No. 861,612. PATENTED JULY 30, 1907.

A. B. SHULTZ.

REVERSIBLE PROPELLER.

APPLICATION FILED NOV. 20, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

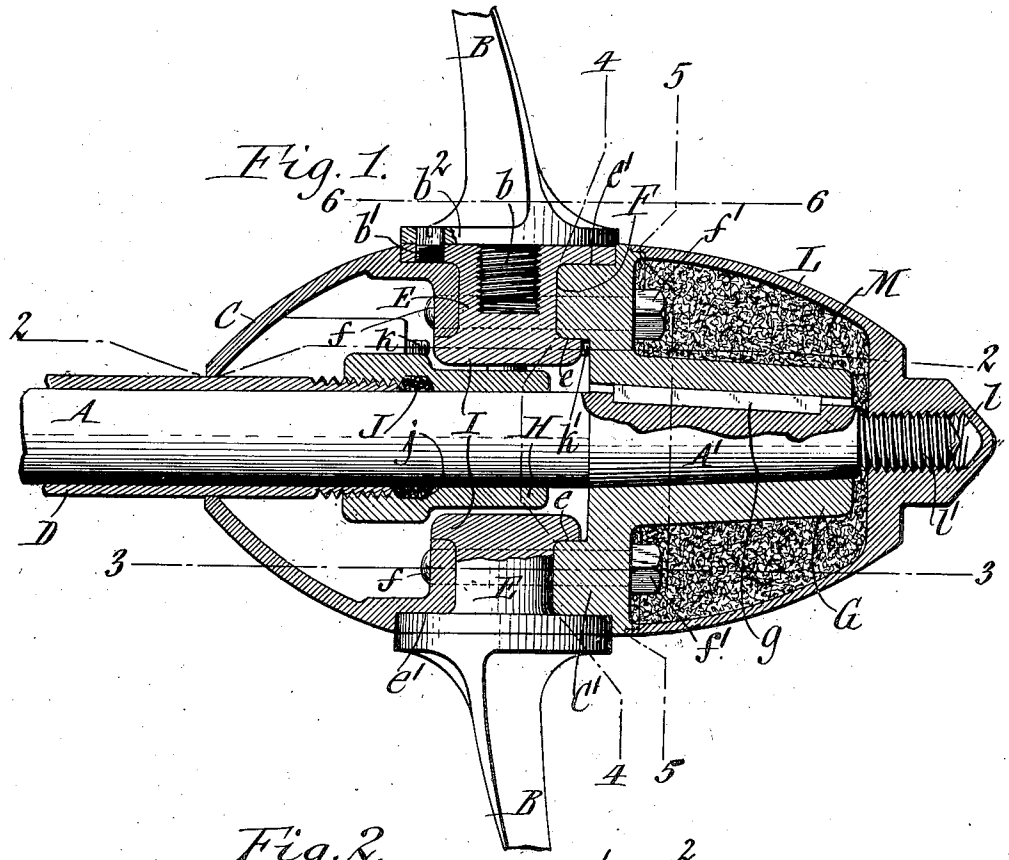
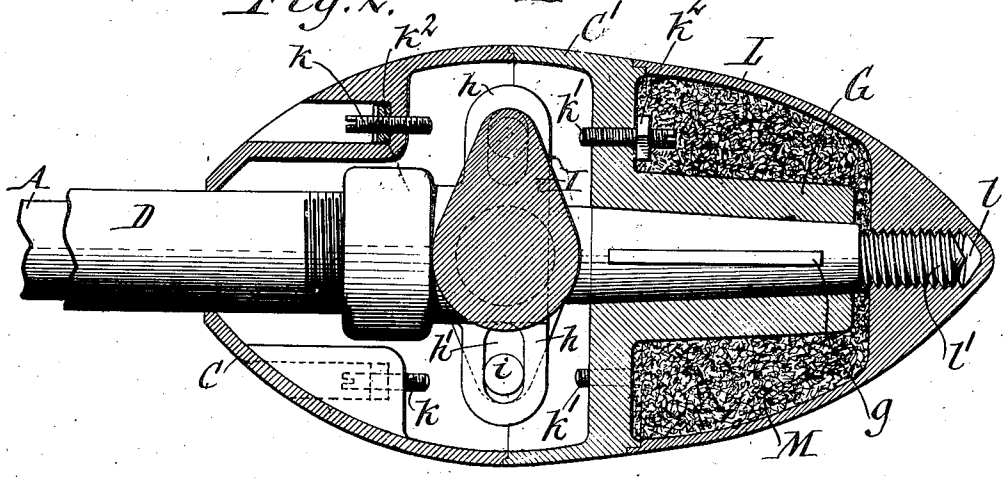


Fig. 2.



Witnesses:
Louis W. Gratz.
Emma M. Graham.

Albert B. Shultz
Inventor
by Geyer & Popp
Attorneys.

No. 861,612. PATENTED JULY 30, 1907.

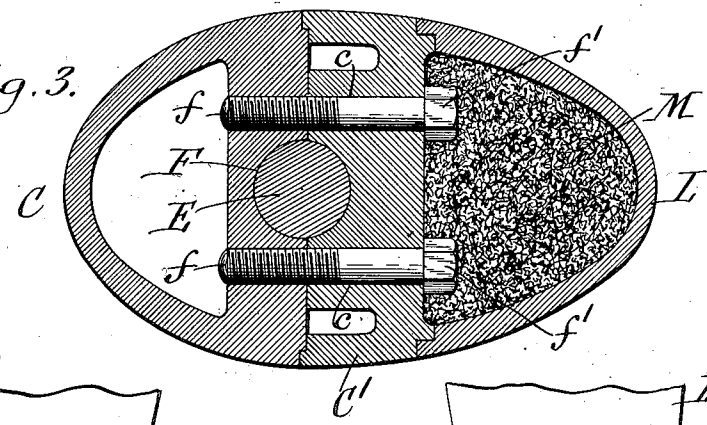
A. B. SHULTZ.

REVERSIBLE PROPELLER.

APPLICATION FILED NOV. 20, 1905.

2 SHEETS—SHEET 2.

Fig. 3.



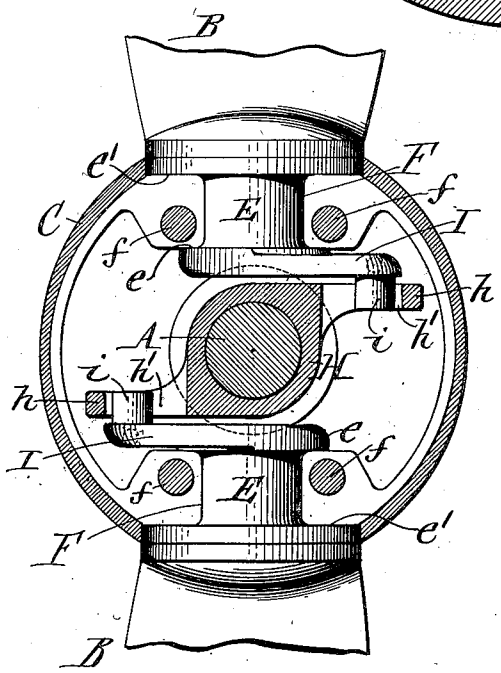


Fig. 4.

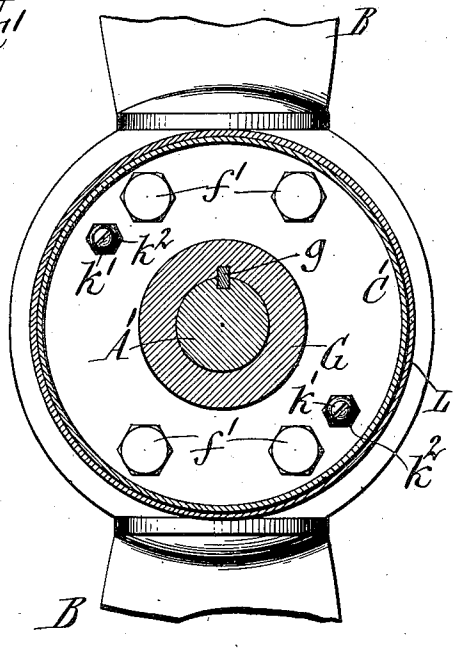


Fig. 5.

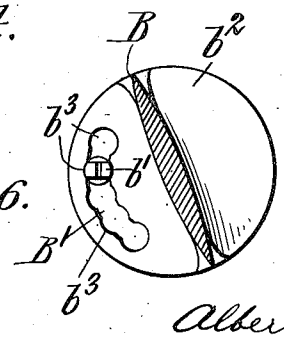


Fig. 6.

Witnesses:
Louis W. Gratz.
Emma M. Graham.

Albert B. Shultz Inventor
by Geyer & Popp
Attorneys.

UNITED STATES PATENT OFFICE.

ALBERT B. SHULTZ, OF BUFFALO, NEW YORK.

REVERSIBLE PROPELLER.

No. 861,612. Specification of Letters Patent. Patented July 30, 1907.

Application filed November 20, 1905. Serial No. 288,099.

To all whom it may concern:

Be it known that I, ALBERT B. SHULTZ, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Reversible Propellers, of which the following is a specification.

This invention relates to reversible propellers such as are commonly employed on motor boats to permit of reversing the movement of the boat while the motor continues to move in the same direction.

The object of this invention is to produce a simple, compact and durable propeller of this character in which the power is transmitted to the blades most effectively and the blades can be adjusted easily, in which the parts are secured together so that they are held reliably in place but can be readily dismembered when necessary, and in which the joints are packed so as to effectually prevent water from reaching the boat.

In the accompanying drawings consisting of 2 sheets: Figure 1 is a longitudinal section of my improved reversible propeller, the section being taken centrally through the same. Figs. 2 and 3 are longitudinal sections taken in lines 2—2 and 3—3, Fig. 1, respectively. Figs. 4 and 5 are transverse sections taken in lines 4—4 and 5—5, Fig. 1, respectively. Fig. 6 is a section in line 6—6, Fig. 1.

Similar letters of reference indicate corresponding parts throughout the several views.

A represents the driving shaft of the propeller, B, B the screw blades, C, C^1 the front and rear sections of the hub on which the blades are pivoted and D the shifting or adjusting sleeve forming part of the mechanism whereby the blades are reversed. As shown in the drawings, two blades are employed but this number may be varied. The two hub sections are joined transversely and are hollow so as to form a chamber between them which receives the blade adjusting mechanism.

Each of the blades is provided at its inner end with a wrist E which is journaled in a divided bearing F formed partly in each hub section at the joint between the same. The sections of the hub are connected by screws *f* two of which are preferably arranged on opposite sides of each wrist bearing, each screw being arranged in an opening *c* formed in the rear hub section parallel to the driving shaft and engaging its threaded front end with a threaded opening in the opposing front hub section while its head *f*^{1} bears against the rear side of the rear hub section, as shown in Fig. 3.

Each of the wrists is held against endwise or axial movement in its bearing by inner and outer shoulders *e*, *e*^{1} formed on the wrist and engaging with the inner and outer ends of its bearing. For the purpose of enabling a blade to be renewed when broken without requiring its wrist to be also replaced these parts are made separate and detachably connected. The preferred means for this purpose shown in Figs. 1 and 4 of the drawings consist in providing the inner end of the blade with a screw threaded shank *b* which engages with a correspondingly-threaded socket in the outer end of its wrist. This means of connecting the blade with its wrist permits of readily removing the blade when broken and replacing the same by a new one without requiring the entire propeller to be dismembered.

In order to prevent the blades from unscrewing from the wrists each blade is interlocked with its wrist by a locking screw *b*^{1} having its inner end threaded and engaged with a threaded opening in the wrist while its outer end or head is oblong and arranged in a curved or segmental slot B^1 formed in the flange *b*^{2} at the base of the blade and having enlargements *b*^{3} at intervals. After the blade has been screwed into the wrist the locking screw is passed through one of the enlargements of the slot B^1 and also screwed into the wrist. Upon leaving the locking screw stand so that the major axis of its oblong head is arranged transversely relatively to the slot B^1 the wide part of the head engages with the respective enlargement of its slot, as shown in Fig. 6, thereby preventing the blade from turning relatively to the wrist. If any looseness develops between the blade and wrist after the propeller has been in use, this can be easily taken up without removing the locking screw *b*^{1} as it is only necessary to give this screw a quarter turn to disengage its wide part from the enlarged part of the slot B^1, then turning the blade for taking up the slack between the same and its wrist and then turning the locking screw so that its wide part engages with another enlargement of the slot B^1.

The preferred means for connecting the driving shaft with the hub consists in forming a conical extension or boss G on the rear side of the rear hub section and engaging the same by the tapered rear part A^1 of the shaft, and a key *g* connecting the shank and boss, as shown in Figs. 1, 2 and 5. This means of connecting the shaft and hub of the propeller is very secure and also causes the blades to be driven from the rear side which enables the same to work more effectively and reliably than when driven from the front side.

The shifting or adjusting tube surrounds the driving shaft and extends through an opening in the front end of the front hub section. At its front end the shifting sleeve is connected with any suitable means for reciprocating the same longitudinally on the shaft and its rear end is operatively connected within the hub sections with the wrists of the blades for turning the same in one direction or the other. The preferred means for this purpose shown in Figs. 1, 2 and 4 of the drawings, consists essentially of a yoke connected at the rear end with the shifting tube and rocking adjusting arms I projecting outwardly in opposite directions from the inner ends of the wrists and loosely connected with said yoke. The latter comprises a tubular body H which surrounds the driving shaft and connects with the rear

end of the shifting tube and ears h projecting laterally in opposite directions from the body and provided with transverse slots h^1 which receive pins i on the outer ends of the rock arms I. Upon moving the shifting sleeve lengthwise of the driving shaft in one direction or the other this movement is transmitted by the yoke and rock arms to the blades for turning them, so that they work either forward or backward. The connection between the yoke and the shifting sleeve is effected by forming an internal screw thread in the enlarged front end of its body and engaging the same by an external screw thread on the rear end of the shifting sleeve, as shown in Fig. 1. In order to permit of producing a compact construction and bringing the pivots of the blades close to the axis of the driving shaft the rear end of the yoke body is reduced, and the rock arms of the blade wrists are brought close to this reduced part of the yoke body, as shown.

For the purpose of preventing any water which may get into the space within the hub from passing lengthwise between the driving shaft and adjusting sleeve into the boat, a packing J is placed around the shaft and between the rear end of the shifting sleeve and an internal shoulder j in the bore of the yoke body. By this means the yoke serves as part of a stuffing box which prevents leakage into the boat through the shifting sleeve.

k, k^1 represent adjustable stops whereby the limit of the rocking movement of the blades may be varied. These stops preferably consist of screws two of which are arranged on the front and rear hub sections and on opposite sides of each rock arm. Upon turning the rock arms and blades so that they engage the front stop screws k the blades operate to move the boat forwardly and by reversing these parts so that the arms strike the rear stop screws the blades are in position to move the boat backwardly. By adjusting these stop screws and locking them by nuts k^2 the blades can be set at any desired angle when working forward or backward as may be most desirable or to suit different conditions under which the engine and propeller are working.

Heretofore the screws f connecting the hub sections have usually been made of bronze in order to prevent the same from being rusted or otherwise affected injuriously by the water in which the propeller runs. Such screws however are comparatively weak and liable to break when subjected to extraordinary strain. In order to permit of making these screws f of steel which will stand any strain to which the same is likely to be subjected and at the same time prevent corrosion thereof by the water, a cap L is applied to the rear side of the rear hub section and forms a chamber which incloses the heads f^1 of the bolts f. This cap is fitted at its front edge against the periphery of the rear hub-section so as to form practically a continuation of the outer surface thereof and is provided internally at its rear end with a threaded socket l which receives a threaded shank l^1 at the rear end of the driving shaft, as shown in Figs. 1 and 2. The space within the cap L is filled with grease or with a packing M of cotton waste soaked in oil thereby effectually protecting the screws f from the action of the water which is particularly desirable when the propeller is running in salt water, whereby the screws are always maintained in a condition to permit of easily removing the same when desired.

Aside from protecting the screws f by the cap and packing therein these parts also serve to prevent these screws from backing out or loosening and interfering with the working of the propeller. Furthermore, the cap L covers the heads of the screws f and prevents the same from catching in weeds or other obstructions in the water, thereby enabling the propeller to run comparatively free under these conditions.

I claim as my invention:

1. A reversible propeller comprising a hollow hub, wrists pivoted on said hub and provided at their outer ends with blades and at their inner ends with rock arms, a driving shaft rigidly connected with the rear end of said hub, a longitudinally movable adjusting sleeve surrounding said shaft and extending into said hub through an opening in the front end thereof, a yoke mounted on the shaft within the hub and operatively connected with said arms and having an internally screw threaded socket on its front end which engages with an external screw thread on the adjusting sleeve and forming a shoulder at the bottom of said socket which faces the rear end of said adjusting sleeve, and a package surrounding the shaft between the rear end of said adjusting sleeve and the bottom of said socket, substantially as set forth.

2. A reversible propeller comprising a hub having bearings, wrists journaled in said bearings, blades having screw shanks at their inner ends which engage with screw sockets in said wrists, a flange arranged at the base of each blade and having a curved slot which is provided at intervals with enlargements, a locking screw engaging said wrist and having an oblong head arranged in said slot and adapted to engage its wide part with any one of said enlargements, a driving shaft connected with said hub, and means for adjusting said blades operatively connected with said wrists, substantially as set forth.

3. A reversible propeller comprising a hollow hub, a driving shaft connected with said hub, wrists journaled in said hub and having blades at their outer ends and rock arms at their inner ends, a shifting device operatively connected with said arms, and adjustable stops for said arms, substantially as set forth.

4. A reversible propeller comprising a hollow hub composed of front and rear sections having bearings formed in the joint between them, wrists journaled in said bearings and having blades at their outer ends and rock arms at their inner ends, a driving shaft passing through said front hub section and connected with the rear hub section, an adjusting sleeve movable lengthwise on the shaft and extending into the interior of the hub through the front section thereof, a yoke arranged on the rear end of the adjusting sleeve and operatively connected with said rock arms, and adjustable stop screws arranged on said hub sections in front and in rear of said rock arms, substantially as set forth.

5. A reversible propeller comprising a hollow hub composed of front and rear sections, reversible blades journaled between said hub sections, a shaft extending through an opening in the front hub section and connected at its rear end with the rear hub section, an adjusting sleeve surrounding the shaft, connecting means whereby said blades are operatively connected with the adjusting sleeve, a hollow cap having an internal screw thread at its rear end which engages with an external screw thread on the rear end of the shaft and bearing at its front end against the rear hub section, screws connecting the hub sections and having their heads arranged within said cap, and a packing arranged in said hollow cap, said rear hub section being constructed to completely separate the space within the hub from the space within said cap, substantially as set forth.

Witness my hand this 14th day of April, 1905.

ALBERT B. SHULTZ.

Witnesses:
THEO. L. POPP,
E. M. GRAHAM.