April 29, 1947. A. WAHLE 2,419,924

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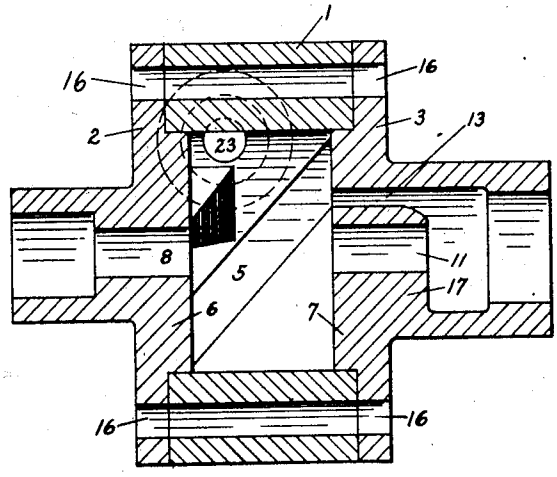


FIG. 1

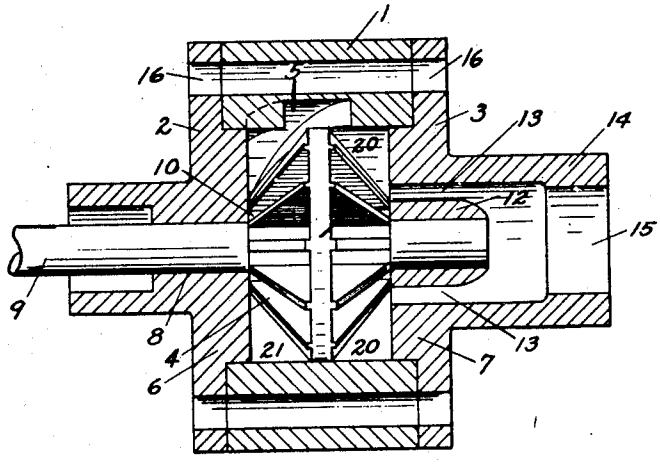


FIG. 2

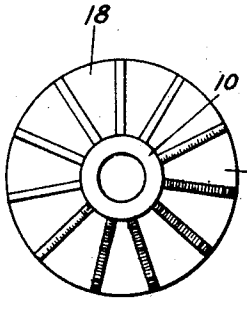


FIG. 3

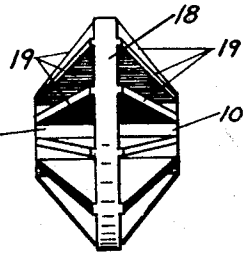


FIG. 4

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April 29, 1947. A. WAHLE 2,419,924

PUMP

Filed Nov. 1, 1944 2 Sheets-Sheet 2

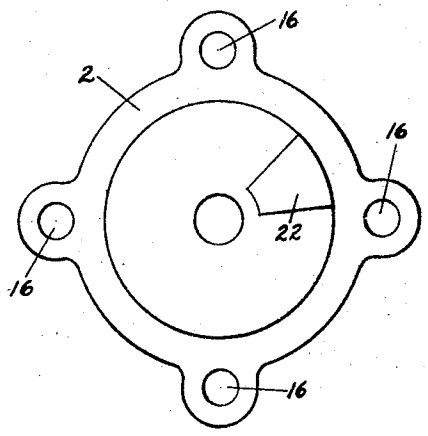


FIG. 5

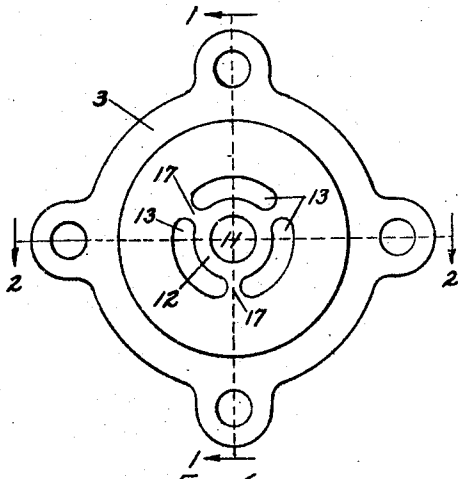


FIG. 6

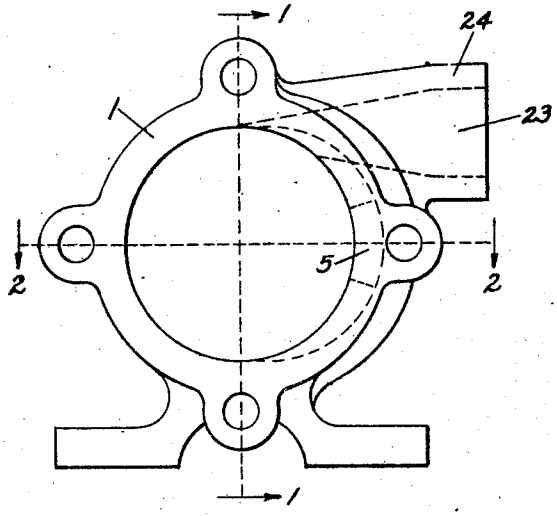


FIG. 7

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Application November 1, 1944, Serial No. 561,427

11 Claims. (Cl. 103—5)

1

My present invention relates to improvements in a certain type of pump, and more particularly to pumps having a rotary impeller for drawing in fluid and forcing it out at a higher velocity. Specifically, the purpose of this invention is to provide a pump of higher efficiency than pumps of the same general class which have heretofore existed. I have found that, by combining two types of pumps into one and operating them in unison, I can, under some conditions, provide a greater flow of liquid, with higher velocity, than can be brought about by other pumps utilizing the same horsepower.

In the drawings annexed hereto and forming a part hereof,

Fig. 1 represents a longitudinal, medial section, substantially along the plane indicated by the line 1—1, Fig. 7;

Fig. 2 represents a horizontal, medial section of my new pump, substantially along the plane indicated by the line 2—2, Fig. 7;

Figs. 3 and 4 show, respectively, side and edge elevations of the impeller of this pump, this form being only one of several which this impeller may assume with varying degrees of efficiency;

Figs. 5 and 6 represent, respectively, inner face elevations of the two closure members for the body of the pump; and

Fig. 7 represents a side elevation of the body of a pump embodying my present invention.

Reference will now be made in greater detail to the annexed drawings for a more complete description of this invention. This pump comprises essentially four elements, namely, a body portion 1, end closure plates 2 and 3, and an impeller 4. These parts are shown in assembled relation in Fig. 2, in which the body portion 1 is shown as having a cylindrical bore, in the wall of which is formed a diagonal crossover channel 5 which extends from one head to the other and which, as shown in Fig. 7, is deepest in its central portion and which fades out to zero at its two ends, located in the vicinity of the vertical center plane of the bore.

The closure 2 is provided with a circular disc-like projection which extends into one end of the body 1, being indicated by the numeral 6, while the closure 3 has a similar projection 7 fitting into the second end of the body. This structure is shown most clearly in Figs. 1 and 2. The closure 2 is provided with an axial opening 8 which serves as a bearing for the impeller drive shaft 9, as indicated in Fig. 2. The impeller has a hub 10 which has driving connection with the shaft 9, the second end of which shaft runs in the opening

2

11 of the support 12 which is mostly surrounded by openings 13 permitting the entrance of water through the closure member 3. The closure member 3 has a projection 14 upon its outer face which is provided with an opening 15, commonly referred to as an eye, for the admission of water or other fluid.

Openings 16 extend through the pump for the reception of bolts (not shown) which serve to hold the parts tightly assembled. A plurality of supports 17 connect the supporting member 12 with the remainder of the closure member 3 and thereby hold this member 12 in a definite position to serve as a bearing for the shaft 9.

For the description of the impeller, reference will be made particularly to Figs. 3 and 4 from which it will be seen that a circular blade or web 18 is connected to the hub 10 and projects outwardly therefrom, substantially midway of the length thereof, and having a running fit with the bore of the body. A plurality of impeller blades 19 project radially outwardly from the hub 10 and are connected both to this hub and to the web 18, thereby forming pockets between the hub, the web, and the vanes. As the shaft 9 is rotated, the impeller 4 rotates therewith relatively to the body or casing 1. There is a circular channel 20 located between the closure member 3, the body member 1, and the impeller 4, which opening is triangular in cross-section, as shown clearly in Fig. 2. At the opposite side of the impeller is a similar opening 21 between the closure member 2, the body member 1, and the impeller 4. The liquid drawn in through the openings 15 and 13 enters the opening 20 and fills the pockets between the vanes. As the impeller rotates, the fluid is forced into the crossover channel 5 and from this into the channel 21. As the impeller continues to rotate, the water is carried around thereby until it hits the upper side of the stop member 22. Since it can no longer circulate in the channel 21, under the influence of the impeller 4, it passes out through the opening 23 of the discharge 24, to which a suitable conduit is connected.

Since the web 18 has a running fit with the bore of the body or casing 1, it is obvious that this separates the interior of the casing into two compartments which are, essentially, unconnected except by the channel 5. Therefore, since the water enters through the eye 15, approximately centrally of the impeller, and moves outwardly to the channel 5, this is a centrifugal type of pump. The water, moving through the channel 5, crosses the periphery of the impeller and is

discharged through the tangential outlet 23. Hence, this second side of the pump is of the turbine type. It will thus be seen that it acts in series with the first pump and serves as a booster therefor, increasing the pressure of the water at the discharge.

Attention is directed to the fact that the triangular shaped channels are bounded by the closure members, the housing, and the sweep of the unconnected blade edges, the greater portion of the water contained within the channels being in the peripheral parts thereof. The purpose of this is to have the most water possible available at the outer or peripheral part of the impeller.

It is clear that the cross-section of the crossover channel should be properly proportioned to the other parts of the pump so that the correct amount of water will be supplied to the turbine side of the pump. The carrying capacity of this channel must necessarily vary with variations in the size of the pump.

It will of course be understood that the specific description of structure set forth above may be departed from without departing from the spirit of this invention as set forth herein and in the appended claims.

Having now described my invention, I claim:

1. A rotary pump comprising a body having a cylindrical bore, closures for the two ends of the bore, a shaft-driven impeller substantially centrally positioned in said bore, the closures having substantially flat faces exposed toward the impeller, the impeller comprising a central hub, a substantially circular plate connected to said hub intermediate the ends thereof, substantially perpendicular thereto, and radial vanes connected to said hub and said plate to form water-receiving compartments between the vanes and the plate, the vanes having their outside edges formed to provide channels which are V-shaped in cross-section between the edges of the impeller vanes and the flat faces of the closures, one of the closures being provided with a water intake extending therethrough for carrying water to the impeller, and the said body having a tangential water discharge opening.

2. In a pump of the type described having a casing provided with a cylindrical bore, an impeller fitting in said bore, said impeller comprising a hub extending axially of said casing, a circular plate surrounding and connected to said hub, said plate being located centrally of the cylindrical opening, and vanes connected to the hub and extending outwardly radially from the hub, said vanes and circular plate having a running fit with the surrounding casing, and the casing being provided in its interior with a diagonal crossover channel permitting water to cross diagonally from one end portion of the bore to the other.

3. In a pump of the type described having a casing provided with a bore of uniform diameter and having a diagonally extending channel formed in the internal wall of the casing and extending from adjacent one end of the bore substantially to the other end thereof, and closures fitted to the ends of the casing, said closures being provided with shaft bearings; an impeller comprising a hub, a circular web carried by said hub perpendicularly thereto, and a plurality of vanes radiating outwardly from said hub into close proximity to the casing, the vanes, in the vicinity of the hub, extending substantially into contact with the casing end closures and, at the periphery of the impeller, being remote from said closures.

4. An impeller for a rotary fluid pump comprising a hub, vanes radiating from said hub and extending substantially equal distances therefrom, each of said vanes being in the form of a trapezoid having its base toward the hub, and a web extending outwardly from said hub perpendicularly thereto and connecting said vanes.

5. An impeller type pump having a dual function impeller, one portion of which functions as a centrifugal type and the other as a turbine type of pump, the centrifugal type having an inlet adjacent its hub and a discharge at its periphery, and the turbine type receiving fluid from the centrifugal type at its periphery and discharging it tangentially, said impeller having a hub and blades extending radially therefrom to the periphery of the impeller.

6. In a pump, a casing having a cylindrical bore provided in its bounding wall with a diagonally arranged crossover passageway leading from one end portion of the bore to the other end portion thereof, a shaft-driven impeller located in said bore with its periphery closely adjacent the wall of the bore, and end walls closing the ends of the bore, said casing having circular channels between the end walls, the impeller, and the bore wall, said circular channels being triangular in cross-section, the smaller portions of the channels being nearer to the axis of rotation of the impeller than the larger portions thereof.

7. A pump of the type described comprising a casing having a cylindrical bore and a diagonally arranged crossover channel from a point adjacent one end of the bore to a corresponding point adjacent the other end of the bore, closures at the ends of the bore, and a stop on the inner face of one of the closures to project into the bore, said casing having a tangentially arranged outlet from the bore, in combination with a bladed impeller, approximately doubly conical in form with the bases toward each other.

8. An impeller for a fluid pump comprising a hub having flat blades extending radially therefrom and a web extending outwardly from the hub perpendicularly to the hub and the blades, said blades being trapezoidal in form with one parallel side adjacent the hub of the impeller and the other at the periphery thereof.

9. A fluid pump comprising a casing and an impeller, rotatable therein, said casing having a cylindrical bore and a closure at each end of the bore, one of the closures having a fluid inlet adjacent the center thereof and the other closure having a fluid stop on the inner face thereof, said casing having adjacent the end remote from the inlet a tangentially extending outlet, the said stop being located closely adjacent the outlet whereby to occasion fluid thrown off from the impeller, when rotated, to enter the outlet and be discharged therefrom, said casing having a diagonally arranged fluid cross-over in its cylindrical wall extending substantially from end to end thereof.

10. A fluid pump comprising a casing and an impeller, rotatable therein, said casing having a cylindrical bore and a closure at each end of the bore, one of the closures having a fluid inlet adjacent the center thereof and the other closure having a fluid stop on the inner face thereof, said casing having adjacent the end remote from the inlet a tangentially extending outlet, the said stop being located closely adjacent the outlet whereby to occasion fluid thrown off from the impeller, when rotated, to enter the outlet and be dis-

charged therefrom, said impeller comprising a hub having a web extending outwardly therefrom, perpendicularly thereto, substantially midway between the end closures, and radially extending blades arranged longitudinally of the hub and connected thereto and to the web.

11. A pump of the type described comprising a casing having a cylindrical bore and a diagonally arranged crossover channel from a point adjacent one end of the bore to a corresponding point at the other end of the bore, said channel having a uniformly decreasing depth from its middle toward its ends, finally becoming zero, closures at the ends of the bore, and a stop on the inner face of one closure, closely adjacent one end of said channel to project into the bore, said casing having a tangentially arranged outlet from the bore in combination with a bladed impeller centrally located in the bore and adapted to rotate therein with its periphery having a running fit with the inner face of the bore.

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