.

Fig. 4 is a detail view showing a method of attaching the diagonal wires to the sheet metal.

Fig. 5 is a section on line 5—5 of Fig. 3, showing the modified form of strut.

In the drawing similar reference characters refer to similar parts throughout the several views.

The spar shown in Figs. 1 and 2 is composed of the top and bottom beam members 10 built up out of sheet metal as clearly illustrated, the tubular strut members 11, and the double diagonal brace wires 12. The box section beam members 10 are made up of the two sections 13 and 14. The section 13 is provided with the reentrant fold 15 which serves as a recess for the flat ends of the struts 11. One of the sections 13 is also "bumped-up", as shown in detail in Fig. 4, to provide a flat bearing area for the flanged nuts 20 by which the tension on the brace wires 12 is adjusted. Of course, if desired, the wires 12 may be fastened at both ends by means of the nuts 20, however, I prefer to provide the wires 12 at one end with a head set at an angle, as shown in Fig. 2, which obviates the necessity of "bumping-up" both of the sections 13.

The tubular struts 11 are flattened at their ends and a single rivet is passed through each strut end and the fold 15 of section 13. The struts 11 and the double brace wires 12 are all inserted before the sections 14 are riveted to the sections 13. Of course the tension on wires 12 may be adjusted at any time by applying a wrench to the hexagonal nut 20, after which the lock nut 21 is tightened.

In Fig. 3 I have shown a modification wherein there are only single diagonal brace wires 12′ instead of the double wires 12 shown in Fig. 1. Preferably the alternate brace wires 12′ which run in the same direction, for example, the alternate lift wires 12′, are placed on alternate sides of the spar in order minimize any tendency to bend the spar laterally.

In Fig. 3 I have also illustrated a modified form of box section beam member wherein the edges of plates 13′ and 14′ are extended and curled over to increase the moment of inertia of the spar section and hence its strength. Fig. 3 also illustrates a modified form of strut 11′ of the section shown in detail in Fig. 5. This strut is shaped from sheet metal, the ends being flattened out similar to the ends of the tubular struts 11.

Spars constructed according to this invention are especially adapted for use in very thick wings where the advantages of a truss spar over a beam spar are greater. This invention is also especially applicable to internally braced wings of varying depth since a tapered spar may be easily formed simply by varying the lengths of the strut members and brace wires and using the same section of beam members throughout the length of the spar. However, if desired, the size of the beam members may be also reduced as the bending moment decreases. This reduction in the beam members may be done either by tapering the box section of the beam, or by splicing together shorter lengths, the successive lengths being of lighter gauge

sheet metal. The strength of the spar may also be increased where it has a large bending moment by riveting additional plates to plate 14 and simply reducing the total thickness of plates as the bending moment decreases.

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

What I claim is as follows:

1. An airplane wing spar, comprising upper and lower beams built up from sheet metal, struts spaced at intervals between said beams, and diagonal brace wires between said struts, said beams having salient folds and said wires being secured thereto at said salient folds.

2. A truss adapted for use as airplane wing spars, comprising upper and lower box section beams built up from sheet metal, struts spaced at intervals between said beams, and diagonal brace members between said struts, said struts being pinned directly to said beams.

3. A truss adapted for use as airplane wing spars, comprising upper and lower box sections beams built up from sheet metal, struts spaced at intervals between said beams, and diagonal brace members between said struts, said diagonal brace members extending into the box section beams and being supported on the interior thereof.

4. A truss adapted for use as airplane wing spars, comprising upper and lower box section beams built up from sheet metal, struts spaced at intervals between said beams, and diagonal brace members between said struts, said box section beams being provided with reentrant folds to receive the ends of said struts.

5. A truss adapted for use as airplane wing spars, comprising upper and lower beams built up from sheet metal, struts spaced at intervals between said beams, and diagonal brace members between said struts, said brace members being provided with screw threaded flange-headed nuts at one end for securing said brace member to one of said beams and for adjusting the length thereof.

6. A truss adapted for use as airplane wing spars, comprising, upper and lower beams, struts spaced at intervals between said beams, and diagonal brace members between said beams, said brace members being secured to one of said beams by extending through an aperture therein and having an enlarged head beyond said aperture.

7. A truss adapted for use as airplane wing spars, comprising, upper and lower beams, struts spaced at intervals, between said beams, and diagonal brace members between said beams, said brace members being secured to one of said beams by being screw threaded into a swivel means extending thorugh an aperture in said beam.

In testimony whereof I hereto affix my signature.

V. E. CLARK.

Witnesses:
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Wm. P. Pasco.