

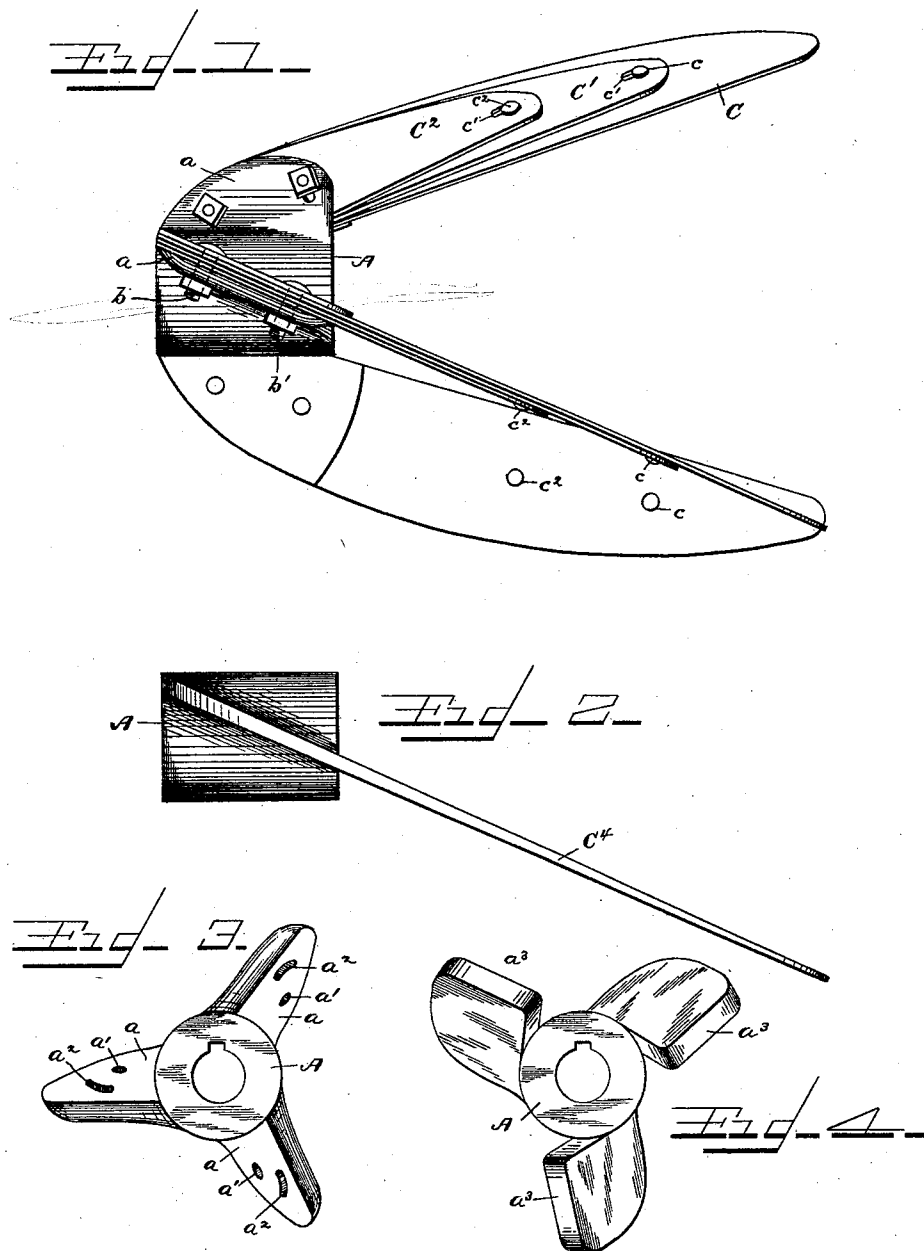
(Model.)

2 Sheets—Sheet 1.

J. H. OSBORNE.
SCREW PROPELLER.

No. 453,361.

Patented June 2, 1891.



Witnesses:

W. J. Korth
W. C. Garrett

Inventor:

John H. Osborne.
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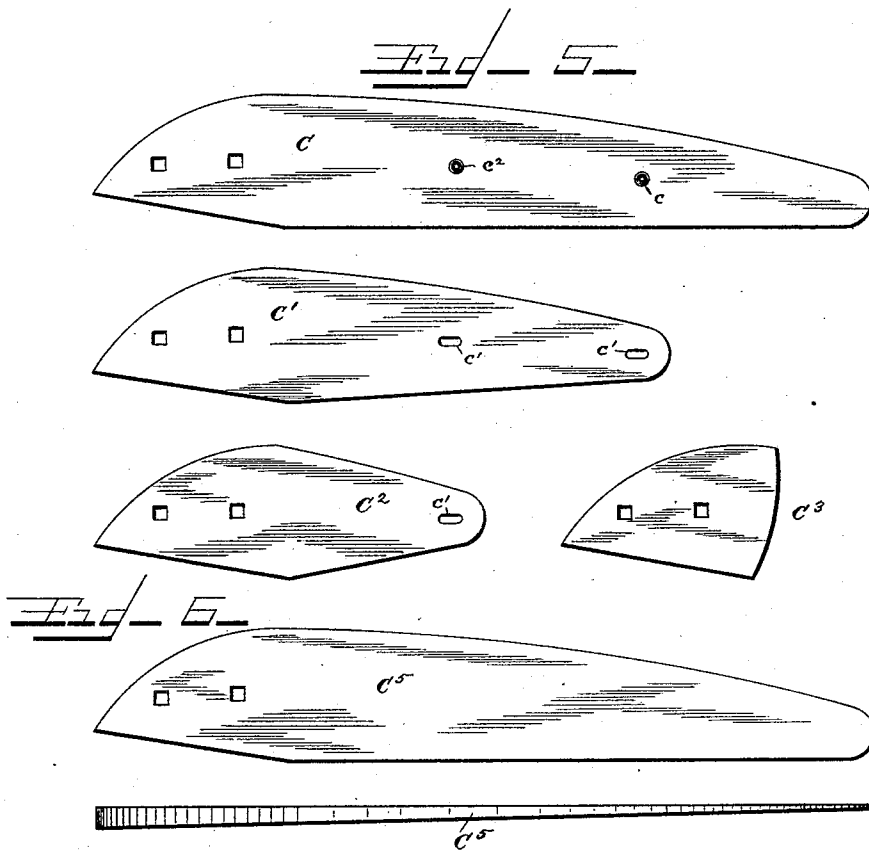
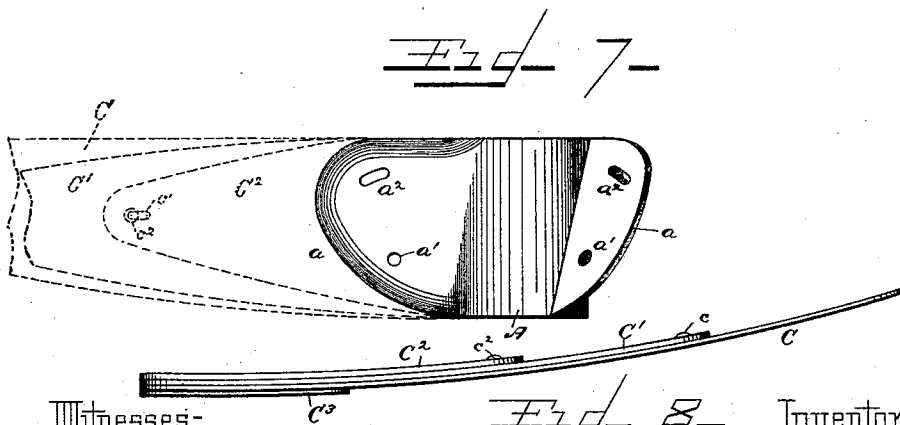
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UNITED STATES PATENT OFFICE.

JOHN H. OSBORNE, OF AUBURN, NEW YORK.

SCREW-PROPELLER.

SPECIFICATION forming part of Letters Patent No. 453,361, dated June 2, 1891.

Application filed December 18, 1890. Serial No. 375,170. (Model.)

To all whom it may concern:

Be it known that I, JOHN H. OSBORNE, a citizen of the United States, and a resident of Auburn, county of Cayuga, and State of New York, have invented a new and useful Improvement in Screw-Propellers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification.

My invention relates mainly to the construction of the blades of screw-propellers, whereby they are made elastic, so as to yield or bend under the resistance of the water to their action, and by such yielding or bending to avoid or prevent any unnecessary commotion in or movement of the water. It is well known that the greater the depth to which a propeller-wheel is submerged the greater is the resulting power exerted by the blade of the wheel upon the water. It is also well known as a correlative fact that the propeller-blade performs more work upon or encounters greater resistance from the water while passing through the lower half or portion of its stroke than while passing through the upper half or portion of its stroke. As a result of these unequal resistances encountered at these two portions of the stroke made by a rigid blade, there is a jarring, tremulous, or vibratory motion communicated to the vessel. If, however, the blade of the propeller were made elastic, it would yield to the greater resistance of the water at the lower portion of the stroke, and then recover, yielding less to the lesser resistance at the upper portion of the stroke, and thus cause the vessel to proceed without, or with much less, jarring, tremulous, or vibratory motion, and also to pass with greater ease and steadiness through and over the water. It will also be manifest that with the blade thus adapting itself by means of its elasticity to the varying pressures encountered at different points in its revolution the reaction of the propeller-wheel upon the engine or motor caused by such unequal pressures of the water is avoided, and the motor will move the wheel with an equable and steady motion and with corresponding ease and economy to the motor.

The object of the present invention is to overcome the defects referred to by the em-

ployment of an elastic or flexible blade or screw that will bend and unbend under and in proportion to the different pressures encountered in its circular path through the water. It will be understood from the following description and claims, reference being had to the accompanying drawings, in which—

Figure 1 is a plan view of a screw-propeller wheel, showing my improvement. Fig. 2 is a similar view of the hub of the wheel, showing a modification in the construction of the flexible blade thereof. Fig. 3 is an end view of the hub and its wings employed in the construction shown in Fig. 1; Fig. 4, a similar view of the hub forming a basis for the construction shown in Fig. 2. Fig. 5 is a detail view of the blade constructed as shown in Fig. 1. Fig. 6 shows in side and edge elevations an elastic blade made in one piece. Fig. 7 is a side view of the hub with the blades removed, and Fig. 8 is an edge view showing the blade curved from end to end.

In the form of construction shown in Fig. 1 the cylindrical hub of the wheel (indicated at A) has a central longitudinal bore to receive the propeller-shaft and a key-seat for securing it to said shaft, and is shown provided with wings *a a*, arranged in oblique relation to the line of the shaft or central perforation therefor, thereby giving to them and to the blades to be attached thereto the necessary spiral or screw form arrangement. These wings are made flat on their rear or operative faces and are provided each at *a'* with a perforation for the reception of a pivotal bolt *b*, and at *a²* with a slot formed in an arc of a circle of which the bolt *b* is the center for the reception of a second bolt *b'*, which permits the adjustment of the blade in or out on its pivotal bolt, and, in connection with the latter, serves to unite the blade rigidly to the wing. The slot *a²* may of course be dispensed with and a simple bolt-hole substituted therefor where no adjustment of the blade is desired.

Although I do not confine myself to any particular form or construction of the blade, the form or construction preferred is shown in Figs. 1 and 5, the latter figure showing the parts thereof in detail. In this construction the blade is composed of a series of plates or

leaves similar to the several leaves of a carriage-spring. These may be of uniform length and tapering like that shown in Fig. 6, but preferably is made up of plates or leaves of different lengths, C indicating the main or longest plate, and C' a shorter one, pivoted at its outer end at c, preferably to the back or inoperative face of the plate C, and slotted at c' to receive and permit its movement on plate C relative to a pivot c², connecting the outer end of a still shorter plate C² through said slot c' to the plate C. The operative face of plate C is countersunk to allow the heads of the pivoting-rivets c and c² to be let in flush with said face, thereby giving the latter a smooth unobstructed surface for the action on the water. The blade thus formed is secured to the wing a by means of the bolts b and b', which also serve to secure a keeper-plate C³ on the outer or operative face of the plate C and to the wing a. This plate at its forward end conforms in shape to the end of the blade-plates, but is made shorter, projecting beyond the rear end of the wing a, however, sufficiently far to stiffen the blade during a reverse rotation of the wheel and relieve the latter from undue strain at said rear end of the wing.

In Fig. 2 the blade is shown formed in one piece with the hub by casting the hub with one, two, three, or more, if desired, projections or protuberances, similar to those shown in Fig. 4, and of steel or other metal or alloy of metal which is both ductile and elastic, such as will permit the casting of the hub in the form indicated, after which the projecting knobs or protuberances (indicated at a³) can be hammered or drawn out into the tapering form (indicated at C⁴ in Fig. 2) and to the desired shape and thinness and then tempered to give it the required degree of elasticity or flexibility, which, as will be readily seen, increases toward the point or outer and thinnest part of the blade, where the movement of the blade is the most rapid and the resistance to such movement is the greatest, and where consequently the greatest elasticity is required. This feature of flexibility pertains also to the construction shown in Figs. 1 and 5, as also to that shown in Fig. 6, in which the blade is shown in a single piece C⁵, tapering like that shown in Fig. 2, but separate from the hub and adapted to be bolted to wings on the latter in a manner similar to the leaved blades in Fig. 1. In this last-named construction the keepers C³ may be used or left off, as preferred, the tapering form of the single plate giving the required stiffness to the fixed end of the blade.

In Fig. 2 the hub is shown provided with a single blade only, while in the other figures where the hub is shown it is provided with three blades, or provision is made therefor; but any desired number may be employed.

Where the laminated blade is employed the slots c' in the shorter plates provide for the necessary movement thereof relative to the

longer plates in bending under the resistance of the water to the action of the blade, which, under such action, owing to its flexibility and rapid rotation, will be made to assume a spiral form, varying at different points in its length to conform to the varying speed of such points and the varying resistance of the water consequent thereon. It is therefore made to assume just that form which is most effective in its action on the water and which produces the least disturbance in the new water to be acted upon by the following blade.

Propeller-blades in their ordinary construction are made inflexible and are projected from the hub in planes oblique in the direction of their width to the axial lines of the hub, and generally in planes perpendicular or nearly perpendicular in the direction of their length to said axial line. So in the arrangement and use of an elastic blade, and particularly in the adaptation of hubs with elastic blades to the propeller-shafts and "wheel-spaces" of vessels now in use, it will often be found desirable to arrange the elastic blades upon the hubs in the manner above described, and as indicated by dotted lines in Fig. 7.

In Fig. 8 the blade is shown curved backward from its heel end, which connects with the wing to its outer end or point. This construction may also be found desirable as facilitating the passage of the blade through the water.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a screw-propeller wheel, a wheel-hub arranged in line parallel or substantially parallel with the line of propulsion, in combination with one or more blades made elastic throughout their length and set in oblique relation to said hub, substantially as described.

2. In a screw-propeller wheel, a propeller-blade composed of thin elastic plates made flexible throughout their length and secured to the hub of the wheel in oblique relation thereto, substantially as described.

3. A screw-propeller blade composed of thin elastic plates or leaves of different lengths, each freely flexible throughout its length and united to form a single blade varying in flexibility at different points in its length, the shorter leaves being applied to the inoperative face only of the longer leaf, substantially as described.

4. A screw-propeller blade composed of thin elastic plates of varying lengths, each freely flexible throughout its length, the shorter of which plates is pivoted to the longer plate through slots permitting movement or play of their outer ends relative to said longer plate, substantially as described.

5. The combination, with the hub of a screw-propeller wheel having the obliquely-arranged wing for the attachment of the blades, of a propeller-blade made elastic throughout its length and secured to said wing, and the keep-

er-plate also secured to said wing outside of the elastic blade and projecting beyond the hub for stiffening said elastic blade, substantially as described.

5 6. The combination, in a screw-propeller wheel, of the hub having the oblique ring slotted to permit the adjustment of the blade, and a propeller-blade made elastic throughout its length and adjustably connected with
10 said wing, substantially as described.

7. The combination, in a screw-propeller wheel, of a hub having obliquely-arranged

wings, elastic propeller-blades adjustably secured to said wings and composed of thin plates or leaves freely flexible throughout 15 their length, and keeper-plates for said blades extended beyond the wings to which the blades are secured, substantially as described.

In testimony whereof I have hereunto set my hand this 15th day of December, A.D. 1890.

JOHN H. OSBORNE.

Witnesses:

J. V. PALMER,

F. E. SWIFT.