(Model.) 2 Sheets—Sheet 1.

C. HOEHLE.

SCREW PROPELLER.

No. 342,011. Patented May 18, 1886.

Fig. 1

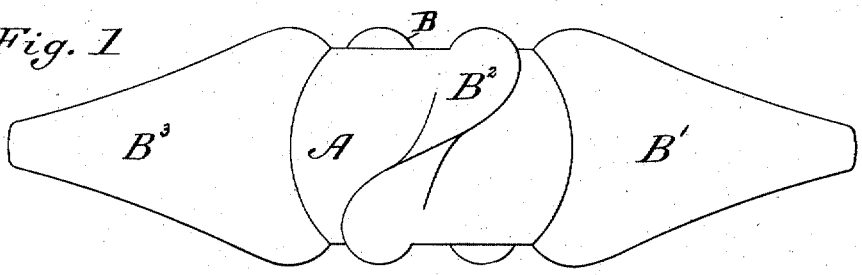
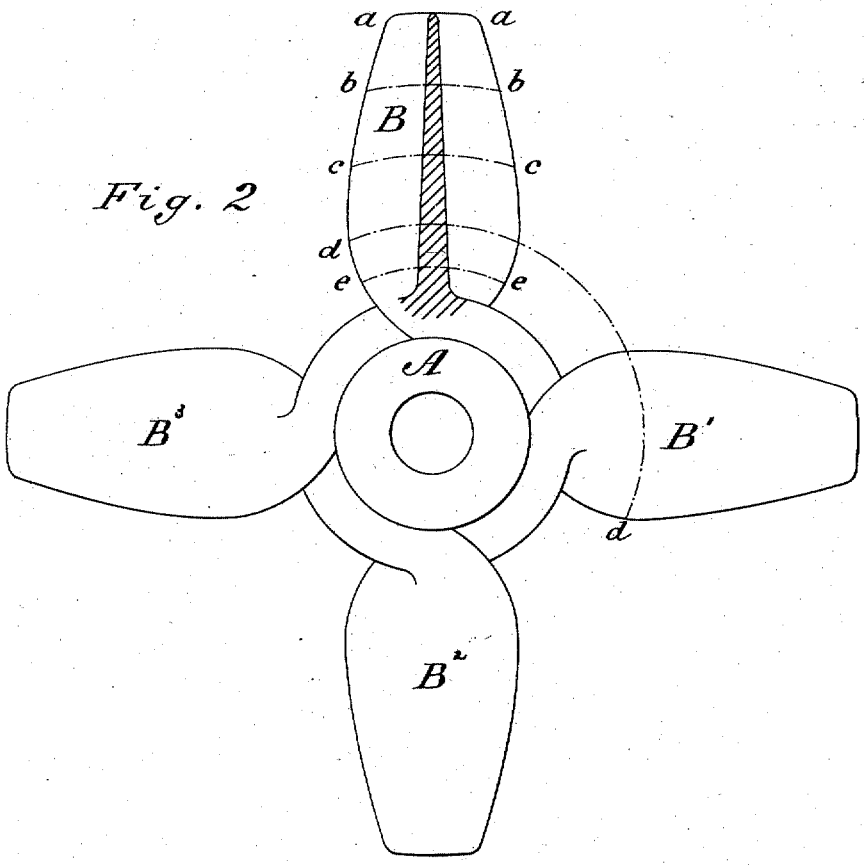


Fig. 2



Witnesses

Hermann Bormann

Thos. M. Smith

Inventor

Christian Hoehle

(Model.) 2 Sheets—Sheet 2.

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Fig. 3

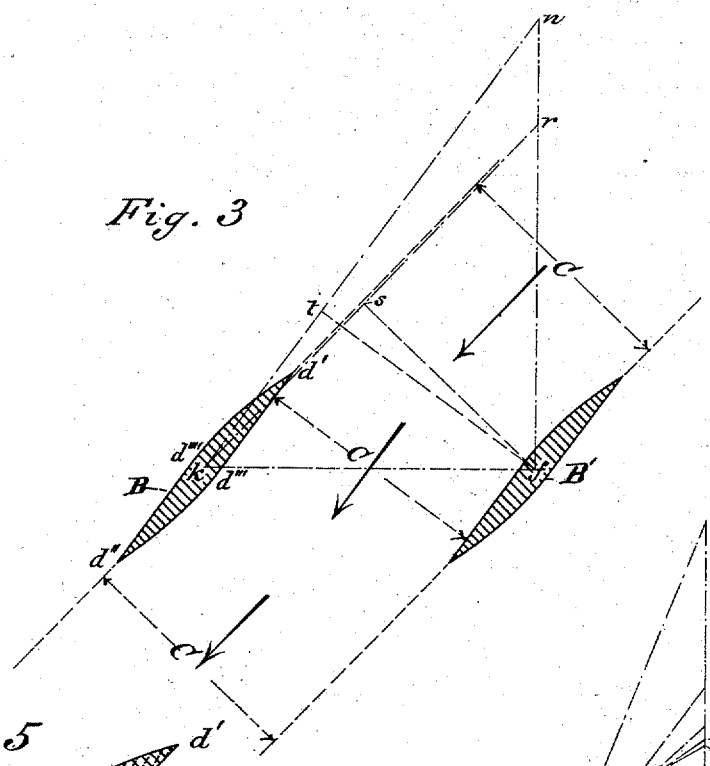


Fig. 5

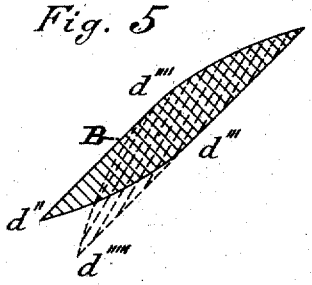
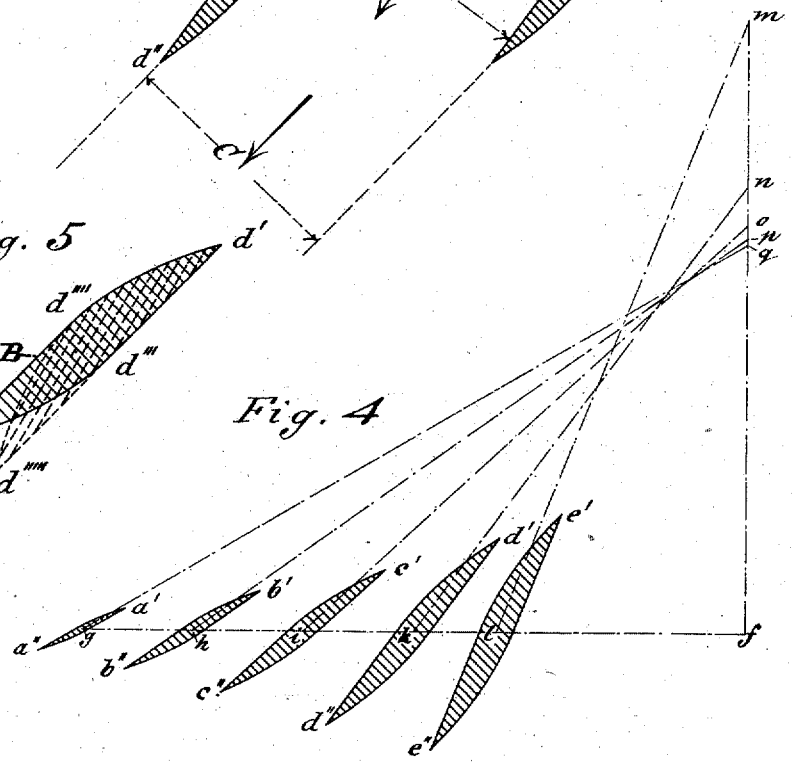


Fig. 4



Witnesses
Hermann Bormann
Thos M. Smith

Inventor
Christian Hoehle

UNITED STATES PATENT OFFICE.

CHRISTIAN HOEHLE, OF PHILADELPHIA, PENNSYLVANIA.

SCREW-PROPELLER.

SPECIFICATION forming part of Letters Patent No. 342,011, dated May 18, 1886.

Application filed February 6, 1886. Serial No. 191,061 (Model.)

To all whom it may concern:

Be it known that I, CHRISTIAN HOEHLE, of the city and county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Screw-Propellers, of which improvements the following is a specification.

My invention relates to certain novel features in the construction of screw-propellers applied to vessels for their propulsion, with a view of enhancing their efficiency and perfection of operation, and more particularly for increasing the speed of the vessel.

The screw-propeller wheel may be generally defined as consisting of helical or twisted blades secured to a hub set upon a shaft or axis revolving beneath the water at the stern of the vessel; but its efficiency as heretofore constructed has only been partially satisfactory in its action, due principally to the considerable loss of power arising from its irregular and improper construction, and in practice I have found that two causes may be assigned for its lack of comparative merit and of its failure to meet fully the requirements demanded; first, to improper pitch given to the blades of the wheel at the different points, and, second, to the improper shape of the cross-sections of the blades. For example, by giving to the screw a uniform or constant pitch the opening in the wheel near the hub is contracted, and the water thereby prevented from passing freely through the wheel, while from the improper shape of the cross-sections the water is prevented from leaving the wheel in the same direction that it enters it; and, again, in the screw-propeller as now ordinarily constructed it is the outer parts of the blades that perform the specific part of the work, while at the same time they are compelled to overcome the resistance of the vessel, as well as the resistance caused by the parts of the blades nearest the hub, and it is the object of my invention to overcome these objectionable features; to which ends it consists in so constructing the blades of the propeller-wheel that the pitch of each blade will be smallest at its periphery and increase at first gradually therefrom and then more decidedly as the hub of the wheel is approached, as hereinafter more fully explained.

In the accompanying drawings, illustrating my invention, Figure 1 represents a plan view of a four-bladed screw-propeller wheel of my improved construction. Fig. 2 is an end view, partly in section, showing the thickness of the blades of the wheel in the middle at the different radii. Fig. 3 is a cross-section of two adjoining blades of the wheel at the same radius. Fig. 4 is a view showing the cross-sections and the corresponding pitches of one of the blades of the wheel at different radii; and Fig. 5 is a view of a cross-section of one of my improved blades, and also showing in dotted lines a cross-section of an ordinary screw-propeller blade.

Referring to the drawings, A represents the hub of the wheel, and B, B′, B², and B³ the four blades rigidly secured in any suitable manner to the hub. Two of the adjoining blades, B and B′, are shown in section in Fig. 3, with a cylindrical surface, as indicated by the dotted line *d d* in Fig. 2, whose axis coincides with the axis of the wheel A laid out flat.

f k, Fig. 3, represents the distance between the two sections, measured perpendicularly to the axis of the wheel, and also may represent the circular velocity of the wheel at the cross-section.

f r represents the velocity of the water relatively to the wheel and parallel with its axis, and *k r*, the resultant of the two, the direction and velocity of the water entering the wheel.

The perpendicular (represented by *f s*) is the width of the current C passing between the two blades B and B′, and the velocity *f r* is a varying quantity, which at the hub of the wheel is never less than the velocity of a well-designed vessel, while at the periphery it is somewhat less than the velocity of the vessel plus the slip of the wheel.

In order that the water may pass freely through the wheel, the width of the current C must be one and the same on entering the wheel, in passing through it and on leaving it; so to accomplish this I construct the pitch of the cross-sections by drawing the line *k n* in such a manner that the perpendicular *f t* is equal to *f s* plus the thickness of the cross-sections *d‴ d⁗* of the blades B and B′. The lines forming the cross-sections consist of the two straight lines, as indicated by *d′ d‴* and

d'' d''', parallel to the line k n, and the two curved lines, similarly indicated by d'' d''' and d' d'''', the straight lines being tangent to the curved lines at the points d''' and d''''; and it will thus be seen that by forming the cross-sections in the above manner the current will pass through the wheel as indicated by the arrows in Fig. 3, while the width of the current C will not in the least be contracted in the wheel, and therefore the water will leave the wheel in the same direction that it enters it. This would not be the case under such a construction of screw-propeller blade as shown in cross-section partly in dotted lines in Fig. 5, and the contour of which particular blade is clearly indicated by d' d'' d''' d'''', and it will be readily understood from this view that the water would not leave the wheel in the same direction that it entered it.

By repeating the operation hereinbefore explained with the cross-sections a a, b b, c c, d d, and e e, I obtain the cross-sections a' a'', b' b'', c' c'', d' d'', and e' e'', with their respective pitches fq, fp, fo, fn, and fm, as clearly shown in Fig. 4, and it will be observed that the pitch f q is smallest at the periphery of the screw and increases gradually at first therefrom and then more decidedly to the hub of the wheel.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A screw-propeller in which the pitch of each blade is smallest at the periphery and increases gradually at first therefrom and then more decidedly to the hub, substantially as described.

2. A screw-propeller in which the cylindrical cross-sections of the blades are each composed of two semi-segments joined together and so arranged that the straight lines of the respective semi-segments form the continuations of the curved lines and are tangent thereto, substantially as described.

3. A screw-propeller in which the pitch of each blade is smallest at the periphery and greatest at the hub, and the cylindrical cross-sections thereof in form that of two semi-segments joined together and so arranged that the straight lines of the respective semi-segments form the continuations of the curved lines and are tangent thereto, substantially as and for the purposes described.

In witness that I claim the foregoing as my invention I have hereunto set my hand in the presence of two witnesses.

CHRISTIAN HOEHLE.

Witnesses:
HERMANN BORMANN,
THOMAS M. SMITH.

Corrections in Letters Patent No. 342,011.

It is hereby certified that in Letters Patent No. 342,011, granted May 18, 1886, upon the application of Christian Hoehle, of Philadelphia, Pennsylvania, for an improvement in "Screw-Propellers," errors appear in the printed specification requiring correction, as follows: On page 1, in lines 75 and 80, the word "represent" should read *represents;* in line 84 the parenthetical marks before and after the clause "represented by *f s*" should be stricken out; in line 87, the last word in the line—"the"—should be stricken out, and the words *a well designed* should be inserted; and in lines 88–9, the words "a well designed" should be stricken out, and the word *the* inserted; and that the Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 6th day of July, A. D. 1886.

[SEAL.]

D. L. HAWKINS,
Acting Secretary of the Interior.

Countersigned:

M. V. MONTGOMERY,
Commissioner of Patents.