(Model.) 6 Sheets—Sheet 1.

A. VOGELSANG.

SCREW PROPELLER.

No. 360,833. Patented Apr. 5, 1887.

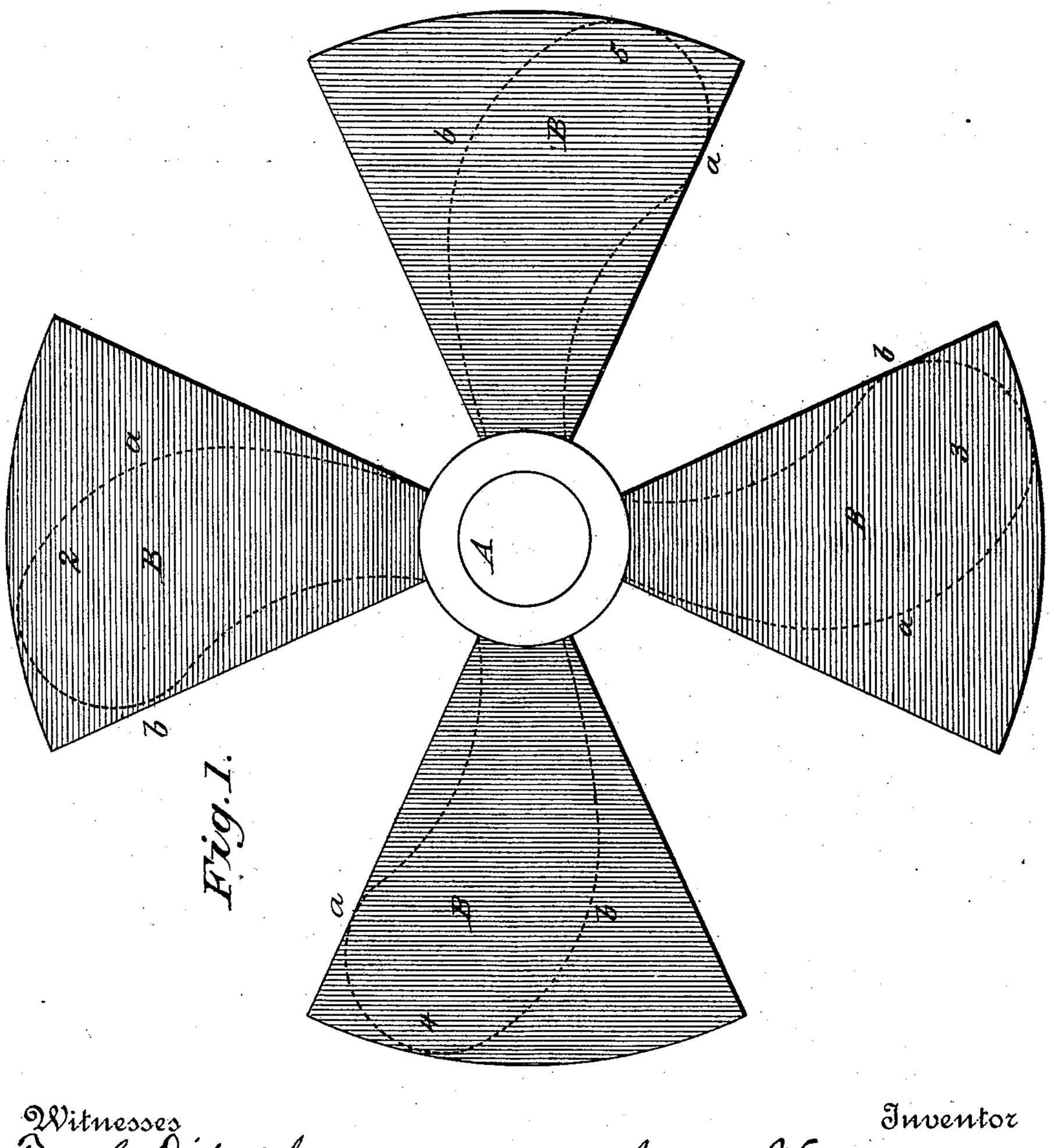

Fig. 1.

Witnesses
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Johnston, Rinehart & Dyer

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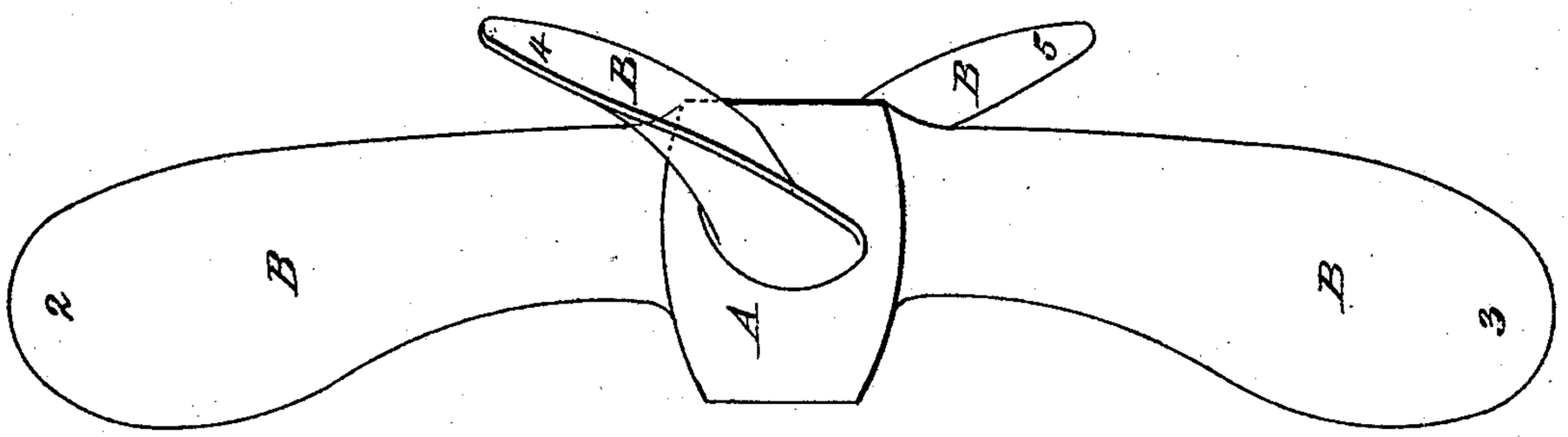

Fig. 3.

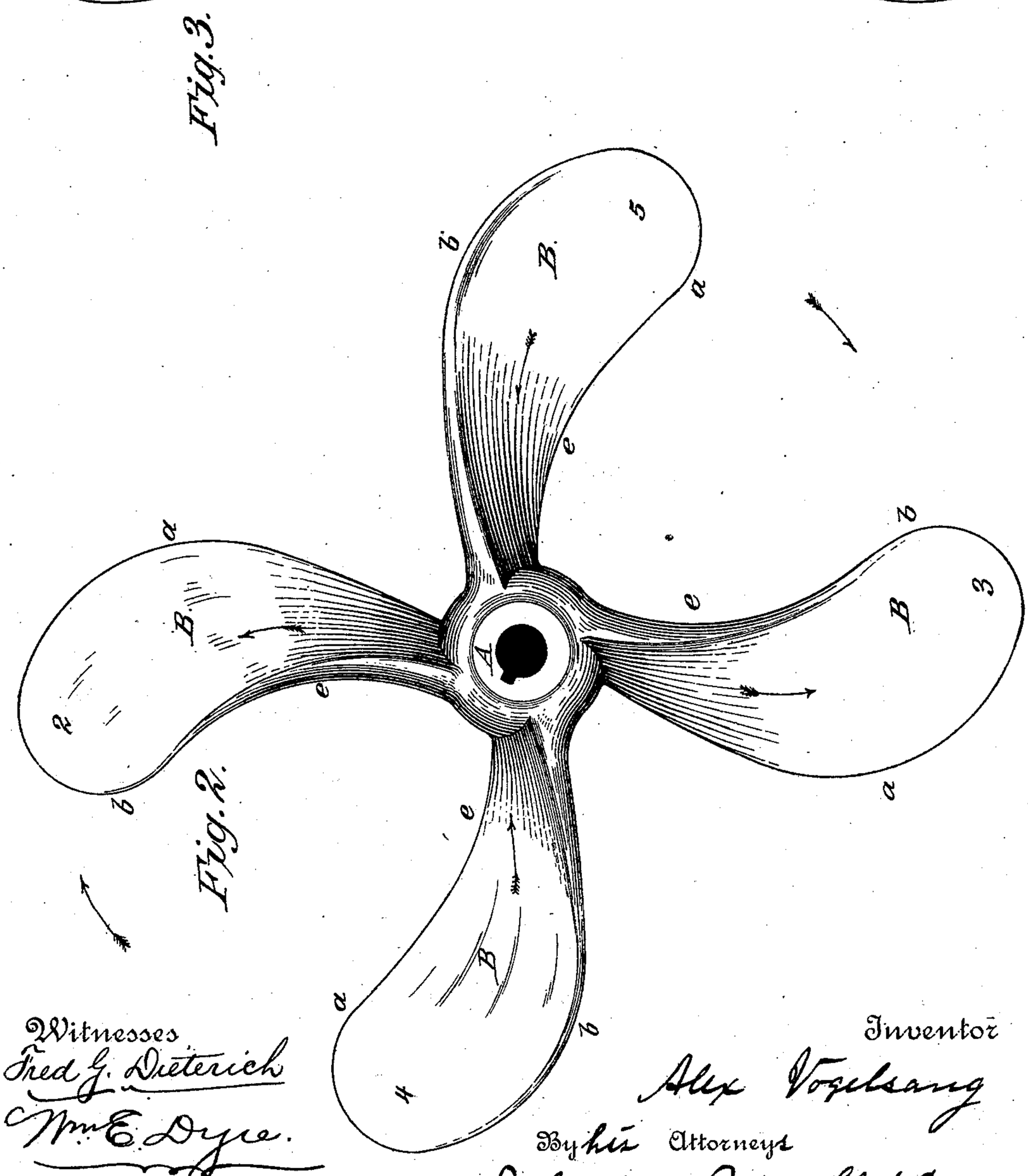

Fig. 2.

Witnesses
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Fig. 5.

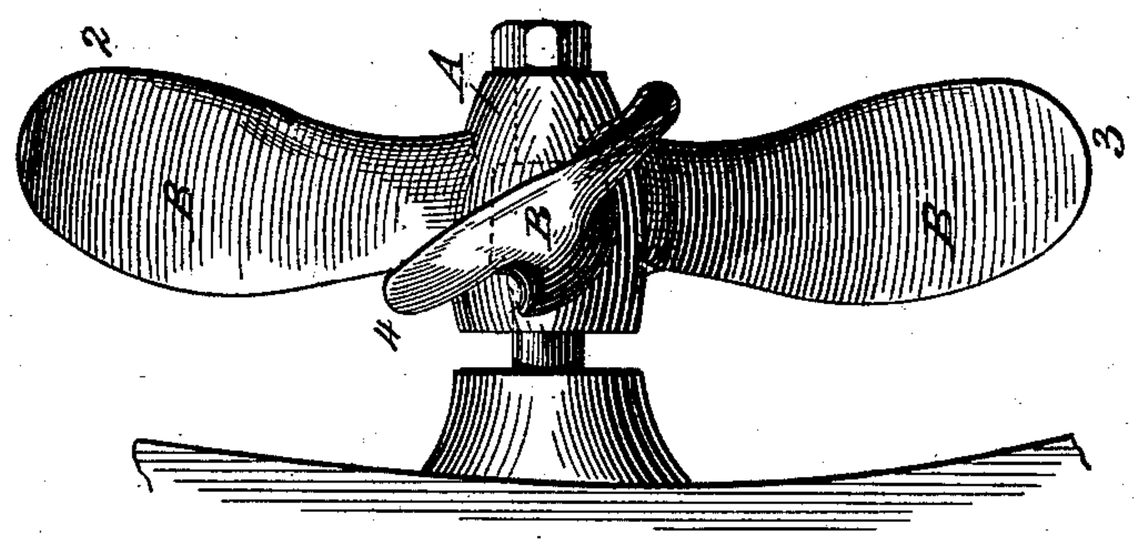
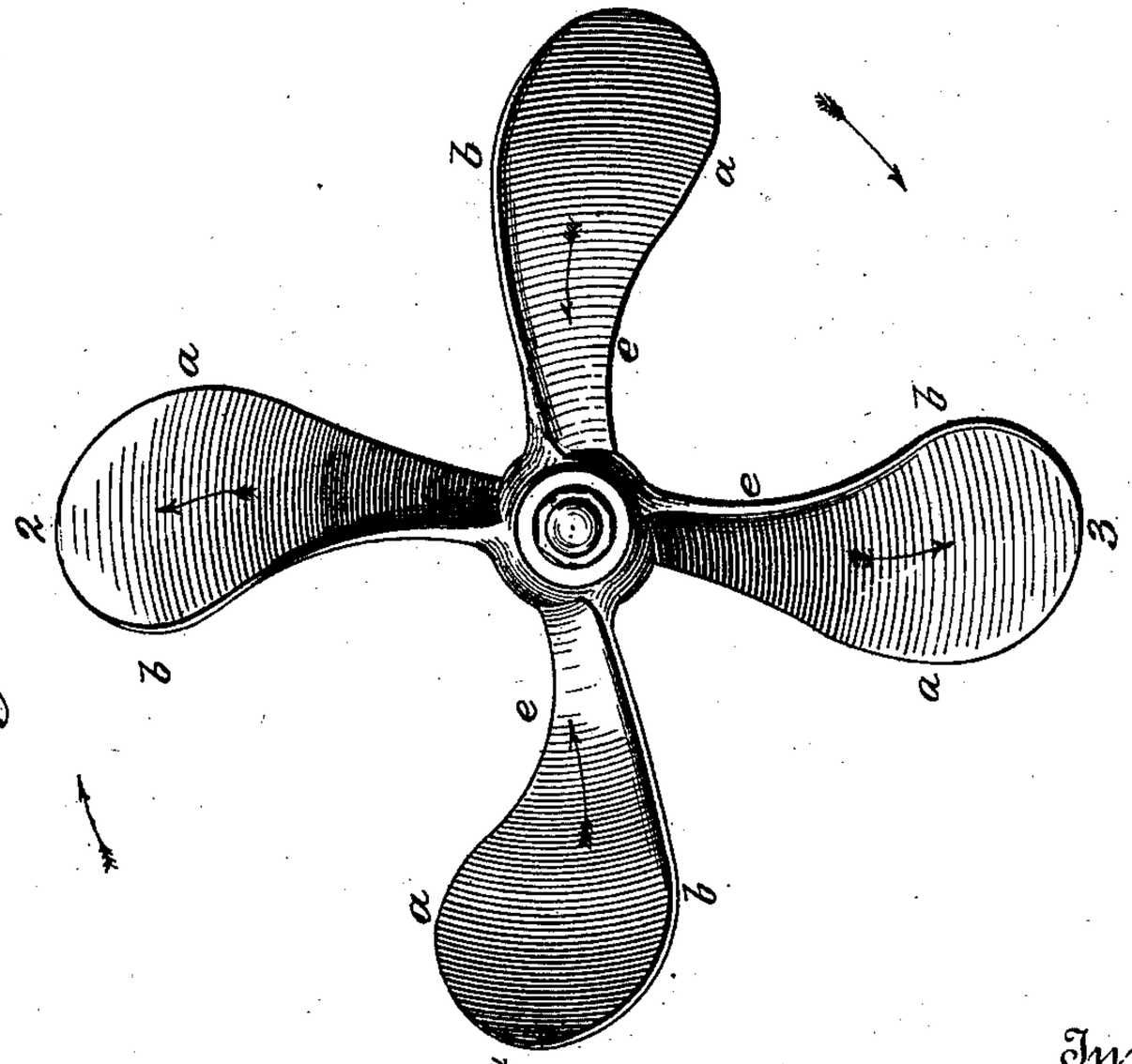


Fig. 4.



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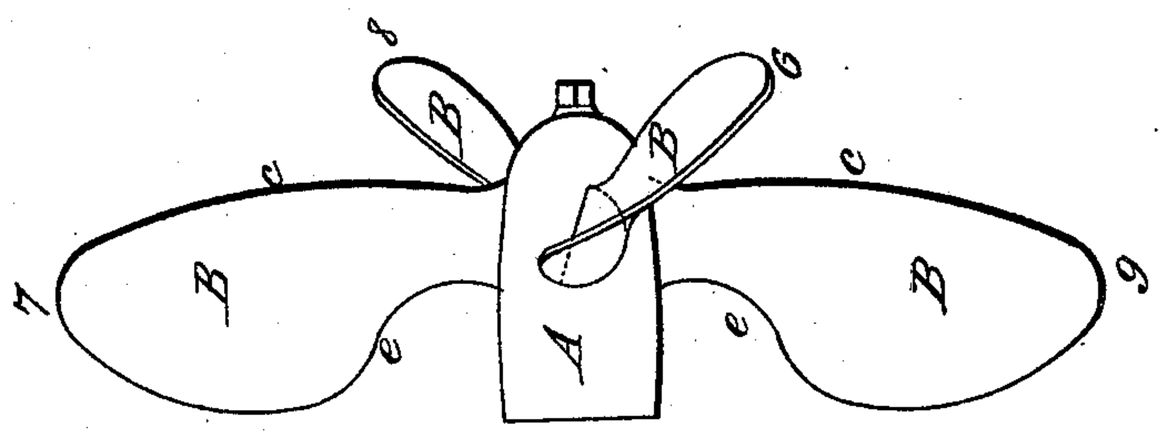

Fig. 7.

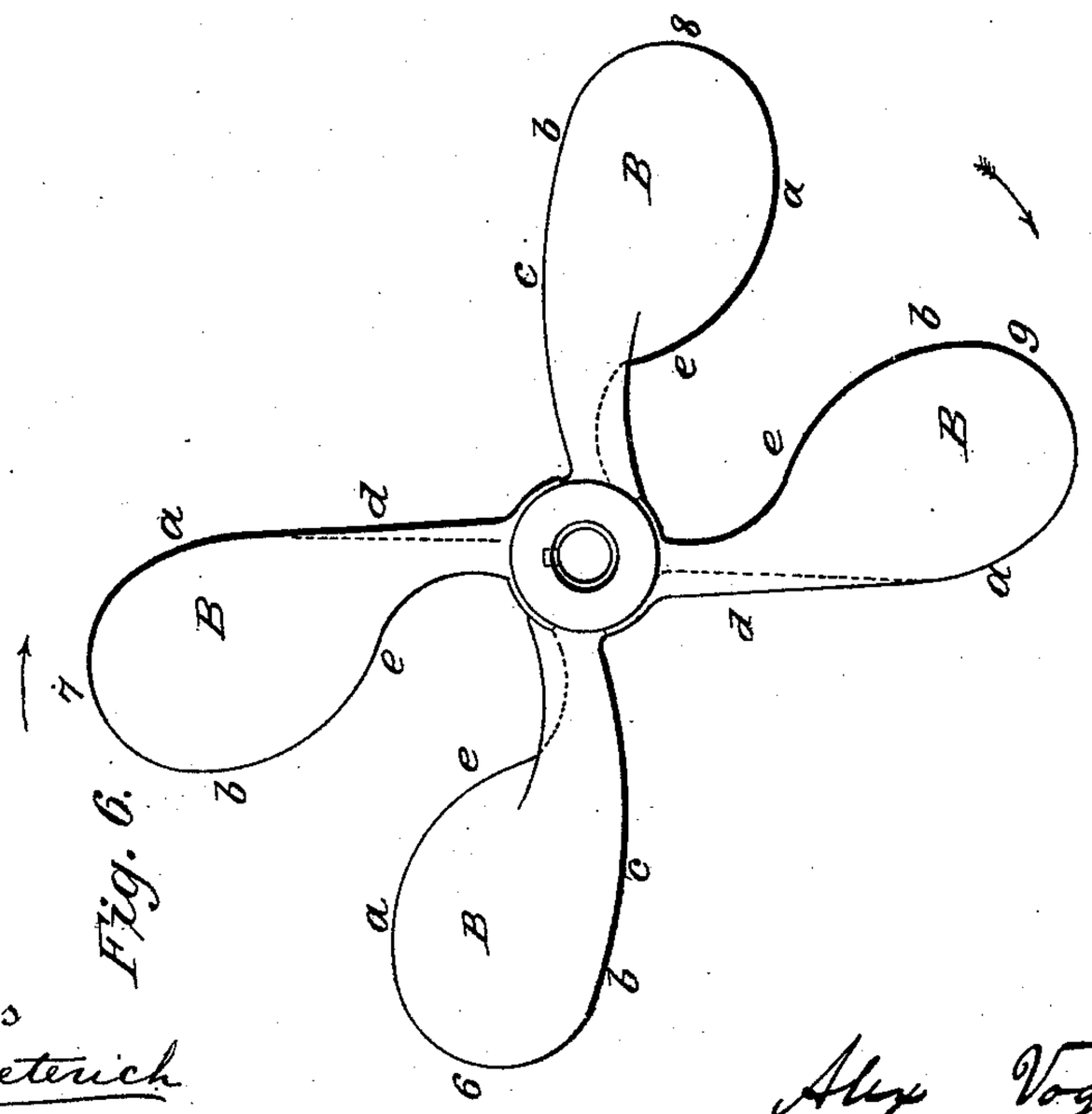

Fig. 6.

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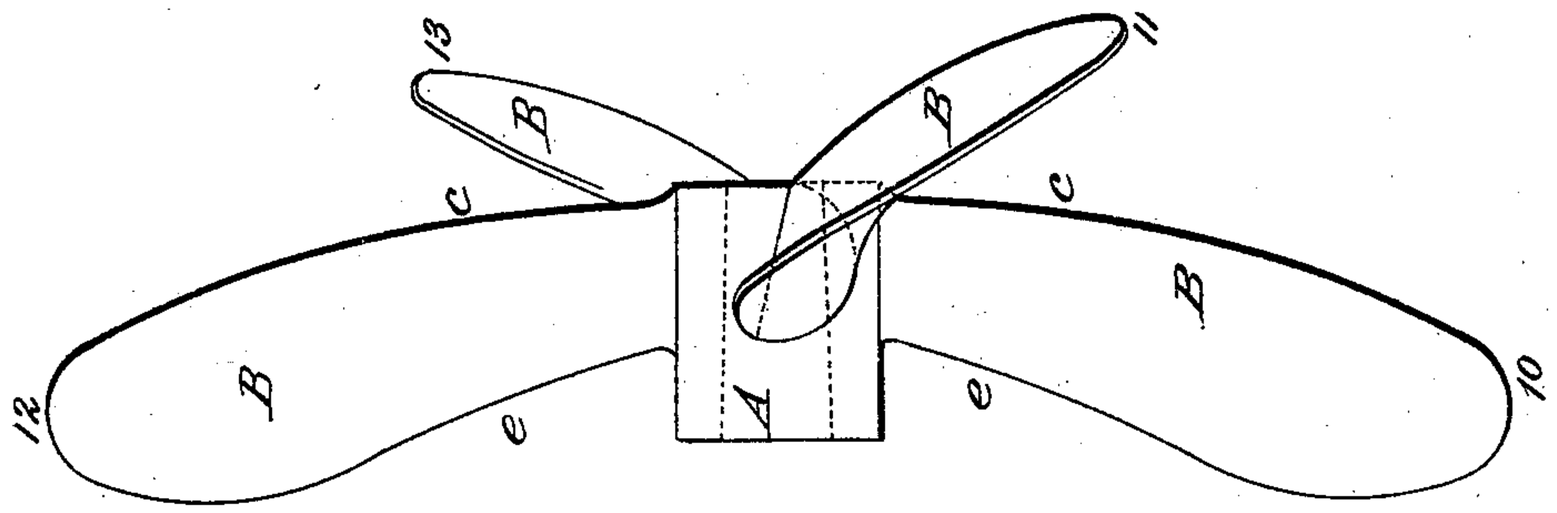

Fig. 9.

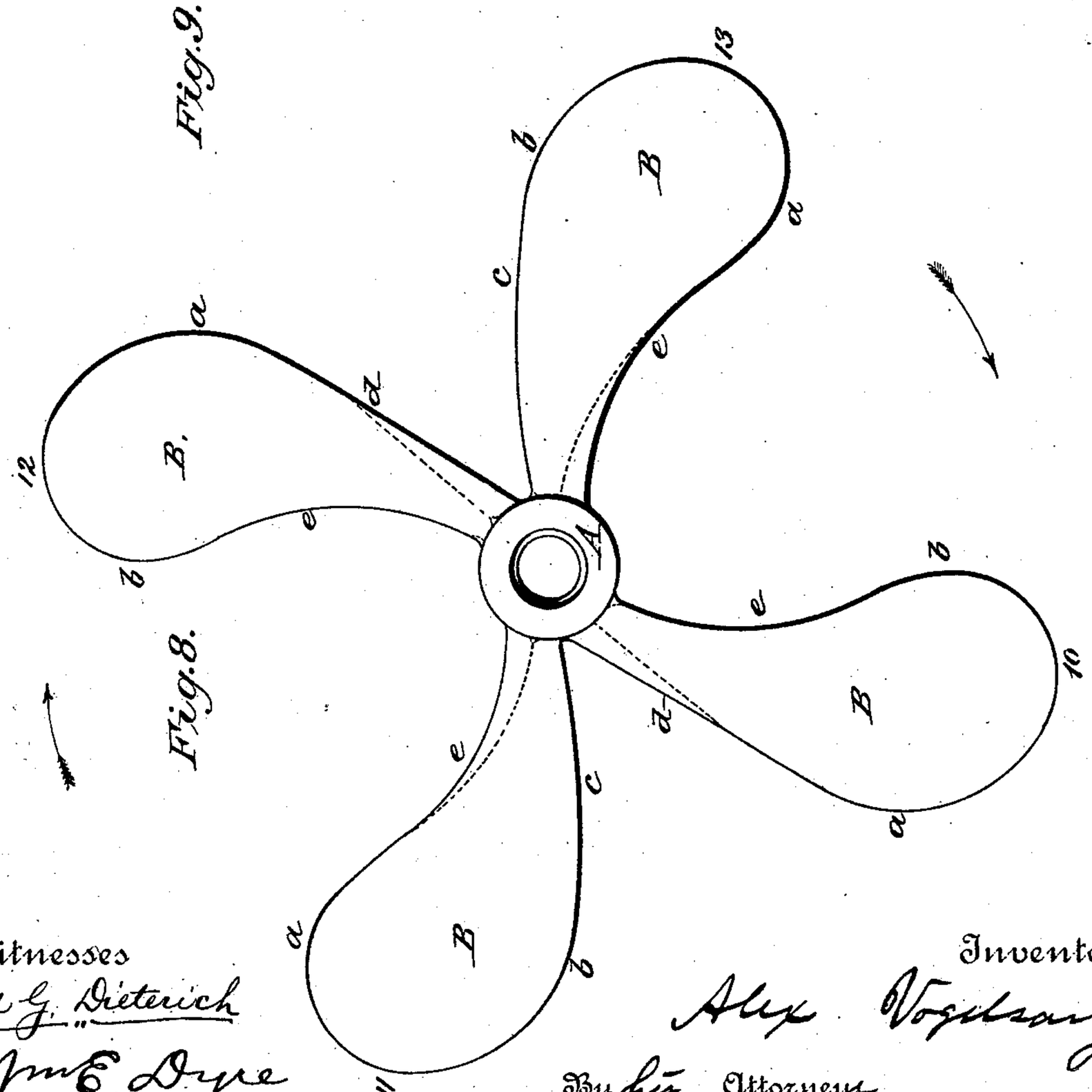

Fig. 8.

Witnesses
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SCREW PROPELLER.

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Fig. 10.

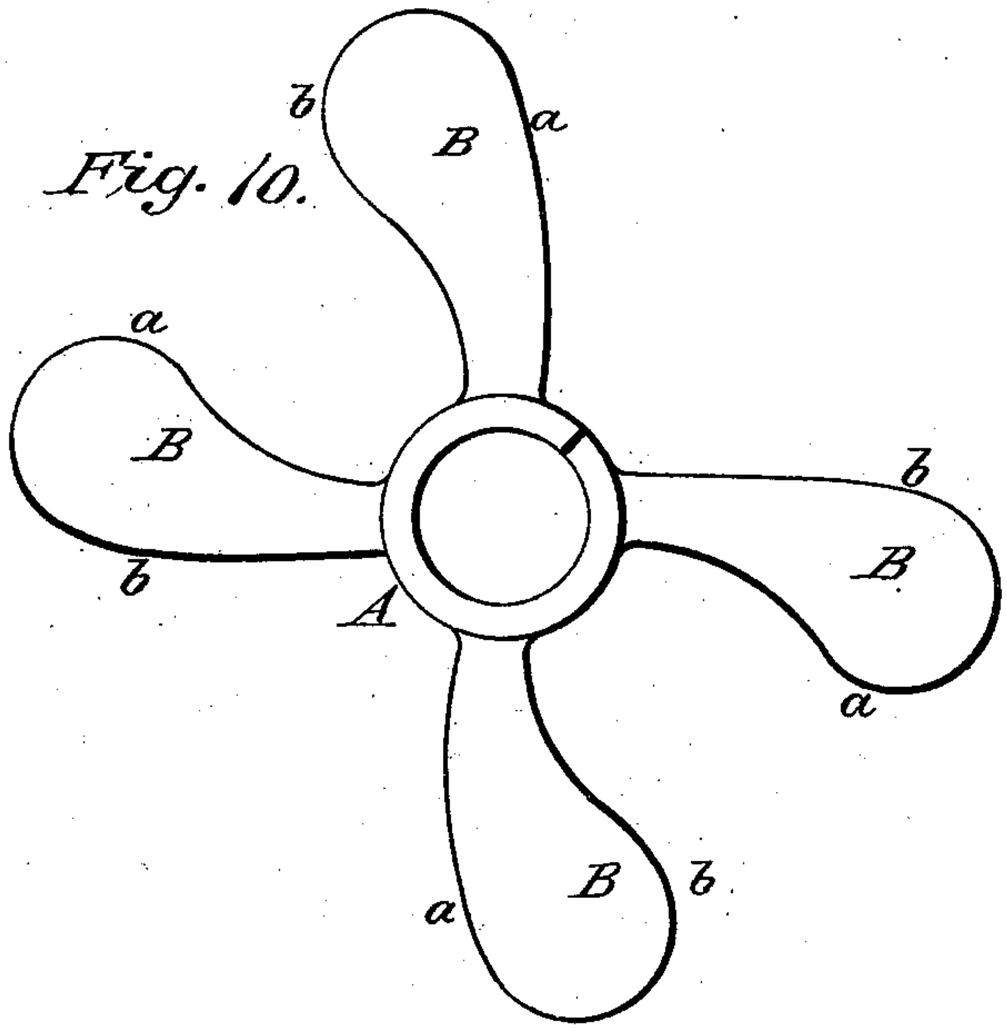


Fig. 11.

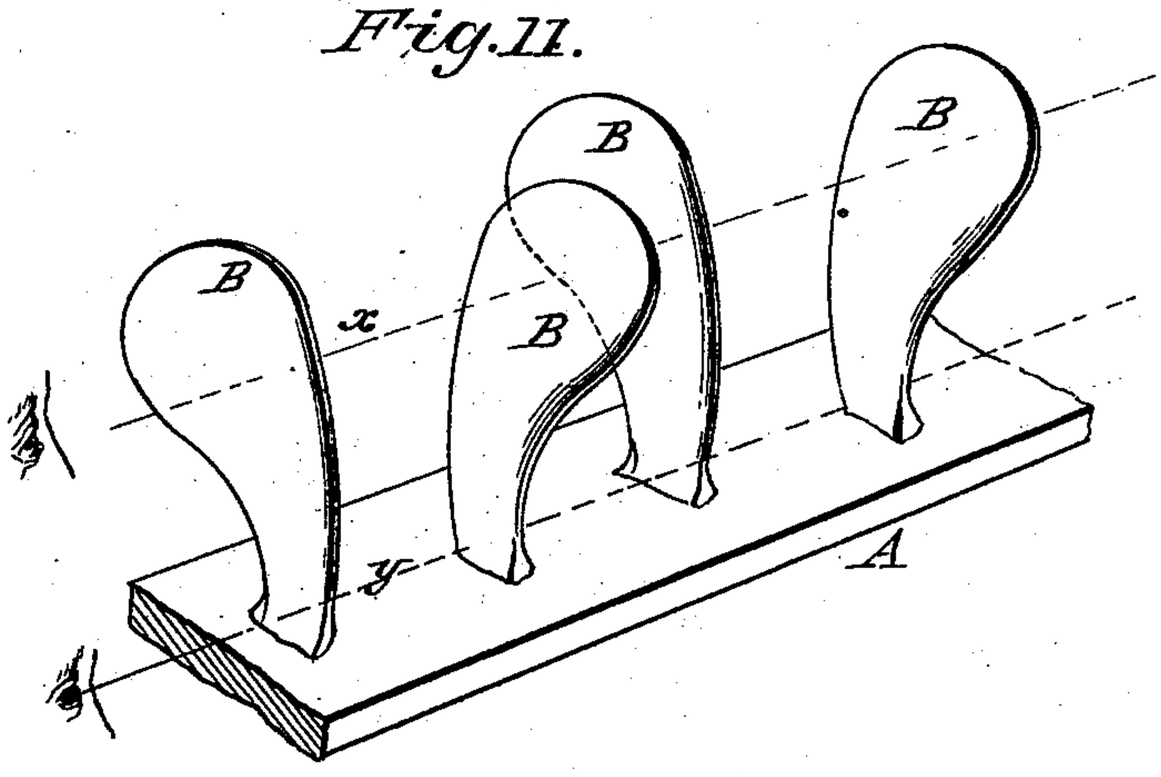
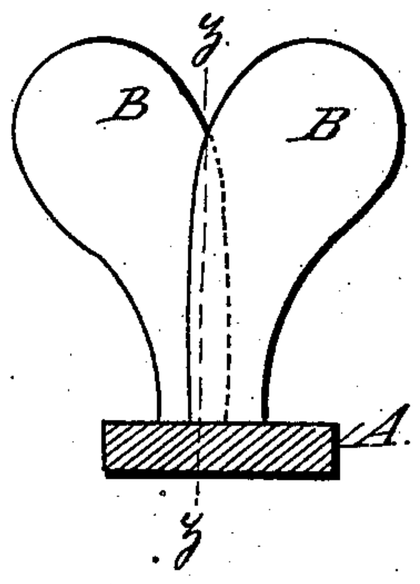


Fig. 12.



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UNITED STATES PATENT OFFICE.

ALEXANDER VOGELSANG, OF NEW YORK, N. Y., ASSIGNOR TO THE VOGELSANG SCREW PROPELLER COMPANY, OF SAME PLACE.

SCREW-PROPELLER.

SPECIFICATION forming part of Letters Patent No. 360,833, dated April 5, 1887.

Application filed December 10, 1886. Serial No. 221,222. (Model.)

To all whom it may concern:

Be it known that I, ALEXANDER VOGELSANG, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Screw-Propellers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to screw-propellers, and has for its object the construction of a single screw-propeller in which the blades are arranged in pairs, and each blade different from the one immediately preceding or following it. The blades may be arranged in pairs diametrically opposite to each other, or they may be grouped in pairs. In either construction the leading and trailing edges of the adjacent blades are the reverse the one of the other.

Under the present construction of single screw-propellers the blades are each made the counterpart one of the other—that is to say, a certain fraction of a turn of a screw is used for all blades alike, and the blades have all the same angle of inclination and the same pitch. The consequence is, that in the rapid revolution of the propeller the water is churned to such an extent that it produces a vacuum at the rear of the hub and a drag upon the vessel, and the displacement of the water by the blades of the propeller absorbs a large per centum of the power of the engine which should be utilized in giving additional speed to the vessel. By my construction of a propeller the churning of the water is not only reduced to the minimum, but the body of the water is rendered more compact than by any other known construction, and the power developed by the engine is applied directly to accelerate the speed of the vessel.

The invention will be hereinafter fully described, and particularly pointed out in the claims.

In the accompanying drawings, which form a part of this specification, Figure 1 represents a diagrammatic view of a screw, with the blades indicated in dotted lines, preparatory to cutting them out to form a pattern for molding my screw-propeller. Fig. 2 represents an end view of a propeller constructed according to my invention. Fig. 3 is an elevation or side view showing the tips of the blades on different planes. Figs. 4 and 5 are respectively end and side views of a propeller in which the tips of the blades are on the same plane. In the latter figure the view is taken in the direction of the arrow 1 in Fig. 4. Figs. 6 and 7 are respectively end and side views of a modified construction of a propeller. Figs. 8 and 9 are respectively similar views of another modification; and Figs. 10, 11, and 12 are diagrammatic views.

The leading features of construction in my propeller are, that instead of a like fraction of a turn of a screw being taken for all of the blades, two blades, diametrically opposite to each other, are fractions of a like part of a turn of a screw, and the other two blades diametrically opposite to each other are like fractions of another part of the same turn of a screw, as shown in Fig. 1; that each blade is the reverse of the one immediately preceding or following it—that is to say, that the cutting-edge of one blade conforms to the configuration of the trailing-edge and the trailing edge of the one to the cutting edge of the other blade; that all of the blades have substantially the same twist or turn of a screw-thread, but are cut off the reverse the one to the other, as shown in Fig. 1; that the angle or curve of the face of the blades is such that in entering the water one blade displaces it toward the hub, while the next blade following it displaces the water away from the hub; that each blade presents the same working-surface to the water, or that the faces of all the blades are substantially alike, while the cutting and trailing edges are reversed in each alternate blade, and the roots of the blades are disposed upon the hub at an angle to the longitudinal axis of the hub.

Having set forth the general features of construction, I will now proceed to describe them in detail.

Reference being had to the drawings and the letters marked thereon, A represents the hub, from which radiates a series of blades, B, which are disposed equidistant around the hub in pairs, arranged diametrically opposite to each other, as shown at 2 3 and 4 5 in Figs. 1, 2, 3, 4, and 5, or they may be grouped in

pairs, as shown at 6 7 and 8 9 in Figs. 6 and 7, and 10 11 and 12 and 13 in Figs. 8 and 9. In either construction it will be observed that the blades, which are diametrically opposite to each other on the hub, have their cutting or entering and their trailing or leaving edges made to conform the one to the other.

In the several figures, *a* represents the cutting or entering edge of the blades, and *b* the trailing or leaving edge. The contour of one of these edges may be a right line, or a curve, as shown at *c* in Figs. 6 and 8, or it may be a right line and a curve combined, as shown at *d* in the same figures. The opposite edge of each blade may be in the form of an ogee or cyma, as shown at *e* in the several figures, or it may be a true curve. In these several figures it will be observed that the concave line begins near the hub and merges into the convex line, which in turn merges into the periphery of the blade.

By referring to Figs. 2 and 4, it will be observed that the curve of the blades by which the water is displaced toward and away from the hub is indicated by shade lines, and arrows upon the faces of the several blades show the direction of displacement of the water produced by the revolution of the wheel. By this construction of the blades centrifugal motion imparted to the water by one blade is arrested and counteracted by the next blade following it, a churning motion of the water and the formation of a vacuum in the trail of the wheel prevented, while the water is kept as near a state of rest as possible, thus affording increased resistance to the revolving propeller, and the tendency of one blade to give lateral motion to the vessel is counteracted by the next succeeding blade. By the effect upon the water described the drag on the vessel is reduced to the minimum and the speed greatly accelerated.

The pitch of the blades may be uniform from the hub to the periphery or ends of the blades, or it may be of an expanding or a variable pitch, or the blades may be flat and set at a suitable angle to the shaft; but in either construction all of the blades must be either a right or all a left screw.

The tips of the blades may be disposed in the same plane as shown in Fig. 5, or they may be disposed in different planes, as shown in Figs. 3, 7, and 9; but in every instance the plane of the blades at their point of juncture with the hub should be such as to permit a single plane that is perpendicular to the axis of the propeller to cut through them all, as shown by the lines of vision *x y* in the diagrammatical view given in Fig. 11, and also by line *z* in Fig. 12. By reference to these Figs. 11 and 12 it will be observed that the blade nearest the point of vision always partly obstructs the one beyond. While the blades may be thus variously disposed upon the hub, they must in no instance be so placed as to have one blade in front of another in the line of the propeller-shaft; or, in other words, the beneficial results due to the construction of the blades will not be developed in a double or twin propeller, for the reason that the rear blades would move directly across the path of the water displaced by the forward blade, and thereby obstruct the passage of the propeller through the water and retard the speed of the vessel correspondingly.

Instead of forming the blades integral with the hub, as shown, they may be made separate therefrom and be attached to the hub in any well-known manner.

By my improved construction and arrangement of the blades of a propeller a material increase of speed is obtained with a smaller expenditure of power as compared with the propellers now in use, while it improves the steering and turning qualities of a vessel, and enables a vessel to be run backward without the tendency to work off to one side, which in ordinary propellers requires the use of a helm to counteract this action of the propeller and to keep the vessel in line.

I do not limit the application of my improved screw-propeller to the propulsion of vessels in water, as it may be applied to aerial ships, to tubes for raising water, and other useful purposes.

Having thus fully described my invention, what I claim is—

1. A single propeller having blades disposed around a hub in pairs, one pair of the blades arranged diametrically opposite to each other on the hub being like fractions of a turn of a screw, and the blades of the other pair, also diametrically opposite to each other, being like fractions of another part of the same turn of a screw, and the working-faces of all of the blades being approximately alike, substantially as described.

2. In a single propeller having a series of blades disposed around a hub in pairs, all of said blades being either a right or a left screw and the cutting and trailing edges of the blades of each pair being reversed to the cutting and trailing edges of the other pair or pairs of blades, substantially as described.

3. A single propeller provided with a series of blades, the working-faces of all of which are substantially alike, whose cutting and trailing edges are reversed one to the other, and the roots of which are disposed at an angle to the longitudinal axis of the hub, substantially as described.

4. A single propeller provided with a series of blades whose working-faces are substantially alike, their cutting and trailing edges reversed one to the other, and the face of one blade constructed to displace water toward the hub, and the face of the succeeding blade constructed to displace water away from the hub, substantially as described.

5. A single propeller provided with a series of blades having approximately the same twist disposed around a hub and arranged in pairs, the cutting and trailing edges of the blades of each pair being reversed to the cutting and

trailing edges of the other pair of blades, substantially as described.

6. A single propeller provided with a series of blades whose working-faces are substantially alike, their cutting and trailing edges reversed one to the other and disposed upon approximately the same plane at their point of juncture with the hub and at different planes at the tips or ends of the blades, substantially as described.

7. A single propeller provided with a series of blades whose working-faces are substantially alike, their cutting and trailing edges reversed one to the other and disposed around a hub in such relation thereto that a single plane that is perpendicular to the axis of the propeller will cut through all of the blades, substantially as described.

8. A single propeller having a series of blades whose working-faces are substantially alike, one edge of each of which blades is formed of straight, curved, or straight and curved lines, and the other edge in the form of a curved line, an ogee, or cyma, the cutting and trailing edges being reversed on each alternate blade, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ALEXANDER VOGELSANG.

Witnesses:

S. A. TERRY,

WM. E. DYRE.