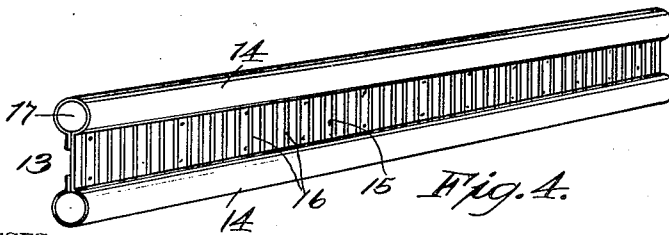
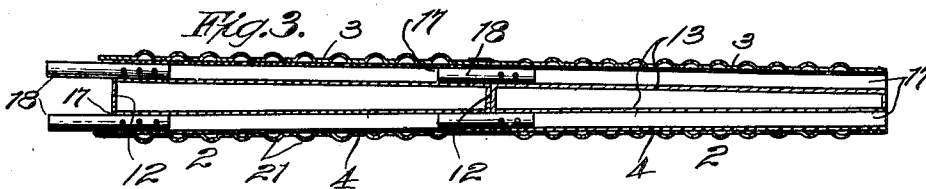
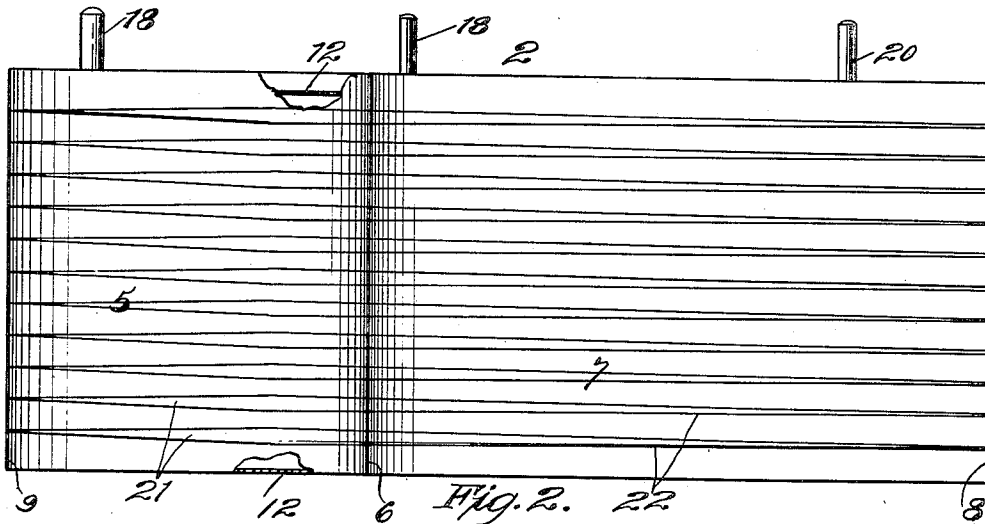
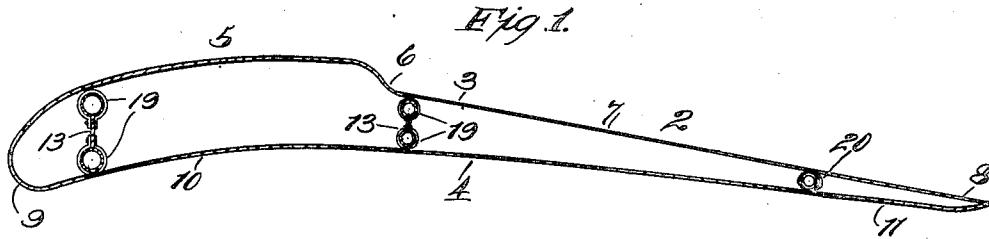


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AEROPLANE BLADE CONSTRUCTION.
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Patented Jan. 14, 1913.



WITNESSES:

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JOHAN RICHARD FROBERG, OF RICHMOND, CALIFORNIA.

AEROPLANE-BLADE CONSTRUCTION.

1,050,530.

Specification of Letters Patent.

Patented Jan. 14, 1913.

Application filed June 25, 1912. Serial No. 705,741.

To all whom it may concern:

Be it known that I, JOHAN RICHARD FROBERG, a citizen of the United States, residing at Richmond, in the county of Contra Costa and State of California, have invented new and useful Improvements in Aeroplane-Blade Construction, of which the following is a specification.

This invention relates to aeroplanes, and particularly to aeroplane blade construction.

The object of the present invention is to provide an aeroplane blade of high supporting efficiency, one which will be buoyant in water, and to provide a blade structure composed of air-tight sections for complementary elements which coöperate when sections are assembled to form a rigid, but light and readily detachable, and easily ported blade.

The invention consists of an aeroplane blade section of hollow construction; the section being provided with upper and lower surfaces of peculiar contour in cross section, having for its purpose the production of a supporting blade designed to enter the wind or air with minimum head resistance, and clear itself with minimum loss due to eddies behind the blade.

Figure 1 is a longitudinal section through a blade. Fig. 2 is a plan view in partial section of an element or section. Fig. 3 is a sectional detail showing in cross section assembled blade members. Fig. 4 is a perspective view of a spar. Fig. 5 is a perspective view of a spar clip.

The present invention relates to improvements in supporting blades for aerial machines, and as shown in the accompanying drawings, the blade is composed of a plurality of detachable, substantially air-tight sections 2, having upper and lower surfaces 3 and 4, which may be made of any suitable, durable and substantial material; metal being preferred. The surfaces or top and bottom sheets 3 and 4 are previously formed before assembling to make an air-tight buoyant section 2, each with a given transverse section, the formation or outline of which is designed to afford in an aeroplane supporting surface, the maximum efficiency.

The top sheet or surface is shown as being formed for substantially a third of its length as convexed, as at 5; the rear portion of the convexed surface dropping quickly as at 6,

to and intersecting with the main portion of the surface or sheet 3, which is shown as at 7 as being substantially flat, from the point of juncture adjacent the downward curve 6 to the trailing edge 8 at the rear of the plane.

The nose 9, or entering edge of the top sheet 3, is curved gradually around and intersects with the forward curved portion 10 of the bottom or supporting surface 4, the central portion of which latter is substantially flat or of a slight concaved curve which continues well toward the trailing edge 8 of the plane, the extreme portion of the supporting surface 4 being curved oppositely or convexly as at 11, to the forward portion of the surface 4.

The benefit or advantage of the peculiar transverse area of the aeroplane element 2, is that during the propulsion of the blade the lower concaved supporting surface 4 acts to lift or support the aeroplane and render it buoyant in the air, while the relieved portion following the drop curve 6 of the top surface is of advantage and use to increase the efficiency due to the lifting effect of the rarefied air above the advancing trailing edge or rear part of the supporting plane.

By forming the nose 9 with a substantially semi-circular curve, the head resistance is reduced and the entering top surface 5 cleaves the air easily; the latter being rarefied by the drop curve 6, which rarefaction is effectual for increasing the efficiency, and the peculiar curve of the supporting surface 4, particularly in its gradual tapering at the rear portion, tends to enable the plane to clear the air at the trailing edge with the least possible production of untoward eddies.

For the purpose of utilizing each of the aeroplane blade sections or members 2, as pontoons, in the event that the aeroplane should fall to the water, it is one of the objects of the invention to connect the upper and lower sheet, both at their entering and trailing edges to form a tight seam, and also to provide a connecting web or wall extending from the top to the bottom sheets 3—4, as at 12, on each of the sides of a section. The juncture of the webs or end walls 12 with the top and bottom sheets 3—4 is hermetically closed, thus forming within each aeroplane section 2 an air-tight chamber

which is useful as a pontoon when the aeroplane alights in water.

The transverse stiffness of each section is procured by introducing transverse spars, illustrated in Fig. 4 at 13; in this instance the spars being composed of upper tubular beads or cylinders 14, connected to or formed with a tie or longitudinal web 15, which is effectually stiffened by being stamped or rolled with transverse corrugations 16. The spars 13 are formed at one end with sockets 17, Fig. 3, and secured in the opposite end of the transverse spars are projecting keys or dowel pins 18 which are adapted to be projected and firmly retained in the contiguous sockets 17 of the next adjacent section 2 in an assembled plane. This type of longitudinal beads and transversely corrugated spars 13 is extremely rigid and is sufficiently light to be practically applicable to aeroplane structures, and as shown in Figs. 1 and 2, the foremost spar 13 is arranged in the chamber between the entering edge or head of the blade, the spar being connected to the upper and lower sheets by clips 19, one of which is shown in Fig. 5, the clips being rigidly secured to the material forming the top and bottom sheets. The central spar 13 is introduced transversely in the section 2 at a point adjacent the drop curve 6, and another spar 20 of elliptical cross-section is introduced adjacent the trailing edge of a blade section between the sheets 3—4.

When the material, of which the blade sheets 3 and 4 is made, is extremely light in weight, its stiffness and rigidity may be greatly increased by forming corrugations extending longitudinally of the sheets; the corrugations being curved in cross-section, and each corrugation being oppositely tapered as at 21 and 22, Fig. 2, from a suitable point between the fore and aft edges of the sheets. That portion of the sheet between adjacent longitudinal corrugations or reinforcing ribs 21—22 being stamped or rolled flat and the clips 19, may be attached to the flat portions between the longitudinal ribs or corrugations.

Manifestly each of the pontoon like sections 2 may be formed of appropriate width, length and depth, and when assembled and connected by the dowel pins 18 a substantial, rigid and efficient lifting plane is obtained. The oppositely tapering corrugations as shown in Fig. 2, are not only for the purpose of making the curved sheets 3—4 stiff and rigid without the use of ordinary wing ribs, but these stream-line formed corrugations are also for the purpose of rectifying eddy-currents of air as they come in contact with the upper or lower surfaces of the supporting blades, thereby increasing the efficiency and stability of the aeroplane, and thus eliminating to a mini-

mum the usual "drift" (or retarding force) which is known to act on blades of smooth surface in the form of air-eddies.

Having thus described my invention, what I claim and desire to secure by Letters Patent, is—

1. An aeroplane blade construction comprising an upper or top sheet and a lower sheet, said lower sheet being made substantially concaved throughout its length, the forward and rear edges of said sheets being rigidly connected, the upper of said sheets being provided for about one-third of its length with a convexed curve and thence quickly dropping, and the rear two-thirds of the sheet at the forward portion connecting with the quickly-dropped portion of said convexed curve and thence continuing rearwardly in an approximate straight line to the rear trailing edge.

2. An aeroplane blade construction comprising an upper or top sheet and a lower sheet, said lower sheet being made substantially concaved throughout its length, the forward and rear edges of said sheets being rigidly connected, the upper of said sheets being provided for about one-third of its length with a convexed curve and thence quickly dropping, and the rear two-thirds of the sheet at the forward portion connecting with the quickly-dropped portion of said convexed curve and thence continuing rearwardly in an approximate straight line to the rear trailing edge, the forward or entering edge of the blade construction being of substantially semi-circular curve and having a downward dip.

3. An aeroplane blade construction comprising an upper or top sheet and a lower sheet, said lower sheet being made substantially concaved throughout its length, the forward and rear edges of said sheets being rigidly connected, the upper of said sheets being provided for about one-third of its length with a convexed curve and thence quickly dropping, and the rear two-thirds of the sheet at the forward portion connecting with the quickly-dropped portion of said convexed curve, and thence continuing rearwardly in an approximate straight line to the rear trailing edge, the forward or entering edge of the blade construction being of substantially semi-circular curve and having a downward dip, and the trailing edge of the lower sheet being slightly convexed adjacent the conjunction with the trailing edge of the top sheet.

4. An aeroplane blade construction comprising a lower supporting surface sheet substantially concaved throughout its length, a top sheet spaced from the lower sheet, the forward and rear edges of said sheets being connected, the former with a substantially semi-circular curve and the rear edge with an acute angle, and side

webs connecting the upper and lower sheets
to form an inclosed light chamber therebe-
tween, and a plurality of transversely extend-
ing spars, each connected to and spacing the
5 upper and lower sheets, said spars compris-
ing spaced tubes and connecting webs.

In testimony whereof I have hereunto

set my hand in the presence of two subscrib-
ing witnesses.

JOHAN RICHARD FROBERG.

Witnesses:

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GENEVIEVE S. DONELIN.