No. 837,391. PATENTED DEC. 4, 1906.

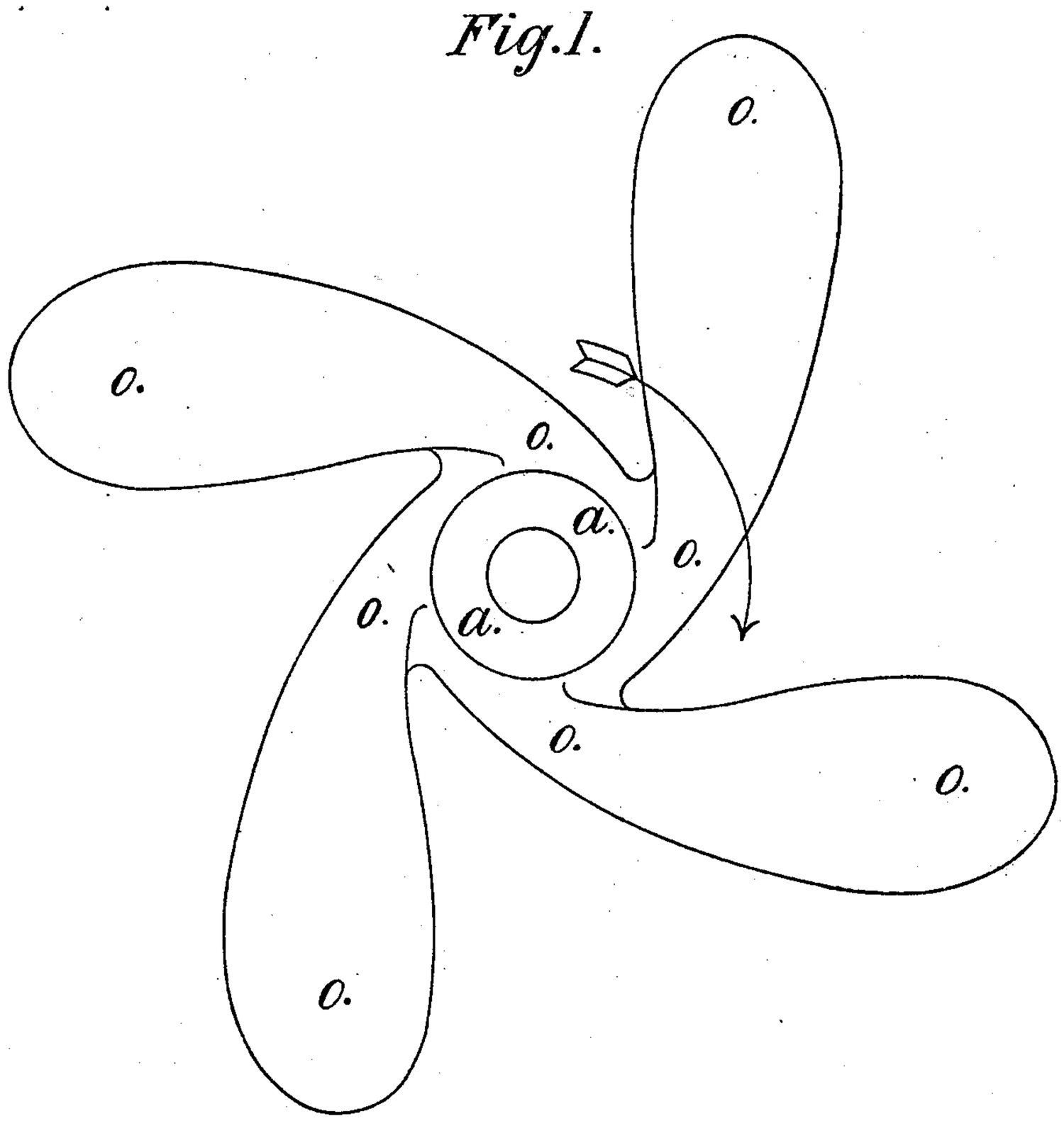
T. EATON.

SCREW PROPELLER FOR NAVIGABLE VESSELS.

APPLICATION FILED MAR. 27, 1905.

4 SHEETS—SHEET 1.

Fig. 1.



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4 SHEETS—SHEET 2.

Fig. 2.

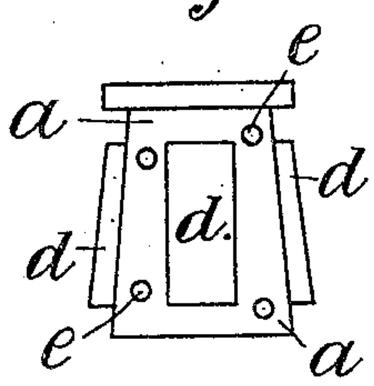


Fig. 4.

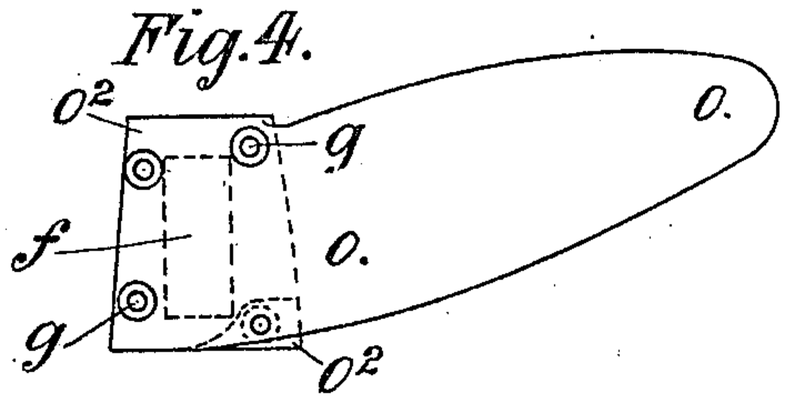


Fig. 3.

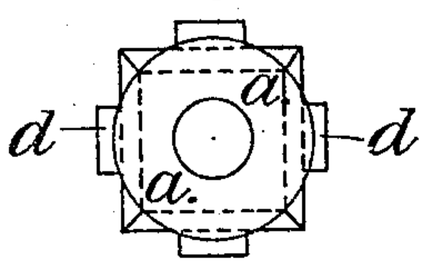
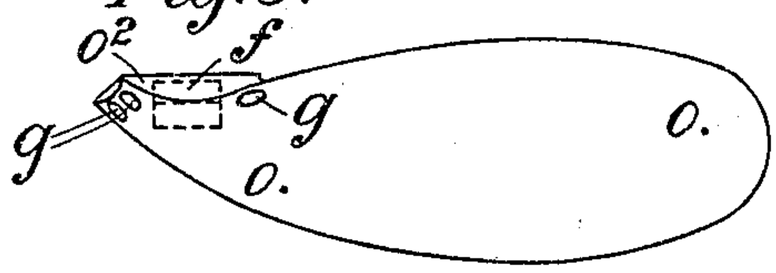


Fig. 5.



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4 SHEETS—SHEET 3.

Fig. 6.

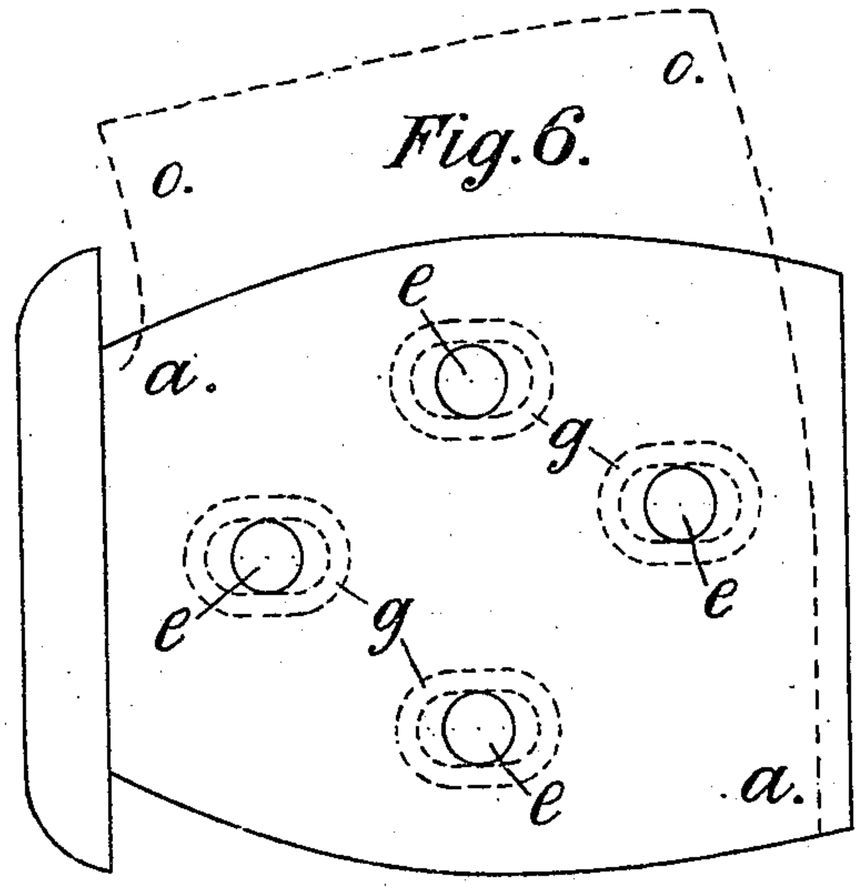


Fig. 7.

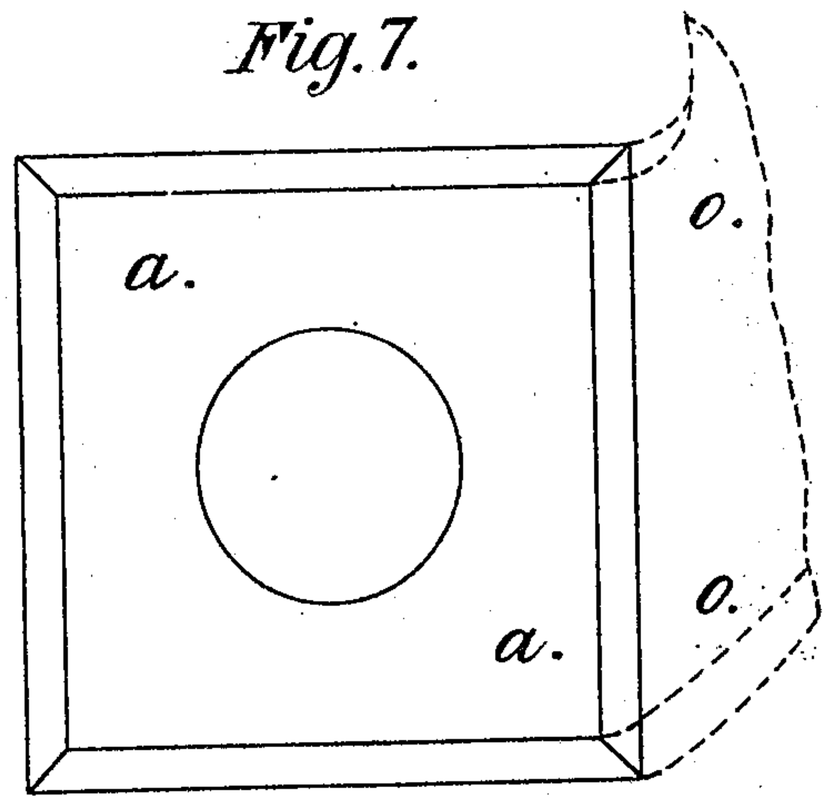


Fig. 8.

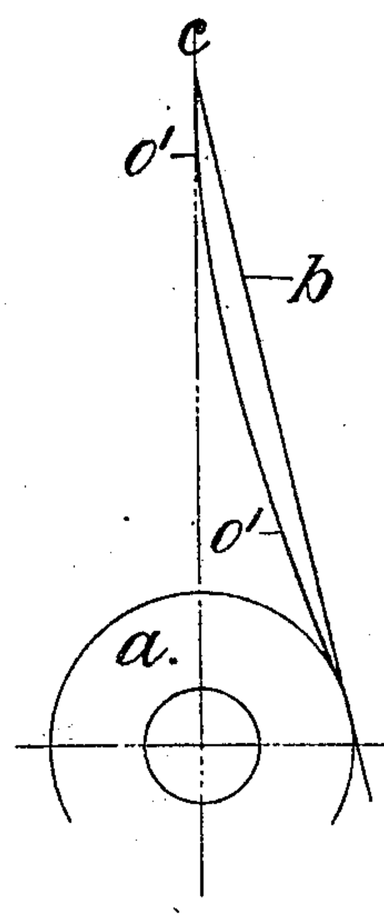


Fig. 9.

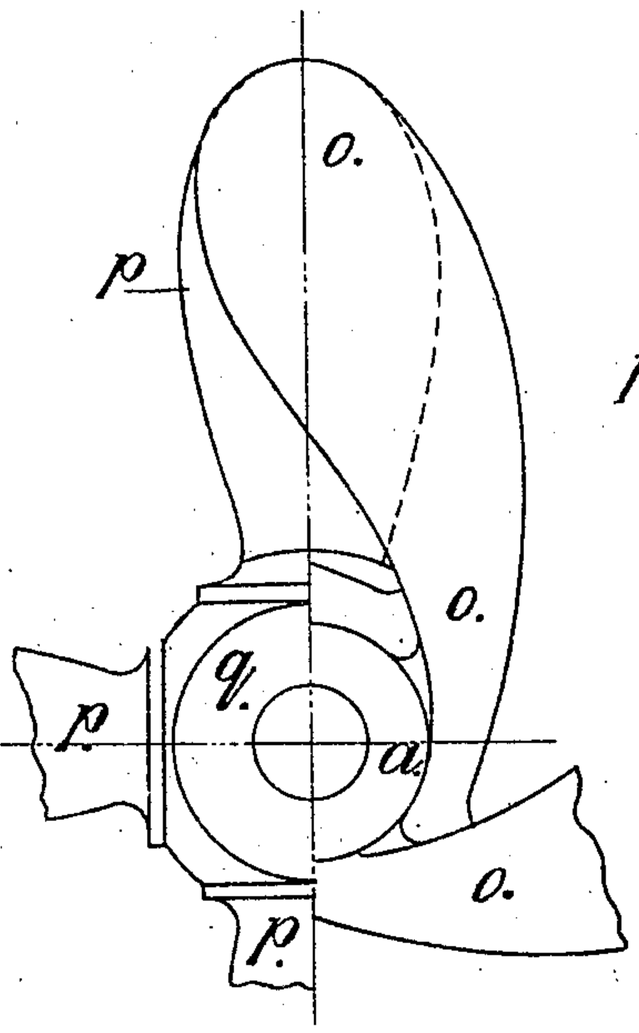
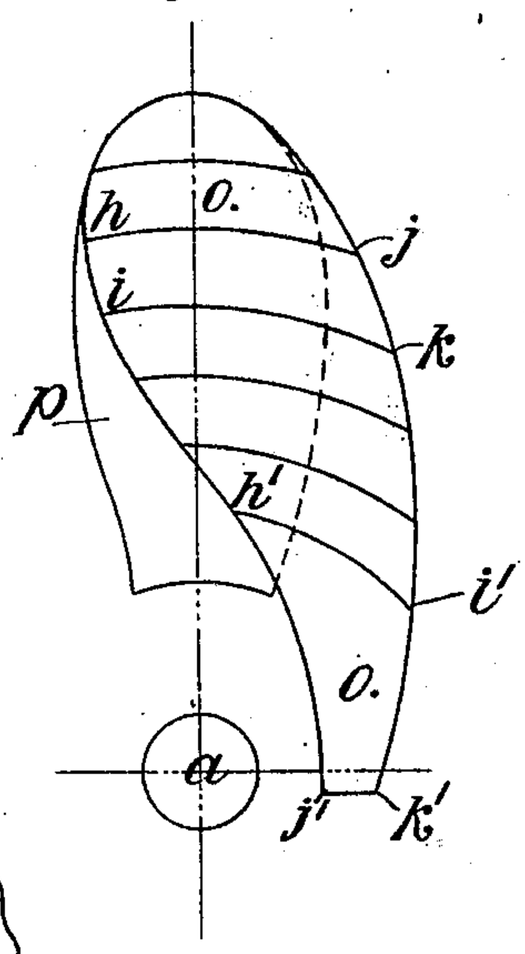


Fig. 10.



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4 SHEETS—SHEET 4.

Fig. 12.

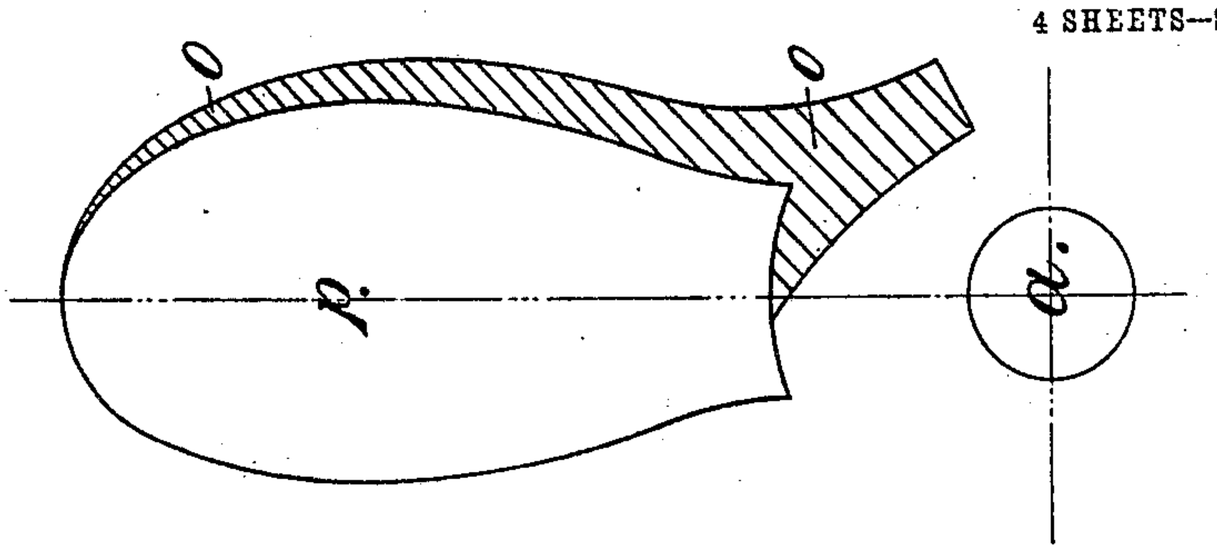


Fig. 11.

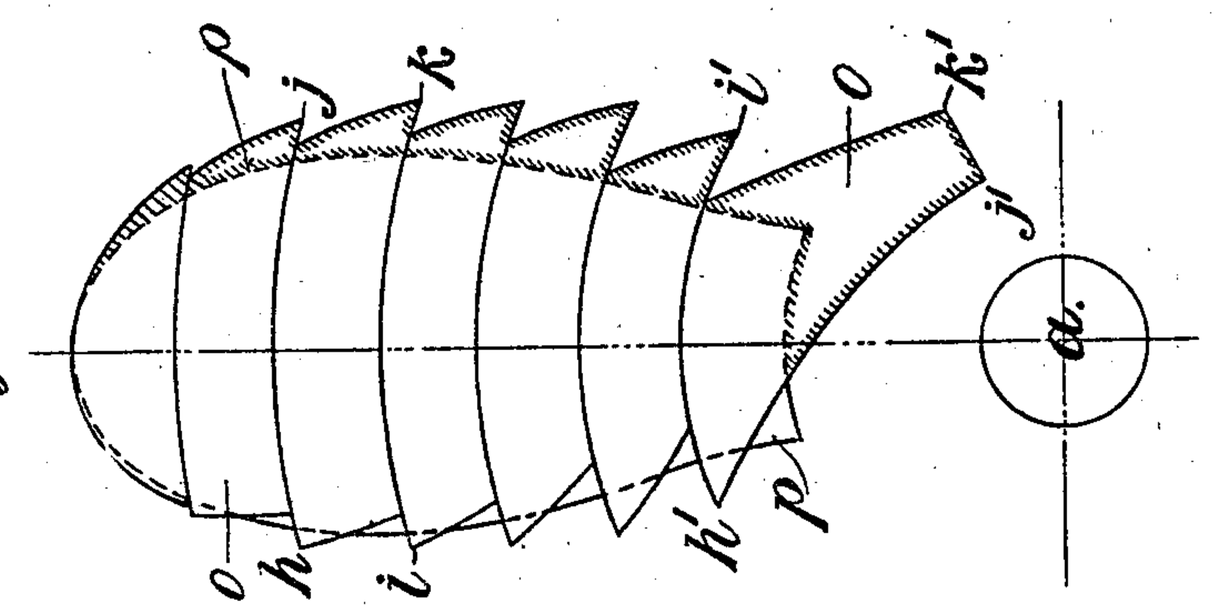
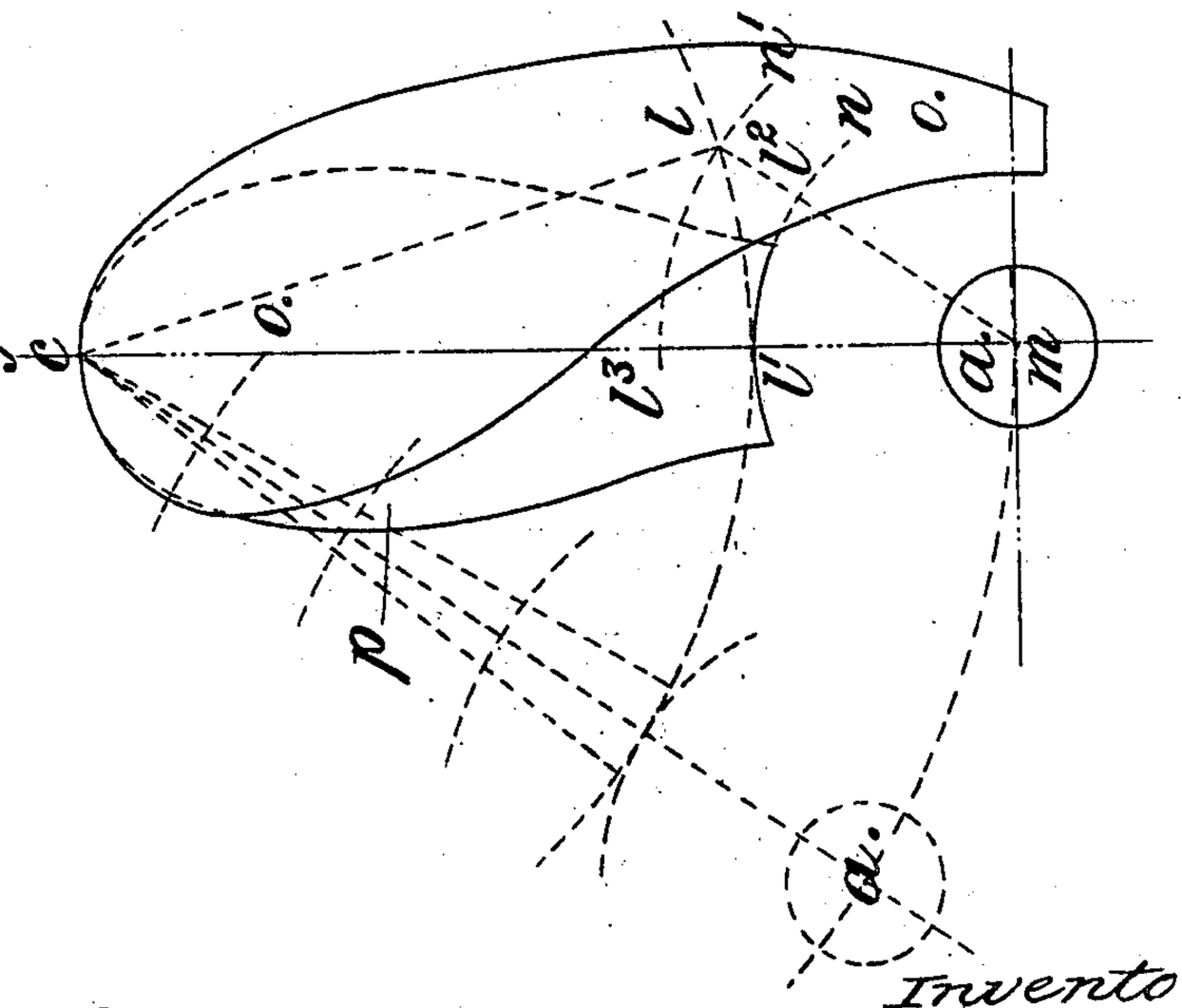


Fig. 13.



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UNITED STATES PATENT OFFICE.

THOMAS EATON, OF NORTHWICH, ENGLAND.

SCREW-PROPELLER FOR NAVIGABLE VESSELS.

No. 837,391. Specification of Letters Patent. Patented Dec. 4, 1906.

Application filed March 27, 1905. Serial No. 252,368.

To all whom it may concern:

Be it known that I, THOMAS EATON, a subject of the King of England, residing at Northwich, in the county of Chester, England, have invented new and useful Improvements in Screw-Propellers for Navigable Vessels, of which the following is a specification.

This invention has reference to screw-propellers for navigable vessels; and it consists of certain improvements hereinafter described in such propellers, having for their objects and effects the characteristics hereinafter specified, and the novel features of the invention are specified or comprised in the claiming clauses, including the specification.

According to this invention the propeller-blades are disposed at their forward faces tangentially to the boss, or nearly so, and the forward faces of the blades are made concave in the tangential line extending from a circle at or near the diameter of the boss—that is, the root of the blades toward the tips.

Further, according to this invention, in the case of the propeller being built up, the boss in one construction at the parts where the wings or blades fit on and are attached to it are made in convex or concave form and so constructed as to allow the blades to be adjusted on and attached to the boss at different points longitudinally, by which means the pitch of the propeller can be varied or adjusted at will, so that in case of any alteration or variation in the machinery or the vessel and a change of pitch of the propeller being desirable on account of alteration of power or speed or otherwise then this propeller enables this to be done without requiring a new propeller to suit the altered conditions.

The invention will be further described with the aid of the accompanying drawings.

In the drawings, Figure 1 is an end elevation of a propeller cast whole. Figs. 2 and 3 are side elevation and end view, respectively, of a boss; and Figs. 4 and 5 are side elevation and end view of the blades of a propeller to be attached to it. Figs. 6 and 7 are side elevation and end view, respectively, showing the boss and root of blade by which the adjustment and variation of the pitch of a propeller is accomplished. Figs. 8 to 13 are various diagrams illustrating the characteristics of the invention which are hereinafter described.

Referring now to the drawings, *a* is the boss of the propeller, and *o* represents the blades. With regard to the characteristics of the tangential concave form of the blade in the radial direction—that is, between the root and tip of the blade—this is shown in Fig. 8, in which *b* represents a tangential line running from the boss *a* to the point *c*, which represents the tip of the blade, and the line *o'* represents the actual radial concave contour of the surface of the blade. In the case of a propeller with the boss and blades being in separate parts, and more particularly that shown in Figs. 2 to 5, the boss *a* is tapered from the aft end outward to the fore end, as shown, and the four sides are plain surfaces with a projection or boss *d* on each of them and holes *e* for the blade-holding studs or bolts, while the blades *o* at the root portions o^2 are made of the form to fit on the sides of the boss—that is, there is provided a recess or chamber *f*, (shown in dotted lines,) corresponding in form and size with the projections *d* of the boss and with holes *g*, corresponding with the holes *e*, through which the holding or fastening studs or bolts pass. By this construction the required position or inclination of the blade on the boss is secured and the propeller as a whole rendered firm and strong.

When the blades are fastened onto the boss, the propeller will have the same characteristics as that described with reference to Fig. 1 and Fig. 8, and the roots of the blades when fitted will make practically an outer portion of the boss, they being so curved on their outer sides and shaped that at the parts where they do not form properly a portion of the active or propelling part of the blade they will furnish a rounded portion to and of the boss, thereby avoiding friction and waste of power at the boss.

Referring now to the construction shown in Figs. 6 and 7, the boss *a* is of convex form on its sides in the fore-and-aft direction and flat in the transverse direction, and the root of the blade, or what may be called the "boss" portion of the blade, is made of corresponding form on its inside. The holes *g* of the blade (shown in dotted lines in Fig. 6) are elongated or oval to allow of the blade being fastened at different points in the fore-and-aft direction of the boss. By being enabled to adjust the blade suitably on the boss in the fore-and-aft direction a choice of

pitch of the propeller within certain limits is provided and can be availed of, so as to suit different conditions such as above referred to, and also in the fitting of a new propeller to a boat by adjusting it in various positions the most efficient performance of the propeller and machinery as regards the propelling effect or speed can be positively determined.

With regard to Figs. 9 to 13, Fig. 9 shows the present propeller in comparison with an ordinary radial-blade propeller with attached blades, the blades and boss of which are represented by the letters *p* and *q*, the leading edge of the propeller being to the right hand.

Figs. 10 and 11 show a radial blade and arcs *h i j k* and *h' i' j' k'* of a propeller-blade according to this invention moved or arranged across, so as to cover the radial blade. At the left-hand side in Fig. 11 the two blades are set out so as to be common and equal on this edge, while the right-hand side shows the gain of area of the improved propeller-blade and the exact amount and position of same, this part being marked by the shaded lines.

Fig. 12 shows a plain radial blade compared with the improved tangent propeller-blade, the average gain in area being shown by the shaded portion.

Fig. 13 shows the extra thrust produced by this propeller as compared with an ordinary radial-blade propeller. This is done by marking off on the tangent blade a line *c l* from the tip equal to the central radial line *c l'* of the radial blade *p* and by joining the point *l* with the center *m* of the boss, and by drawing circumferential lines *n n'* it will be seen that the point *l* is further from the center *m* of the propeller than the point *l'* by the distance *l* to l^2. Hence the speed on the circumferential line *l* l^3 is greater than that of the circumference *l'* l^2 per revolution.

What is claimed is—

1. In a screw-propeller comprising separable blades and boss, the said boss, and the roots of the blades by which they are attached to the boss, being curved in the fore-and-aft direction of the propeller, and the boss and blades adjustable longitudinally in relation to each other, whereby the pitch of a blade can be varied by longitudinal adjustment; substantially as set forth.

2. A screw-propeller with separable boss and blades, the combination of a boss *a* of polygonal form in cross-section, and presenting a plurality of surfaces, to which the roots of the blades are attached, and of convex form in the fore-and-aft direction; and a blade *o*, the roots o^2 of which are concave on their interior surface, and adapted to be adjusted longitudinally in the fore-and-aft direction on the boss; substantially as set forth.

3. A screw-propeller with separable boss and blades, the combination of a boss *a* of polygonal form in cross-section, and presenting a plurality of surfaces, to which the roots of the blades are attached, with projections *d* thereon; said boss being of tapered form in the fore-and-aft direction; and blades *o* with roots o^2, adapted to fit on the faces of the boss, and having recesses *f*, in which the projections *d* fit; substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

THOMAS EATON.

Witnesses:
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W. HARRISON.