O. A. BOWERS.

REVERSING PROPELLER.

APPLICATION FILED FEB. 17, 1908.

910,899.

Patented Jan. 26, 1909.

2 SHEETS—SHEET 1.

Fig: 1.

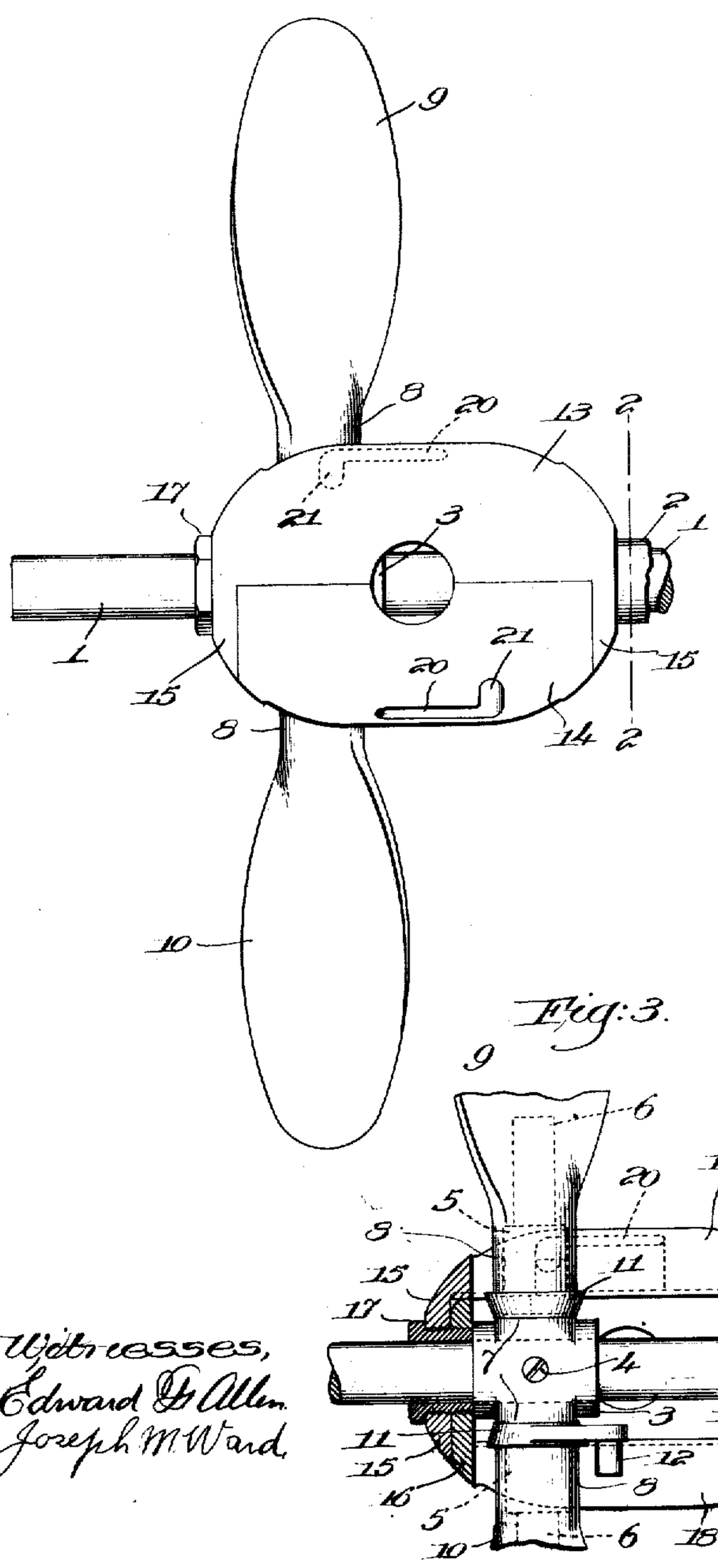

Fig: 2.

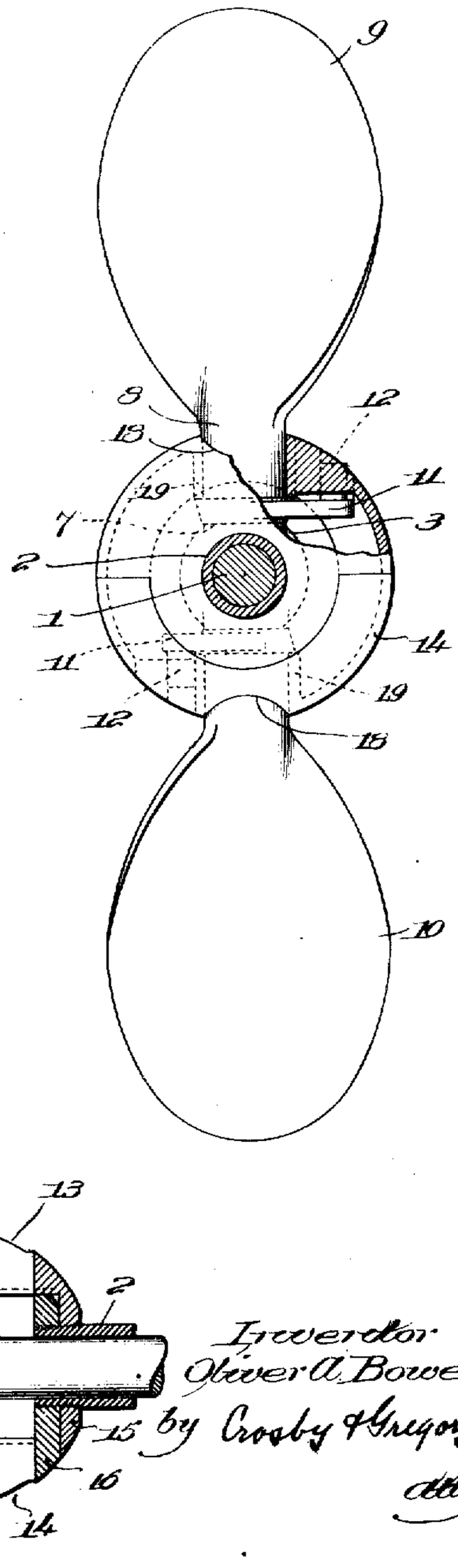

Fig: 3.

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2 SHEETS—SHEET 2.

Fig: 4.

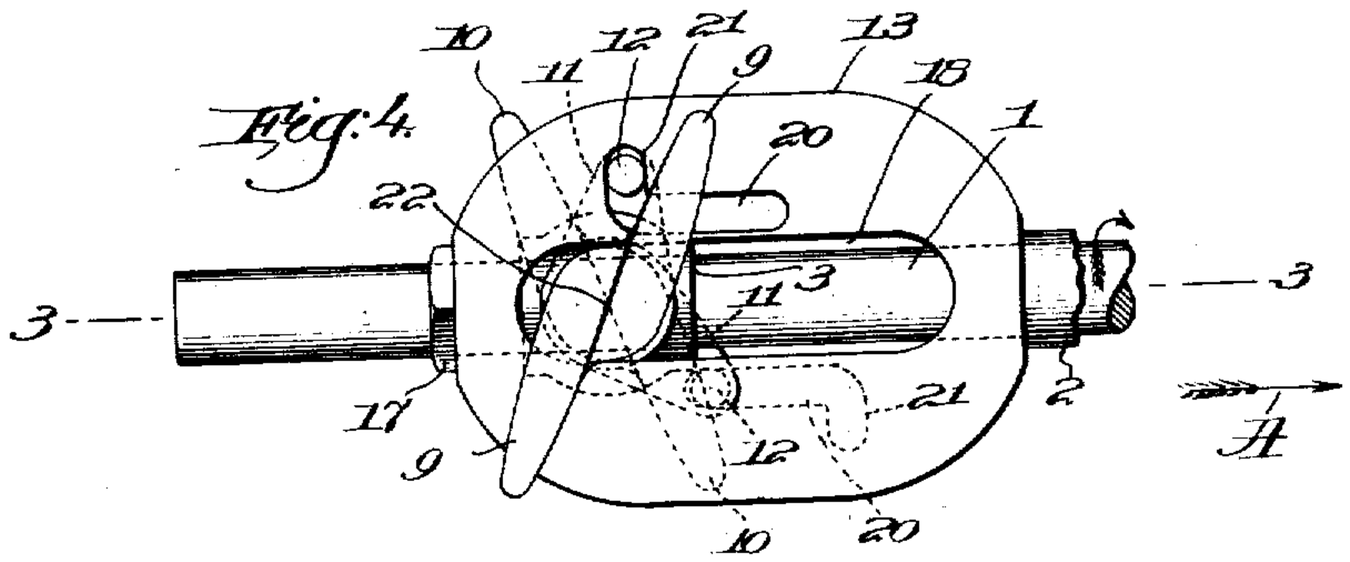


Fig: 5.

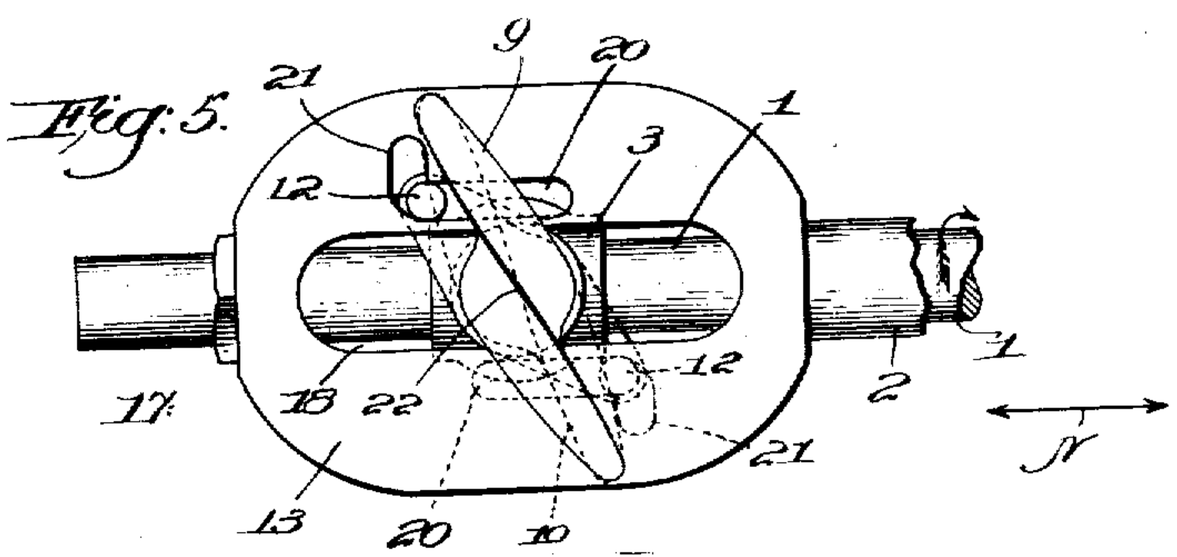
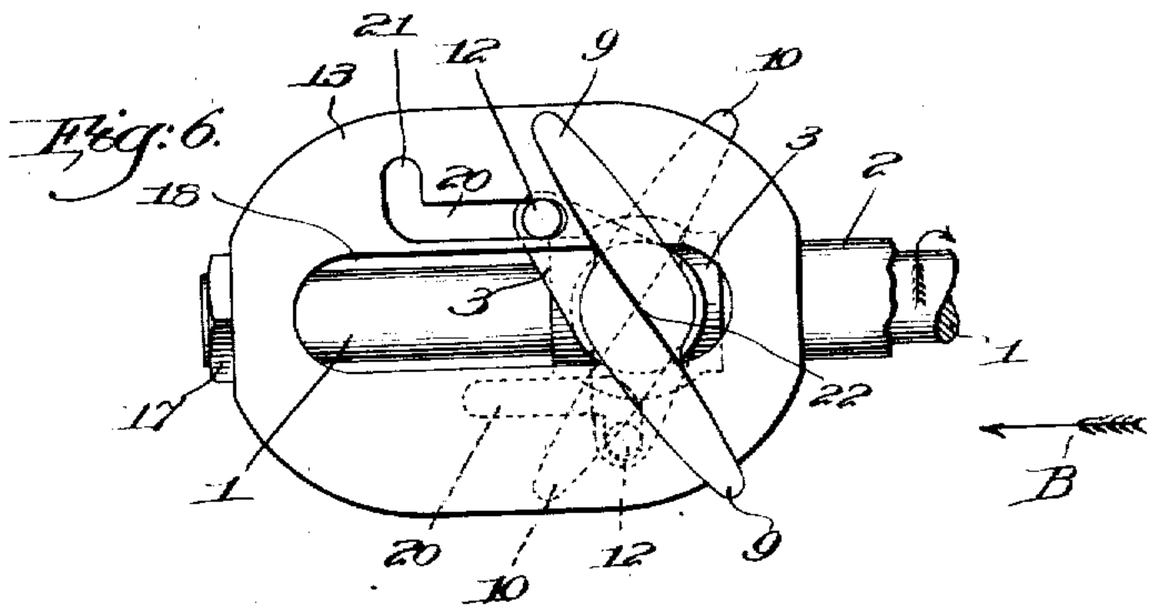


Fig: 6.



Witnesses,
Edward F. Allen.
Joseph M. Ward.

Inventor:
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UNITED STATES PATENT OFFICE.

OLIVER A. BOWERS, OF MILFORD, MASSACHUSETTS, ASSIGNOR TO C. F. ROPER & COMPANY, OF HOPEDALE, MASSACHUSETTS, A FIRM.

REVERSING-PROPELLER.

No. 910,899. Specification of Letters Patent. Patented Jan. 26, 1909.

Application filed February 17, 1908. Serial No. 416,199.

To all whom it may concern:

Be it known that I, OLIVER A. BOWERS, a citizen of the United States, and resident of Milford, county of Worcester, State of Massachusetts, have invented an Improvement in Reversing-Propellers, of which the following description, in connection with the accompanying drawing, is a specification, like letters on the drawing representing like parts.

This invention has for its object the production of a novel and efficient two-bladed reversing propeller, so constructed and arranged that a substantially constant resistance or load is maintained on the motor irrespective of the position of the blades.

The reversal in the propulsive effort of the propeller is effected by the propeller itself and without reversing the direction of rotation of the motor or requiring the assistance of intermediate gearing, the speed of the boat being also controlled by or through the propeller. United States Patent No. 807498 granted to C. F. Roper December 19, 1905 shows and describes a four-bladed propeller having similar objects in view, but in utilizing a two-bladed propeller certain important changes in operation are necessary.

The constant resistance on the motor is effected by holding one of the two blades in one of its extreme positions while the opposite blade is moved from its corresponding position to the opposite extreme, and maintained in such position, after which the first blade is turned to its opposite extreme, the two blades then working together. Supposing the blades are set for full speed ahead, in reversing one blade is turned to reverse position before the other blade starts, and the neutral position is attained, during which the boat stands still. The second blade is then turned to reverse position and both blades acting together the boat is propelled backward. An intermediate position between neutral and full speed ahead or astern will of course diminish the propulsive effort in one or the other direction and the boat will travel at a proportionately reduced speed.

A screw blade, that is, one which is of the same pitch at any distance from its center of rotation, and which consequently has a different angularity at each of such points has more slant near the axis of rotation and on account of that fact it is desirable to turn the blades somewhat farther in reverse position than they are turned when in forward position, in order that at neutral position the extra or additional angle of the reversed blade will compensate for the decreased angle of its central portion, balancing the pull of the other blade in forward position.

The various novel features of construction embodied in my invention will be fully described in the subjoined specification and particularly pointed out in the following claims.

Figure 1 is a side elevation of a propeller embodying my invention, the motor shaft being broken off and the manually-operated means for changing the position of the propeller blades being omitted as they may be of any suitable construction and form no part of my invention; Fig. 2 is a sectional view on the line 2—2, Fig. 1, looking toward the left, a portion of the casing being broken out; Fig. 3 is a partial vertical section on the line 3—3, Fig. 4, only the ends of the casing being in section; Fig. 4 is a top plan view of the apparatus shown in Fig. 1, the blades being set for full speed ahead, the shaft being supposed to turn in the direction of the arrow thereon; Fig. 5 is a similar view but with the blades set in neutral position; Fig. 6 shows the apparatus in plan with the blades set for full speed astern.

The driving or motor shaft 1 is extended loosely through a sleeve 2 which in practice is mounted rotatably and slidably in a suitable bearing in the stern-post of the boat, substantially as in the Roper patent referred to, and within the boat manually-operated means will be provided to move the sleeve longitudinally of the shaft without interfering with its rotation. The shaft 1 is driven by the motor at a constant speed and always in the same direction. Near its outer end the shaft has secured to it a blade-carrying hub 3, fixed by a suitable set-screw 4, the hub having rigidly attached to or forming part of it two oppositely extended radial bearing pintles 5, preferably reduced in diameter at their outer ends, as at 6, (see dotted lines Fig. 3) the hub having flat bearing faces 7 at the base of and concentric with each pintle. I make no claim, however, to the particular construction of the pintles nor to the fitting of the blades thereon, as the same is not of my invention.

Each of the two pintles has mounted upon it a propeller blade which is conveniently

made as a casting having a heavy hub 8 socketed to receive the pintle, and a screw blade portion, and while both blades are alike I have indicated them at 9 and 10 for convenience in reference. The blades are pivotally mounted on the pintles and the ends of the blade-hubs 8 are each provided with a lateral foot 11 which rests upon the adjacent bearing face 7, the foot having near its outer end a pin or follower 12 parallel to the pintle and eccentric thereto, the oppositely extended feet and their followers being shown in Fig. 2. The blades revolve with the shaft 1 but they can be turned about their own axes on the pintles 5, as will be clear, to change their angularity with respect to each other and to the axis of the shaft. To control the angularity of the blades, I inclose the hub 3 and the adjacent portions of the blades, and to retain the latter in place on the pintles I have provided a two-part combined controller and casing, consisting of the two shell-like members 13, 14, divided longitudinally and circular in cross-section but substantially elliptical in elevation, as shown. The ends 15 of the part 13 overlap the adjacent ends 16 of the part or member 14, the overlapped ends at the inner extremity of the casing being screwed onto the threaded end of the sleeve 2, see Fig. 3, while a threaded bushing 17 is screwed into the overlapped ends at the outer extremity of the casing, thereby holding the two members thereof rigidly connected. This bushing 17 turns easily on the shaft 1 and is also freely slidable thereon when the casing is moved longitudinally of the shaft to control and vary the angularity of the two blades. Each member of the casing has a longitudinal and central slot 18 to loosely receive the blade hubs 8, the slots being long enough to permit the full longitudinal controlling movement of the casing.

As shown in Fig. 2, and also in Figs. 4, 5 and 6, the feet 11 of the two blades project from opposite sides of the blade hubs toward the sides of the casing members, and the enlarged portion of each follower at the base of the hub 8 is held upon the seat 7 by the overlying part 19 of the casing member, see dotted lines Fig. 2. The members of the casing have each a cam-slot of substantially L-shape, but said slots are in reversed position in the assembled casing, and relatively located as shown in Figs. 4, 5 and 6, the longitudinal portions 20 of the slots lying parallel to the large openings 18, while the short transverse portions or bends 21 are at right angles to the openings 18, a follower 12 entering each cam-slot.

In its general character the casing herein shown and described is substantially the same as is shown in United States Patent No. 878022, granted to C. F. Roper, February 4, 1908, for a four-bladed reversing propeller, but the location of the cam-slots herein is different, as will be referred to, to effect a different operation.

Referring now to Fig. 4, the blades are set for full speed ahead, in the direction of arrow A, and to avoid confusion the blades 9 and 10 have not been shaded, the angles which the outer ends of the blades bear to each other being clearly shown by the full and dotted lines indicating such ends. When in full speed ahead position the follower 12 of the blade 9 is at the outer end of the short bend 21 of its cam-slot while the follower of blade 10 is at the end of the longitudinal part 20 of its cam-slot, Fig. 4, and both followers are at the right of the intersection 22 of the lines indicating the outer ends of the two blades.

To change the propeller blades to neutral position the controlling casing is moved toward the outer end of the shaft 1 by longitudinal movement of the sleeve 2, and by such movement the blade 9 is turned, by the action of the bend 21 acting on the follower 12 of said blade, to its extreme opposite position, as shown in Fig. 5. During such change the blade 10 is held in its original position because its follower travels along the longitudinal part 20 of its slot, so that the blade 10 remains at full speed ahead while the blade 9 has been set for full speed astern, and the neutral position is maintained, when the boat stands still as the propulsive effort of one blade is counterbalanced by the propulsive effort of the other blade, but in the opposite direction. This neutral state is indicated by the double-headed arrow N, Fig. 5. In the position shown in said figure the crossing point of the outer edges of the blades, at 22, is located between the two followers 12, as is clearly apparent. Now by continuing the movement of the controller outward the blade 9 remains set, but as the follower of the blade 10 enters the bend 21 of its cam-slot the said blade is given an additional angular movement, as shown in Fig. 6, both blades then being positioned for full speed astern, indicated by arrow B. The crossing point 22 of the outer edges of the two blades is now wholly at the right of both of the followers 12.

Inasmuch as a screw blade usually has more slant near its axis of rotation I have found it desirable to turn the blades so that their outer edges are at a greater angle when they are in reversed position, Fig. 6, than when they are in forward position, Fig. 4, so that at neutral position the additional angle of the then fully reversed blade, viz: the blade 9 in Fig. 5, will compensate for the decreased angle of its central portion and thereby balance the forward pull of the other blade 10. This increased angularity can be seen in Figs. 5 and 6, for in the former it will be seen that the angle of the reversed blade 9 is greater than its angularity when set forward, as in Fig. 4, and in Fig. 6 the angle between the two blades is greater than in Fig. 4.

When in reversed position, however, the blades are set properly with relation to each other, each being set at the same angle with relation to the axis of the shaft 1, so that the two blades act with uniformity of effort.

It will understood from an inspection of the drawings that when changing from the position shown in Fig. 6 to that shown in Fig. 4 the blade 10 will be given its full movement angularly before the change in the angularity of the blade 9 is begun.

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

1. A shaft adapted to be rotated in one direction at a substantially uniform speed, a propeller mounted thereon comprising two oppositely located and angularly-movable blades, and a single means to reverse the angularity of said blades and connected with both, said means operating to turn one blade to full reversed position while holding the other blade in its original position and thereafter turning the last-mentioned blade to its full reversed position while the first-named blade is maintained in full reversed position.

2. A propeller having two oppositely located blades, and means, including a single member permanently connected with both blades, to vary the relative angularity of the blades from either extreme position to a neutral position, said means turning one blade to full reversed position while maintaining the angularity of the other blade unchanged.

3. In a reversing propeller, angularly movable screw blades, and means, including a single member permanently connected with both blades to change the angularity of the blades so that the angle between the blades at their outer ends is greater when said blades are in reverse position than when they are in their forward position, said means completely reversing one blade before beginning the reversing movement of the other blade.

4. In a reversing propeller, two angularly movable blades, and means including a single member permanently connected with both blades to turn one blade to substantially full reverse position before the reversing movement of the other blade begins, whereby a substantially constant load is maintained on the motor.

5. A shaft adapted to be run in one direction at a substantially uniform speed, two oppositely extended and angularly movable propeller blades mounted thereon, and means common to both blades, movable longitudinally of the shaft and operatively connected with said blades to turn one blade to full reversed position before beginning the reversing movement of the other blade, said means retaining the first-named blade in full reversed position, while the movement of the other blade is effected by said means.

6. A propeller having two screw blades, in which one blade at extreme reverse position neutralizes the effect of the other blade at extreme forward position, and means including a single member permanently connected with both blades to control the position of the blades, said means reversing one blade before beginning the reversing movement of the other blade.

7. In a reversing propeller, two oppositely extended, angularly movable blades, and means to turn one blade from full forward position to full reversed position, and at a greater angle, before acting upon and beginning the reversing movement of the other blade, whereby at neutral position the greater angle of the reversed blade compensates for the decreased angle of its central portion, and balances the opposite pull of the other blade.

8. A shaft adapted to be rotated in one direction, propeller blades mounted thereon and angularly movable about their own axes, and a single means to reverse completely the position of one of the blades and thereafter start and complete the reversal of the other blade and increase the angularity of the outer edges of the blades when in reversed position over such angularity when the blades are in forward position, said means being permanently connected with both the blades.

9. In a two-bladed reversing propeller, in which the blades are angularly movable, means, including a single controlling member, to start the movement of one blade to reverse position and substantially complete such movement before the movement of the other blade begins, whereby a substantially constant resistance is maintained on the motor.

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

OLIVER A. BOWERS.

Witnesses:
WALTER F. ROPER,
EDWARD F. ALLEN.