

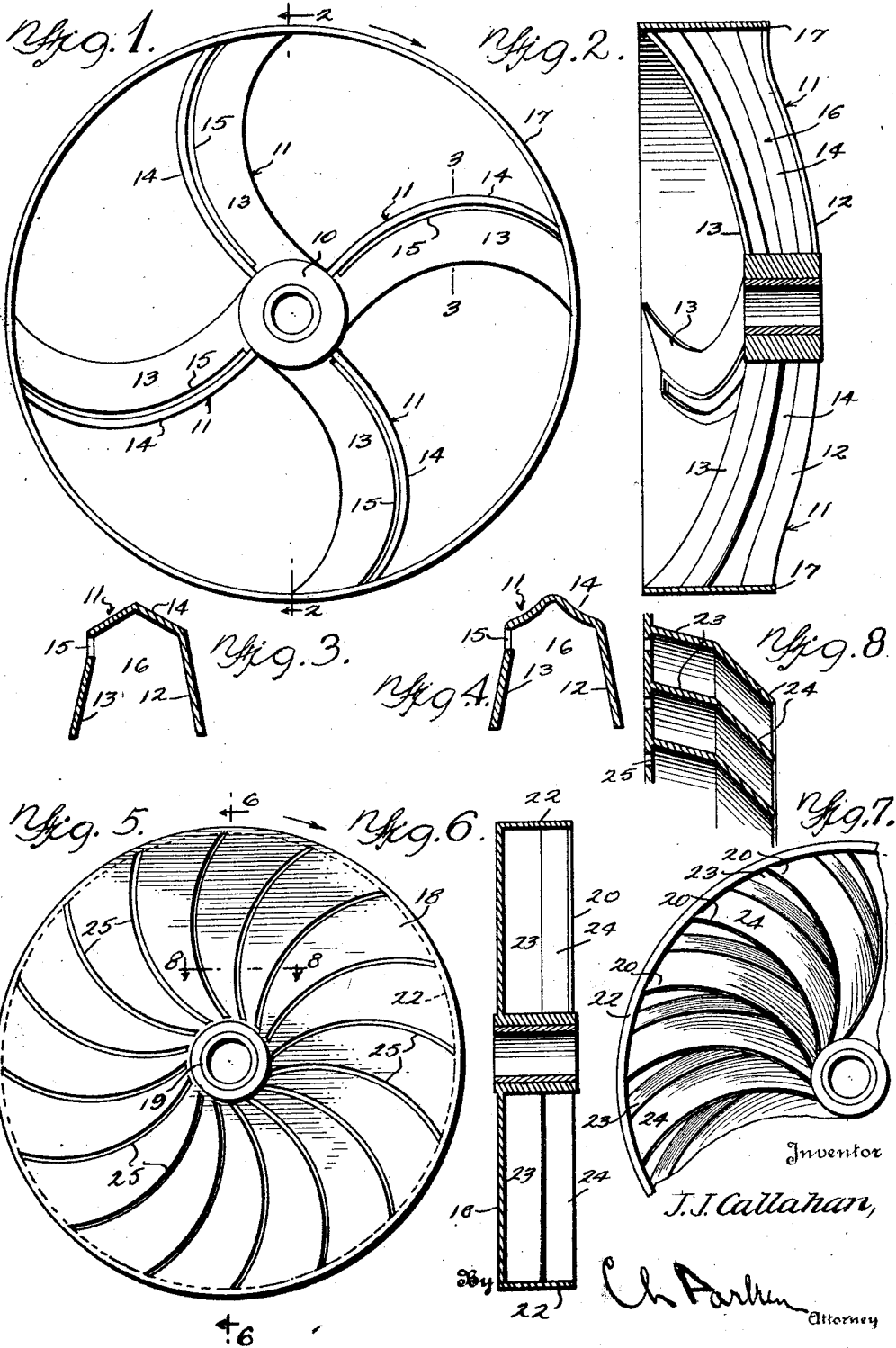
June 23, 1925.

1,542,853

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PROPELLER

Filed June 24, 1924



UNITED STATES PATENT OFFICE.

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PROPELLER.

Application filed June 24, 1924. Serial No. 722,148.

To all whom it may concern:

Be it known that I, JOSEPH J. CALLAHAN, a citizen of the United States, residing at Cornwells Heights, in the county of Bucks and State of Pennsylvania, have invented certain new and useful Improvements in Propellers, of which the following is a specification.

This invention relates to propellers and more particularly to such a device employing a plurality of blades each of which is provided with a pocket having one wall so arranged that fluid will be compressed within the pocket, each pocket being provided with an opening to permit escape of fluid under pressure in one direction parallel to the axis of rotation.

An important object of the invention is the provision of a propeller having an unusually high degree of propelling efficiency when used in either air or water.

A further object of the invention is to overcome the action of centrifugal force normally set up by the rotation of the propeller at high speeds, the rotative action being utilized for expelling the fluid parallel to the axis of rotation and preventing its escape outwardly radially of the propeller.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the drawings, I have shown several embodiments of the invention. In this showing.

Figure 1 is a rear elevation of one form of propeller,

Figure 2 is a section on line 2—2 of Figure 1,

Figure 3 is a section on line 3—3 of Figure 1,

Figure 4 is a section similar to Figure 3 showing a modified form of blade section,

Figure 5 is a rear elevation of a modified form of propeller,

Figure 6 is a section on line 6—6 of Figure 5,

Figure 7 is a fragmentary front elevation, and

Figure 8 is a section on line 8—8 of Figure 5.

Referring to the drawings the numeral 10 designates a suitable hub adapted to be keyed or otherwise secured to a propeller shaft of the usual construction. A series of blades 11 are formed preferably integral

with the hub 10 and extends outwardly therefrom as shown in Figure 1. Each of the blades 11 comprises forward and rear walls 12 and 13 respectively and an end wall 14 preferably angularly formed as clearly shown in Figure 3. The rear wall 13 is provided adjacent the end wall 14 with a slot 15 which extends throughout the length of the blade as shown in Figure 1. Each of the blades is curved in the plane of rotation as shown in Figure 1, the blades toward their outer ends curving toward the direction of their rotational travel as shown by the arrow in Figure 1. Each of the blades 11 also curves rearwardly as shown in Figure 2 of the drawings and the pocket 16 formed between the front and rear walls and the end wall of each blade widens materially toward its outer end as shown in Figure 2. It will be apparent that the volume of fluid within each pocket 16 will be increased toward the outer end for a purpose to be described. The blades 11 are preferably connected by a circular band 17 which forms a closure for the outer end of each blade pocket as shown in Figure 2 and also serves to rigidly connect the ends of the blades. In Figure 4 of the drawings I have shown a slightly modified form of blade section in which the end wall 14 is preferably curved outwardly from each side toward its center, the center portion being formed of an arc of a circle instead of an angle as in the form of the blade shown in Figure 3.

In Figure 5 of the drawings I have shown a modified form of propeller. In this form the numeral 18 designates a disc carried by a hub 19 suitably secured to the propeller shaft. A series of blades 20 are secured to the rear wall of the disk 18 and may be formed integral therewith as shown in Figure 8. These blades curve in the plane of rotation in a manner similar to the blades of the form previously described, as shown in Figure 7 of the drawings. The spaces between the blades 20 are closed at their outer ends by a band 22 as shown in Figure 7 to prevent the escape of fluid outwardly radially of the blades. Each of the blades 20 is provided with a rear portion 23 arranged at an angle to the disk 18, and a forward portion 24 which is arranged at an angle to the portion 23, as shown in Figure 8. It will be apparent that the spaces between the blades 20 form pockets for the

fluid as the propeller revolves. Slots 25 communicate with these pockets and the slots extend substantially from the hub to the outer edge of the disk 18 as clearly shown in Figure 5.

In the form of the device shown in Figures 1 to 4 of the drawings the end walls 14 of the blades curve inwardly toward the axis of the shaft in such a manner that the inner portions of the end walls are arranged substantially radially of the axis as shown in Figure 1 of the drawings. Similarly the inner portions of the blades 21 in the form of the device shown in Figures 5 to 8 of the drawings, is arranged substantially radially as shown in Figure 7.

The operation of the device is as follows:

In the form of the device shown in Figures 1 to 4 of the drawings the propeller is mounted on a suitable shaft and may be operated in either air or water as previously stated. The propeller is rotated in the direction of the arrow as seen in Figure 1 whereby the pockets 16 will be filled with surrounding fluid. Rotation of the propeller at high speeds creates a pressure within the fluid in the pockets 16 as will be obvious and this compressed fluid escapes through the slots 15 substantially parallel to the axis of rotation to create the desired propelling force. The curvature of the blades as shown in Figure 1 serves to overcome the action of centrifugal force which would normally permit the pocketed fluid to slip outwardly radially of the propeller. It will be obvious that the outer portions of the propeller blades will be driven into the fluid angularly rather than tangentially thus creating a tendency of the fluid to flow inwardly toward the axis of the shaft. This overcomes the centrifugal tendency as previously mentioned so that there will be no outward movement of the fluid. The rotative force of the propeller therefore is employed for directing the compressed fluid rearwardly parallel to the axis of the shaft. The curvature of the blades as shown in Figure 2 also tends to overcome the centrifugal action. The enlargement of the pockets 16 toward their outer ends is provided for the purpose of pocketing a greater amount of fluid near the outer ends of the blades where the lineal speed of the blades is greatest. It will be apparent therefore that a greater amount of fluid will be expelled from the outer portions of the blades and due to the greater volume of air in the pockets at these points and a greater lineal speed the increased pressure at the outer portions of the blades will also serve to minimize the outward slipping of the fluid due to centrifugal force. The structures of the end walls 14 as shown in Figures 3 and 4 tends to minimize the vacuum which would be created back of the blades as they

rotate thereby minimizing the force necessary to revolve the propeller at any given speed.

The operation of the form of the device shown in Figures 5 to 8 inclusive is substantially the same as that previously described. This form of the device is particularly adapted for use in air as an airship propeller or ventilating fan and the pockets between the blades 20 are adapted to receive the air which will be thrown toward the angles formed between the blades and the disk 18. The air under pressure is permitted to escape through the slots 25 parallel to the axis of the shaft. As the propeller moves longitudinally in the direction of the arrow in Figure 5 it will be apparent that an ample supply of fluid will be maintained within the pockets at all times. The curvature of the blades 20 as shown in Figure 7 serves to minimize the action of centrifugal force in the manner previously described in connection with the other form of the device. Escape of fluid from the ends of the pockets will be prevented by the band 17 in the preferred form of the device and by the band 22 in the modified form.

It is to be understood that the forms of my invention herewith shown and described are to be taken as preferred examples of the same and that various changes in the shape, size, and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

Having described my invention, I claim:

1. A propeller comprising a hub, a blade extending outwardly therefrom, said blade having walls forming a pocket and having an open side adapted to receive fluid, one portion of said blade comprising a compressor portion, and a slot extending substantially throughout the length of one wall of the pocket to permit escape of fluid in one direction parallel to the axis of the hub.
2. A device constructed in accordance with claim 1 wherein the blade toward its outer end curves in the direction of its rotation.
3. A device constructed in accordance with claim 1 wherein the blade curves toward its outer end in the direction of its rotation and rearwardly in the direction of said slot.
4. A propeller comprising a hub, a blade extending outwardly therefrom, said blade comprising side walls and a rear wall forming a pocket adapted to intercept and compress fluid, one of said walls being provided with a slot spaced from the bottom of the pocket formed by said walls.
5. A propeller comprising a hub, a blade extending outwardly therefrom, said blade comprising a pair of spaced side walls and a rear wall, said walls forming a pocket adapted to intercept and compress fluid, one of said side walls being provided with a

slot extending substantially throughout the length of the blade.

5 6. A device constructed in accordance with claim 5 wherein the pocket formed by said walls is closed at its outer end, said blade being curved toward its outer end in the direction of its rotation.

10 7. A device constructed in accordance with claim 5 wherein the space between said side walls increases to its outer end.

8. A device constructed in accordance with claim 5 wherein the longitudinal center of said rear wall is extended away from the direction of rotation.

15 9. A propeller comprising a hub, a blade extending outwardly therefrom, said blade having walls forming a pocket having an intake side open in the direction of rotation of the blade and adapted to discharge fluid
20 at substantially right angles to the plane of rotation, the deepest portion of said pocket

being extended in the opposite direction from the intake side beyond the point of discharge of fluid.

10. A propeller comprising a hub, a blade 25 extending outwardly from said hub, said blade including a portion adapted to act substantially at right angles to the plane of rotation, said portion being provided substantially throughout its length with an 30 angular projection extending opposite to the direction of rotation, means for preventing escape of fluid outwardly of said blade, and means for preventing escape of fluid in one direction at right angles to the plane of ro- 35 tation.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH J. CALLAHAN.

Witnesses:

JOHN J. SULLIVAN,
MARY A. MCBRIDE.