L. R. FULDA.

PROPELLER.

APPLICATION FILED NOV. 29, 1909.

970,319.

Patented Sept. 13, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

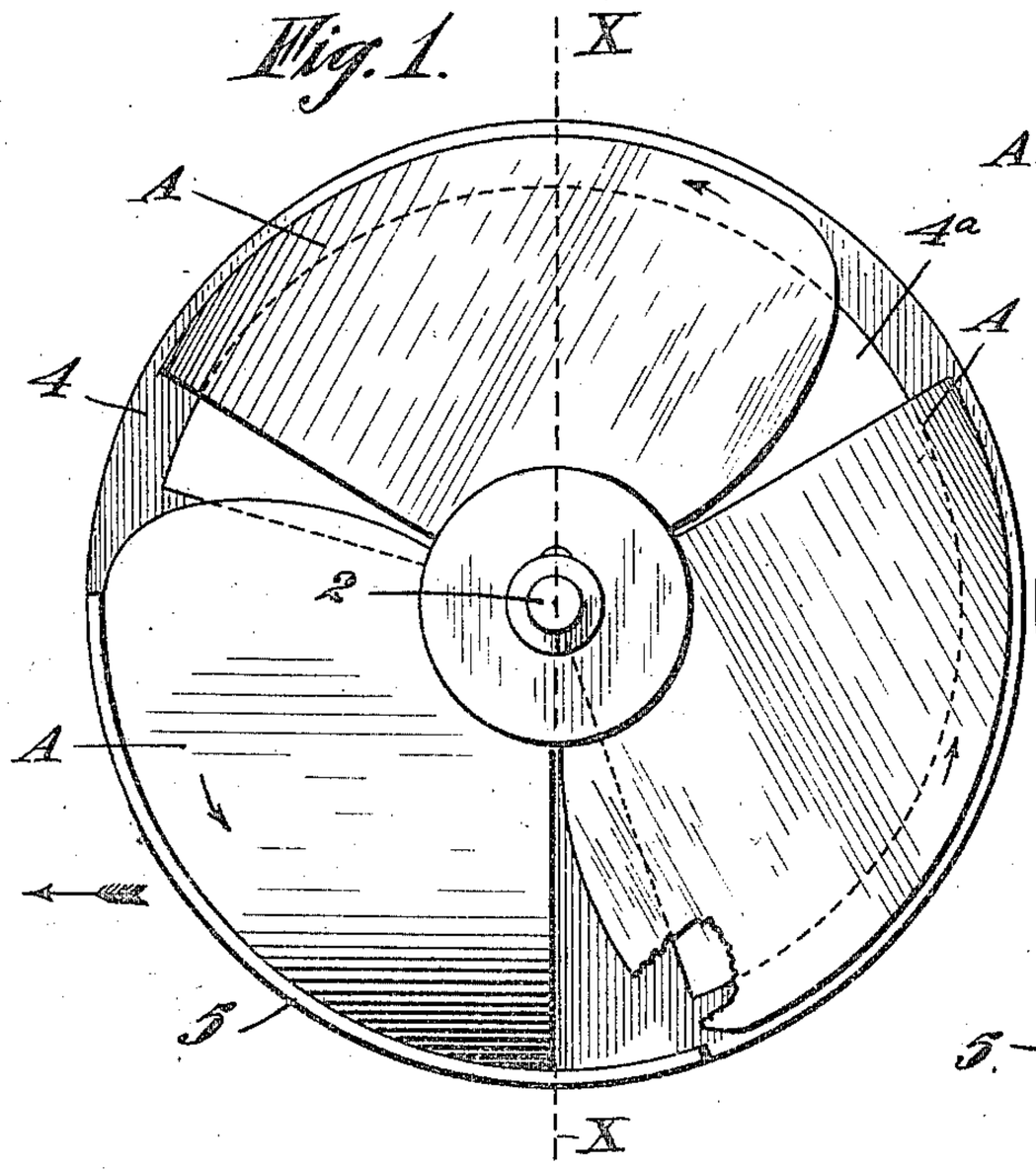


Fig. 2.

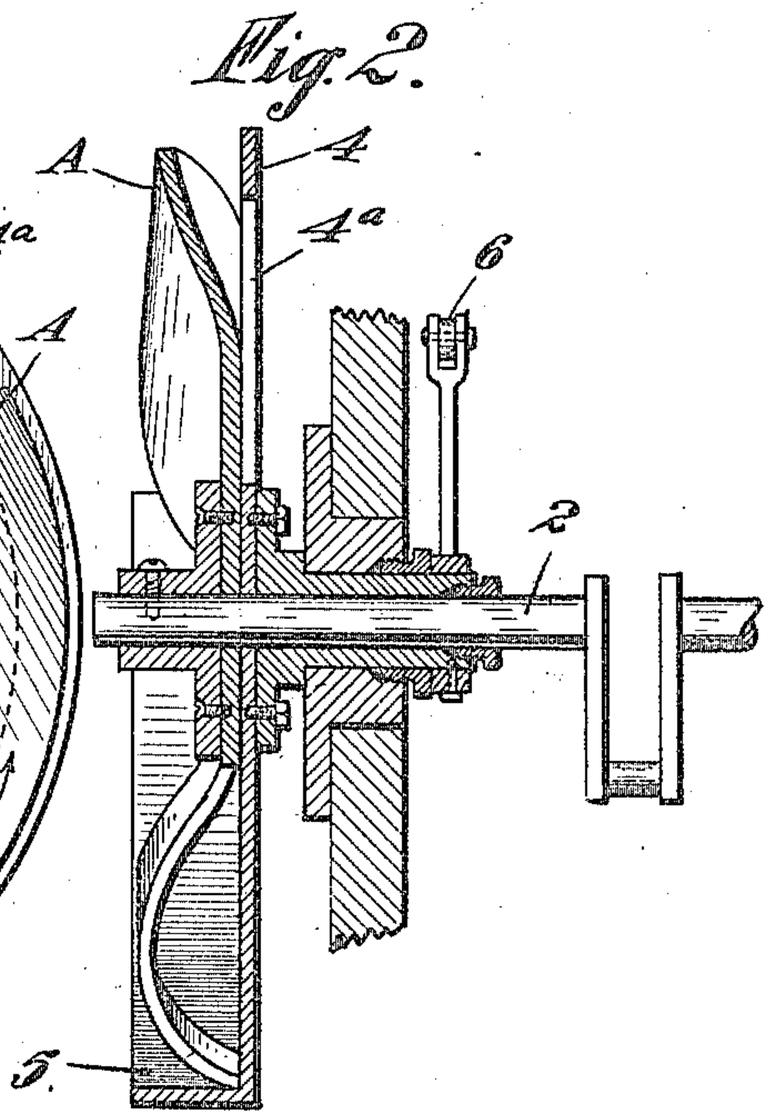


Fig. 3.

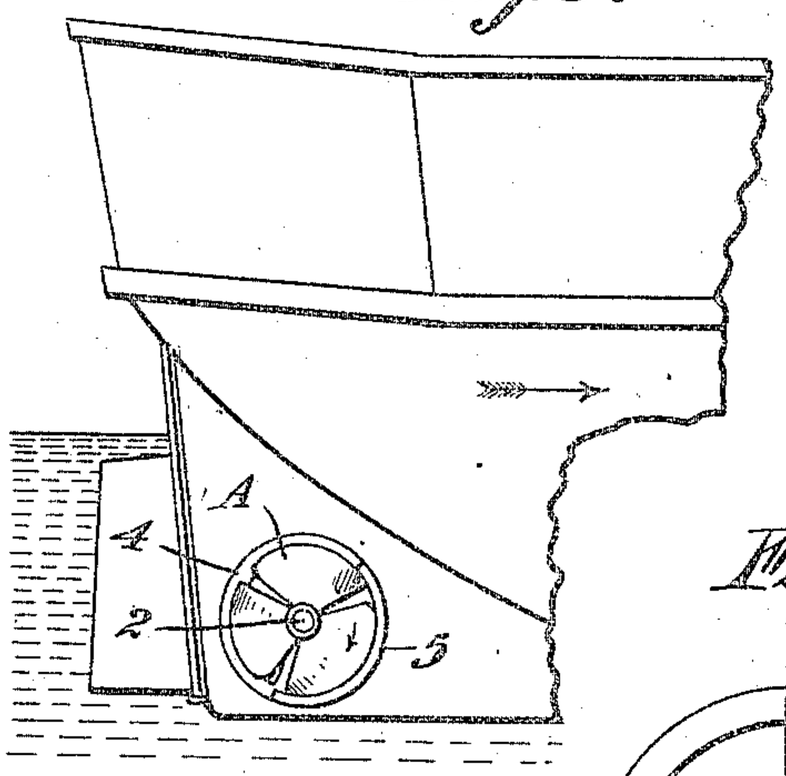


Fig. 4.

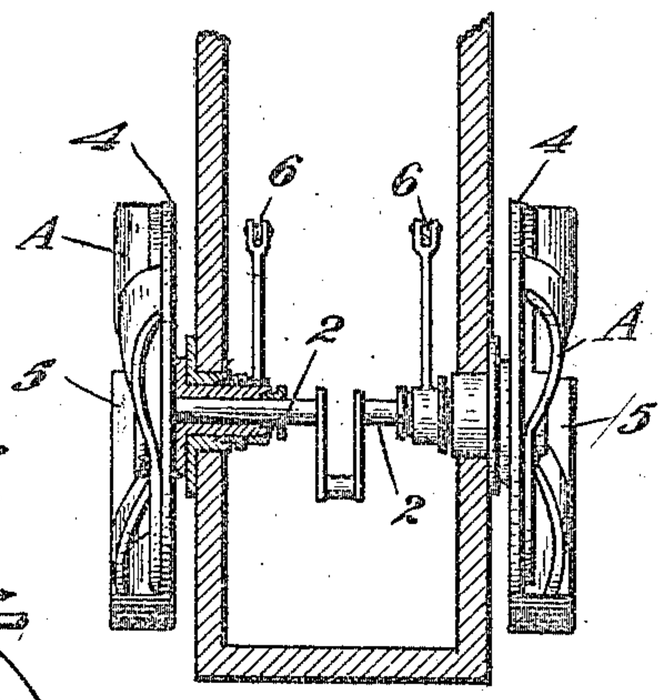
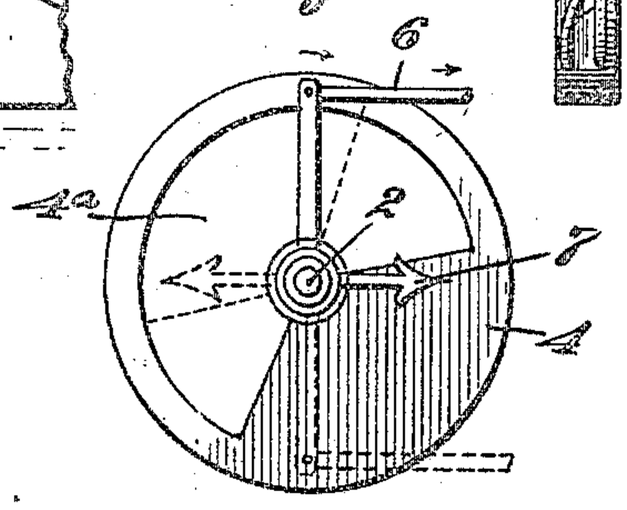


Fig. 5.



Witnesses;

R. S. Besse.

F. E. Maynard

Inventor

Lamartine R. Fulda

By Geo. H. Strong.

His Attorney.

L. R. FULDA.

PROPELLER.

APPLICATION FILED NOV. 29, 1909.

970,319.

Patented Sept. 13, 1910.

2 SHEETS—SHEET 2.

Fig. 6

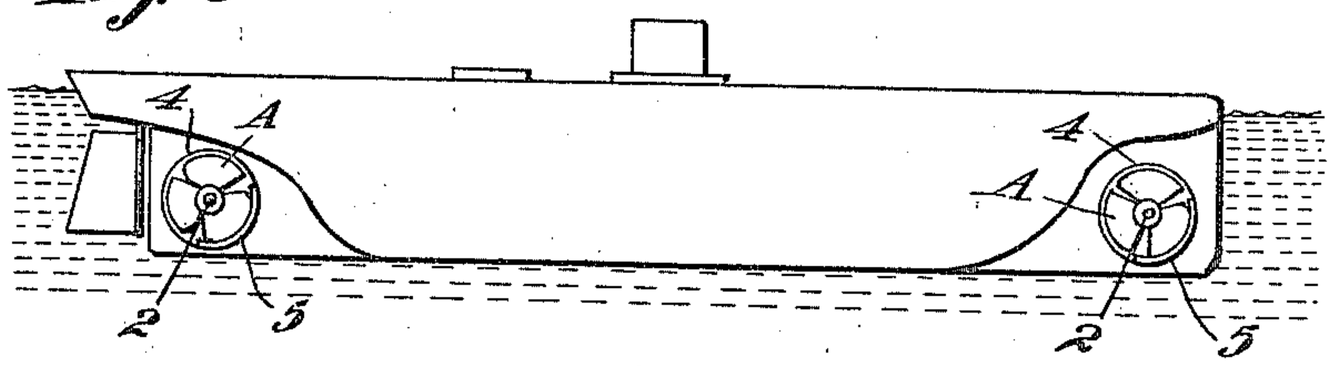


Fig. 7.

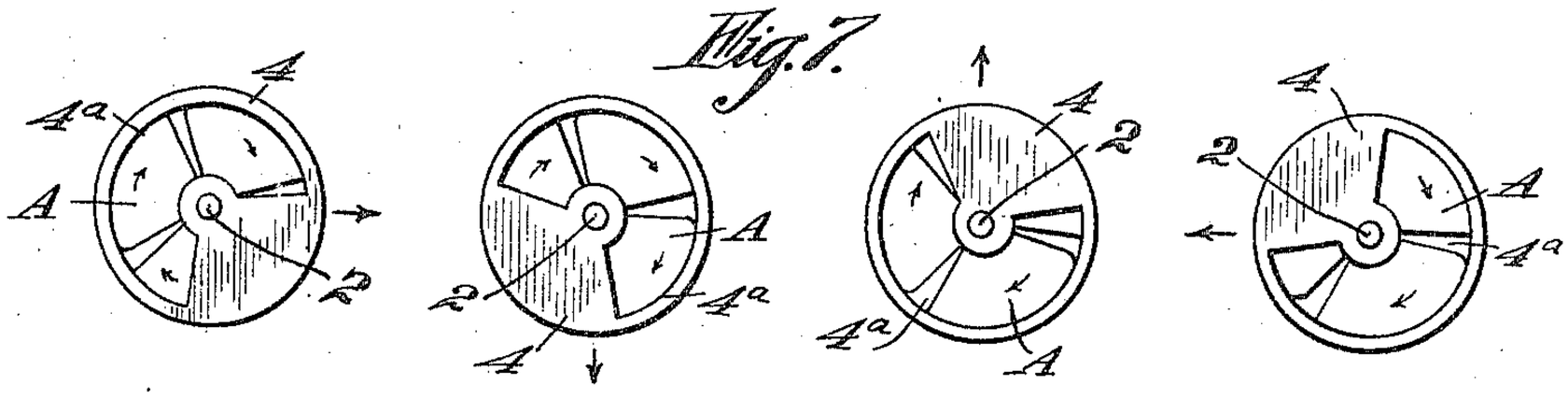


Fig. 8.

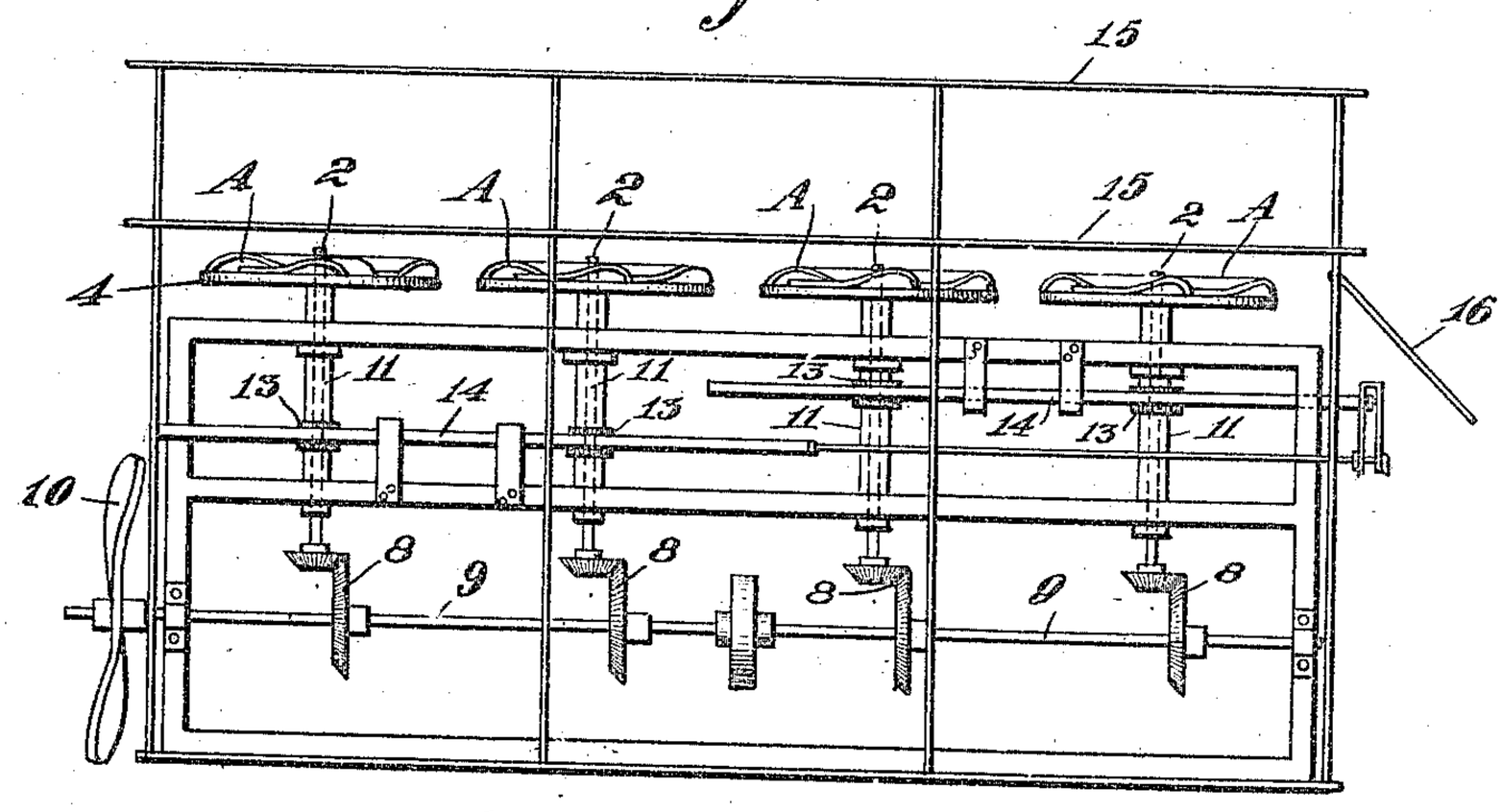


Fig. 9.

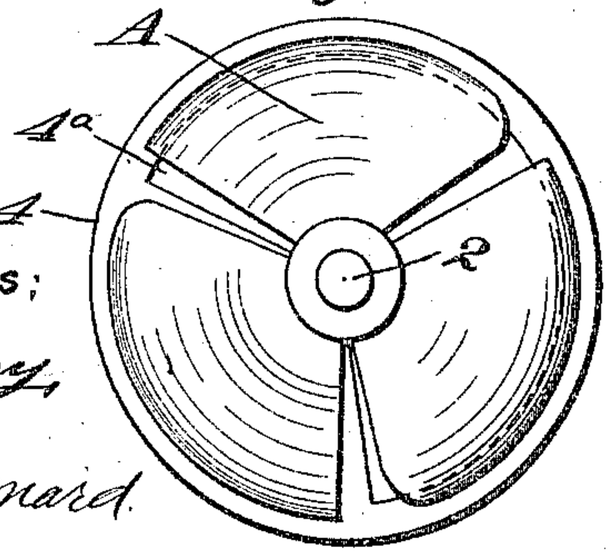
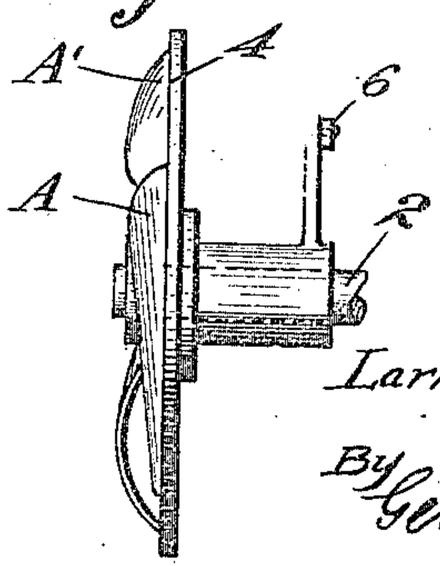


Fig. 10.



Witnesses;
R. F. Berry,
F. E. Maynard.

Inventor
Larmartine R. Fulda
By Geo. H. Strong.
His Attorney.

UNITED STATES PATENT OFFICE.

LAMARTINE R. FULDA, OF SAN FRANCISCO, CALIFORNIA.

PROPELLER.

970,319. Specification of Letters Patent. Patented Sept. 13, 1910.

Application filed November 29, 1909. Serial No. 530,328.

To all whom it may concern:

Be it known that I, LAMARTINE R. FULDA, a 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.

My invention relates to improvements in propellers which are adapted for the transmission of power by means of fluid in which the propellers are revolved.

It consists in a novel construction of the propellers, and means by which the propulsive action may be changed or reversed without stopping the engine or motor.

It comprises the combination of parts, and details of construction which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a front elevation of my propeller. Fig. 2 is a section on the line *x*—*x* Fig. 1. Fig. 3 is a side view showing the propeller as applied to the stern of a vessel. Fig. 4 is an end view, partly in section, of the propellers mounted in pairs. Fig. 5 is a rear elevation of a disk. Fig. 6 is a view of the propeller as applied to submarines. Fig. 7 shows the successive positions of the direction controlling disks for driving in different directions. Fig. 8 is a view of the invention as applied to air-ships. Figs. 9 and 10 show a modified form of the propeller.

It is the object of my invention to provide a device for the propulsion of vessels or structures through any fluid medium, such as water or air.

The propeller as constructed consists of blades A secured to a hub on the revoluble shaft 2, through which power may be transmitted from any suitable or desired motor to revolve the device. These blades are arch-shaped to form a front edge of little or no resistance in the direction of revolution. The outer edge portion of these blades follows approximately the curvature of the circle which bounds the outer periphery of the blades, and may be closed as shown at A′. Disks 4 having substantially the same diameter as the exterior periphery of the blades, are so mounted that the concavities formed by the arching of the blades are presented toward the disks, and the disks are so constructed that as the blades revolve, the open front edges of the blades will sweep the fluid through which they revolve inwardly, and by the closure of the rear of the propeller blades, this body of fluid is temporarily confined during a portion of the revolution of the propeller blades.

As shown in Fig. 2 where the inner face of the propeller blades is practically in contact with the plane of the disk 4, a portion of the disk is provided with an aperture, and another portion of the disk is without aperture, as plainly shown. The operation of this will then be as follows: The unapertured portion of the disk is set in such a manner as to control the direction of travel. This is done by revolving the disk independently of the revolution of the shaft, and fixing it so that during the operation of the propeller, the fluid which is swept inwardly during that portion of the revolution, in which the propeller blades are passing over the unapertured portion of the disk, will be temporarily confined, and the action of the blades will then be to propel the apparatus in the direction opposite to that in which the blades are moving. The remainder of the disk is open or provided with the aperture, as shown at 4ª, and allows for the free escape of the fluid after passing the unapertured portion of the disk.

In Fig. 1 the curve of the blades of the propeller is such that a substantially open passage is left through blades, so that when revolving freely, the blades simply cut through the fluid without any sensible action. When constructed in this manner, the disks are provided with rims 5 which project from the face, and as the propeller blades revolve, they enter the space within this rim, and as the outer edge of the blades has a curvature corresponding with the curvature of the rim, it will be seen that the space in rear of the blade will be closed by the rim while the blade is passing through this portion of the disk. The effect then will be to temporarily close the space in rear of the blades, and to produce an action like that previously described where the blades are absolutely closed at the rear. As soon as the blades have passed the rim, the space in rear of the blades will again be opened so that the fluid can readily pass without obstruction; the action in this case being to propel the vessel in the opposite di-

rection to that in which the propeller is revolving, as described in the previous instance.

The disks may be made open at all points except the portion through which the rim extends, and where the power is to be applied.

If the device is to be used to propel vessels through the water, the propellers may be mounted in pairs upon the shaft 2, and facing each other, with the disks 4 located between them so that the water which escapes from the inside of the propeller blades will be directed toward the center and rear, and thus assist in the propulsion of the vessel to which the propellers are applied. In order to reverse the direction of motion without reversing the motor, it is only necessary to turn the disks so as to bring that portion which coacts with the propellers to a position opposite to that which it occupies when driving the vessel ahead. This is readily effected by connecting the disks in such a manner that they may be turned in unison. Such a connection may be in the form of cranks with suitable connecting rods 6, so that two or more pairs of the disks may be moved simultaneously with relation to their propeller blades, and an indicator may be employed, as at 7, to show when they are in the proper position. When thus turned, it will be seen that the blades of the propellers co-act with the closed portions of the rims of the disks at a point opposite to that in which they acted to drive the vessel forward, and thus the vessel may be reversed. If used upon a submarine, it will be seen that by turning the disks to another point, the propellers will act to sink the vessel directly, and when the disks are turned again to the proper position, the propellers will act to raise the vessel; either operation being effected without stopping the motor or changing its speed unless the latter be found desirable.

When applied to the propulsion of vessels in the air, the propellers may be mounted on vertical shafts, and the disks 4 arranged in horizontal planes. In Fig. 8 I have shown four of these propellers, which may be driven by suitable gearing, as at 8, through a driving shaft 9, power being applied from any suitable motor. These propellers will act both to lift and to drive the apparatus in either direction, as previously described. In addition to this, a propeller as at 10, may be mounted upon a horizontal driving shaft so as to add its power toward driving the apparatus in a forward direction. The disks 4 are here shown as connected in pairs, and the vertical propeller shafts are independently turnable in suitable sleeves 11. The sleeves have pinions 13 fixed to them, and rack bars 14 engage the pinions. These rack bars are slidable in guides, and each rack bar controls two of the disks, so that the disks may all be set to operate in unison and conjunction with their propeller blades; or one set may be reversed or partially turned with relation to the other, thus producing a lifting or turning movement of the front pair of propellers in one direction, and the rear pair in the opposite direction. The propellers thus controlled will assist in steering or turning the vessel in any desired direction.

I have only shown in the present drawings a sufficient portion of the apparatus to explain the propelling mechanism, but it will be understood that various arrangements of aeroplanes 15 and steering rudders 16 may be employed in the usual manner of aeroplanes or other aerial apparatus.

It will be understood that the rims 5 or their equivalents may be mounted upon supports which are contiguous to the disks, and the rim may be moved and adjusted independently of the disks. Their action relative to the propeller will be similar in either case.

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

1. A propeller consisting of blades, a shaft on which said blades are mounted and through which they are revoluble, said blades having an arched outer periphery, disk fitting against the concaved inner sides of the blades, said disk having an unapertured portion so that the fluid through which the blades are revolved will be confined while the blades are passing said portion.

2. The combination in a propeller, of blades fixed to a shaft, said blades having the outer portions arched, a disk lying contiguous with the concavities formed by the blades, said disk having a portion forming a closure therefor whereby the fluid through which the blades are revolved will be confined while passing said closures, and allowed to escape after passing them, means for turning the disk so that the closure may be so placed as to drive the vessel ahead, or to reverse it without changing the direction of rotation of the propellers.

3. The combination in a propelling apparatus, of blades mounted upon a revoluble shaft, said blades being disposed in opposing pairs upon each shaft and having their outer portions arched, a disk having its face contiguous to the concaved portions of the propeller blades, said disk having an unapertured portion over which the blades pass during their revolution, and by which the fluid is temporarily confined between the blades and disk, and said disk having other apertured portions through which the fluid may escape toward the center.

4. The combination in a propeller, of blades, a shaft by which the blades are re-

volved, said blades having the outer portions arched, disks having their faces lying contiguous to the concaved portions of the propeller blades, said disks having unapertured portions with which the blades coact to propel the vessel, means by which the disks may be turned to change the position of the unapertured portions, and to reverse or change the direction of travel of the vessel without reference to the motor, and means connecting pairs of the disks whereby said pairs may be changed independently of each other.

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

LAMARTINE R. FULDA.

Witnesses:

RAYMOND A. LEONARD,

CHARLES EDELMAN.