Aug. 30, 1927. 1,640,601

E. F. DELERY

AXIAL FLOW PUMP OR TURBINE

Filed June 8, 1923 3 Sheets-Sheet 1

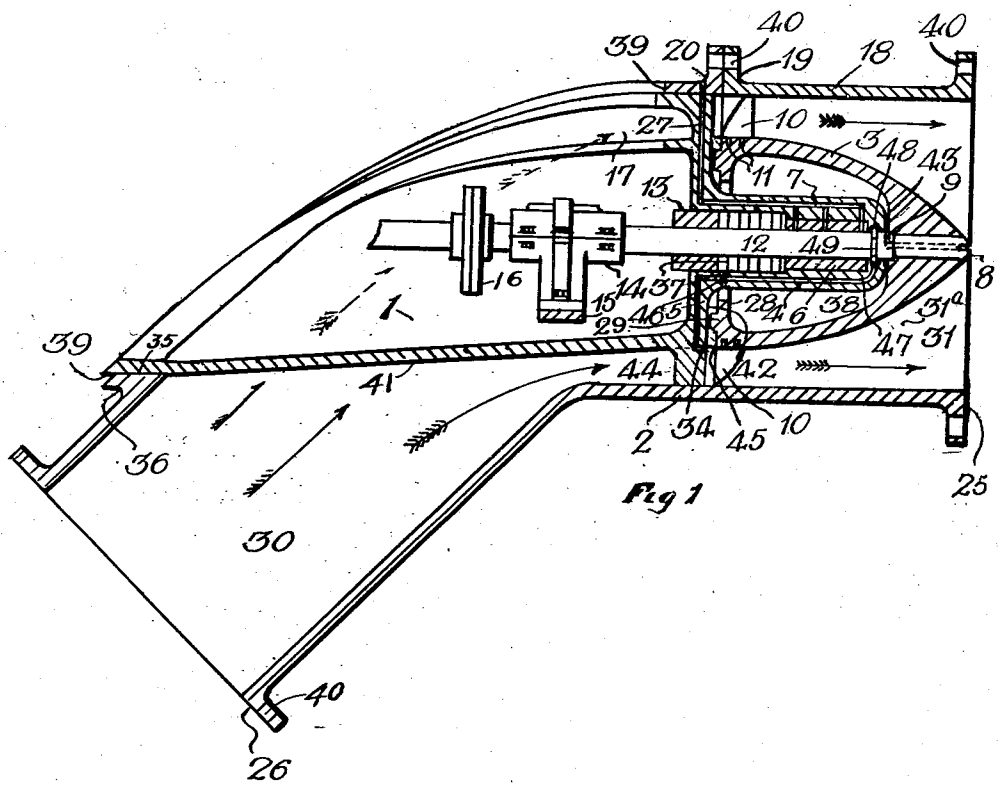


Fig 1

J. H. Boarts
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Filed June 8, 1923 3 Sheets-Sheet 2

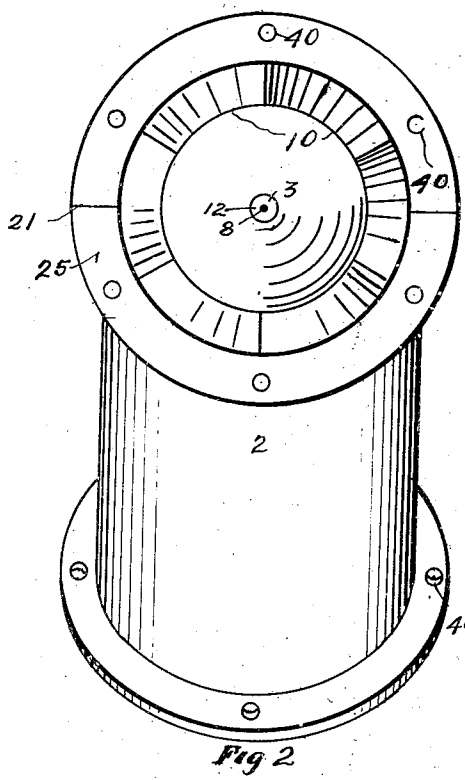


Fig 2

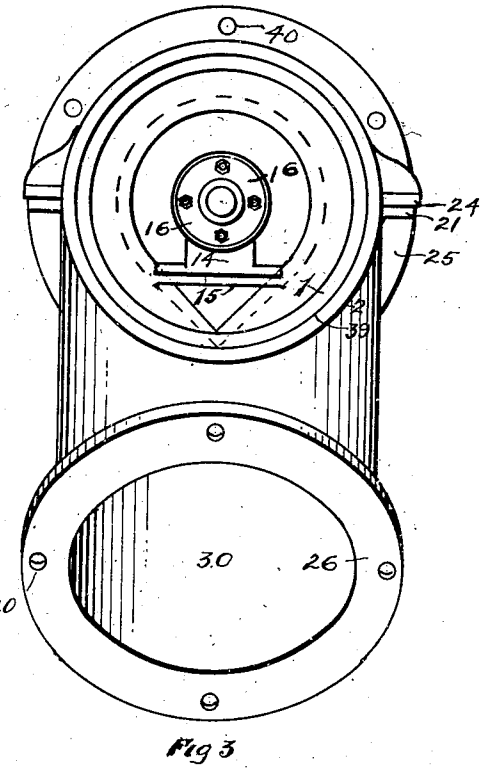


Fig 3

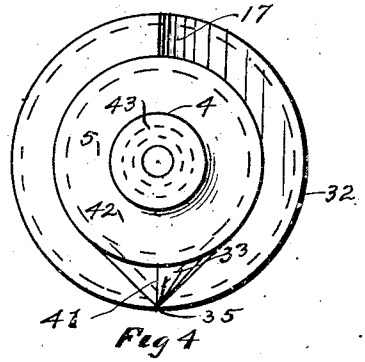


Fig 4

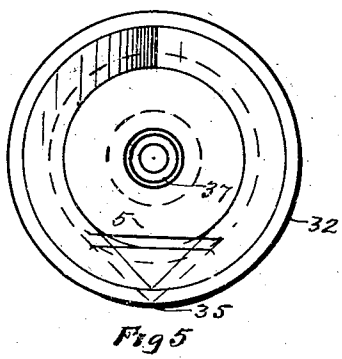


Fig 5

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Filed June 8, 1923 3 Sheets-Sheet 3

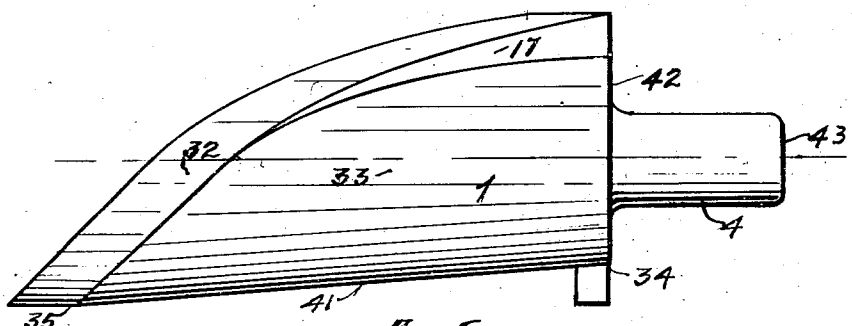


Fig 6

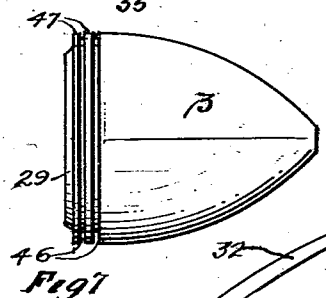


Fig 7

Fig 10

Fig 8

Fig 9

Eugene F. Delery
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Patented Aug. 30, 1927. 1,640,601

UNITED STATES PATENT OFFICE.

EUGENE F. DELÉRY, OF NEW ORLEANS, LOUISIANA.

AXIAL-FLOW PUMP OR TURBINE.

Application filed June 8, 1923. Serial No. 644,256.

My invention relates to axial flow pumps and turbines for operation at relatively low pressures, and the object is to provide a construction at once cheap and efficient, provision being made for easy passage of the fluid to and from the impeller, the positioning of the main bearing so as to balance the stresses in the bearing and substantially eliminate stresses due to overhang in the shaft and the diffuser cone, and the provision of means for keeping grit out of the main bearing by discharge of all grit to the suction side of the impeller, simple means being also provided for partly balancing the impeller thrust, hydraulically. I attain these objects by the means and mechanism hereinafter described and illustrated in the accompanying drawings and specification in which:

Figure 1 is a sectional elevation through the pump; Figure 2 is an elevation of the pump viewed from the right of Figure 1; Figure 3 is an elevation of the pump viewed from the left of Figure 1; Figure 4 is a view of the central directing body 1, removed from the main body of the pump and viewed from the face 43; Figure 5 is an elevation of part 1 viewed from the left and removed from the main body 2 of the pump; Figure 6 is a side elevation of the central directing body 1 removed from 2; Figure 7 is a side elevation of the discharge impeller cone 3 on which is shown the grooves 46 for mounting the blades 10; Figure 8 is a view of Figure 7 viewed from the left, and Figure 9 is an elevation of Figure 7 viewed from the right; Figure 10 is a side elevation of the assembled pump. In all figures, similar numerals refer to similar parts.

In Figure 1, part 2 is the main outer wall of the pump and consists essentially of two cylindrical fluid passages 30 and 31 intersecting at an angle. Passage 31 connects by means of the flange 25 with the discharge pipe, and is closed at its farther end by the inclined flange 32 of the central directing body 1, held by welding or other usual means with the flange 39 of 2. The passage 30 connects with the suction pipe by means of the flange 26.

Within 2 is inserted the central directing body 1, so that the shaft 12 shall be concentric with the passage 30.

This central directing body which forms an important part of this invention shows in Figures 1, 3, 4, 5, and 6 and is formed as follows: the inclined flange 32, Fig. 6 is cylindrical and concentric with the shaft 12 and fits in the flange 39 of 2. A web 17 connects 32 with the body 33 of 1 and is shaped as in Figures 1, 4, 5, 6, being wedge shaped where it approaches the face 42, Figures 4 and 6. The body 33 of 1 is so formed that it is hollow, Fig. 1, having a lower edge 41 which at the lowest point nearest the incoming fluid at 35 is substantially wedge shaped as in Figs. 1, 3, 4, 5, 6, but as it approaches the face 42 it gradually merges into a cylindrical shape having a support 34 at that point, as in Figs. 3, 4, 5, 6. The part of 1 above the horizontal plane of the shaft is cylindrical throughout, see Figs. 4 and 5.

In Figure 4 the lug 34 was intentionally omitted in order to bring out the shape of the edge 41.

1 is closed at its forward or discharge end by a cylindrical header 5 whose discharge face is 42, within which is concentrically mounted the shaft 12, which is mounted in a bearing 6 and stuffing box 37 within an extension support 4 extending beyond the face 42 of the header 5. It will be observed that this extension 4 extends the full internal length of the discharge impeller cone 3 and so mounts the bearing 6 that the said bearing is positioned between the face 43 of the rotary discharge cone and the discharge edge of the impeller blades 10. In this extension 4 are also formed oil grooves 7 and the grit discharge groove 47, which is placed on the discharge side of 6. The gland 13 also fits in the extension 4 at the header 5.

The exterior bearing 14 may be mounted within the exterior hollow body of 1 on a bracket 15 as shown, and a drive coupling 16 is likewise shown, though any other method of driving may be made use of. The grit passage 47 registers with an annular groove 48 in 4, which in turn registers with a concentric recess 49 on the shaft 12, Fig. 1. 8 is a concentric passage in the center of the shaft registering with 31 and a right angle turn 9, which registers with the interior of 3, admitting fluid from 31 to 38 at a pressure substantially equal to that existing at 31. As 38 is practically a closed chamber due to a running fit at the face 42 due to the annular ring 45, it follows that as the pressure within 38 is equal to that

pressure outside of 3 that all collapsing stresses have been eliminated. This is a point of improvement.

The discharge impeller cone shown parabolic in section, and hollow is marked 3 and is attached to the shaft 12 close to the face 43 of 4, just enough clearance being allowed for the fluid through 9 to register with 38. It extends back over 4 to the face 42, terminating in an annular flange 28 which is closed to the passage 44 by the annular leakage ring 45. At the outer surface of 3 next the face 42 are mounted the blades 10 either integral with 3 or mounted in grooves 11 after the manner shown in my Patent #1404346 of January 24, 1922, to which I make reference and which I will therefore not redescribe. These fastening grooves are shown on 3 in Figure 7. Any of the usual means, such as a key, or a set screw, or pin may be used for fastening the shaft 12 to the discharge impeller cone 3. The removable semicylindrical plate 18, shown in Fig. 10, fastened to 2 by the bolts 23 is merely a splitting of the casing for ease of repair and is a very usual device, and while shown is no part of this invention, in itself.

Among the advantages of my improved pump are: Better guidance of the entering fluid, better balancing of the stresses in the shaft and the interior bearing, elimination of collapsing stresses in the hollow discharge impeller cone, and partial balance of the impeller thrust, by simple means.

The following claims are to be understood to apply to axial-flow pumps of the general type comprising a dished suction elbow, closed next the impeller by a cylindrical header that carries a bearing support extended into and concentric with a hollow rotating discharge cone on which are mounted the impeller blades, which cone is itself fastened at the high pressure end of the actuating shaft, and in all the following claims the expression "a pump of the type described" shall be construed to designate this class of pump and is used to eliminate undue verbiage and clear up the meaning of the claims.

I claim:

1. In combination, in a pump of the type described, a casing having an elbow portion, a central directing body in the casing, the directing body tapering from a wedge shape form, where it intersects the suction elbow to a cylindrical form, a shaft extending through the directing body and into the casing, a hollow rotatable discharge impeller cone attached at its forward end to the shaft, impeller blades on the other end of the cone, a bearing for the shaft, placed within the hollow impeller cone at a point between the discharge edge of the impeller blades and the point at which the cone is attached to the shaft, means providing communication between the discharge side of the impeller and the interior of the impeller cone, said shaft being formed with an annular groove, and communicating means between the annular groove and the suction side of the impeller.

2. In combination, in a pump of the type described, a hollow rotatable cone, impeller blades on the cone, means for communication between the pump discharge chamber and the interior of the hollow cone whereby pressure within the cone is made substantially equal to the discharge pressure, communicating means between the pressure chamber and the suction side of the impeller, a central directing body wedge shaped where it intersects the suction elbow and tapering to a cylindrical form next the impeller.

Signed at New Orleans, in the Parish of Orleans and State of Louisiana, this 13th day of January, 1925.

EUGENE F. DELÉRY.