(Model.)

2 Sheets—Sheet 1.

L. BIDAULD.

SCREW PROPELLER.

No. 395,538. Patented Jan. 1, 1889.

FIG. 1.

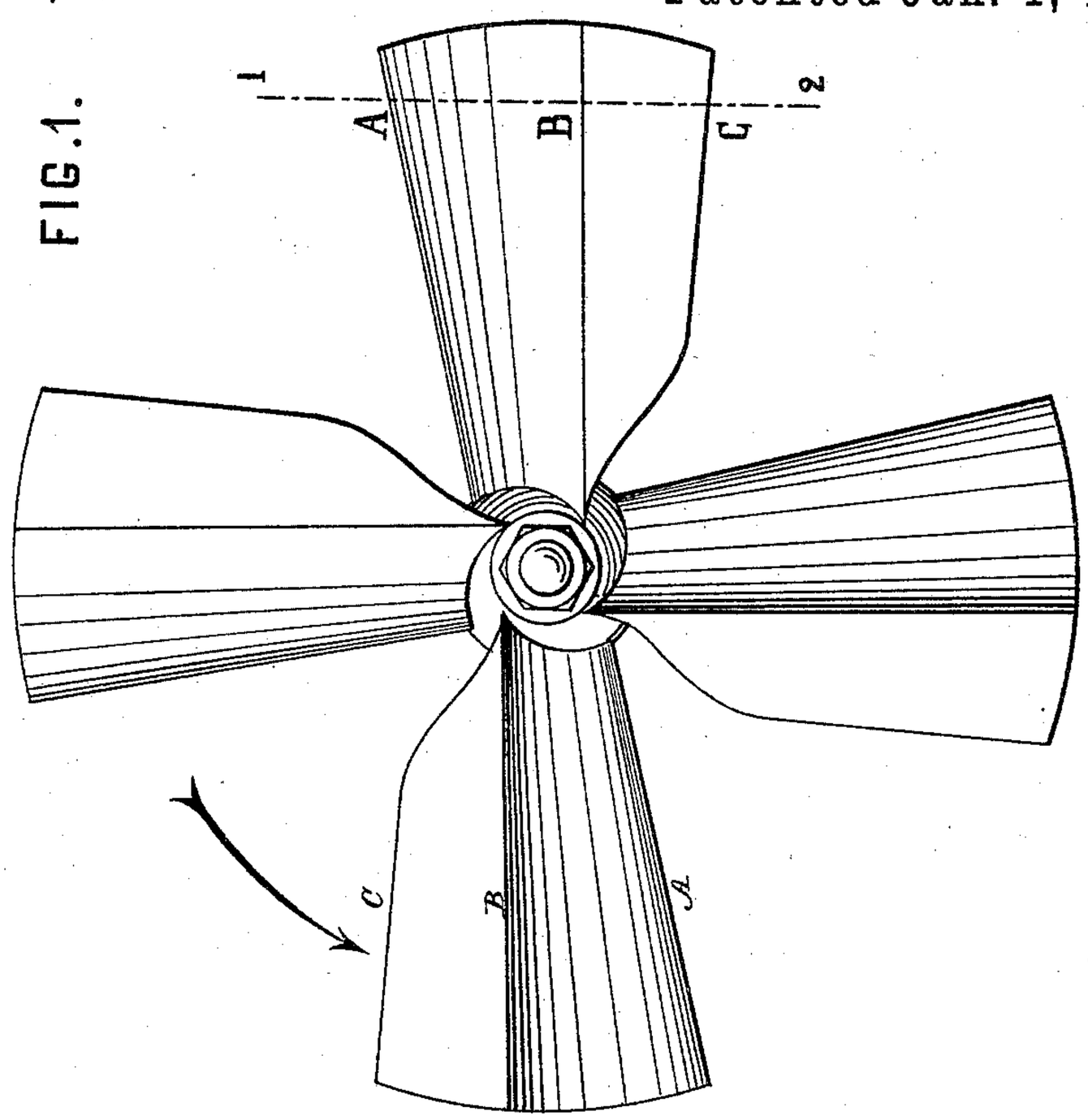
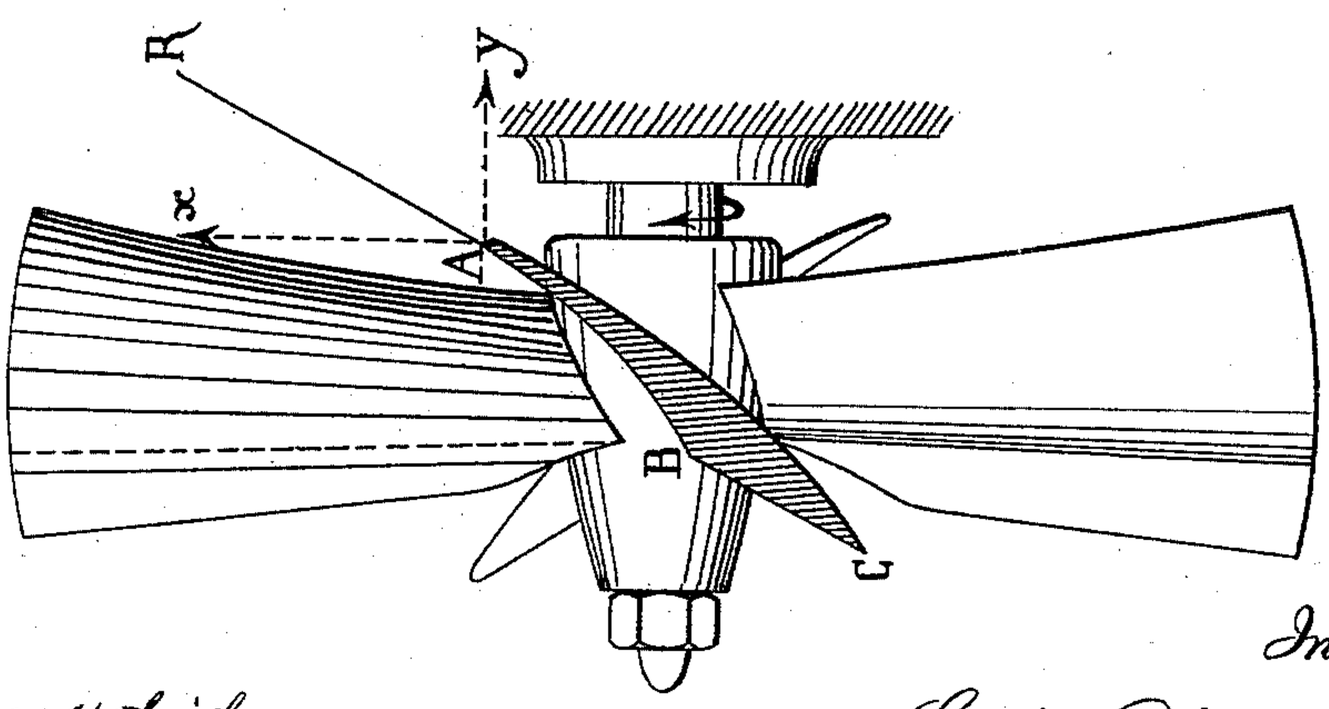


FIG. 2.



Witnesses,
Chas. H. Smith.
J. Staib

Inventor,
Louis Bidauld.
per Lemuel W. Serrell
atty.

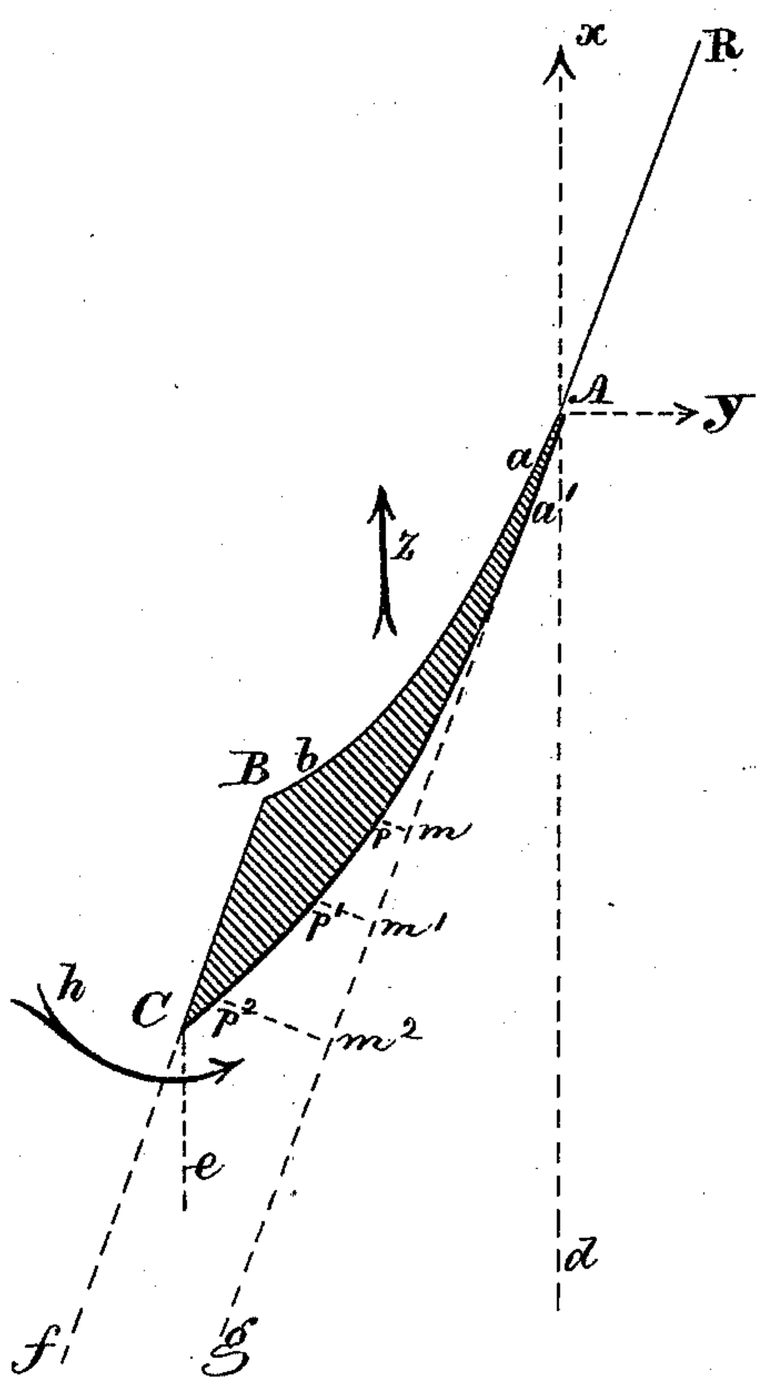
(Model.) 2 Sheets—Sheet 2.

L. BIDAULD.

SCREW PROPELLER.

No. 395,538. Patented Jan. 1, 1889.

Fig. 3.



Witnesses

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Inventor,

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per Lemuel W. Serrell

atty.

UNITED STATES PATENT OFFICE.

LOUIS BIDAULD, OF LYONS, FRANCE.

SCREW-PROPELLER.

SPECIFICATION forming part of Letters Patent No. 395,538, dated January 1, 1889.

Application filed May 1, 1888. Serial No. 272,408. (Model.) Patented in France May 3, 1886, No. 173,694, and in England April 11, 1888, No. 5,402.

To all whom it may concern:

Be it known that I, LOUIS BIDAULD, of Lyons, France, have invented an Improvement in Propellers, of which the following is a specification.

Letters Patent have been granted to me for this invention in France, deposited January 21, 1886, and granted May 3, 1886, No. 173,694, and in Great Britain, dated April 11, 1888, No. 5,402.

This new propeller turns like the screw-propeller in a plane perpendicular to the direction of the vessel. It is composed of a varying number of blades, the particular shape of which forms the object of this invention.

Figure 1 of the drawings represents a face view of the propeller. Fig. 2 is a side view, the nearest blade being in section at the line 1 2, Fig. 1; and Fig. 3 is a diagram and section of the blade.

By reference to Fig. 3 it will be seen that the front and rear surfaces of the blade are different curves. The rear surface, AB, has a concave shape, the first element, A*a*, of which has about the direction of the resultant AR of the speed A*x* and of the speed A*y* of the boat. The last element, B*b*, of the same curve approaches more or less the direction of the axis of rotation without quite reaching it. The direction of the element A*a* is determined by the speed A*x* of the blade and the speed A*y* of the boat. (These last values depend upon the requirements imposed in the construction.) A*x* is the speed of the blades at the point of the circumference farthest from the axis, and is determined by the diameter of the screw and the number of revolutions which it has to make under normal conditions. A*y* is the speed of the boat. The proportion between these two speeds may vary according to circumstances, and is determined in each particular case to suit the boat that is to be propelled. The result of this shape is that the water slides more easily from A to B than on a plane surface and without producing eddies detrimental to the effective power.

The water may really be compared to an object falling from the point A and arriving quicker at B by following a curve than by following a straight line. The rear face is not alone active in propelling, because while it presses on the water for the purpose of advancing, the front face creates a vacuum along the line AC, which creates a forward suction, and thus to a great extent makes up the effective power.

If the blade is given an almost uniform thickness, as has been the custom up to the present time, by making the curve AC parallel to AB the vacuum produced extends outside of the blade after its passage and is filled with eddies which follow the blade and neutralize all suction. The curve AC has therefore to be chosen in such a manner as to be followed closely by the water, so that the suction can exert itself without eddies and without loss. Experience has shown to me that this curve should be at a considerably less inclination toward the axis than the rear curve AB. These two curves being thus started from the point A diverge rapidly and give to the rear part of the blade a considerable thickness limited by the line BC parallel to the entering line AR. The face BC has thus but little action and offers a better bearing surface to the water, which, sliding on the two curved surfaces, leaves the blade at the two points B and C, and thus prevents a part of the recoil.

The curve A*c* is laid out so that the water follows it closely, as next explained.

If the water and the boat were at a standstill, the blade, turning in the direction of the arrow *z*, Fig. 3, would produce a vacuum or minus pressure in *d*AC *e;* but the boat advancing with the speed A*y* the vacuum created would be in the direction of *g*AC *f*. C*f* and A*g* being parallel to AR, the first element A*a'* of the curve AC is consequently parallel to A*a*, and approaches it as much as the necessary thickness of the metal will allow it. The other part of the curve AC is determined, subject to the condition that the molecules of water at m m' m^2 on the line A*g* are drawn by the partial vacuum created and meet the curved surface just at the moment of its passage, so as not to leave an empty space behind which would be filled by the backwater moving in the direction of the arrow *h*, as is the case in the present propellers, producing eddies and interfering with the effect of the attraction produced by the vacuum. The speed

of the molecule m is evidently an accelerated one. The line AC is therefore a curve, the ordinates mp' $m'p'$, &c., of which are the distances traversed by the molecule m, and the ordinates Am Am', &c., of which are the distances traversed during the same time by the blade, the speed Ax of which is known. The speed of the molecule m is determined by the atmospheric pressure, to which is added the pressure due to the depth of immersion. The last named is evidently variable; but as these variations are of little consequence compared to the atmospheric pressure there is no great error made by taking its average value. It is evident that this purely theoretically-laid-out curve can be corrected in practice, so as to take into account the numerous elements impossible to calculate and which modify more or less the supposed effect. Experience alone can teach exactly how these corrections shall be made. Thus the section of the blade prevents a curvilinear triangular shape, each of the sides being specially shaped for the result to be obtained according to the relative speeds of the vessel and of the propellers.

The drawings represent what is usually known as a left-handed screw, turning from right to left. With a right-handed screw-propeller the directions or inclinations are reversed.

I claim as my invention—

The propeller having blades, each of which has an inclined and convex front face, the curvature increasing toward the rear edge, and a concave rear face from the advancing edge A to the line B, and an inclined plane between the line B and the rear edge, C, substantially as set forth.

The foregoing specification of my improvement in propellers signed by me this 11th day of April, A. D. 1888.

LOUIS BIDAULD.

Witnesses:
L. VANDENENE,
JULES LEPNIETTE.