Sept. 27, 1932. G. L. FERGUSON 1,879,149

PUMPING APPARATUS

Filed May 31, 1930

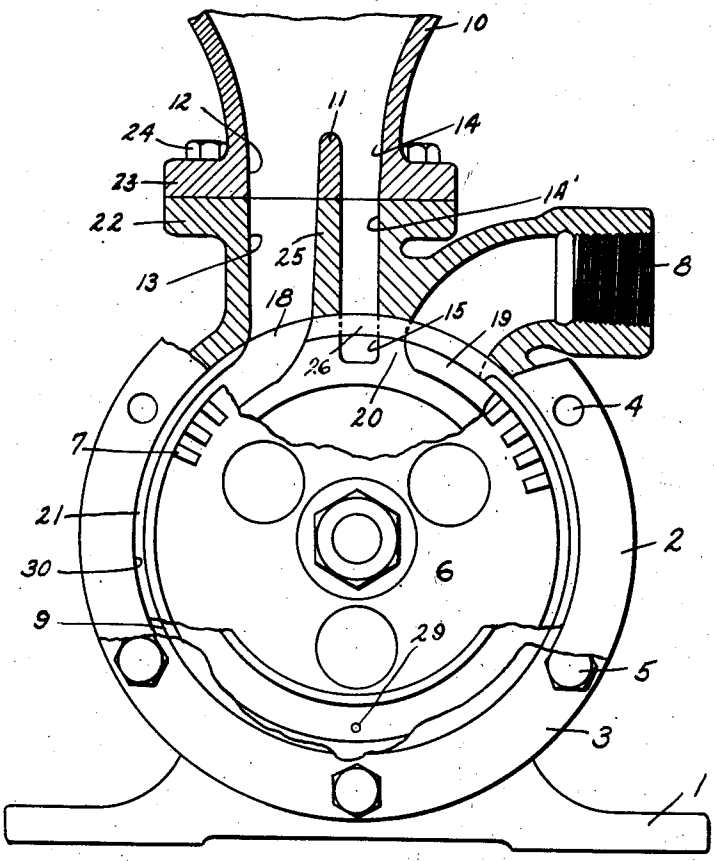


Fig 1

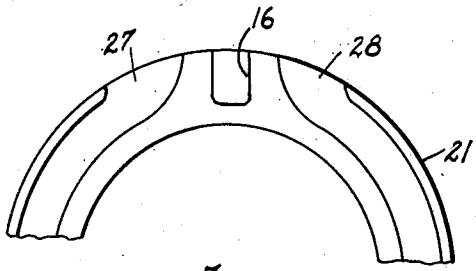


Fig 2

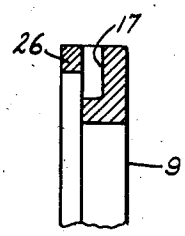


Fig 3

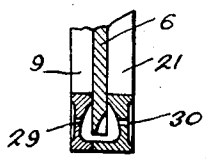


Fig. 4

INVENTOR.

Gale L. Ferguson

BY

Fay Oberlin & Fay

ATTORNEYS.

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UNITED STATES PATENT OFFICE

GALE L. FERGUSON, OF CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO WESTCO PUMP CORPORATION, OF DAVENPORT, IOWA, A CORPORATION OF DELAWARE

PUMPING APPARATUS

Application filed May 31, 1930. Serial No. 458,437.

This invention, relating, as indicated, to pumping apparatus is more particularly directed to a pump of the "automatic priming" type. Briefly stated, the object of this invention is to provide a pump in which there is a certain amount of priming fluid, and one in which such priming fluid is always kept in the pump proper and quickly reaches the impeller channel. Heretofore, pumps have been devised which had priming means, but in the majority of these devices the priming fluid was carried along with the pumped fluid and this resulted in the necessity for frequently replenishing the priming fluid.

Another difficulty with devices of the prior art is that the priming means usually necessitates the addition of considerable parts to the pump, and this has two important disadvantages, namely, the cost of the parts and the space taken up thereby. In my improved pumping apparatus the whole organization is no larger than an ordinary pump which does not have a priming means.

A still further object of this invention is to provide a pump with a means of separating the priming liquid from any air or gases which are being pumped over, and returning this liquid to the pump to a point immediately adjacent the inlet port of said pump.

The annexed drawing and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawing:—

Fig. 1 is a vertical sectional view of my improved pump with parts in elevation; Fig. 2 is an elevation of one of the impeller rings; Fig. 3 is a section taken transversely to Fig. 2 of the other impeller ring; and Fig. 4 is a fragmentary transverse section through the bottom of the impeller and rings.

Referring now to Fig. 1, a base 1 is shown having a pump casing 2 rising therefrom, said casing being enclosed by means of bolts 5 which are received in screw threaded sockets 4 and clamp a face plate 3 to the beforementioned casing. This casing has a cylindrical bore 30 within which two allochirial impeller rings 21 and 9 are mounted. The impeller 6 revolves in mating grooves which form a channel, said impeller having peripheral buckets which carry the fluid from an inlet 19 to an outlet 18.

Small holes 29 and 30 in the bottoms of the rings 9 and 21, respectively permit water within the casing to flow into the pump channel more rapidly than it can enter through the close clearance between the rings and the impeller, with the result that the pump picks up its priming charge more rapidly than would otherwise be the case. These holes, being small and at the side of the impeller channel, do not impair the efficiency of the pump.

The screw-threaded passage 8 is the inlet port of the pump assembly, and this passage is connected to a pipe which pipe in turn communicates with a source of fluid which is desired to be moved by pumping. The impeller rings when placed in position mate to form the inlet 19 which results from orifices such as 28, shown in Fig. 2, in each of the rings. In a similar manner the outlet 18 is formed by orifices such as 27. A passage 13 in the pump casing leads upwardly from the outlet port 18 to a chamber 10, which may be termed a separating chamber.

The upper portion of the separating chamber (not shown) has a discharge port and plug, all gases escaping through said port, and said plug serving as a means of introducing a priming liquid into the pump when the pump is initially started. The chamber 10 flares outwardly and has at its base a circular flange 23, which, when seated on the pump casing flange 22, aligns itself therewith, and is held in place by means of head bolts 24. A partition 11 separates the passage 12 in the chamber 10, and such partition may be an integral part of said chamber or may be a separate piece attached thereto. This partition seats directly over a similar partition 25 so that a return passage from the separating chamber 10 is formed by the smaller passages 14 and 14'. The passage 14' terminates at its lower end in a socket 15 which extends downwardly a sufficient distance so that priming liquid readily runs into the peripheral buckets of the impeller.

The socket 15 is formed by the pockets 16 and 17 in the rings 21 and 9, respectively. The cross piece 26 shown in Fig. 3 seals the outer edge of the impeller rings and prevents a great amount of the fluid which is being pumped from entering the return passage 14'.

In starting operation from a dry condition a small amount of liquid is admitted initially to the separating chamber 10 to fill the pump up to the level of the inlet port 8. The pump is then started, throwing water up into the chamber 10, whence some of it drains back into the return passages 14 and 14'. When starting, in the event that the source of supply is not close at hand, the pump will be in a condition known as "air bound." The admission of liquid to the socket 15 immediately corrects this condition, and as the buckets 7 of the impeller sweep past the socket 15 they are filled with liquid and carry enough of that liquid across the land 20 to seal the channel beyond the inlet port 19. In this manner a portion of the air in the supply line is exhausted, and the priming liquid is carried around the impeller channel and up through the discharge port 18 and into the separating chamber 10; and then, by reason of my novel construction, the water again falls into the return passage and the operation just described is continued. This is continued until all the air in the supply line is exhausted, when the fluid in such line will rise and be forced through the discharge port and eventually fill the separating chamber. If, at that time, the supply is cut off or diminished a certain portion of the liquid in the separating chamber 10 will still fall into the return passage and the pump will again be primed until liquid is carried over.

The location and particular construction of the return passage has an extremely advantageous effect upon the efficiency of the pump in that a relatively small amount of priming fluid will readily relieve a pump system which is air-bound, this latter condition being one of the most troublesome factors in the operation of pumps of the character described.

As the impeller revolves most of the water contained in the impeller buckets will be thrown up through the discharge outlet 18 and the object of the return passage 14 and 14' is to return enough water to the impeller to again fill these buckets before they enter the inlet port 19. The water thus passing back to the suction will accumulate at the bottom of the water channel in the rings until it rises to a height sufficient for the impeller buckets to carry it on through to the discharge. When this occurs air from the suction pipe and inlet 19 will be carried along with the water and such action will cause no loss in efficiency because of the fact that after the pump has picked up its prime the amount of water being returned to the suction is limited by the size of the buckets and the speed of the impeller.

While the holes 29 and 30 are not essential to the working of the invention, they offer the advantage of allowing whatever water enters or remains in the pump within the casing to more rapidly find its way into the impeller channel than it could otherwise. Thus, for example, with a lift of 20 feet on a one-inch pipe, the pump will get into full operation about a minute quicker with the holes 29 and 30 than without them. This subject matter, however, is disclosed and claimed in my copending application Serial No. 558,455, filed August 21, 1931.

From the foregoing description it will be clear that I have provided a pump of unusual compactness, and one in which all unnecessary and cumbersome priming parts have been omitted, the priming means of my improved construction necessitating no extra parts or enlargements. It will also be apparent that I have provided a pump in which the priming liquid can not become exhausted so that the pump will always function, and any priming that is necessary will be done automatically. Furthermore, it will be seen that any mixed liquid and gases forced over by the pump will be separated, the gases going out through a discharge port in the separator and the liquid being returned to a point adjacent the inlet port of the impeller channel.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In a pumping mechanism, a pair of mating casing sections, each having an annular channel therein coaxial with and forming with the other a circular fluid passageway, said sections being substantially in circumferential engagement with each other outwardly of said passageway, peripherally arranged inlet and outlet passages in said casing sections in communication with said fluid passageway, an impeller positioned between said sections and having marginal laterally disposed buckets disposed within said fluid passageway, said impeller having sealed running engagement with said sections radially inwardly of said fluid passageway, said sections having radial sealing lands closing the annular channels therein between said inlet and outlet passages and being in running engagement with said marginal buckets, said sections also having a fluid return passage in communication at one end with said outlet passage and terminating at the other end in

an opening in at least one of said lands, whereby a portion of the fluid discharged may be reconducted to said buckets in the region sealed by said lands.

2. In a fluid pumping mechanism, a pair of mating casing sections, each having an annular channel and forming with the other a circular fluid passageway, said sections being substantially in circumferential engagement with each other outwardly of said passageway, peripherally arranged inlet and outlet passages in said sections in communication with said passageway, said inlet passage being vertically disposed, an impeller having laterally opened peripheral buckets disposed within and axially spaced from the walls of said passageway, said impeller having sealed running engagement with said casing sections radially inwardly of said annular channels and having radial channel-closing lands between said inlet and outlet passages and in sealed running engagement with the lateral faces of said buckets to prevent flow of fluid in said passageway from the outlet to the inlet side thereof, at least one of said casing sections having a vertical return passage opening through the land of the said section and terminating at its other end adjacent the opening of said outlet passage whereby a portion of the fluid discharged through said outlet passage may be conducted through said return passage and discharged into the buckets then sealed by said land.

3. In a fluid pumping mechanism, a casing, an impeller rotor mounted therein and having laterally opening peripheral buckets, a pair of impeller rings mounted in said casing at opposite sides of said impeller and having annular channels therein to form a fluid passageway enclosing said buckets, peripheral openings in said rings mating to form an inlet passage, other peripheral openings in said rings mating to form an outlet passage, lateral lands extending across said channels intermediate said inlet and outlet passages and being in sealed running engagement with said impeller buckets to prevent flow of fluid in said passageway from the outlet to the inlet side thereof, at least one of said rings having a return passage opening in its inner lateral face through said land, whereby fluid may be fed into the buckets sealed by said land, said casing having continuation passages respectively in communication with said inlet, outlet and return passages.

4. In a fluid pumping mechanism having an impeller provided with laterally opening marginal buckets, and a casing provided with an annular fluid passageway completely enclosing said buckets, peripherally arranged inlet and outlet passages in communication with said passageway, radial lands between said inlet and outlet passages and in engagement with said buckets to close said passageway against flow of fluid from the outlet to the inlet side thereof, and a fluid return passage opening through at least one of said lands to feed fluid into the buckets sealed by said land.

Signed by me this 24th day of April, 1930.

GALE L. FERGUSON.