L. R. FULDA.

PROPELLER.

APPLICATION FILED APR. 26, 1910.

1,044,371. Patented Nov. 12, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

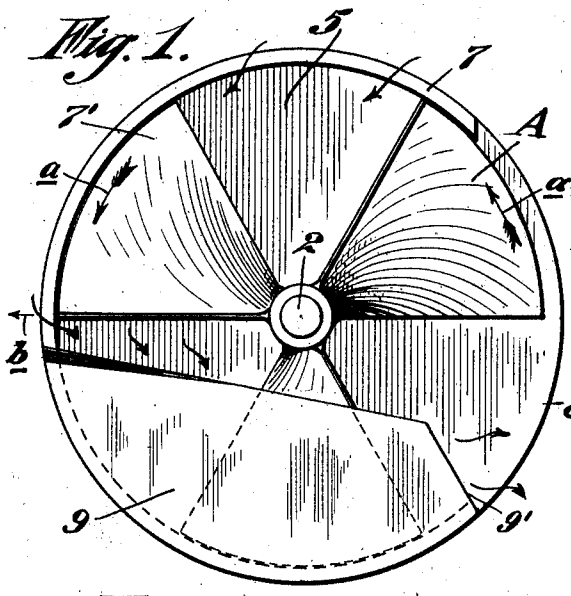


Fig. 2.

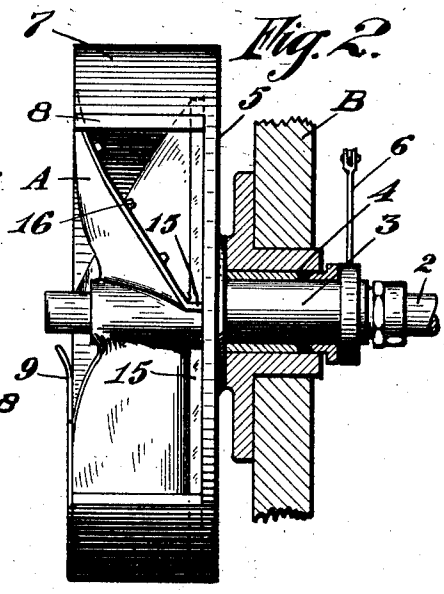


Fig. 3.

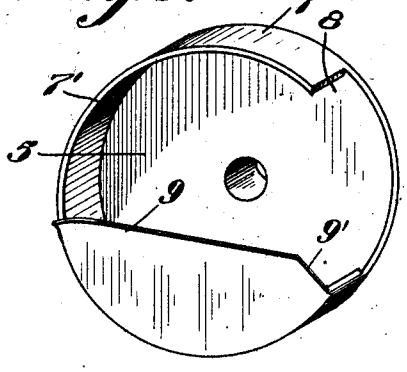


Fig. 4.

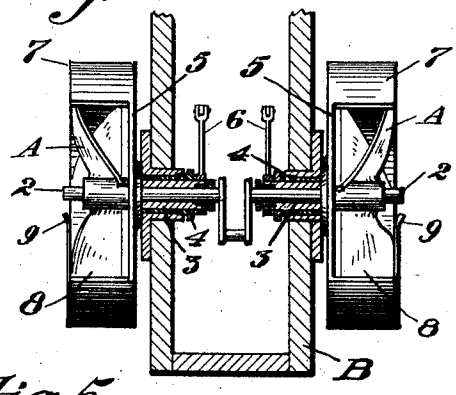
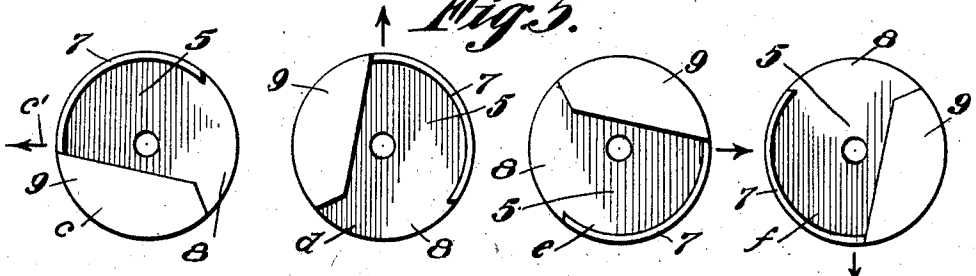


Fig. 5.



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2 SHEETS—SHEET 2.

Fig. 6.

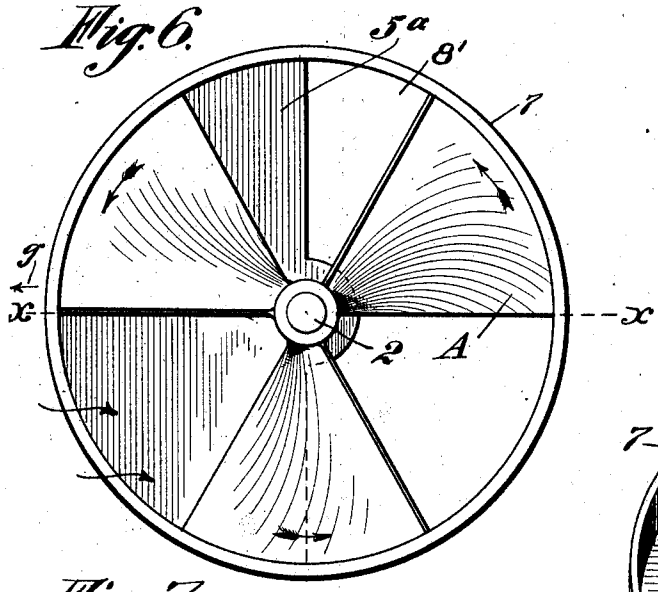


Fig. 8.

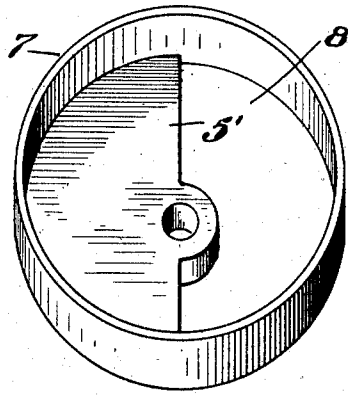


Fig. 7.

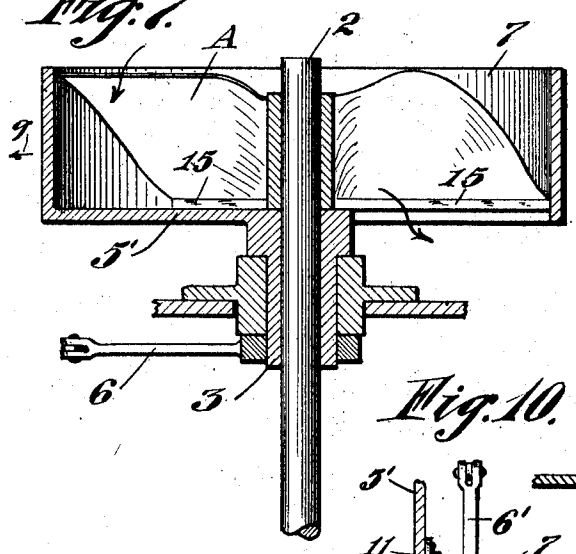


Fig. 9.

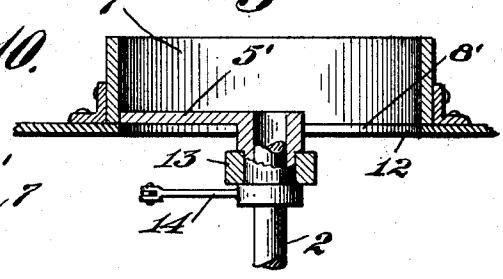
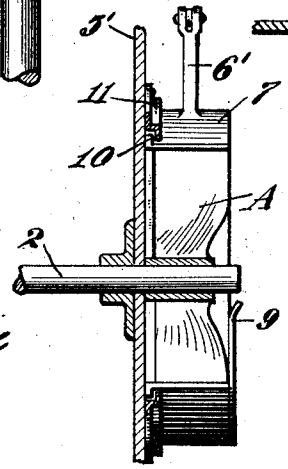


Fig. 10.



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PROPELLER.

1,044,371. Specification of Letters Patent. Patented Nov. 12, 1912.

Application filed April 26, 1910. Serial No. 557,699.

To all whom it may concern:

Be it known that I, LAMARTINE R. FULDA, citizen of the United States, residing in the city and county of San Francisco and State of California, have invented new and useful Improvements in Propellers, of which the following is a specification.

This invention relates to a device for controlling the direction of the propulsive action of propellers.

It is the object of this invention to provide a means for controlling the direction of the propulsive force of propellers without stopping or diminishing the speed of the propellers or their motive power.

A further object is to provide a device which is applicable for use in any situation where propellers are employed, whereby the structure driven by the propellers may be caused to stop, reverse, go ahead, or travel at various speeds without changing the direction of the rotation or altering speed of the propeller.

A device of this nature is especially adapted for use on aerial machines, submarines, and sea-going vessels. It is also suitable for launches and other craft using propellers for their propulsion, and particularly on boats which are designed to travel at a high rate of speed.

The invention consists of the parts and the construction and combination of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a front elevation of my invention. Fig. 2 is a side elevation. Fig. 3 is a perspective view. Fig. 4 is a view depicting the manner of applying the device to the stern of a ship. Fig. 5 shows the successive positions of the direction controlling device for driving in different directions. Fig. 6 is a plan view of a modified form of the invention as applied to aerial propellers. Fig. 7 is a cross section on the line X X Fig. 6. Fig. 8 is a perspective view of the modified form of the invention shown in Figs. 6 and 7. Fig. 9 is a detail in section showing another form of constructing the device shown in Fig. 7. Fig. 10 is a similar view illustrating a different manner of constructing and operating the device shown in Figs. 1 and 2.

In the drawings A represents a propeller which may be of any suitable type or construction, as it is merely a means for obtaining propulsive force, and any propeller in common use may be employed for that purpose. The propeller A, as shown, has, however, been put to a number of practical comparative tests and has been found to be of greater efficiency in propulsive force than any other type of propeller; but as further experiments may result in the employment of other propellers than that here shown, for the purpose of increasing propulsive speed, and as to obtain speed is not the essence of this invention, it can be readily understood that I do not wish to be limited to the use of the particular structure shown.

The propeller A is mounted on a revoluble shaft 2, which may be driven by any desired means and in any suitable manner. In applying the invention to propeller driven ships, the shaft 2 is preferably disposed at right angles to the keel of a vessel B, as shown in Fig. 4, passing through each side, and may be situated at the stern thereof; or a number of drive shafts may be disposed at intervals throughout the length of the vessel, but in either case a propeller blade A would be mounted on each end of the drive shaft 2, so as to act in pairs to produce an even driving action.

The shaft 2 is shown as passing through a sleeve 3, mounted in a suitable stuffing box 4, where it extends through the side of a vessel B, the sleeve 3 being secured to or formed integral with a circular disk or back-plate 5, which is disposed back of and adjacent to the blades of the propeller A. This construction permits of the shaft 2 and propeller A being rotated independent of the sleeve 3 and back-plate 5, which latter is adapted to be revolved freely in either direction, irrespective of the shaft 2, by means of a lever 6 or its equivalent secured to the inner end of the sleeve 3, which may be operated in any suitable manner.

The back-plate 5 is substantially the same diameter as that of the propeller A, and has a flange or rim 7 formed at right angles on its outer periphery, forming a cylinder, the inner face of which follows the curvature of the circle, which bounds the outer periphery of the blades A. The flange 7, or cylinder, may be a portion of the plate 5, or may be suitably secured thereto. In some instances, however, the flange or cylinder 7 may be formed independent of the back-plate 5 and be revolved by any means independent thereof, the object of the plate 5 being merely to

form an essential backing or wall at the rear of the propeller blades A, and is here shown as attached to the flange 7 as a means of transmitting movement to the latter from the interior of the vessel B through the sleeve 3.

The flange or cylinder 7 is designed to be of a height approximately equal to the widest depth of the blades A and may be continuous, that is, to extend entirely around the periphery of the propeller A, as shown in Fig. 6, or it may have a section removed so as to form an open space 8 on one side, as shown in Figs. 1—2—3, a condition depending upon whether the propeller is employed in a vertical position, Figs. 1 and 2, or in a horizontal position, Fig. 7. Where the propeller A is used in a vertical position, as on ships and submarines, the open space 8 in the flange or cylinder 7 extends approximately about one-quarter the distance around the propeller A, as shown in Fig. 1, thus virtually incasing the propeller in a cylinder formed by the flange 7 and back-plate 5, which cylinder is open on one side, as at 8, and one end.

I have found by experiment that the efficiency of the propeller A, when used in conjunction with my invention, was greatly increased by partially closing the front of the cylinder 7 with a plate 9, the upper edge of which terminates at one end just below the center line of the propeller and a short distance above the lower edge of the opening 8 at the other end, the plate 9 being trimmed at 9′ to bring its upper edge down to the cylinder end.

The operation of this form of the invention is as follows, the propeller A being vertically mounted and disposed parallel with the keel of the vessel, instead of at right angles thereto, as in common practice: The propeller A, being rotated in the direction of the arrows *a* Fig. 1, the fluid medium or water in which it operates is drawn in at the open end of the cylinder 7, as indicated by the arrows Fig. 1, and is carried around the interior of the cylinder 7 into the pocket formed back of the plate 9, by the propeller blades A, to be discharged through the open space 8. The volume of fluid forced out of the opening 8 drives the vessel forward in the direction indicated by the arrow *b* Fig. 1, which direction is that on the side of the propeller opposite the opening 8. It will be readily seen that when the cylinder 7 is rotated so as to change the position of the opening 8 in relation to the propeller blade A, the direction of propulsion will be correspondingly changed. This is clearly illustrated in Fig. 5, which shows the cylinder 7 turned in four different positions and indicating by arrows the direction of travel in each position. For instance, with the cylinder *c* the travel will be to the left, with cylinder *d* up, with cylinder *e* to the right, and with cylinder *f* the direction of travel is down.

From the foregoing, it is evident that if a vessel is being propelled in the direction of the arrow C′, Fig. 5, and it is desired to reverse the direction of travel, it is only necessary to give the cylinder 7 a half turn, so as to throw it into the position shown at *e*, Fig. 5, the turning of the cylinder 7 changing the direction of travel without affecting the propeller A. To stop the forward or rearward movement of a vessel while the propellers A are rotating, the cylinder 7 is turned in the position shown at *d* or *f*, Fig. 5, in which position the propulsive action would be to lift the vessel in the water or pull it down, an action which would have but little effect on a large ship other than to bring it to a stand-still, for in this position the direction of the propulsive force is neither ahead nor astern. This feature of the invention, however, can be taken advantage of in submarine construction, as by turning the cylinder to one point, the propellers will act to sink the vessel, and at another point to raise it, while by varying the position of the cylinder on its axis, the vessel may be driven at any angle up or down, ahead or astern. As the turning of the cylindrical flange 7 is essential to the successful operation of this form of the invention and as the flange or cylinder 7 is the essence of the invention, it becomes obvious that any suitable means may be employed by which the cylinder may be revolved. Fig. 10 shows a simple and different manner by which this may be effected. In this form the cylinder 7 is revolubly supported on the face of a stationary back-plate 5′ by means of a flange 10 on the cylinder 7 engaged by a band 11 on the plate 5. A lever 6′ is secured on the cylinder 7 through which the latter may be rotated in any suitable manner.

Where the propeller A is operated in a horizontal position, as shown in Figs. 6 and 7, to produce an upward and horizontal propulsive force, such, for instance, as in flying-machine construction, the cylinder 7 completely surrounds the propeller A, and a portion of the back-plate 5^a is removed as at 8′, so as to form an open space of approximately half the area of the cylinder. In this form the air acted upon by the rotation of the blades A, is drawn in through the open end of the cylinder 7 from above and is discharged through the open space 8′ in a downward direction, thus tending to raise or lift the vessel in an upward direction and at the same time propel it in a horizontal position in the direction of the arrow *g*, Figs. 1 and 2, which direction is toward the side of the cylinder 7 opposite the opening 8′. This being the case, it is readily apparent that an air ship fitted with this in-

vention can be navigated in any direction, as turning the cylinder 7 to right or left to change the position of the opening 8′ changes the direction of the propulsive force of the propeller A. This form of the invention being put to an experimental test in a volume of water, was found to pull equally in an upward and a horizontal position at the same time.

As the changing of the position of the opening 8′ influences the direction of travel, in a manner like that of the opening 8 in the form previously described, it is evident that the same results can be accomplished by mounting the cylinder 7 stationary over a circular opening 12, as shown in Fig. 9, and mounting the back-plate 5′ separately therein, in which case the latter will be supported on a bearing 13 and provided with means for being rotated, such as a lever 14. By turning the lever 14 the back-plate 5′ will be caused to rotate on its axis within the cylinder 7 and thus change the position of the opening 8′.

Each propeller blade A is provided with an outwardly projecting rib or flange 15 on its rear edge, which is designed to contact with the face of the back-plate 5 or 5′ and acts to form a straight or plane surface, against which the fluid medium operated on is impinged; it being found that greater efficiency is obtained in propulsive force where this construction is employed than where the blade A meets the back-plate 5—5′ at an angle. The back of the blades A may also be provided with a number of ribs or corrugations 16, if desired, which act to offer a greater resistance, or prevent a certain slip of the fluid medium, on which the propeller revolves.

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

1. In a device of the character described, and in combination with a propeller, a cylinder completely closed on one side and having an opposite side with an opening which extends from substantially the axis of the cylinder to the periphery of the cylinder at the other side of the axis, said cylinder having a discharge opening in its periphery.

2. In a device of the character described, and in combination with a propeller, a cylinder completely closed on one side and having an opposite side with an opening which extends from substantially the axis of the cylinder to the periphery of the cylinder at the other side of the axis, said cylinder having a discharge opening in its periphery, a shaft, a sleeve on the shaft and fixed to the closed side of the cylinder, and means whereby the shaft and sleeve may be independently rotated.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

LAMARTINE R. FULDA.

Witnesses:
CHARLES EDELMAN,
W. COOK.