March 24, 1931. I. C. JENNINGS 1,797,980

HYDROTURBINE PUMP

Filed Jan. 19, 1929 3 Sheets-Sheet 1

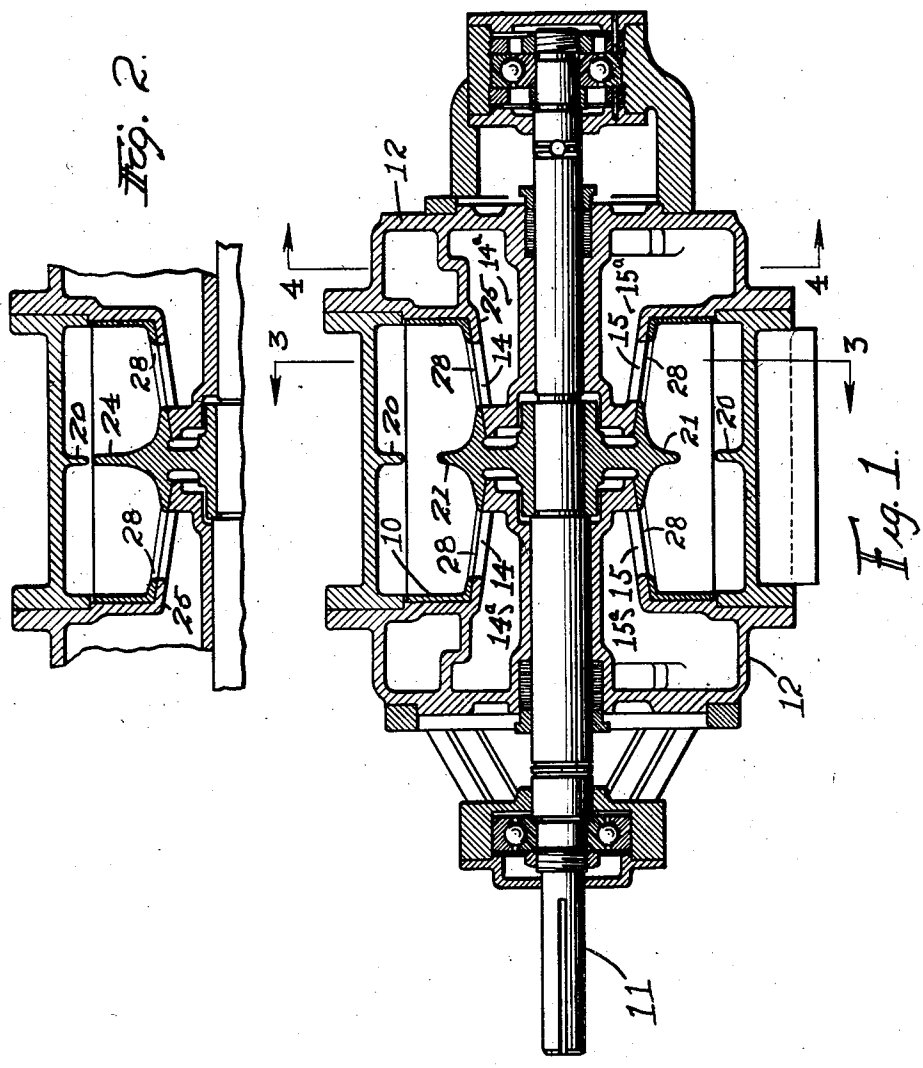


Fig. 1.

Fig. 2.

INVENTOR
Irving C. Jennings
BY Sonnenschein Fay & Hardy
ATTORNEYS

March 24, 1931. I. C. JENNINGS 1,797,980

HYDROTURBINE PUMP

Filed Jan. 19, 1929 3 Sheets-Sheet 2

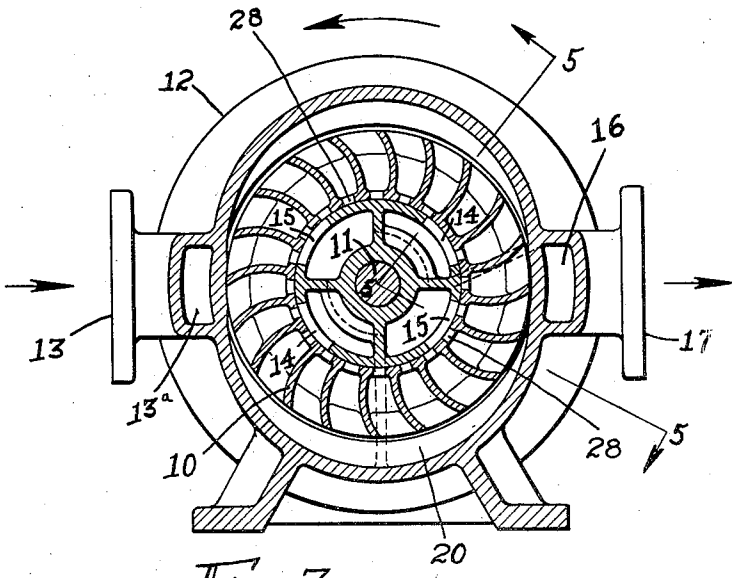


Fig. 3

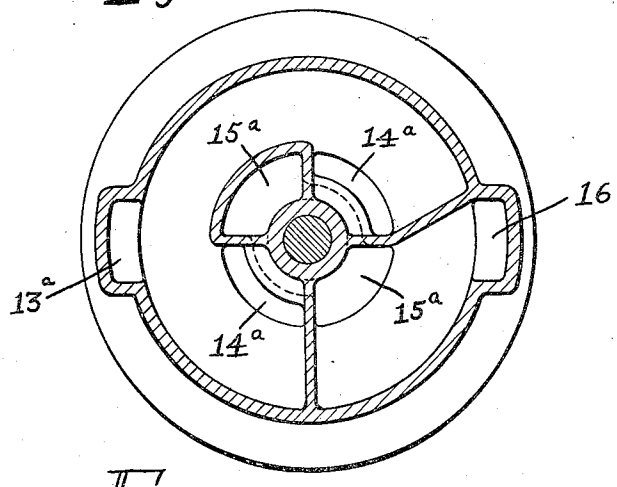


Fig. 4

INVENTOR
Irving C. Jennings

BY
Southgate Fay & Hawley
ATTORNEYS

March 24, 1931. I. C. JENNINGS 1,797,980

HYDROTURBINE PUMP

Filed Jan. 19, 1929 3 Sheets-Sheet 3

Fig. 5.

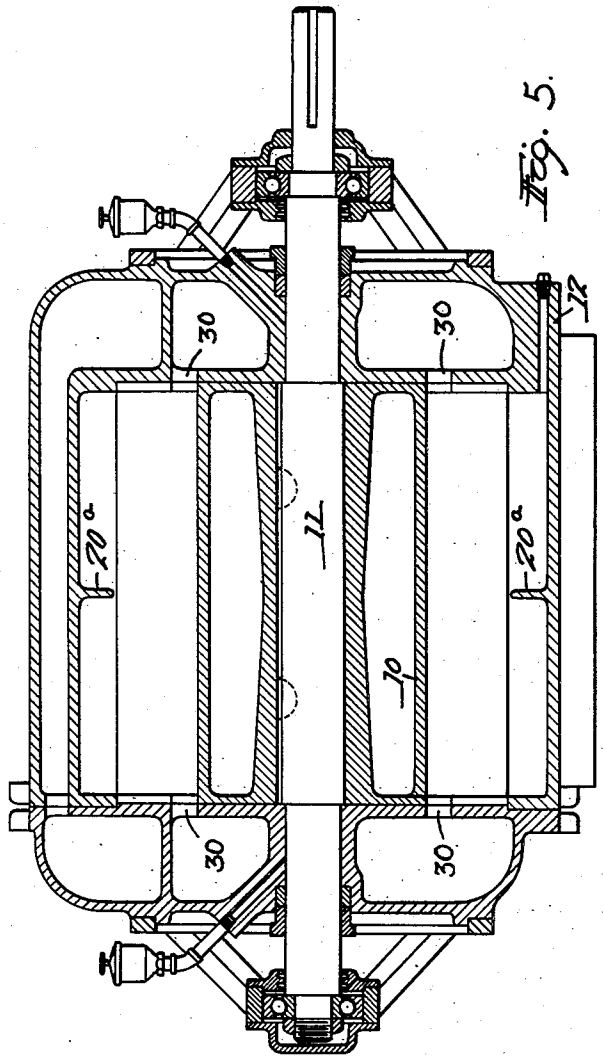
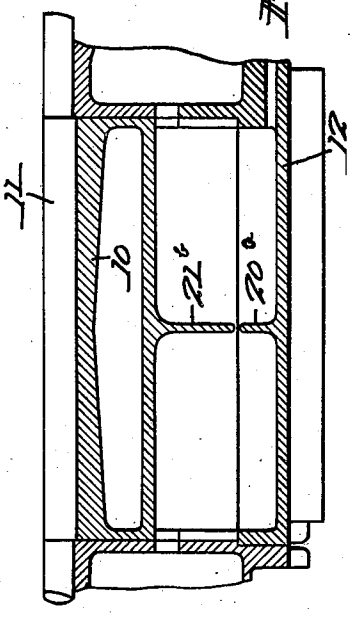


Fig. 6.



INVENTOR
Irving C. Jennings
BY Sanderson Fay & Harley
ATTORNEYS

Patented Mar. 24, 1931

1,797,980

UNITED STATES PATENT OFFICE

IRVING C. JENNINGS, OF SOUTH NORWALK, CONNECTICUT

HYDROTURBINE PUMP

Application filed January 19, 1929. Serial No. 333,602.

This invention relates to the type of hydroturbine pump shown in the prior United States patents to Nash, No. 953,222, granted March 29, 1910, and No. 1,091,529, granted March 31, 1914.

In the manufacture of the Nash type of pump, it has been found that the peripheral speed of the rotor must not exceed a definitely known rate if the efficiency of the pump is to be maintained. All attempts to increase the relative axial length of the rotor beyond approximately 40% of its outside diameter have also been found to produce a sharp drop in efficiency in higher vacuum operation. Consequently, the only practical method heretofore known for increasing the capacity of the Nash type of pump has been by increasing the diameter proportionately to any increase in rotor length, and by correspondingly reducing the number of revolutions so as to maintain the same peripheral speed of the rotor. This method of increasing capacity involves increases in weight and motor size out of all proportion to the gain in capacity.

The principal object of this present invention is to provide means permitting widening of the pump rotor and thus securing additional capacity without reducing the efficiency of the pump. A more specific object is to provide means, as a separating member, for stopping the surging of the water in the lobes of the pump casing, whereby the length of the rotor may be substantially increased while maintaining or increasing the efficiency of the pump. Other objects and advantages of the invention will be hereinafter described and more particularly pointed out in the appended claims.

Certain forms and modifications of the invention are shown in the drawings, in which

Fig. 1 is the longitudinal sectional elevation of a pump embodying my improvements, taken on line 5—5, Fig. 3.

Fig. 2 is a partial elevation similar to Fig. 1, but showing a slight modification;

Figs. 3 and 4 are transverse sectional elevations, taken along the lines 3—3 and 4—4 in Fig. 1.

Fig. 5 is a longitudinal sectional elevation showing the application of my invention to a slightly different type of pump, and

Fig. 6 is a similar detail view showing a further modification.

Referring particularly to Figs. 1, 3 and 4, I have indicated a pump which is in general the well known Nash type and comprises a rotor 10 mounted on a shaft 11 and rotatable in a casing 12. The rotor is positively driven from a motor or other suitable source of power. The rotor 10 is preferably of a general cylindrical shape and rotates within a compartment or chamber in the casing 12, which is substantially of elliptical cross-section, the chamber closely fitting the rotor at the two sides thereof, as shown in Fig. 3, and being spaced therefrom to form lobes above and below the rotor.

The rotor, as is usual in Nash pumps, is divided by substantially radial vanes in a series of rotor pockets or compartments, each having a port or opening at the bottom. The casing 12 is provided with an inlet 13, connected through an inlet passage 13*a* to inlet ports 14.

In the preferred form, the walls of the rotor chamber are extended inward to form conical hub portions 25, provided with openings 28 connecting the inlet ports 14 and passages 14*a* with the rotor pockets. Additional openings 28 connect the rotor pockets with passages 15*a* and discharge ports 15, connected by an outlet passage 16 to the pump outlet 17.

In the operation of pumps as thus far described, it has been found that the axial length of the rotor cannot substantially exceed 40% of its outside diameter without greatly reducing the efficiency of the pump. It appears probable that this reduction in efficiency on increase of length is due to the surging of the water axially in the elliptical lobes or spaces surounding the rotor in the upper and lower portions of the casing.

In order to reduce or prevent this surging action, I have provided one or more separating members 20, preferably formed integral on the inside of the casing in the elliptical portions thereof and extending inward closely adjacent to the periphery of the rotor.

When such a separating partition is provided, it is found possible to very substantially increase the length of the rotor relative to its out side diameter without loss of efficiency. It is thus possible to correspondingly increase the capacity of the pump by merely increasing the length thereof and without change in the peripheral speed.

I also find it desirable to provide a corresponding separating member 21 (Fig. 1) in the hub portion of the rotor itself, this separating member 21 strengthening the vanes of the rotor and also co-operating with the separating members 20 in reducing cross currents within the pockets of the rotor.

In Fig. 2 I have indicated a separating member 24 in the rotor extended outward substantialy to the periphery of the rotor to still further decrease the cross currents.

In Fig. 5, I have indicated the use of the separating members 20*a* in a slightly different type of pump, in which the ports 30 are formed directly in the rotor chamber end walls, instead of being formed in extended hub portions of the casing. The action and the advantages of the separating members 20*a* are the same as previously described.

In Fig. 6, I have indicated the additional use of separating members 21*b* in a pump of the type shown in Fig. 5.

In all forms of the invention illustrated, the apparently simple change over previous practice by inserting the separating members in the casing lobe or lobes, or in the lobe or lobes and also in the rotor, has been found to produce very remarkable increases in efficiency and also great economy in manufacture. It has been found, for instance, that the capacity of a certain size pump can be increased by this method with a saving of at least one-third in weight of metal over a pump of the same capacity but with a larger diameter and narrower rotor, and with a reduction in motor size due to the increased speed at which the longer pump of smaller size can be operated.

While the liquid used in the pumping action is designated "water" in the specification and claims, it will be understood that this designation is illustrative only, as other liquids may be substituted without impairing the utility or advantages of my invention or necessitating any mechanical alteration therein.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed otherwise than as set forth in the claims.

What I claim is:

1. In a hydro-turbine pump of the type using water as a seal and having ports, and displacement chambers cooperating with said ports, the combination of a circular rotor with an elliptical casing therefor and means to prevent the surging of the water in an axal direction comprising a projection extending in from the peripheral casing toward the rotor.

2. In a hydro-turbine pump of the type using water as a seal and having ports, and displacement chambers cooperating with said ports, the combination of a circular rotor with an elliptical casing therefor and means to prevent surging of the water in an axial direction along the space outside of the path of the rotor comprising a separating member projecting transversely inward from the casing toward the rotor in said space.

3. In a hydro-turbine pump of the type using water as a seal and having ports, and displacement chambers cooperating with said ports the combination with a rotor and a casing in which said rotor is located, said casing having a lobe of greater diameter than the rotor, of means to reduce the axial surging of the water in the lobe of the pump comprising a separating member located within the casing in said lobe and between the ends of said casing.

4. In a hydro-turbine pump of the type using water as a seal and having ports, and displacement chambers cooperating with said ports, the combination with a rotor and a casing in which said rotor is located, said casing having a lobe of greater diameter than the rotor, of means to reduce the axial surging of the water in the lobe of the pump comprising a separating member located within the casing in said lobe and between the ends of said casing, said member extending inward closely adjacent said rotor.

5. In a hydro-turbine pump, the combination with an elliptical casing of a cylindrical rotor contained within the casing, whereby the casing has portions spaced from the rotor on opposite sides, of means to prevent the flow of water longitudinally of the pump comprising a separating member extending in from each side of the casing substantially half way between its ends toward the rotor, whereby the efficiency of the pump is maintained when the relative length of the rotor is increased.

6. In a hydro-turbine pump of the type using water as a seal and having ports, and displacement chambers cooperating with said ports, the combination with an elliptical casing of a rotor contained within the casing, whereby the casing is spaced from the rotor on opposite sides, of means to restrict the longitudinal flow of water in the casing comprising separating members extending in from each side of the casing toward the rotor to prevent the flow of the water longitudinally thereof, and a separating member extending outwardly from the hub of the rotor substantially in registration with the first named members.

7. In a hydro-turbine pump of the type

using water as a seal and having ports, and displacement chambers cooperating with said ports, the combination of a circular rotor with an elliptical casing therefor, of means to restrict the surging of the water in an axial direction comprising means extending transversely of the casing in the space between the peripheral casing and the path of the rotor.

8. In a hydro-turbine pump of the type using water as a seal and having ports, and displacement chambers cooperating with said ports, the combination of a circular rotor with an elliptical casing therefor, of means to reduce cross currents in the pump comprising a continguous baffle wall located in the central part of the enlargement between the side walls of the pump and projecting into the chamber between the surface passed over by the extreme edge of the rotor and the periphery of the housing.

9. In a hydro-turbine pump, the combination of a circular rotor with an elliptical casing therefor, of means to reduce cross currents within the casing and within the pockets of the rotor comprising a contiguous baffle wall located in the central part of the enlargement between the side walls of the pump and projecting into the chamber between the surface passed over by the extreme edge of the rotor and the periphery of the housing, and another baffle wall located in the upper portion of the rotor to cooperate with said first mentioned baffle wall.

In testimony whereof I have hereunto affixed my signature.

IRVING C. JENNINGS.