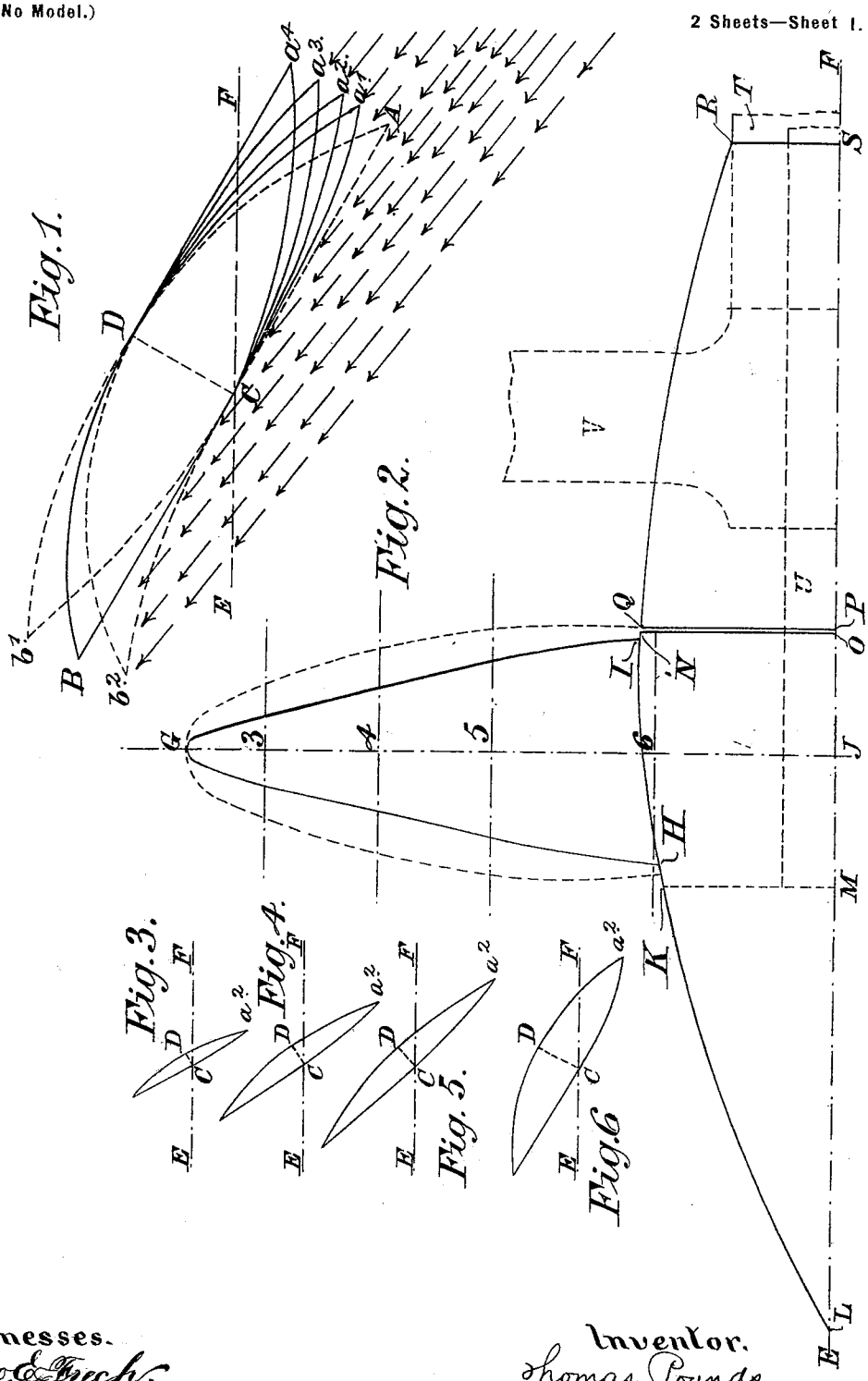
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T. POUNDS.

SCREW PROPELLER.

(Application filed Oct. 28, 1897.)

(No Model.) 2 Sheets—Sheet 1.



Witnesses.
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B. E. Seitz

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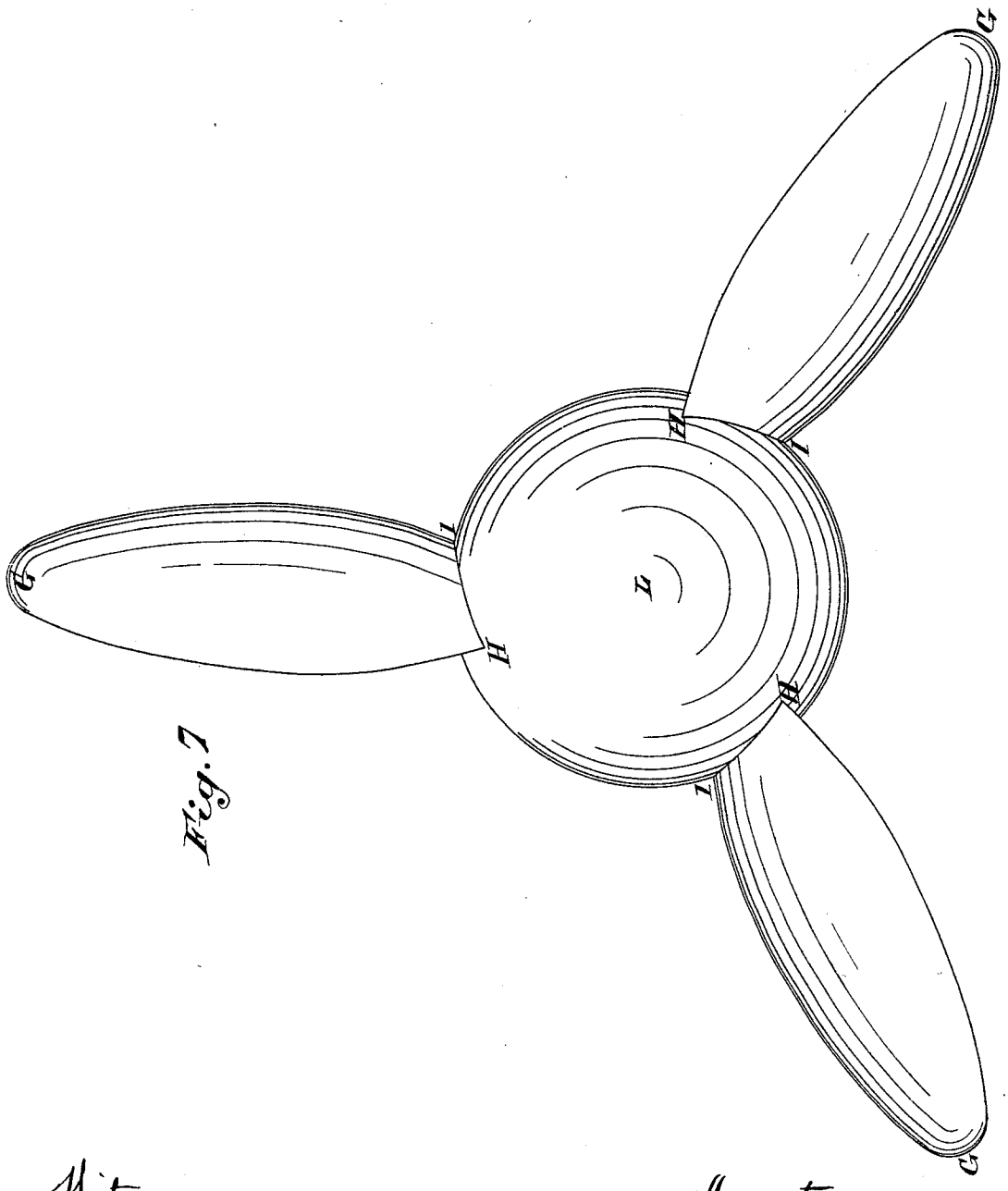


Fig. 7

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UNITED STATES PATENT OFFICE.

THOMAS POUNDS, OF PLYMOUTH, ENGLAND.

SCREW-PROPELLER.

SPECIFICATION forming part of Letters Patent No. 634,368, dated October 3, 1899.

Application filed October 28, 1897. Serial No. 656,689. (No model.)

To all whom it may concern:

Be it known that I, THOMAS POUNDS, a subject of the Queen of Great Britain and Ireland, residing at Mannamead, Plymouth, England, have invented Improvements in Screw-Propellers, (for which the following patents have been granted: French patent, dated November 12, 1897, No. 272,134, and English patent, dated July 6, 1897, No. 16,098,) of which the following is a specification.

This invention has for its object to obviate as much as possible in a screw-propeller the negative pressure due to the thickness of the blades which in the case of a screw-propeller of ordinary construction is exerted by the relative streams or currents upon the forward faces of the blades near their leading edges, and which calculation shows to be very considerable, and is, moreover, doubly wasteful, since it wastes not only the power required to produce it, but also sufficient power to produce an amount of thrust equal to counteracting its mischievous effect. For this purpose according thereto the after or propelling face of each blade is made at each cylindrical section not of uniform pitch from the following edge to the leading edge, like an ordinary blade, but of uniform pitch in its following half, or from its following edge to where the blade is thickest, and of gradually-increasing pitch from there to the leading edge, and the forward face of the blade is made convex transversely, but of less transverse convexity in its leading half than in its following half, or even straight in cross-section in its leading half, so that not only will there be less negative pressure on the leading half of the forward face than usual, but what negative pressure there may be will be exerted at a less detrimental angle than usual.

Figure 1 of the accompanying drawings is a diagram representing various developed cylindrical sections of screw-propeller blades—*i. e.*, developments on planes of sections each of which is formed by a straight line parallel to and revolving about the axis of a propeller-shaft; and Figs. 2 to 7, inclusive, represent a screw-propeller constructed according to this invention, Fig. 2 being a half side elevation thereof, Figs. 3, 4, and 5 showing developed cylindrical sections of the blade shown in Fig. 2 corresponding, respectively, to the points 3, 4, and 5 thereof, Fig. 6 showing what would be the developed cylindrical section corresponding to the point 6 if the blade were continued to that point, and Fig. 7 being a rear elevation of the entire propeller.

In Fig. 1, A C B D represent a developed cylindrical section of an ordinary blade near the root, A representing the leading edge, A B the after or driving face, and B the following edge of the blade. a' C B D, a^2 C B D, a^3 C B D, and a^4 C B D represent corresponding sections of blades according to this invention in which the increase of pitch in the leading half of the driving-face is different in the several cases, the distances A a', A a^2, A a^3, and A a^4 being respectively equal to one-fourth, one-half, three-fourths, and the whole of the maximum thickness C D of the blade where the section is taken. The arrows indicate approximately the mean direction of flow toward each section of the blade of the relative stream produced by the velocity of the blade, the velocity of the stream running past the propeller and the inclination of the stream flowing past the propeller to the axis E F of the propeller. It will be seen that the driving-face of such a blade instead of being represented simply by a straight line A B, as in an ordinary screw-propeller, is represented as regards the following half of the face by a straight line B C, but as regards the leading half of the face by a curve C a', C a^2, C a^3, or C a^4, tangential to the line B C, whereas the forward face of the blade is represented as regards its following half by a curve B D, as in an ordinary propeller, and as regards its leading half by a curve D a', D a^2, or D a^3 or by a straight line D a^4, tangential to the curve B D, according to the distance of the leading edge a', a^2, a^3, or a^4 from the continuation C A of the straight line B C, representing the following half of the driving-face of the blade.

The driving-face of the blade is bent forward from where the blade is thickest (which in the examples shown is at C—the middle of each section) rather than from a point nearer the leading edge, in order that near the leading edge the driving-face may make as small an angle with the direction of the relative stream as is consistent with adequate strength and may consequently stand at the greatest practicable angle to the axis, and therefore

at the best practicable propelling angle. The following half of the driving-face is made such as to be straight in developed cylindrical cross-section, because if it were made convex, as indicated by the dotted line C b', by gradually decreasing the pitch from C to b' it would do little or no work, for the driving-face of the blade is struck by the relative stream at such a small angle that nearly the whole of the pressure would fall upon the leading half, and if it were made concave, as indicated by the dotted line C b^2, by gradually increasing the pitch from C to b^2 its propelling efficiency would be reduced thereby.

In the example shown in Figs. 2 to 7, inclusive, the axial line G J of each blade is straight and perpendicular to the axis E F of the propeller-shaft in order that the force exerted upon the blade may as far as practicable be parallel to the said axis and have no component radial thereto. The developed outline of the blade is approximately semi-elliptical, as indicated in dotted lines in Fig. 2. The several sections, Figs. 3, 4, 5, and 6, are all similar as regards the ratio of the distance A a^2 of the leading edge a^2 from the continuation C A of the following half B C of the driving-face to the thickness C D of the blade, this ratio being one to two, which is the one that is expected to be most generally used.

It will be seen from Figs. 3, 4, 5, and 6 that as the axis E F is approached, although the negative pressure is to a great extent obviated, the pitch near the leading edge increases, so that at the point a^2 of Fig. 6 it would have become nearly infinite, and therefore the leading part of the driving-face would be at a bad angle for propulsion, while if the blade were prolonged slightly farther toward the axis negative pressure, which it is the special object of the invention to prevent, would actually be produced on a portion of the driving-face of the blade. It is therefore very desirable to provide a propeller having blades according to this invention with a large boss, which should in diameter be about thirty per cent. of the extreme diameter of the propeller and which has its greatest diameter at the leading edges of the blades—*i. e.*, at I, Fig. 2—whence it preferably tapers, as shown in Fig. 2, to and a little beyond H to K, where it has as a continuation a tapering bonnet K L M. The boss may, however, be cylindrical from I to a little beyond H and then taper rearwardly to a point about E. At its fore end N O there should adjoin the boss a fixed body P Q R S, the external surface of which forms a continuation of that of the boss K M O N. In the case of a single-screw vessel this surface is preferably cylindrical and is continued so until it meets the lines or run of the vessel. In that of a double-screw vessel it may be cylindrical or partially so and be formed by bossing out the hull of the vessel or otherwise, or it may be tapered gently forward, as shown, toward the external surface of the casing T of the propeller-shaft U. V is the bracket for supporting the propeller-shaft.

What I claim is—

1. A screw-propeller blade having, at each cylindrical section, its driving-face of uniform pitch from its following edge to where the blade is thickest and of gradually-increasing pitch from there to its leading edge.

2. A screw-propeller comprising a number of blades each of which has its driving-face, at each cylindrical section, of uniform pitch from its following edge to where the blade is thickest and of gradually-increasing pitch from there to the leading edge, and a rearwardly-tapering boss having its greatest diameter at the leading edges of the blades.

3. A screw-propeller comprising a number of blades each of which is of approximately semi-elliptical developed outline and has its driving-face, at each cylindrical section, of uniform pitch from its following edge to where the blade is thickest and of gradually-increasing pitch from there to the leading edge, and a rearwardly-tapering boss having its greatest diameter at the leading edges of the blades, substantially as described and shown.

4. A screw-propeller comprising a number of blades each of which has its axial line straight and perpendicular to the axis of the propeller, and its driving-face, at each cylindrical section, of uniform pitch from its following edge to where the blade is thickest and of gradually-increasing pitch from there to the leading edge, and a rearwardly-tapering boss having its geatest diameter at the leading edges of the blades.

5. A screw-propeller comprising a number of blades each of which has its driving-face, at each cylindrical section, of uniform pitch from its following edge to where the blade is thickest and of gradually-increasing pitch from there to its leading edge and a rearwardly-tapering boss having its greatest diameter at the leading edges of the blades, combined with a fixed body which adjoins the boss and whose external surface forms a continuation of that of the boss.

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

THOMAS POUNDS.

Witnesses:
EDMUND S. SNEWIN,
WM. O. BROWN.