No. 864,190. PATENTED AUG. 27, 1907.

J. H. PIERCE.

PROPELLER.

APPLICATION FILED JAN. 7, 1907.

2 SHEETS—SHEET 1.

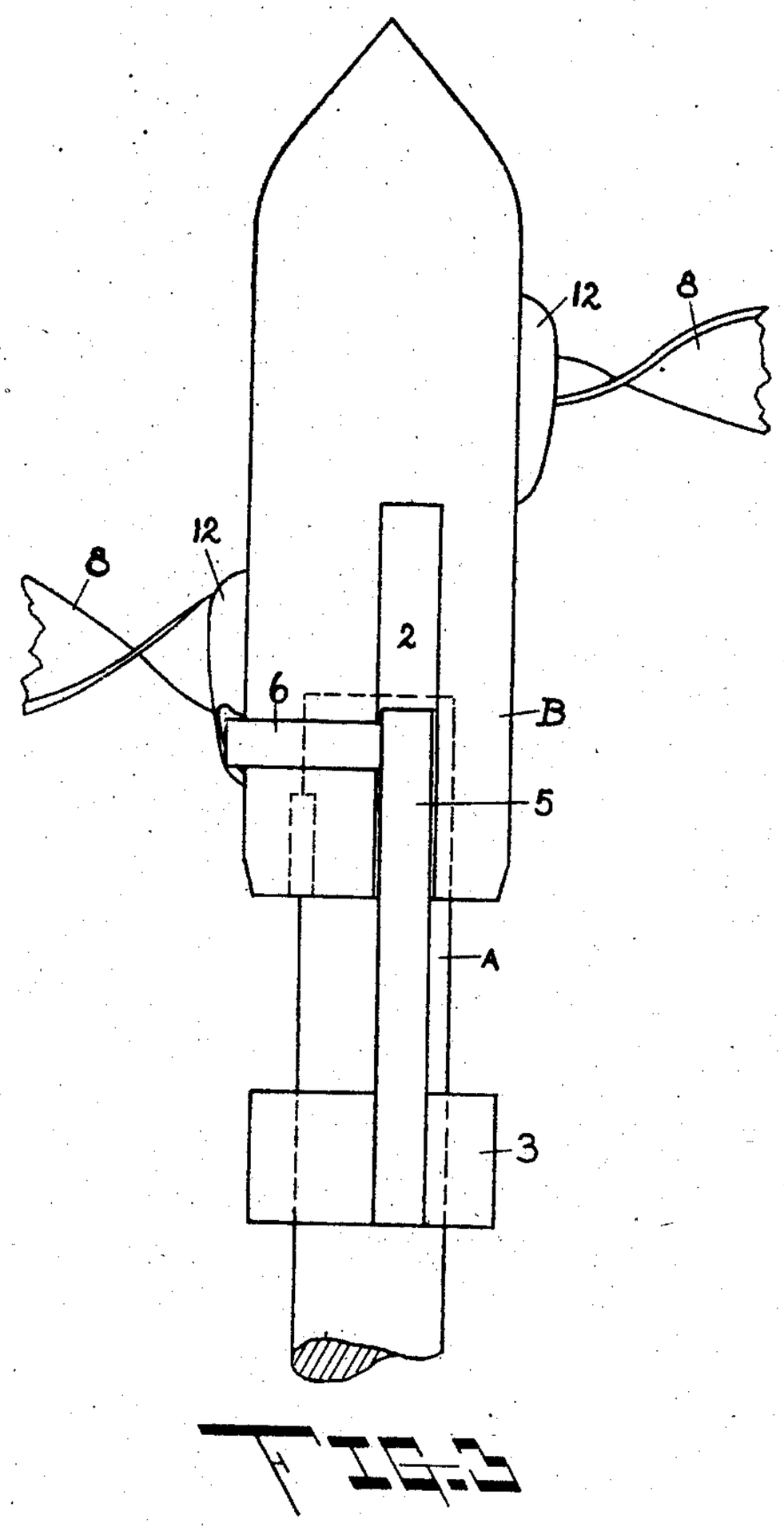

FIG. 3

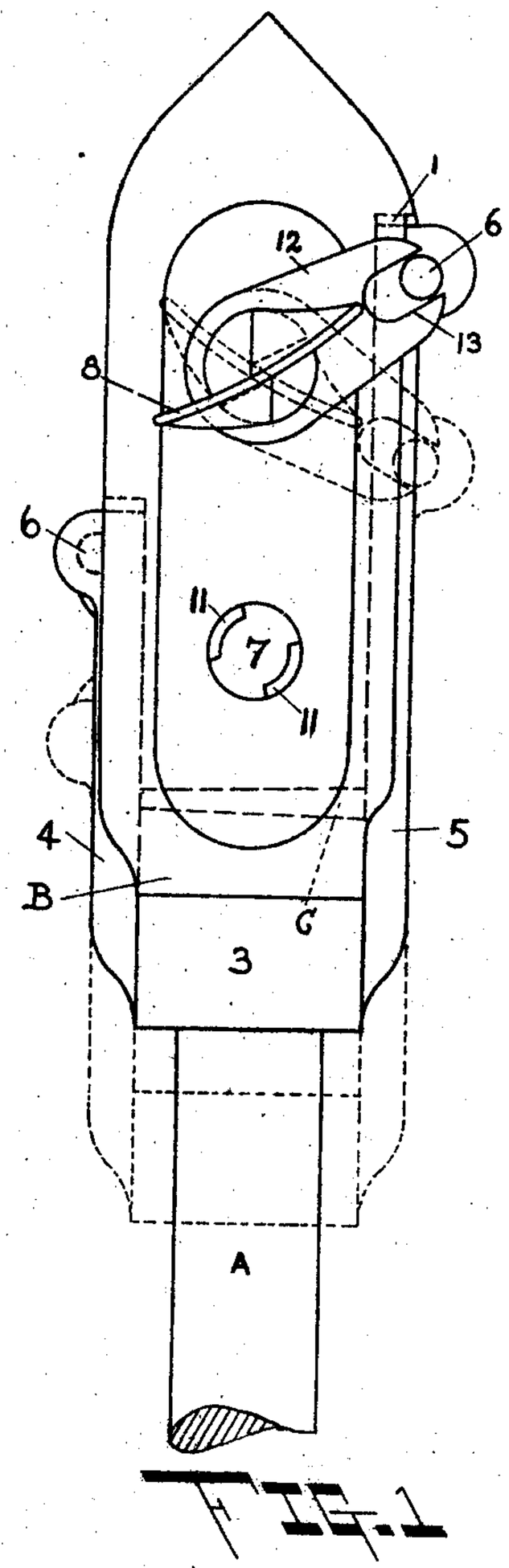

FIG. 1

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2 SHEETS—SHEET 2.

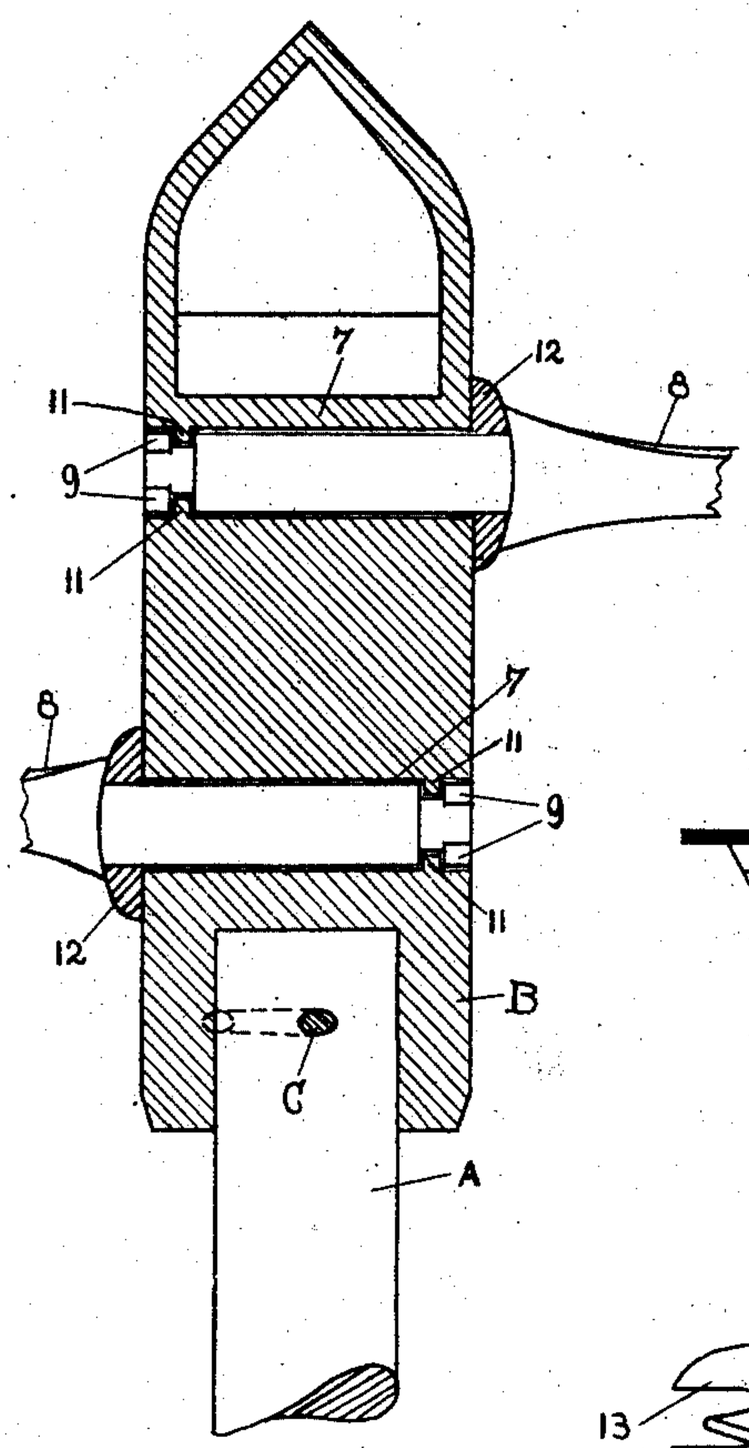

FIG. 2

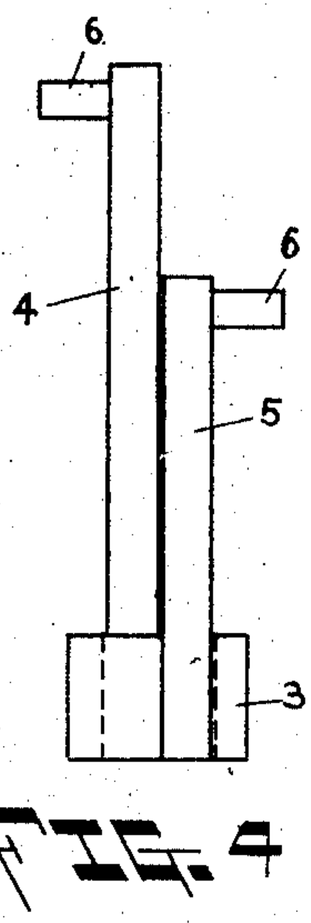

FIG. 4

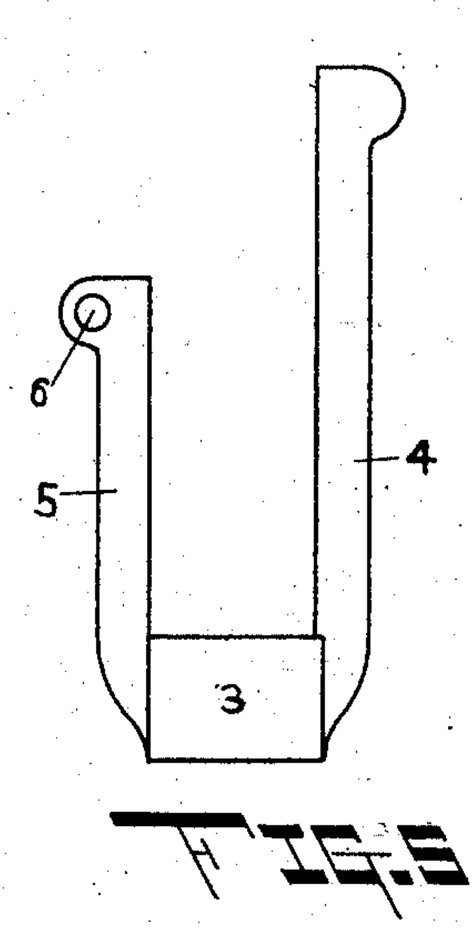

FIG. 5

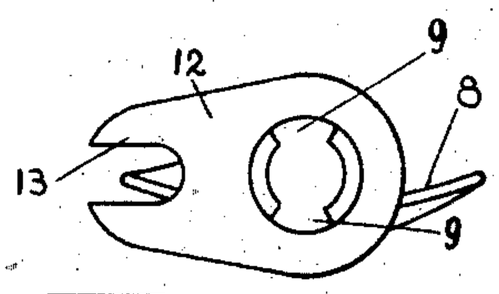

FIG. 6

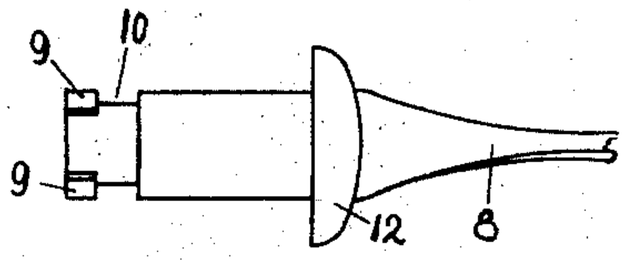

FIG. 7

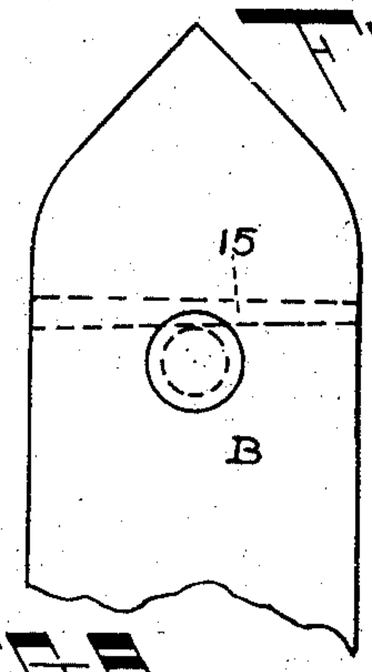

FIG. 8

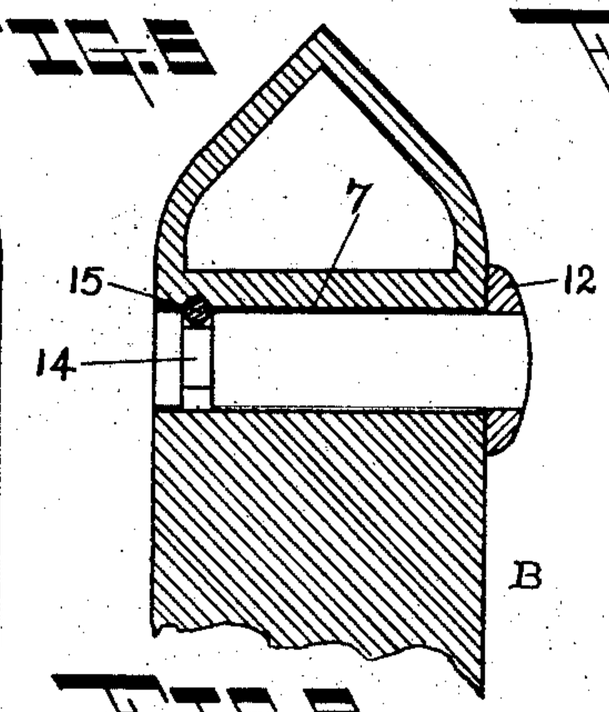

FIG. 9

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UNITED STATES PATENT OFFICE.

JAMES H. PIERCE. OF BAY CITY, MICHIGAN, ASSIGNOR TO SMALLEY MOTOR COMPANY, LIMITED, OF BAY CITY, MICHIGAN.

PROPELLER.

No. 864,190. Specification of Letters Patent. Patented Aug. 27, 1907.

Application filed January 7, 1907. Serial No. 351,209.

To all whom it may concern:

Be it known that JAMES H. PIERCE, a citizen of the United States, residing at Bay City, in the county of Bay and State of Michigan, has invented certain new and useful Improvements in Propellers; and he does hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to propellers, one object being to provide a device of this character wherein the drag on the propeller caused by the dead water lying between the blades is avoided.

Another object is the provision of means for more easily and quickly accomplishing the reversal of the blades with a less expenditure of strength than heretofore.

A further object is the provision of a propeller having a hub adapted to receive the shanks of the propeller blades passing diametrically therethrough, whereby a larger bearing is afforded the shanks and the size of the hub reduced, as well as affording a better leverage for reversing the blades.

A still further object is the provision of an approximately cylindrical hub which does not tear up the water to any appreciable extent.

Still another object is the provision of a bearing in the hub to receive a longer shank which is locked to the hub at that end opposite the blade, whereby a long journal bearing is afforded and the strain and stress on the parts reduced.

A further object is the provision of a propeller comprising a solid hub, the inner end of which is secured to the outer end of the shaft without the use of screw threads, the hub being apertured diametrically to receive the shanks of the blades.

Another object is the provision of a propeller blade in combination with its hub, the blade having a long neck or shank to afford a longer bearing surface and resist the strain caused by the turning of the blade in the water.

To these and other ends, therefore, my invention consists in certain novel features and combinations, all of which will be more fully described hereinafter, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a side view of my invention, Fig. 2 is a longitudinal cross sectional view therethrough, Fig. 3 is a top plan view of the propeller, Figs. 4 and 5 are detail views of the yoke, Figs. 6 and 7 are detail views of the shank and propeller blade, and Figs. 8 and 9 are detail views of a modified means for securing the shanks in position.

(A) indicates the rear end of the propeller shaft receivable in the forward end of the propeller hub (B), to which it is keyed, as shown, and I may also secure the hub and shaft together by means of a tapered pin (C) to prevent accidental disconnection, the pin being easily driven out, its ends lying flush with the grooves (1) and (2), hereinafter described.

The propeller hub is approximately cylindrical and has two parallel longitudinally extending grooves (1) (2) formed therein, the grooves being located on opposite sides of the hub and somewhat out of direct alinement with each other. Furthermore, the groove (1) is longer than the groove (2). A yoke comprising a collar (3) slidable on the propeller shaft and arms (4) (5) projecting from the collar is provided, the arms being of different lengths and lying out of lateral alinement with each other. These arms are received in the respective guide grooves (1) (2), and at their ends are provided with the oppositely projecting pins (6) (6), for a purpose hereinafter set forth. The yoke is connected with a lever (not shown), whereby the yoke is reciprocated on the shaft (A).

The propeller hub is provided with the parallel apertures (7) (7) passing diametrically therethrough from side to side, one of the apertures being in advance of the other, and while I have illustrated a two-bladed propeller, the number of blades may be increased without departure from the invention. These apertures passing diametrically through the hub afford a long journal bearing for the shanks of the propeller blades, thus permitting the use of a long shank and obtaining a better leverage from the longitudinal center of the shank to the pin (6) on the yoke arm, which advantage cannot be obtained by incasing the rear end of the shaft in the hub and mounting the short shanks in the casing.

It will be observed that I do not extend the shaft through the hub, and hence I am able to aperture the hub centrally and extend the shanks therethrough. The advantage thus obtained is considerable, since there is a great strain on the blades when turning in the water and a short neck or shank would be liable to snap or break off, whereas the long bearing resists the strain. Furthermore, by mounting the blades centrally of the hub rather than offset or tangentially, I reduce the vibration imparted to the vessel, and at the same time reduce the strain on the blades while obtaining just as effective operation or contact with the water. Also by mounting one blade in advance of the other, I reduce the amount of drag on the propeller caused by the "dead water" between the blades. Again the offset arms (4) and (5) enable me to provide an approximately cylindrical hub which will not break up the water during rotation, and also permits the use of a smaller hub than could be employed if the yoke was incased within the hub.

By keying the inner end of the hub to the rear end of

the shaft, I avoid the necessity of threading the parts, which is more laborious and also creates a liability of working loose.

The propeller blades (8) (8) project from opposite sides of the hub, one blade lying in advance of the other. The shanks of the blades are cylindrical, and journaled in the respective apertures (7) (7), and I prefer to cut away the ends of the shanks to leave the oppositely located segmental flanges (9) (9), an annular groove (10) being formed on the end of the shank behind the flanges.

The apertures (7) (7) are provided with segmental ribs (11) (11) located near, but preferably not at the opposite inner ends of the apertures. The shanks are inserted into the apertures from the outer ends, the ribs and flanges being so located relative to each other that the shanks can only be received in the apertures when the blades occupy an abnormal position, the flanges passing between the ribs, after which the shanks are given a quarter turn, whereby they are locked in position. Thus the shanks are permitted an oscillatory movement in the apertures to reverse the propeller blades without danger of becoming disengaged from the apertures, since the stationary ribs in such apertures project into the annular grooves in the shanks at all times when the blades are in normal position and lie against the flanges.

Instead of using the segmental ribs and flanges, however, I may use the constructions shown in Figs. 8 and 9, wherein the shanks are provided, near, but not at their ends, with semicircular peripheral grooves (14), and tapered keys (15) are driven through the hub tangentially of the shanks in such manner as to enter the grooves to permit rotary, but not longitudinal movement of the shanks.

Located at the juncture of the shank and blade of each propeller blade is a laterally extending foot (12) slotted at its outer end, as shown at (13), the foot limiting the inward movement of the shank and lying just outside the aperture. This foot is of such length that its outer or free slotted end lies adjacent one of the pins (6), which is receivable in the slot. Thus the reciprocation of the yoke will operate to partially rotate the shanks and shift or reverse the inclinations of the blades when going ahead or backing.

The collar (3) lies close to the end of the hub when the boat is going ahead, so that no sticks, leaves or other extraneous material can lodge between the hub and collar, and in view of the fact that the boat is generally traveling forwardly, this operates to reduce the resistance offered the water during the rotation of the propeller. In going backward, the collar is moved forwardly drawing the arms therewith and causing a partial rotation of the shanks to reverse the inclination of the blades. It will be observed that the yoke arms lie outside the hub and are not incased therein.

To remove the blades, all that is necessary is to slide the yoke forwardly far enough to withdraw the pins (6) (6) from the slots (13) (13) of the feet, whereupon the feet and shanks can be turned until the flanges on the shanks register with the spaces between the ribs of the apertures, so as to permit the withdrawal of either or both of the shanks. Or if the tapered keys (15) are employed for fastening the blades and shanks to the hub, all that is necessary is to knock out the keys, whereupon the blades may be freely removed and replaced.

From the foregoing, it is evident that I have devised a simple compact propeller, wherein the disadvantages of former constructions have been obviated and the cost reduced, as well as obtaining advantages and combinations not hitherto disclosed.

Having thus fully disclosed my invention, what I claim as new is—

1. In a propeller, the combination with a shaft, of an approximately cylindrical hub secured to the extreme rear end of the shaft and extending rearwardly of the shaft, the hub provided with diametrically extending apertures, one located in advance of the other and passing centrally of the hub, shanks oscillatory within the apertures, blades carried by the shanks, the hub provided with offset grooves of different lengths, arms of unequal lengths slidingly received in the respective grooves, a collar slidingly mounted on the shaft, the collar normally lying against the forward end of the hub, the arms connected to the collar pins carried by the arms, and laterally projecting feet located at the juncture of the shanks and blades, the outer ends of the feet being slotted to receive the pins on the arms, the reciprocation of the arms operating to reverse the propeller.

2. A propeller comprising a shaft, an approximately cylindrical hub secured to the rear end of the shaft whereby the latter does not extend longitudinally through the hub, the hub provided with solid bearings extending diametrically and continuously therethrough from side to side, propeller blades, shanks carried by the blades, the shanks received in the bearings, operating means located exteriorly of the hub, and means carried by the blades exteriorly of the hub with which means the operating means engages to reverse the blades.

3. In a propeller, the combination with a shaft, of a hub secured thereto and provided with apertures, blades, shanks carried by the blades and journaled in the apertures, the hub provided exteriorly of itself with oppositely located longitudinally extending grooves of varying lengths offset relative to each other, a collar slidable on the shaft, offset arms of varying lengths carried by the collar and receivable in the respective grooves and means connecting the arms and shanks to oscillate the latter.

4. In a propeller, the combination with a shaft, of a hub secured thereto and extending rearwardly of the shaft, the hub provided with diametrically extending apertures, one located in advance of the other, segmental ribs located near the respective inner ends of the apertures, shanks journaled in the apertures, segmental flanges carried by the shanks and adapted to pass between and lie against the segmental ribs in the apertures, blades carried by the shanks and means for oscillating the shanks in the apertures to reverse the blades.

5. In a propeller, the combination with a shaft, of a hub secured to the outer end thereof, the hub provided with diametrically extending apertures, one located in advance of the other, shanks journaled in the apertures and having peripheral grooves near their respective inner ends, tapered keys passing transversely through the hub and intersecting the peripheral grooves, blades carried by the shanks and means for reversing the blades.

In testimony whereof, he affixes his signature in presence of two witnesses.

JAMES H. PIERCE.

Witnesses:
GEO. B. WILLCOX,
RALPH S. WARFIELD.