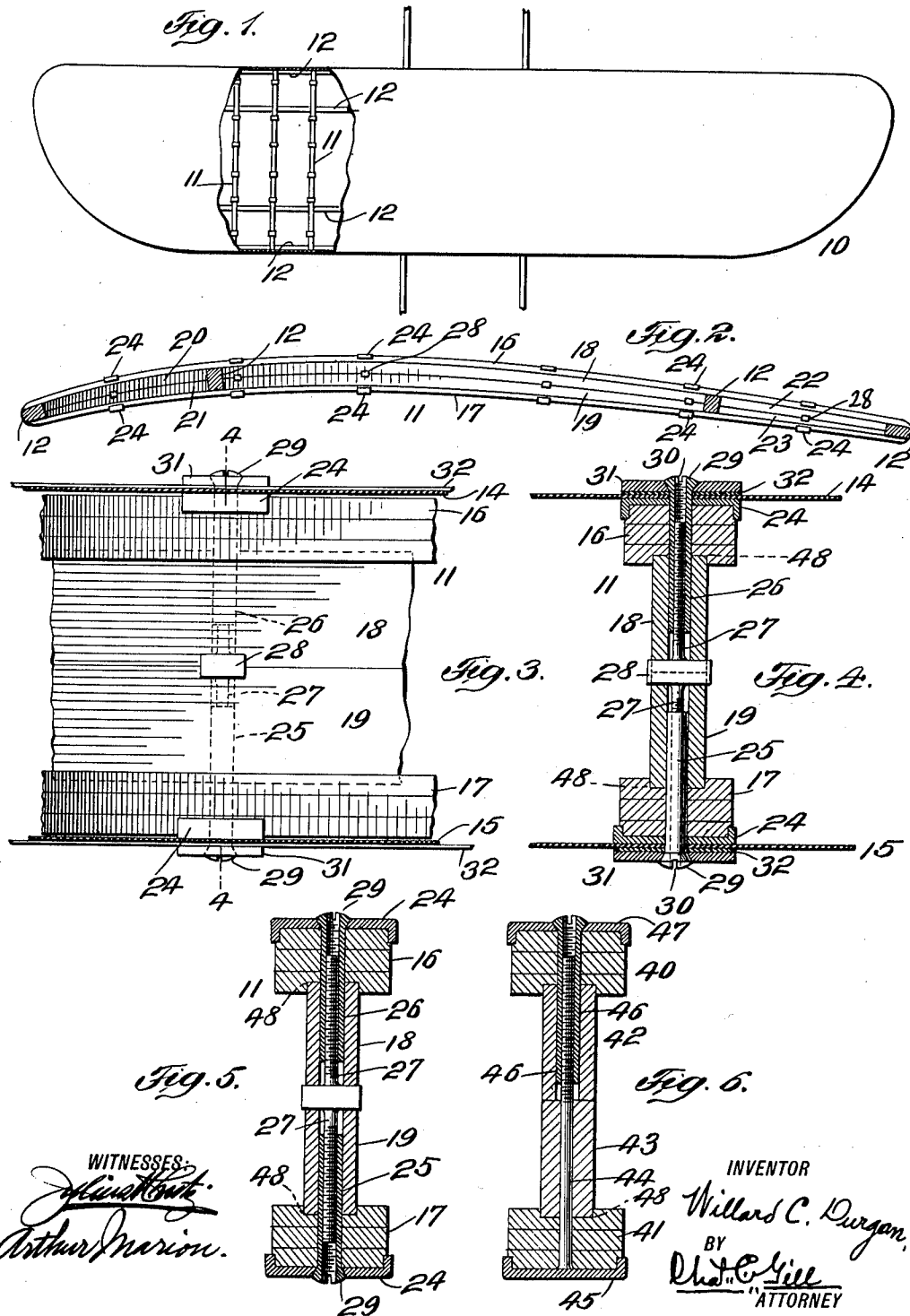


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AEROPLANE.
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AEROPLANE.

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To all whom it may concern:

Be it known that I, WILLARD C. DURGAN, a citizen of the United States, and a resident of Syracuse, in the county of Onondaga and State of New York, have invented certain new and useful Improvements in Aeroplanes, of which the following is a specification.

The invention relates to improvements in aeroplanes, and it consists in the novel features, structure and arrangements of parts hereinafter described, and particularly pointed out in the claims.

The invention resides more particularly in a novel aeroplane wing, and in the construction and assemblage of the parts thereof.

The object of the invention is to produce an aeroplane wing, the parts of which may be very quickly and securely assembled, and at the same time to provide a structure which will enable the ready repair of the wing in the event that a rib thereof should become broken or otherwise injured and require to be replaced by a new rib.

A great deal of difficulty, expense and delay has heretofore been occasioned whenever it became necessary to remove a broken rib from the wing of an aeroplane and substitute a new rib therefor.

One of the main purposes of my invention is to provide an aeroplane wing structure in which, with very slight delay or difficulty, an entire rib may be removed from the wing and another rib substituted therefor.

The invention will be fully understood from the detailed description hereinafter presented, reference being had to the accompanying drawings, in which:

Figure 1 is a top view, partly broken away, of an aeroplane wing constructed in accordance with and embodying the invention; Fig. 2 is a longitudinal section through the wing of an aeroplane and is intended to represent more particularly a side elevation of my new aeroplane wing-rib with relation to the spars of the wing, Fig. 2 showing the spars in cross-section; Fig. 3 is an enlarged longitudinal section through a portion of an aeroplane wing embodying my invention, the portion of the rib illustrated being shown in side elevation; Fig. 4 is a

vertical transverse section through the same on the dotted line 4—4 of Fig. 3; Fig. 5 is a like section illustrating the rib-construction of the invention, and Fig. 6 is a corresponding section showing a partial modification of the invention.

In the drawings, 10 designates the aeroplane wing as a whole, 11 the ribs thereof, 12 the spars extending at right angles to and embraced by said ribs, 14 the upper layer of canvas of the wing, and 15 the lower layer of canvas thereof.

The spars 12 are elongated bars of suitable material and may be of any usual or suitable construction. The ribs 11 are of special construction, and they comprise upper and lower integral strips or bars 16, 17, respectively, and intermediate corresponding sections 18, 19, respectively, located between the two middle spars 12, intermediate corresponding sections 20, 21, disposed between one of the inner spars and the adjacent outer edge spar, and corresponding sections 22, 23 located between the other inner spar and the other outer edge spar, as clearly represented in Fig. 2. The upper and lower strips or bars, 16, 17 extend the full length of the rib and engage the opposite surfaces of the several spars 12, four of said spars being shown, while the corresponding sections 18, 19 match each other and at their ends engage the facing sides of the two inner spars and completely fill the space defined by said spars and between the upper and lower strips or bars 16, 17. The sections 20, 21 at their ends engage the adjacent spars and the facing sides of the upper and lower strips or bars 16, 17, and the sections 22, 23 at their ends engage the adjacent spars and closely fit against the inner facing surfaces of the upper and lower strips or bars 16, 17. The several parts of the rib are firmly secured together by screws and nuts extending there-through at appropriate points along the length of the rib, and I illustrate in detail in Figs. 3 and 4 one appropriate screw and nut means for securing the parts of the rib together. In the employment of the means illustrated in Figs. 3 and 4, I apply metal cap plates 24 to the upper and lower edges of the rib and introduce through one of said

plates an elongated tubular nut 25 and through the other of said plates an elongated tubular nut 26 to engage a stationary screw 27 disposed within tubular openings in the corresponding upper and lower rib sections (18, 19, or 20, 21, or 22, 23), said screw being a double-ended screw carried by a block 28 set within recesses in the adjoining edges of said rib sections, which block, with the cooperation of the rib sections, prevents this screw 27 from having any turning motion. The nuts 25, 26 are in the form of hollow internally threaded tubes to be screwed upon the ends of the screw 27, and said nuts are provided with heads 29 having screw-driver slots 30 by which, with the aid of a screw-driver, they may be readily applied to operative position. The ends of the screw 27 extend outwardly into the bars or strips 16, 17, and the nuts 25, 26 extend inwardly through said bars or strips and to a considerable extent through the rib sections confined between said bars or strips. I may employ the cap plates 24, nuts 25, 26, and screw 27 without additional or other attachments, but preferably I will also utilize the said screw and nuts as means for securing the upper and lower sheets of canvas 14, 15 upon the ribs of the wing, and therefore in Figs. 3 and 4 I illustrate the canvas as applied against the cap plates 24 and show on the outer ends of the nuts 25, 26 plates 31 to clamp the canvas against the cap plates 24. When the plates 31 are made use of as means for securing the canvas to the ribs, I will, between the sheets of canvas and the plates 31, employ a strip of strong tape or the like 32 extending lengthwise of the rib at the inner side of all of the plates 31 with which the rib may be provided.

In Fig. 5 I show the rib having the nuts 25, 26 and screw 27 without the canvas-securing plates 31. Figs. 4 and 5 illustrate the same rib structure and the same nuts and screw, but in Fig. 5, as in Figs. 1 and 2, I omit the supplemental plates 31 for securing the canvas, the rib and its parts in each instance being the same and my main invention being present whether the canvas is secured by the plates 31 or otherwise fastened to the ribs. I prefer to secure the canvas to the ribs by means of the plates 31 and to apply said plates on the nuts 25, 26 but I may tack or nail the canvas to the ribs, in lieu of using the plates 31, should occasion so require or seem desirable.

In the modification illustrated in Fig. 6, I number the upper and lower strips or bars of the rib 40, 41, respectively, and the intermediate sections 42, 43, respectively. In the construction shown in Fig. 6 the screw 44 is integral with the lower cap plate 45 and extends through the lower strip or bar 41 and the intermediate sections 43, 42 and into

the upper strip or bar 40. The upper portion of the screw 44 receives the tubular nut 46 which corresponds with the tubular nuts 25, 26, hereinbefore referred to, and extends downwardly through the upper cap plate 47 and upper strip or bar 40 and also nearly through the intermediate section 42.

In the several forms of the invention shown, the rib is in the nature of a sectional or knock-down rib, the parts of which are capable of being very readily assembled from the opposite or upper and lower sides of the spars and of being very firmly and quickly secured together by means of the screws and nuts. In the event that a rib of the wing should become broken, said rib may be very readily replaced by another rib of the construction presented by me, the canvas being slit only along the rib to be removed and the parts of the new rib being inserted very quickly and secured together mainly with simply the use of a screw-driver.

It has heretofore been the subject of great annoyance and difficulty, especially on the field, to replace a broken rib of an aeroplane wing with a new rib. My invention enables a new rib to be substituted for a broken or injured rib at minimum cost, trouble and delay.

I shall preferably utilize the rib-securing means of my invention as an aid to fastening the canvas in position, and hence in Figs. 3 and 4 I illustrate the outer binding plates 31 and tapes 32 held by the same nuts that engage the screw for the purpose of securely fastening the upper and lower sheets of canvas on the ribs of the wing. The plates 24, as well as those numbered 43, 47, are preferably formed with flanges to engage the opposite side edges of the upper and lower strips or bars of the rib, as clearly shown in Figs. 4, 5 and 6, said flanges serving to prevent said plates from having any turning action during the tightening of the nuts and screws and to present an efficient and desirable construction. I also recess the facing sides of the strips or bars 16, 17 (and 40, 41) of the rib, as at 48, to receive and interlock with the intermediate rib-sections, as 18, 19, and thereby increase the stability, efficiency and desirability of the rib structure as a whole.

I do not limit my invention to all of the details of form and construction shown, since I know of no earlier aeroplane-wing having a rib formed of detachable sections or at all analogous to the constructions presented by me. The parts of my rib are readily constructed and transportable and may be assembled in the wing in a very convenient manner and also readily removed therefrom should occasion so require, the upper and lower halves or sections of the rib being detachable from each other upon the freeing

of the nuts and screws which bind said parts together.

What I claim as my invention and desire to secure by Letters Patent, is:

5 1. An aeroplane-wing comprising spars, ribs, a suitable covering fabric, said ribs being composed of upper and lower strips or bars extending crosswise of said spars at opposite sides thereof and intermediate sections between said strips or bars and the facing sides of said spars, and means applicable at opposite sides of the ribs and extending through the same for securing the parts thereof together and against the spars, said
10 means comprising a series of screws and nuts and the nuts being in the form of internally threaded tubes entering the ribs to engage the screws and having slotted heads.

2. An aeroplane-wing comprising spars, ribs, a suitable covering fabric, said ribs being composed of upper and lower strips or bars extending crosswise of said spars at opposite sides thereof and intermediate sections between said strips or bars and the facing sides of said spars, and means applicable at opposite sides of the ribs and extending through the same for securing the parts thereof together and against the spars, said means comprising flanged-cap-plates engaging the opposite upper and lower surfaces and side edges of the ribs, and a series of screws and nuts in operative relation to said plates, said nuts being in the form of internally threaded tubes entering the ribs
35 to engage the screws and having exposed heads.

3. An aeroplane-wing comprising spars, ribs, a suitable covering fabric, said ribs being composed of upper and lower strips or bars extending crosswise of and at opposite sides of the spars and intermediate sections between said strips or bars and the facing sides of said spars, and means at opposite sides of the ribs for securing the parts thereof together and against the spars, said intermediate sections being in upper and lower parts or divisions faced against each other at their inner edges and having their outer edges set in recesses provided for them in the facing sides of said strips or bars.
50

4. An aeroplane-wing comprising spars, ribs, a suitable covering fabric, said ribs being composed of upper and lower strips or bars extending crosswise of said spars at opposite sides thereof and intermediate sections between said strips or bars and the facing sides of said spars, and means applicable at opposite sides of the ribs and extending through the same for securing the parts thereof together and against the spars, said means comprising flanged cap-plates engaging the opposite upper and lower surfaces and side edges of the ribs, and a series of screws and nuts in operative relation to

said plates, said nuts being in the form of internally threaded tubes entering the ribs to engage the screws and having exposed heads, combined with outer plates on said nuts for securing the canvas of the wing against said cap-plates.
65 70

5. An aeroplane-wing comprising a suitable covering fabric, spars, ribs composed of upper and lower strips or bars extending crosswise of said spars at opposite sides thereof and intermediate sections between said strips or bars and the facing sides of said spars, and means for securing the parts of the ribs together and against the spars comprising double-ended screws embedded in said intermediate sections and tubular nuts extending inwardly through said strips or bars and engaging said screws.
75 80

6. An aeroplane-wing comprising a suitable covering fabric, spars, ribs composed of upper and lower strips or bars extending crosswise of said spars at opposite sides thereof and intermediate sections between said strips or bars and the facing sides of said spars, and means for securing the parts of the ribs together and against the spars comprising double-ended screws embedded in said intermediate sections, cap plates applied on the outer edges of said strips or bars and tubular nuts extending inwardly through said cap plates and said strips or bars and engaging said screws, said nuts having heads on their outer ends.
85 90 95

7. An aeroplane-wing comprising a suitable covering fabric, spars, ribs composed of upper and lower strips or bars extending crosswise of said spars at opposite sides thereof and intermediate sections between said strips or bars and the facing sides of said spars, and means for securing the parts of the ribs together and against the spars comprising double-ended screws embedded in said intermediate sections, cap plates applied on the outer edges of said strips or bars and tubular nuts extending inwardly through said cap plates and said strips or bars and engaging said screws, said nuts having heads on their outer ends, combined with outer plates on the outer ends of said nuts for securing the canvas of the wing against said cap plates.
100 105 110 115

8. An aeroplane-wing comprising a suitable covering fabric, spars, ribs composed of upper and lower strips or bars extending crosswise of said spars at opposite sides thereof and intermediate sections between said strips or bars and the facing sides of said spars, and means for securing the parts of the ribs together and against the spars comprising double-ended screws embedded in said intermediate sections and tubular nuts extending inwardly through said strips or bars and engaging said screws, said intermediate sections being in upper and lower
120 125

divisions and said screws having blocks at their middle portions set in recesses formed in the adjacent edges of said divisions.

9. A portable knock-down rib for the
5 wing of an aeroplane comprising upper and lower strips or bars extending the full length of the rib, upper and lower intermediate sections confined between said upper and lower strips or bars and at their ad-
10 joining end portions being spaced apart, and means applicable from the upper and

lower sides of the rib and extending through the same for detachably binding the parts of the rib together.

Signed at Syracuse, in the county of 15
Onondaga and State of New York, this 31
day of May, A. D. 1912.

WILLARD C. DURGAN.

Witnesses:

LUDWIG TRAGE, Jr.,
RALPH K. DORAN.