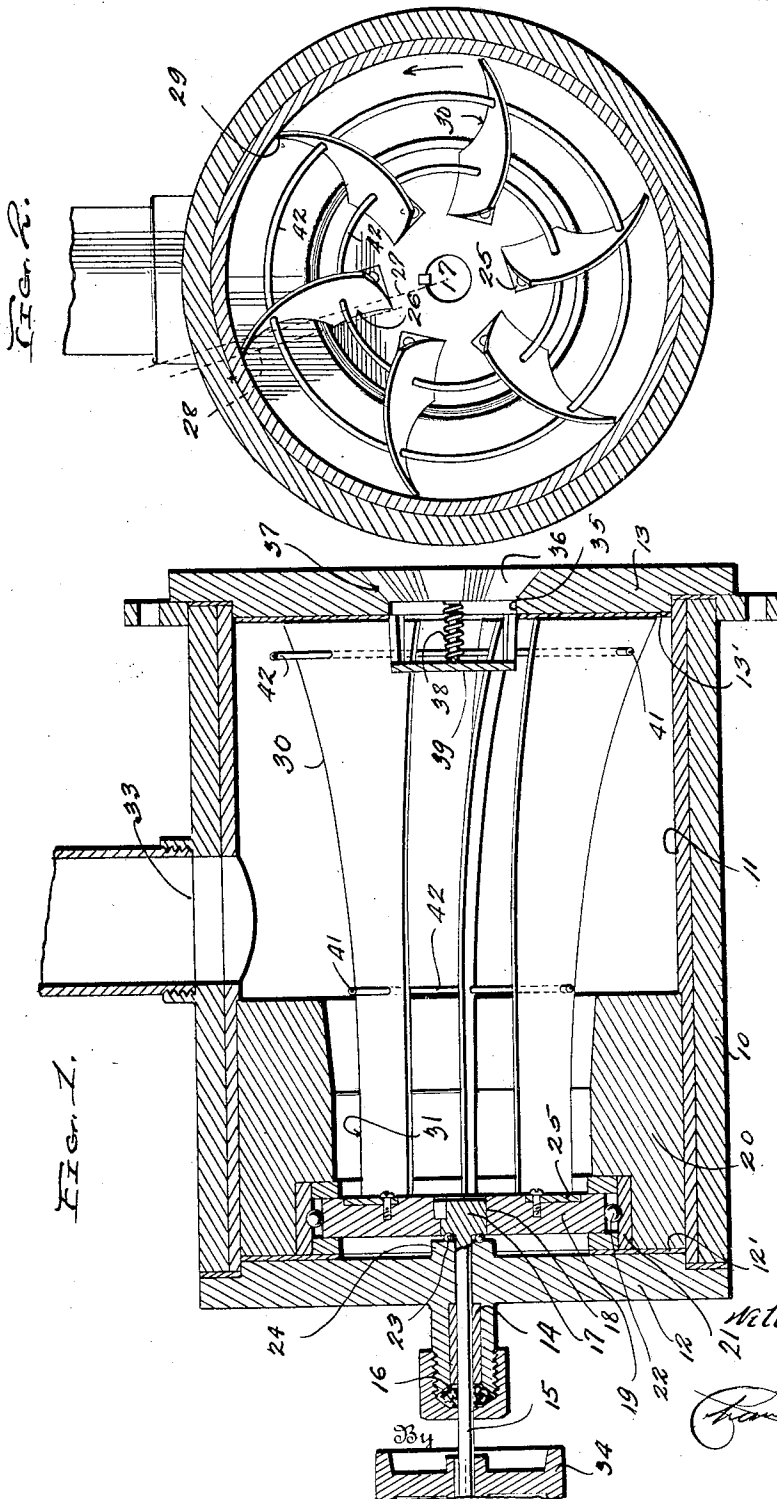


W. M. FRIDELL.
CENTRIPETAL APPARATUS.
APPLICATION FILED JAN. 3, 1920.

1,359,048.

Patented Nov. 16, 1920.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

FIG. A.

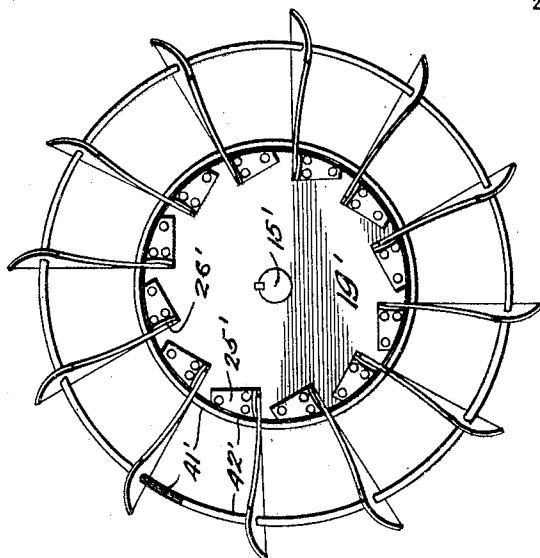
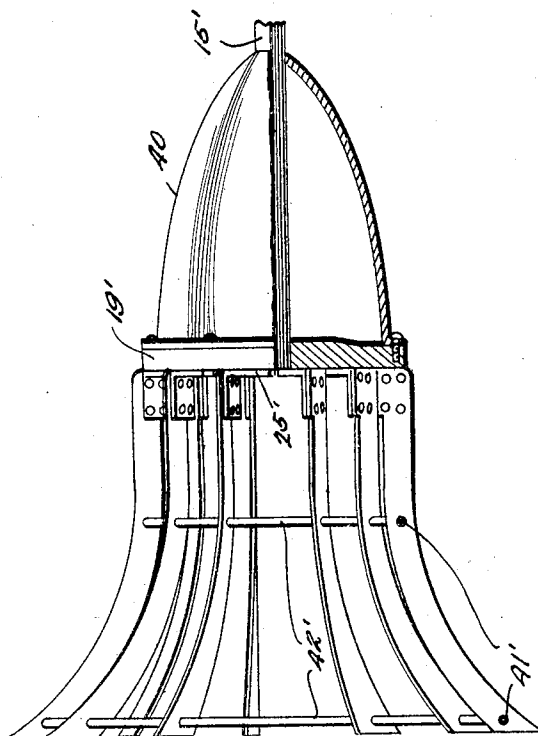


FIG. B.



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UNITED STATES PATENT OFFICE.

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CENTRIPETAL APPARATUS.

1,359,048.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIS M. FRIDELL, a citizen of the United States, residing at Washington, District of Columbia, have invented certain new and useful Improvements in Centripetal Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains, to make and use the same.

This invention relates to centripetal wheels broadly, whether employed in a liquid pump, whether employed as a marine or aeroplane propeller or whether employed as a fan.

It is the object of the invention to provide a construction that will be highly efficient in all of its varied uses and in which the medium operated upon will be drawn to the center and then discharged axially of the wheel in a form desired and with the expenditure of minimum energy.

Other objects and advantages of the invention will be understood from the following description:

In the drawings:

Figure 1 is a section taken diametrically through the casing of a pump, embodying the present invention.

Fig. 2 is an end view of the structure shown in Fig. 1, looking at the discharge end of the wheel, the discharge end of the casing being omitted.

Fig. 3 is a side elevation showing a propeller wheel embodying the present invention.

Fig. 4 is a view showing the discharge end of the propeller shown in Fig. 3.

Referring now to the drawings and more particularly to the pump embodiment of the invention, illustrated in Figs. 1 and 2, there is shown a cylindrical casing 10 having a non-corrosive lining 11 and provided with end closures 12 and 13, the inner faces of which that are exposed within the casing, having non-corrosive facings 12' and 13'.

Centrally of the closure or head 12 is formed a bearing 14 for the pump shaft 15, there being provided the usual stuffing box 16, as illustrated.

The shaft 15 is provided with an enlarged cylindrical end portion 17 within the cylinder or casing 10, which enlarged end portion is fitted into and keyed within the cen-

tral axial opening 18 of a carrier disk 19 that constitutes the hub of the wheel.

Within the lining 11 of the cylindrical casing 10 and against the facing 12' is fitted a bushing 20 the rear end portion of the bore of which is provided with an annular race 21 that circumscribes and is concentric with the hub 19. Between the race 21 and the periphery of the hub 19 are disposed bearing balls 22 that sustain the hub or disk while endwise movement of the hub in the direction of the head 12, is prevented by the thrust bearing balls 23, between it and the annular boss 24 that is formed on the inner face of the head 12 and concentric with the bearing 14 in the latter.

In connection with the hub 19 is employed a plurality of wheel blades that project or range in a general lateral direction from the vertical front face of the hub, which latter is illustrated to rotate in a vertical plane.

Each blade includes a foot member 25 that is seated in a correspondingly shaped recess in the face of the hub and near to its periphery. Projecting from one side edge portion of each foot member 25 is the blade proper. Referring particularly to Fig. 2 of the drawings, it will be noted that each blade at its connected end is curved transversely as shown at 26 and that the cord of this arc of curvature is parallel with a radius 27 of the hub 19 and spaced in advance of such radius in the direction of rotation of the wheel, it being understood of course that the wheel rotates with the convex-concaved faces of the blades directed forwardly. The transverse curvature of each blade is of constantly decreasing radius to the free end of the blade, the outer end of the curved free edge of the blade touching a plane including the chord of the curve 26 and parallel with the axis of the hub 19. In order that this may be fully understood, the continuation of the chord of the curve 26 is indicated in dotted lines at 28 in Fig. 2. The inner end of the curved free edge of the blade terminates materially rearwardly of that radius of the hub 19, (indicated at 27) with which the chord of the curve 26 is parallel.

From the outer free tip 29 of each blade, the outer longitudinal edge of the blade is concaved, as shown at 30, for nine-elevenths of its length, the outer edge for the remaining two-elevenths of the length of the blade

being parallel with the axis of the hub 19, as shown at 31. The width of each blade at its attached end is substantially one-fourth of the diameter of the wheel at that end, which is the end of minimum diameter, the width of each blade at its free end, in the particular structure illustrated, being somewhat more than twice that of its attached end, while the maximum diameter of the wheel is illustrated as slightly less than twice the minimum diameter, it being of course understood that these specific dimensions may be varied to suit the specific conditions of use.

The inner edge of each blade is substantially parallel with the axis of the hub for approximately one-half of its length, beginning at the attached end of the blade while thence to the free end of the blade it swings with a gradual curve away from the axis.

Through the wall of the cylindrical casing 10 and its lining is entered a feed pipe 33 that leads from a source of fluid supply, the pipe opening into the cylinder slightly in advance of the bushing 20.

It will be noted that the minor bore of the bushing 20 is shaped to conform to the outer edges of the blades so that they may rotate in close proximity to it, when the shaft 15 is rotated, as through the medium of a belt pulley 34, while the remainder of the blades rotate in considerable spaced relation to the wall of the cylinder 10, this spacing between the blades and the cylinder wall, providing a chamber to receive the fluid to be pumped and to permit of its passage circumferentially of the wheel to be drawn between the blades of the latter.

With this construction, it will be understood that as the wheel is rotated, the fluid will be drawn centripetally by the blades to the axial chamber of the wheel, and having no vent at the hub, will be forced axially of the wheel and from its opposite end. To permit of this movement of the fluid, the head 13 is provided with an outlet 35 of the same diameter as the inlet and axially aligned with the wheel, while to prevent return of fluid when the wheel ceases to discharge, a check valve 36 is provided for the opening 35. The opening is flared at its outer end portion as shown at 37 to provide a seat for the similarly formed valve and to limit outward movement of the valve and to insure its proper return under appropriate conditions, a helical spring 38 is attached to its central portion and to a spider 39 attached to the inner side of the head 13 and bridging the opening 35.

Referring now to Figs. 3 and 4 of the drawings, the invention is illustrated as embodied in a propeller. In this embodiment of the invention, the propeller hub 19' is provided with a shaft 15' and the forward

face of the propeller is provided with a housing 40 of bullet shape, to reduce friction in the passage of the propeller through the medium in which it is operated.

The propeller blades are provided with feet 25' that are secured in sockets in the rear face of the hub, the blades themselves ranging longitudinally of the continuation of the axis of the hub and curvingly diverging therefrom, at their outer end portions. The inner end portions of the blades are parallel with the said axis. Each blade is transversely curved and the curve 26' at the attached end of each blade is disposed with its chord to the rear of the radius with which it is parallel, while the curvature at the outer end of each blade has the same general arrangement as that previously described, this displacement of the curve at the outer end of each blade with respect to the curve at the inner end, being accomplished by a torsional bending of the blade.

The operation of the last described embodiment of the invention, is similar to that of the first described, in that the medium is drawn by the blades inwardly to the chamber described by the inner edges of the blades and from which it is forced axially and from the rear end of the wheel in cylindrical form to effect propulsion.

In both constructions described, the blades are suspended by wires 41 and 41' respectively, that are passed through the blades in ring form and sustain the tubular spacers 42 and 42' respectively.

It will of course be understood that the propeller described may be employed in marine work or in aeronautics and that the principles hereinbefore referred to may be embodied in a wheel of either particular form described or in a wheel of other specific dimensions for use as a fan.

What is claimed is:

1. A wheel of the class described comprising a plurality of mutually connected similar and equally spaced blades revoluble about the axis of the wheel, each blade being torsionally bent with the inner end of its outer end edge rearwardly of the outer end of the same end edge.

2. A wheel of the class described comprising a plurality of mutually connected similar and equally spaced blades revoluble about the axis of the wheel, each blade being torsionally bent with the inner end of its outer end edge rearwardly of the outer end of the same end edge, the outer end of the free end edge of the blade touching a plane including the inner and outer ends of the inner end edge and parallel with the axis of the wheel.

3. A wheel of the class described comprising a hub having a plurality of like blades ranging therefrom at one side of the hub

and along the continuation of the axis of the hub and with their outer edges curvingly divergent from said axis continuation, each blade being transversely curved and torsionally bent with the outer corner of the free end of the blade touching a plane including the chord of curvature of the inner end of the blade and parallel with the axis of the wheel and the inner corner of the blade at its outer end being spaced rearwardly of the outer corner with respect to the direction of effective rotation of the wheel.

4. The combination with a cylinder having a bushing in one end portion and provided with a bearing, of a hub mounted on the bearing and having a driving shaft extending exteriorly of the cylinder, centripetally operative blades connected with the hub and extending through the bushing into the unbushed portion of the cylinder, fluid supplying means communicating with,

the unbushed portion of the cylinder, the unbushed portion of the cylinder having an outlet alining with the axis of the wheel. 25

5. The combination with a cylinder having a bushing in one end portion and provided with a bearing, of a hub mounted on the bearing and having a driving shaft extending exteriorly of the cylinder, centripetally operative blades connected with the hub and extending through the bushing into the unbushed portion of the cylinder, fluid supplying means communicating with the unbushed portion of the cylinder, the unbushed portion of the cylinder having an outlet alining with the axis of the wheel, and an outwardly opening check valve for the outlet. 30 35

In testimony whereof, I affix my signature, in the presence of a witness. 40

WILLIS M. FRIDELL.

Witness:

Jos. L. TEPPER.