March 8, 1932. F. D. McMASTER 1,848,368

AEROPLANE WING

Filed Nov. 17, 1930 3 Sheets-Sheet 1

Fig. 5.

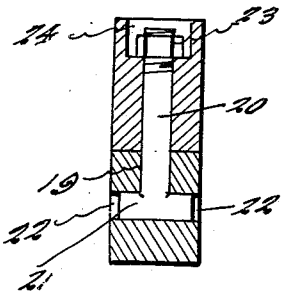


Fig. 1.

Fig. 6.

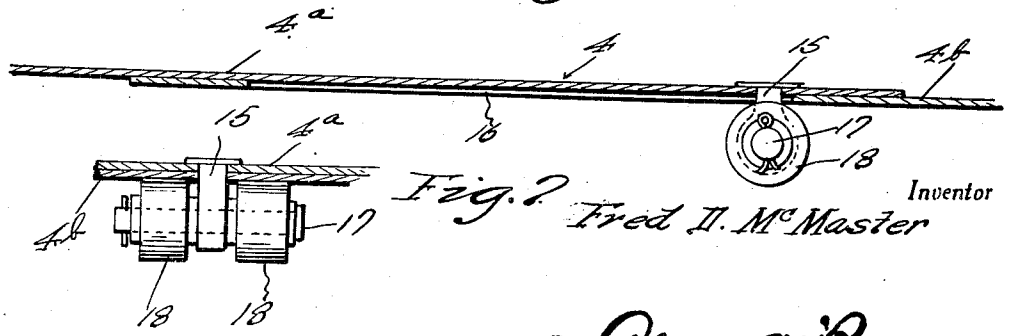


Fig. 2.

Inventor

Fred H. McMaster

By Clarence A. O'Brien

Attorney

March 8, 1932. F. D. McMASTER 1,848,368

AEROPLANE WING

Filed Nov. 17, 1930 3 Sheets-Sheet 2

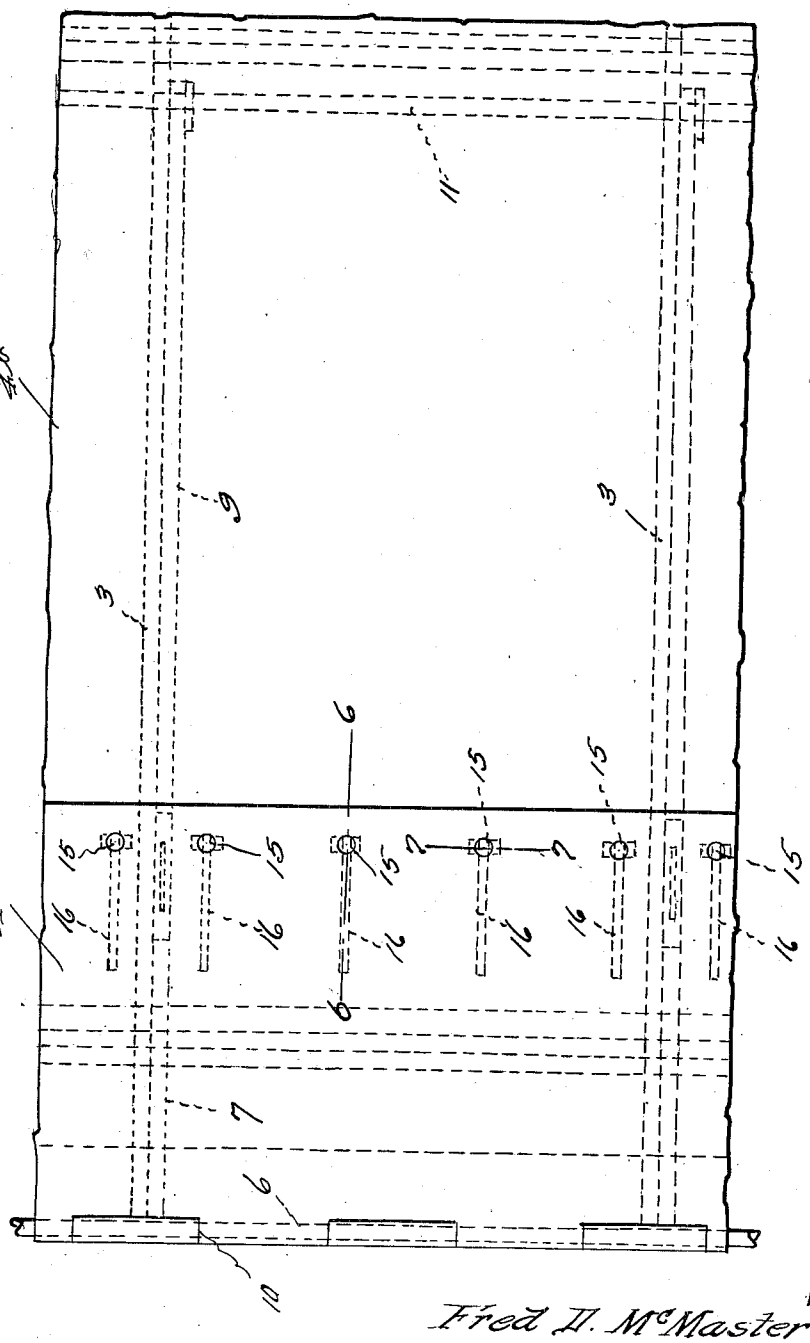


Fig. 2.

Inventor
Fred D. McMaster

By Clarence A. O'Brien
Attorney

March 8, 1932. F. D. McMASTER 1,848,368

AEROPLANE WING

Filed Nov. 17, 1930 3 Sheets-Sheet 3

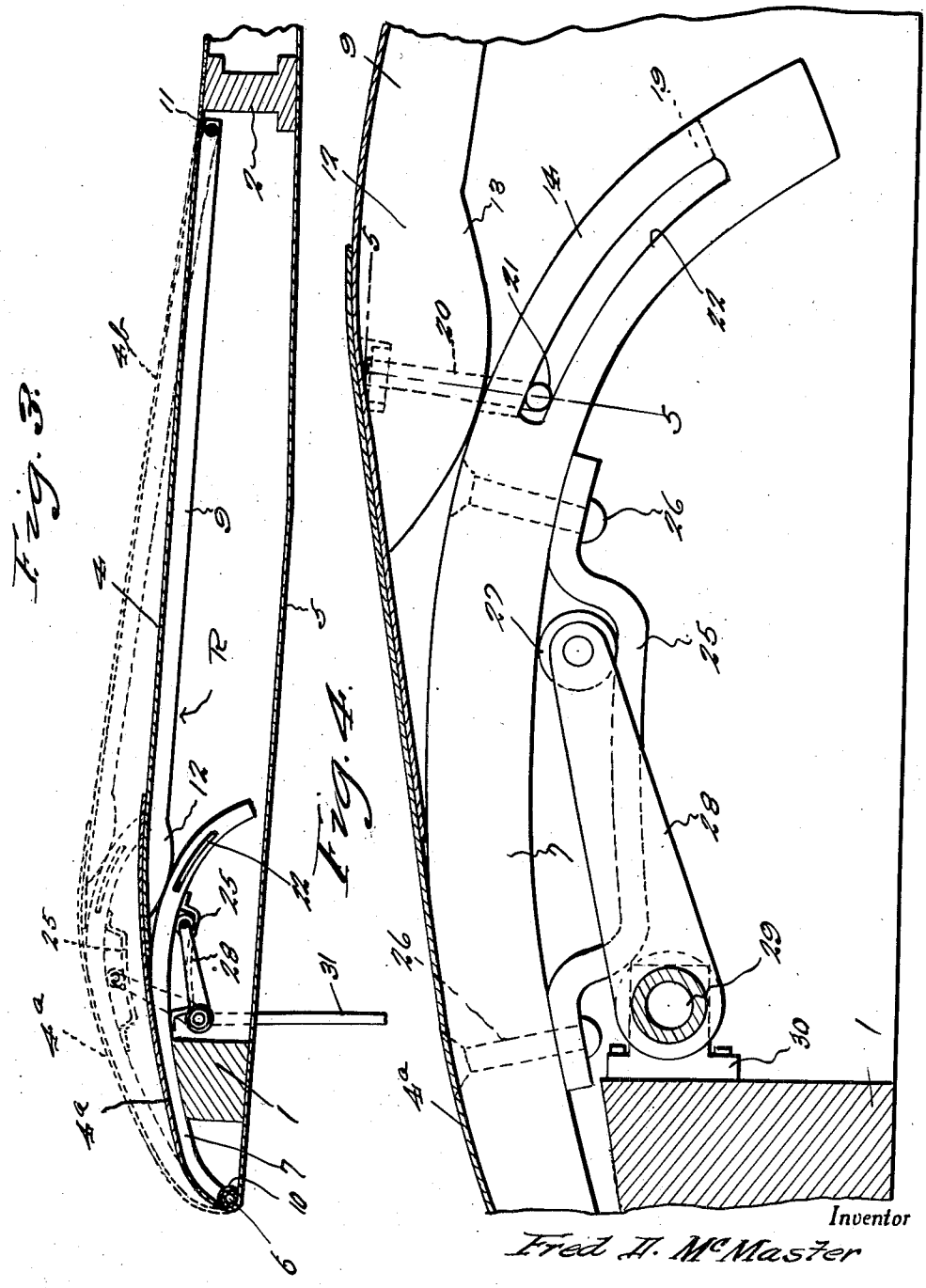


Fig. 3.

Fig. 4.

Inventor

Fred D. McMaster

By Clarence O'Brien

Attorney

Patented Mar. 8, 1932 1,848,368

UNITED STATES PATENT OFFICE

FRED D. McMASTER, OF DANVILLE, ILLINOIS

AEROPLANE WING

Application filed November 17, 1930. Serial No. 496,296.

This invention relates broadly to aeroplanes and has more particular reference to a wing therefor.

A primary object of this invention is to provide an aeroplane wing that is capable of being adjusted so as to provide a variable cambered wing.

A still further object of the invention is to provide a variable cambered wing that has improvements over similar types of wings now in use, in that the wing, in accordance with the present invention, is capable of being adjusted with a minimum amount of effort, and can be readily controlled by the pilot; also an aeroplane equipped with a wing comprehended by the present invention, will be capable of a very high flying speed. Further an object of the invention is to permit the landing of the aeroplane at a slow safe speed, thus especially adapting an aeroplane equipped with the wing, for training purposes or for taking very heavy loads when rising from the ground at the start of its flight.

Other objects and advantages of the invention will become apparent from a study of the following description, taken in connection with the accompanying drawings wherein:

Figure 1 is a top plan view of the wing, the same being shown as applied to a conventional type of aeroplane,

Figure 2 is a fragmentary top plan view of the wing per se.

Figure 3 is a transverse sectional view taken substantially on the line 3—3 of Figure 1.

Figure 4 is a fragmentary detail view partly in section and partly in elevation for more clearly illustrating the means for effecting an adjustment or variation in the camber of the wing.

Figure 5 is a detail sectional view taken substantially on the line 5—5 of Figure 4.

Figure 6 is a similar view taken substantially on the line 6—6 of Figure 2.

Figure 7 is a fragmentary detail view taken substantially on the line 7—7 of Figure 2.

With reference more in detail to the drawings, it will be seen that the wing designated generally by the reference character W, may be mounted on a conventional type of aeroplane designated generally by the reference character A, to extend transversely thereof in the usual manner, and as is conventional with the sustaining wing of a monoplane.

The wing W in many respects is similar to the conventional type of wing, including a frame structure embodying the front and rear spars 1 and 2 respectively and the transverse ribs 3. The wing is further provided with the top and bottom coverings 4 and 5 respectively and formed of any suitable and well known type of material used for such purposes.

Extending for the full length of the wing, and suitably supported thereon at the leading edge thereof in advance of the forward bar 1 is a rod 6. Adjustable camber ribs designated generally by the reference character R are provided, and are arranged one adjacent each of the usual wing ribs 3. (See Figure 2.) Each of the adjustable ribs comprises a pair of sections including a relatively short lingitudinally curved front section 7 and a relatively elongated straight rear section 9.

The front sections 7 at one end are hinged as at 10 on the leading edge axle rod 6 and are suitably secured to the leading edge top section 4*a*, and in their normal position, the rib sections 4 contact with and rest on the upper beveled surface of the front bar 2.

The rear or trailing camber rib sections 9 have their rearmost ends rockably engaged with an axle rod 11 supported by the usual wing ribs 3 slightly in advance of the wing bar 2. At their forward free ends, the rib sections 9 are provided with enlargements 12 having curved cam faces 13 ridable over the curved faces 14 of the adjustable camber rib sections 7 at the free end of said sections 7. The rear or trailing top cover section 4*b* is suitably secured to the camber rib sections 9. The top sections 4*a*, 4*b* at their adjacent edges are arranged in overlapping relation, and the top section 4*a* adjacent its free edge is provided with a plurality of transversely spaced hangers or brackets 15 that extend therefrom

through longitudinally spaced transversely extending slots 16 provided therefor in the top section 4*b*. Carried by each of the hangers or brackets 15 is a horizontal shaft 17 that has rotatably mounted thereon rollers 18 for contact with the under face or side of the top section 4*b*. Thus the overlapping portion of the sections 4*a*, 4*b* are maintained in overlapping rotation when the sections of the adjustable camber ribs are moved relative to one another for varying the camber of the wing.

Each of the adjustable camber rib sections 7 adjacent their free curved ends is provided with elongated slots 19 for accommodating the lower end of a guide bolt 20 carried by the adjustable camber rib section 9 at the enlarged end 12 of said section. Each of the bolts 12 at the lower end is provided with lateral projections 21 operable in lateral openings 22 provided therefor at the bottom of the slots 19 for retaining the lower end of the bolt 20 within said slot 19.

The upper end portion of the bolt 20 extends through a suitable opening or bore in the enlarged end 12 of the rib section 9 and at its upper end has threadedly engaged therewith a nut 23 fitting in a counter bore or socket 24 formed in said enlarged end 12.

Carried by each of the rib sections 7 is a substantially U-shaped guide bracket 25 suitably bolted to said section 7 as at 26. Operatively engaging the brackets 25 are rollers 27 journalled on the outer free end of crank arms 28 carried by a rocker shaft 29 journalled in bearing brackets 30 suitably mounted on the rear side of the forward bar 1. Suitably and operatively connected with the rocker shaft 29 is a rocker arm 31 that extends down into the fuselage of the aeroplane A to terminate within the cockpit of the aeroplane within convenient reach of the pilot, whereby the latter may control the camber of the wing as desired.

When in normal position, the parts are shown in full line in Figure 3. When for any reason, it is desired to vary the camber of the wing, the pilot or the like, by suitably manipulating the rod 31 will rock the shaft 29 and the roller 27 engaging the brackets 25 and adjustable camber rib section 7 will swing said sections about their hinges 10 effecting a swinging movement of the adjustable camber rib sections 9 about their pivots 11, the same being effected through the medium of the cam faces 13 riding over the curved faces 14 thus effecting a raising of the wing top cover 4 relative to the bottom cover 5, and the top sections 4*a*, 4*b* moving relative to one another until the parts have assumed the position shown in broken line in Figure 3, thus materially increasing the camber of the wing as is apparent.

Manifestly, the operation is the reverse when the camber of the wing is being adjusted to normal.

It is thought from the foregoing description, taken in connection with the accompanying drawings that a clear understanding of the operation, structure, utility and advantages of an invention of this character will be had by those skilled in the art without a more detailed description.

Even though I have herein shown and described the preferred embodiment of my invention, it is to be understood that the same is susceptible of various changes, modifications and improvements coming within the scope of the appended claims.

Having thus described my invention, what I claim as new is:

1. A variable camber rib comprising in combination a plurality of rib sections hingedly supported at one edge adjacent the leading edge of the wing, a top covering section carried by said rib section, a plurality of additional rib sections pivotally mounted at one end adjacent the trailing edge of said wing, a second top covering section carried by the last mentioned rib sections, means operatively connecting the first mentioned rib sections with the second mentioned rib sections for effecting a simultaneous movement of all of said rib sections for varying the camber of the wing, said top covering sections having adjacent portions arranged in overlapping relation, and one of said top covering sections provided with roller supporting brackets operable in slots provided in the other of said top covering sections, and rollers carried by said brackets engaging the under face of said other top covering section.

2. A variable camber wing including in combination an expansible top covering, and means for expanding and contracting said cover for varying the camber of said wing, said means including a plurality of ribs respectively including a pair of sections one of which is hinged at one end adjacent the leading edge of the wing, and the other of which is pivotally mounted at one end adjacent the trailing edge of the wing, said sections having their free ends arranged in overlapping relation, for effecting simultaneous movement of said rib sections, a rock shaft mounted within said wing, rocker arms carried by said rock shaft, and means operatively connecting said rocker arms with the first referred to sections of said ribs for moving the sections of the respective ribs relative to one another for effecting a variation in the camber of the wing.

3. A variable camber wing including in combination an expansible top covering including a pair of sections, adjustable ribs, each of said ribs including a section pivoted at one end adjacent the forward edge of the wing, and a second section pivoted at one end adjacent the trailing edge of the wing, said first mentioned section at its free end being curved, and said second section at its free end

provided with a cam face engaging the curved end of the first mentioned section, and means operatively connected with the first section for rocking the sections of the ribs simultaneously for expanding and contracting said top covering.

4. A variable camber wing comprising in combination a covering including a pair of sections having adjacent portions arranged in overlapping relation, one of said sections being provided with a roller supporting bracket operable in a slot in an adjacent portion of the other of said sections, and laterally disposed rollers carried by said bracket and engaging the under face of said other section.

5. A variable camber wing including a top covering comprising two sections having adjacent portions in overlapping relation, the overlapping portion of one of said sections being provided with a relatively fixed member extending through a slot in an adjacent portion of the other of said sections, and a rotatably mounted element on said member laterally thereof and engaging the under face of said other section.

6. A variable camber wing including in combination, an articulated rib pivoted at relatively opposite ends, said rib determining an adjustable curvature of the upper side of the wing, one of the sections of said rib having a longitudinally curved portion, a rockably mounted arm, said arm provided with means engageable with the concave edge of the curved portion of said one section whereby provision is made for increasing the curvature of the upper portion of the wing upon rocking movement of the arm in one direction.

In testimony whereof I affix my signature.

FRED D. McMASTER.