2 Sheets—Sheet 1.

S. W. IRWIN.

Feathering Paddle-Wheels.

No. 209,267. **Patented Oct. 22, 1878.**

Fig. 1.

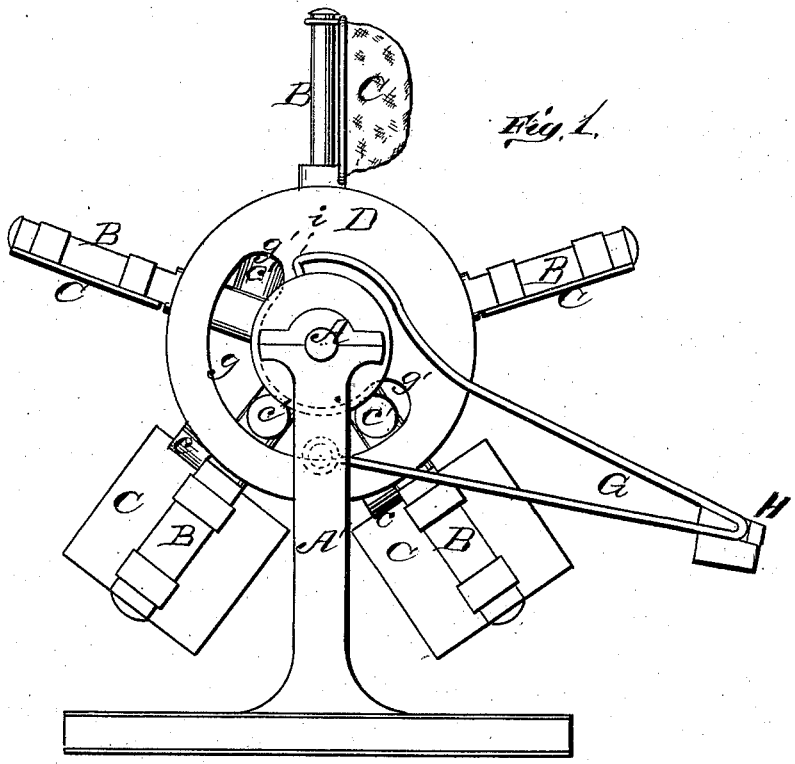
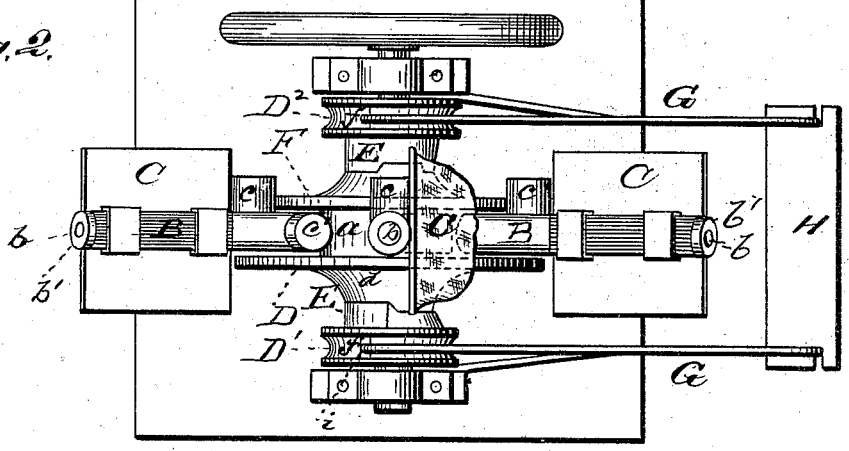


Fig. 2.



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2 Sheets—Sheet 2.

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No. 209,267. Patented Oct. 22, 1878.

Fig. 8.

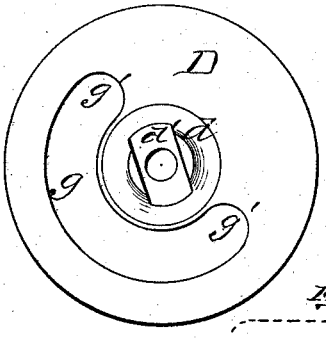


Fig. 4.

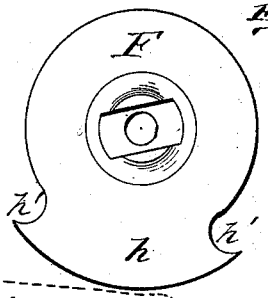


Fig. 5.

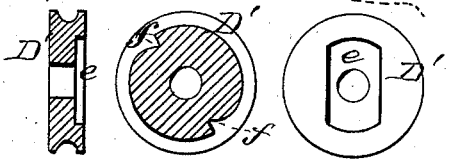


Fig. 6.

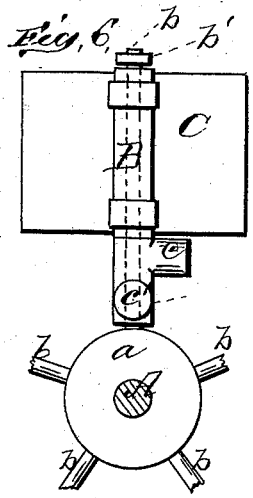


Fig. 7.

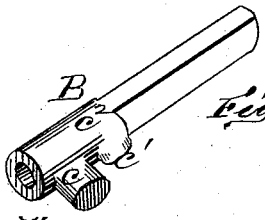
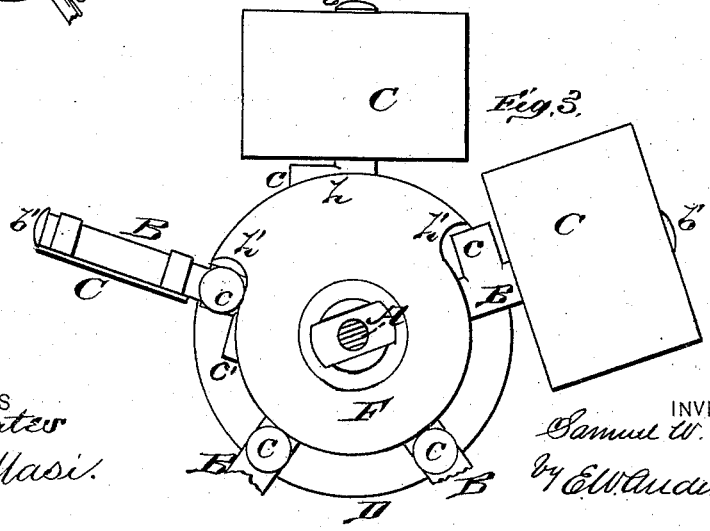


Fig. 3.



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UNITED STATES PATENT OFFICE.

SAMUEL W. IRWIN, OF COLUMBIA, SOUTH CAROLINA.

IMPROVEMENT IN FEATHERING PADDLE-WHEELS.

Specification forming part of Letters Patent No. **209,267**, dated October 22, 1878; application filed September 28, 1878.

To all whom it may concern:

Be it known that I, SAMUEL W. IRWIN, of Columbia, in the county of Richland and State of South Carolina, have invented a new and valuable Improvement in Propellers; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is an end view of this invention. Fig. 2 is a plan view of the same. Fig. 3 is an end view of the same opposite to that shown in Fig. 1; and Figs. 4, 5, 6, 7, and 8 are details.

This invention has relation to improvements in propellers for steam-vessels, balloons, and other objects.

The object of the invention is, first, to devise a submerged propelling-wheel, the blades of which will be turned edgewise to the supporting medium, as water or air, when the said blades cannot be used in propelling the vessel or balloon; and, secondly, to devise an expeditious and reliable means for reversing the action of the blades without changing the direction of rotation of the propeller, and without reversing the motor.

The nature of my invention consists in combining, with a shaft having radial arms projecting therefrom and blade-bearing arms rotating thereon, mechanisms, substantially as described, for turning said blades edgewise or flatwise to the medium in which the propeller is submerged, as will be hereinafter more fully set forth.

In the annexed drawings, the letter A designates the main shaft of my improved propeller, having a hub, *a*, cast or secured thereon, from which project the radial arms *b*. These arms are circular in cross-section, and are removably secured to the hub in any suitable manner.

B designates a blade-arm, having a tubular body, c^2, that is applied upon the arm *b*, and has the blade C rigidly but removably applied thereto. The blade-carrier is prevented from being thrown off the arm *b* by a nut, *b'*, applied upon the end of said arm outside of the bearing-arm aforesaid, as shown in Fig. 6.

The blade-arms B are each provided with spurs *c* c^1, the former outside of the latter and at right angles thereto, which spurs are cylindrical in form, as shown in Figs. 6 and 7, and the shaft A has its bearings in the pillow-blocks A', not differing essentially in their construction from those commonly used as shaft-bearings.

D indicates a metallic disk, having a central laterally-enlarged hub, *d*, provided with a transverse groove or recess, *d'*; and D^1, a second disk, usually of less size than the disk D, and having a grooved perimeter. The disk D^1 has in its face, contiguous to disk D, a rectangular recess, *e*, and the said disks are locked together by means of a key-plate, E, fitting snugly in the groove *d'* and recess *e* of the disks D and D^1, respectively. The exterior disk, D^1, has in its perimeter the shoulders *f*, the object of which will be hereinafter set forth.

The disk D has in its face a semi-annular concentric slot, *g*, having rounded ends *g'*, the said slot being of a size to readily admit the spurs *c* c^1 of the blade-arms. The latter rotate freely on the radial arms *b*.

Upon the opposite side of the hub *a* is a circular metallic plate, F, having upon its edge an extension, *h*, forming, with the plate, rounded shoulders *h'*. This plate is locked to the disk D^2 by means of a key-plate, E, recessed into a depression in the contiguous faces of the said plate and disk, precisely as above set forth for the disks D D^1, above described.

The disk D^2 has in its perimeter the shoulders *f f*, diametrically opposite each other, as in disk D^1, and they are properly reversing-wheels. The disks D D^1 D^2 and plate F rotate freely on the shaft A, disk D and plate F fitting up closely against the hub of the propeller, as shown in Fig. 2, including between them the blade-arms aforesaid.

G G represent the reversing-rods, the same being of angular form, as shown in Fig. 1. One end of these rods is secured to the pillow-blocks aforesaid, and the other passes over the disks, and is provided with a hook, *i*, adapted to engage the shoulders *f f* of the said disks. These reversing-rods are connected at their free ends, as shown at H. The

reversers G G have usually sufficient spring to maintain their engagement with the disks D^1 D^2 and to hold them stationary while the shaft revolves. The terminal shoulders h' of the flange h of disk F are inside of the ends of the slot g in disk D—that is, the slot is longer than the said flange—as shown in Figs. 4 and 8.

The operation of my improved propeller is as follows: The apparatus being in working order, the inner spurs, c^1, of the blade-bearers are in line with the slot g, and the outer spurs, c, tangential, or nearly so, to the disk F, on the other side of the hub. Some of the said spurs c^1 being engaged in the said slot, and those not thus engaged being in between the disks D and F. Those of the blade-bearers B whose inner spurs are between the disks D F have their outer spurs, c, extending across disk F, tangential or nearly so to the disk. If, now, rotary motion be given to the shaft A, the reversing-levers G G being engaged with the shoulders f f of the disks D^1 D^2, the spurs c^1, engaged in the slot g, come successively in contact with the farther end g of said slot, forcing the bearing-arms to turn one-fourth round and causing the flat surfaces of the blades to be presented to the water or air successively. This turn being made, the outer spurs, c, are placed across the disk F, and as the shaft turns over they come successively in contact with the shoulder h' of said disk F, opposed to the direction sought to be given to the vessel, and as each blade ceases to be effective it is turned back by such contact edgewise to the plane of revolution of the propeller.

In propelling the vessel the flange h will be uppermost. To reverse the vessel the reversers are slightly raised, disengaging the hooked ends thereof from one set of the notches f, and allowing the disks D D^1 D^2 and plate F to revolve with the shaft until the second set of notches comes uppermost, when the hooks i are sprung into engagement therewith.

In this new position the flange h and curved slot g, respectively, are below the shaft A, but in the same relative position to each other. The rotary motion of shaft A has been uninterrupted during this change, which is all that is required to reverse the propeller. This is due to the fact that when the outer spurs, c, strike against the shoulder h', which is now below the shaft A, the blades are turned edgewise to the plane of revolution of the wheel as the said spurs come successively against said shoulder, and continue so until the inner spurs, c^1, strike against the end of slot g, when the said blades turn flatwise to the plane of revolution as they come upward.

The wheel being submerged and the blades being flatwise to the plane of revolution at the upper part of the wheel and edgewise thereto at its lower portion, a retrograde movement must necessarily be given to the vessel.

In the case first stated, when the slots g and flange h were uppermost, the blades at the top of the wheel were edgewise to the plane of revolution, and those at the bottom of the same flatwise thereto, and consequently the vessel would be propelled in a forward direction. In either case only those blades which are effective to produce motion in a desired direction are flatwise, the others being edgewise to the plane of revolution, and they are changed from edgewise to flatwise positions and the reverse automatically.

The blades that actuate the vessel or balloon are composed, preferably, each of a frame and of a flexible bag-sail secured thereto, that, as the said frame comes edgewise to the plane of revolution of the wheel, flattens out, discharges its contents, and offers no appreciable resistance to the rotation of the propeller.

What I claim as new, and desire to secure by Letters Patent, is—

In a propeller, the combination, with the main shaft A, having a hub, a, with radial arms b, of the blade-bearing arms B, rotating on said rods or arms b, and provided with spaced cylindrical spurs c c^1 at right angles to each other, the disks D D^1, locked together, having respectively the curved slot g and opposite notches f f, and rotating on said shaft, at one side of the hub, the disks D^2 F, at the other side of the hub, rotating together on the main shaft, and provided respectively with the notches f f and flange h, and the holding-arms G G, adapted to keep the disks D^1 D^2 D and plate F stationary, substantially as specified.

In testimony that I claim the above I have hereunto subscribed my name in presence of two witnesses.

S. W. IRWIN.

Witnesses:
W. T. JOHNSON,
WALTER C. MASI.