J. W. WAY.

VANE FOR PROPELLER WHEELS.

APPLICATION FILED NOV. 10, 1909.

1,014,730.

Patented Jan. 16, 1912.

2 SHEETS-SHEET 1.

FIG. 1.

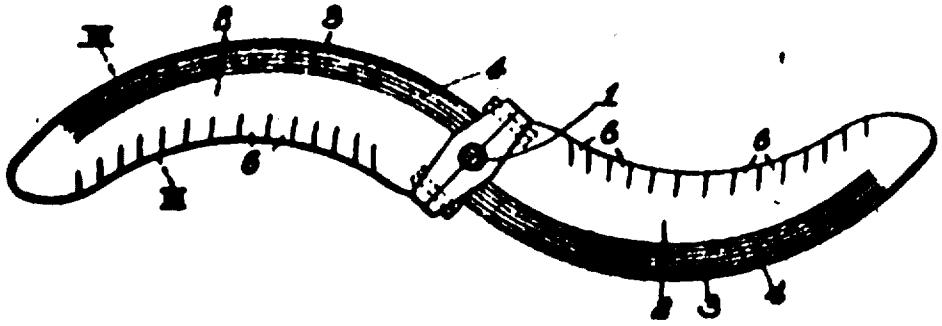

FIG. 2.

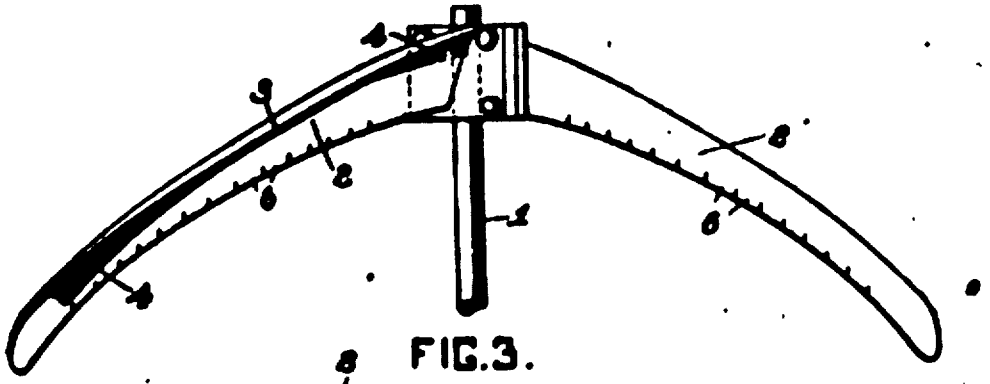

FIG. 3.

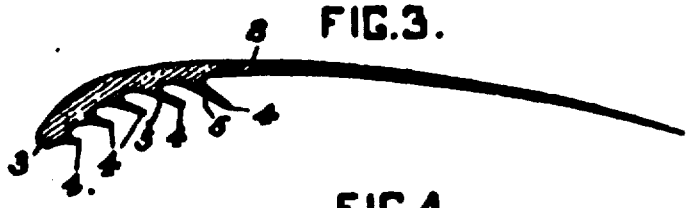

FIG. 4.

WITNESSES:

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J. W. WAY.

VANE FOR PROPELLER WHEELS.

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2 SHEETS-SHEET 2.

FIG. 6.

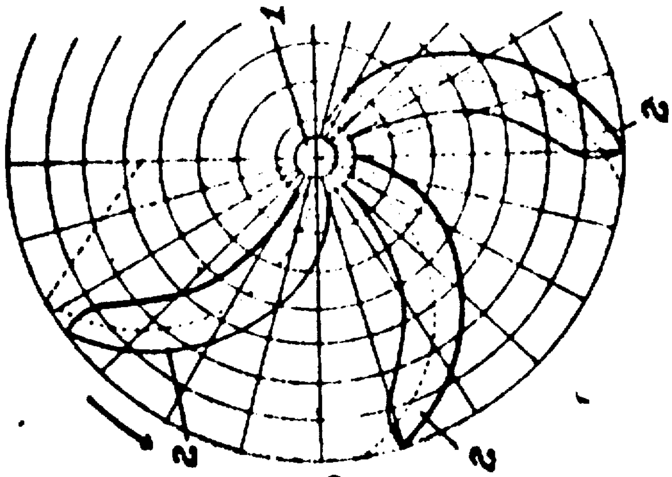
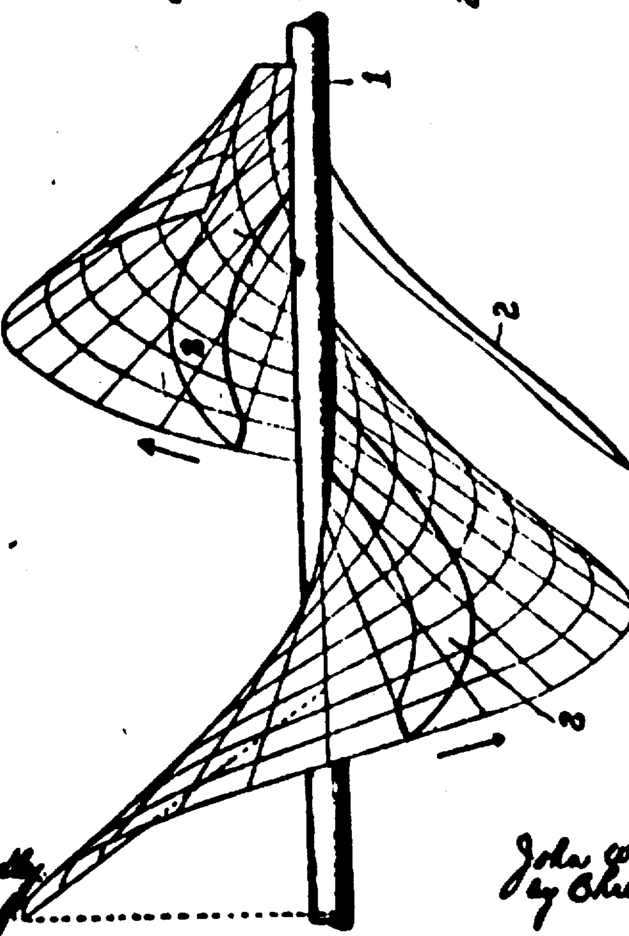


FIG. 5.



WITNESSES:

[signatures]

John W. Way INVENTOR

by Christy and Christy Att'ys

UNITED STATES PATENT OFFICE.

1,014,730. VANE FOR PROPELLER-WHEELS. JOHN W. WAY, Edgeworth, Pa. Filed Nov. 15, 1909. Serial No. 528,199.

To all whom it may concern:

Be it known that I, JOHN W. WAY, residing at Edgeworth, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Vanes for Propeller-Wheels, of which improvements the following is a specification.

My invention relates to improvements in the construction of vanes for propeller wheels; and, while it is not so limited, the particular object in view is a propeller blade especially adapted to meet the requirements of aerial navigation.

In the accompanying drawings which form a part of this specification, Figure 1 is an end view of the propeller wheel, the shaft thereof being shown in section and the blades in perspective; Fig. 2 is a side perspective view of the same structure; Fig. 3 is a transverse sectional view through one of the vanes, the plane of section being indicated at III—III of Fig. 1; Fig. 4 is a side elevation, that is an edgewise view, of one of the blades or wings. It will be understood that Figs. 3 and 4 are drawn to larger scale than Figs. 1 and 2; Figs. 5 and 6 illustrate diagrammatically the shape of the forward and the rear edges of the vanes of the propeller wheel; Fig. 5 is a side elevation, and Fig. 6 is a plan, showing a surface generated by a directrix extending angularly from the shaft, 1, and following at one end a helical path upon the shaft. The edges of the vanes of the propeller lie in the surface so generated.

The reference numerals used in the several figures are applied to corresponding parts throughout.

The shaft of the propeller wheel is indicated at 1, and the blades or vanes of the propeller are indicated at 2; Fig. 1 of the drawings shows the wheel equipped with two such vanes or blades, but it will be understood that any desired number of vanes may be employed; furthermore, the shaft may be equipped with any desired number of wheels.

The feature of my invention which I shall first describe is the general configuration of the individual vane or blade. As the drawings show, the vane extends in curved contour longitudinally and, as is more particularly illustrated in Fig. 3, the contour of the vane in transverse section is curved also. Having reference to the transverse contour, it will be observed in Fig. 3, that the curve is a spiral one, this spiral curve increasing in its radius from the anterior to the posterior edge of the blade or vane. The curved anterior edge of the vane, through a substantial part of its length, from the center of revolution outward, extends in a single plane, and the same is true of the posterior edge also; but the planes in which the said edges lie are angular to one another. This is indicated in Fig. 4, wherein the two edges are designated 8 and 9. In other words, there is a twist in the blade.

The blades are preferably mounted on the shaft to incline rearwardly from the center of revolution to the tip, as is illustrated in Fig. 2; each individual blade is so mounted that the general plane in which it extends does not coincide with, nor approximately coincide with, the conical or approximately conical path in which the blades revolve, but is angular thereto. This feature also is indicated in Fig. 2, where it will be observed that the blade at its inner end extends in a line angular to the general direction of rotation; and it will be seen that, in consequence, as the shaft turns, the blade will advance angularly against the opposing body of air. The degree of inclination of the blade bears a certain determinate relation to the speed of revolution, to attain maximum efficiency; and, since the speed of the blade increases outwardly from the center of revolution to the tip, this inclination of the blade is changed in corresponding degree. This is the purpose of the twist in the blade, above referred to; it is not my invention, but is understood by those familiar with the art. Or, expressed differently, the edges of the blade lie in a surface generated by a directrix which extends at a constant angle to the axis of the shaft and one end of which in its movement follows a helical path on the shaft. This detail is believed to be adequately shown in Figs. 5 and 6 of the drawings.

The vane is so mounted on the shaft that the convex side of the vane is the forward side; and, as said above, the mounting is such that the blade inclines rearwardly with respect to the direction in which the vessel is intended to go, from its point of attachment to the shaft, to the tip.

The anterior edge of the vane is rounded, as is indicated at 3 in Fig. 3, and by its shape in this particular, the generation of eddies at this point is prevented.

The body of the vane is preferably rigid, except at its tip and along its posterior edge; those portions of the vane, however, are preferably flexible, and to the end that the flexibility of these parts of the vane may be effective the posterior edge is preferably slitted, as is indicated at 6 in Fig. 1. The slits will be preferably cut in arcs or circles struck from the center of revolution as a center. While I do not limit myself to par-

ticular dimensions, I believe the effect will be best if the flexible posterior edge be about one quarter of the entire width of the vane, and the flexible tip portion be about one fifth or one sixth of the entire length of the vane.

Upon the inner concave surface of the vane is formed a projection or projections (preferably more than one) which are indicated at 4 in the drawings, these projections forming air-retarders. They extend longitudinally of the vane, as is particularly shown in Fig. 1, from the inner end outwardly, but preferably over so much of the vane only as is rigid; they are arranged adjacent to the anterior edge of the vane; and project rearwardly, that is toward the posterior edge. If there be only one, it is arranged at the very edge, as is indicated in the position of the foremost of the series shown in Fig. 3; and, if there be more than one, each succeeding projection is preferably longer than the one standing next in front of it. These projections are preferably made flexible, and are preferably provided with ports or openings 5, to allow a restricted passage of air. The ports or openings may be in the form of slits or in the form of perforations. These air-retarding projections serve to increase the efficiency of the propeller; for, as the blade revolves, a swirl or eddy is formed in the concavity of the vane, and the swirling air impinging upon these projections tends to augment the propulsion.

It remains to note that the vanes are mounted upon the shaft approximately midway of their transverse extent, as is indicated in Fig. 1; and, the air-retarding projections 4 on the concave side of the vane being arranged (as already described) adjacent to the anterior edge of the vane, the center of rotation of the vane is rearward of these projections. The effect of this arrangement is that, as the blade revolves, centrifugal force further augments the force of the contact of eddying air against these projections, in the direction of their advance.

I claim herein as my invention.

1. A propeller blade of curved contour in cross section, the concave surface thereof being provided with a rearwardly diverging air-retarding projection extending longitudinally of the blade, substantially as described.

2. A propeller blade of curved contour in cross-section provided on its concave surface with an air-retarding projection, such projection being provided with openings to permit a restricted passage of air, substantially as described.

3. A propeller blade of curved contour in cross-section provided on its inner surface with a flexible air retarder, said air retarder extending longitudinally upon the surface of the blade, substantially as described.

4. A propeller blade of curved contour in cross section provided on its inner surface with a series of air-retarding projections extending longitudinally thereon, the width of the succeeding projections of the series increasing from the foremost rearwardly, substantially as described.

5. A propeller blade of spiral contour in cross section, the curve of spiral increasing in radius from the front to the rear edge of the said blade, and an air-retarding projection, extending longitudinally of the blade upon the concave surface thereof, and adjacent to the anterior edge thereof, and projecting from said surface rearwardly, substantially as described.

6. A blade for a propeller wheel curved in its longitudinal or radial extent from its inner end to its tip, rigid throughout the major portion of its longitudinal extent, but flexible at its outermost end, substantially as described.

7. A blade for a propeller wheel curved in its longitudinal or radial extent from its inner end to its tip, rigid throughout the major portion of its longitudinal extent, but flexible along its posterior edge and at its outermost end, substantially as described.

In testimony whereof, I have hereunto set my hand.

JOHN W. WAY.

Witnesses:
BAYARD H. CHRISTY,
ALICE A. TRILL.