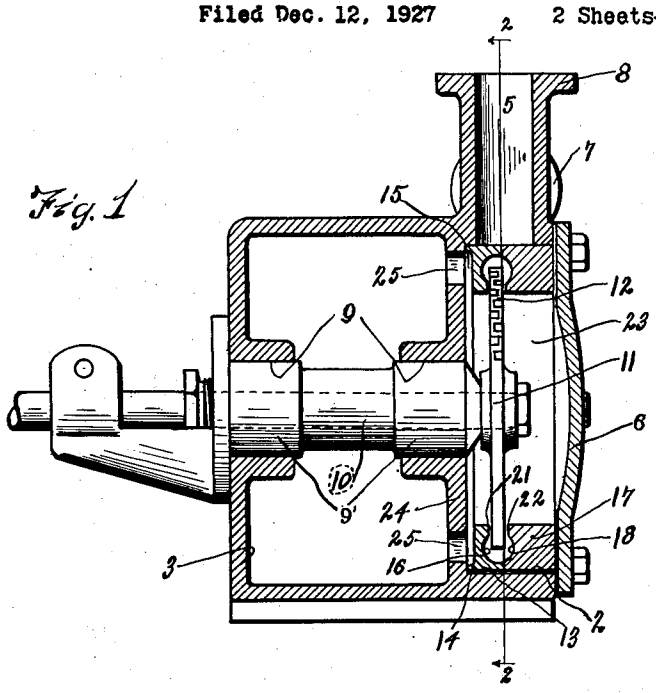
June 24, 1930. G. L. FERGUSON 1,768,243

PRIMING MEANS FOR CENTRIFUGAL PUMPS

Filed Dec. 12, 1927 2 Sheets-Sheet 1

Fig. 1



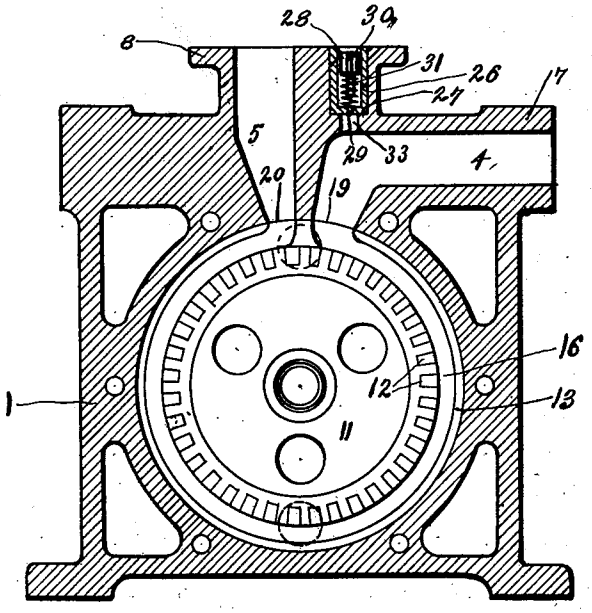


Fig. 2

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PRIMING MEANS FOR CENTRIFUGAL PUMPS

Filed Dec. 12, 1927 2 Sheets-Sheet 2

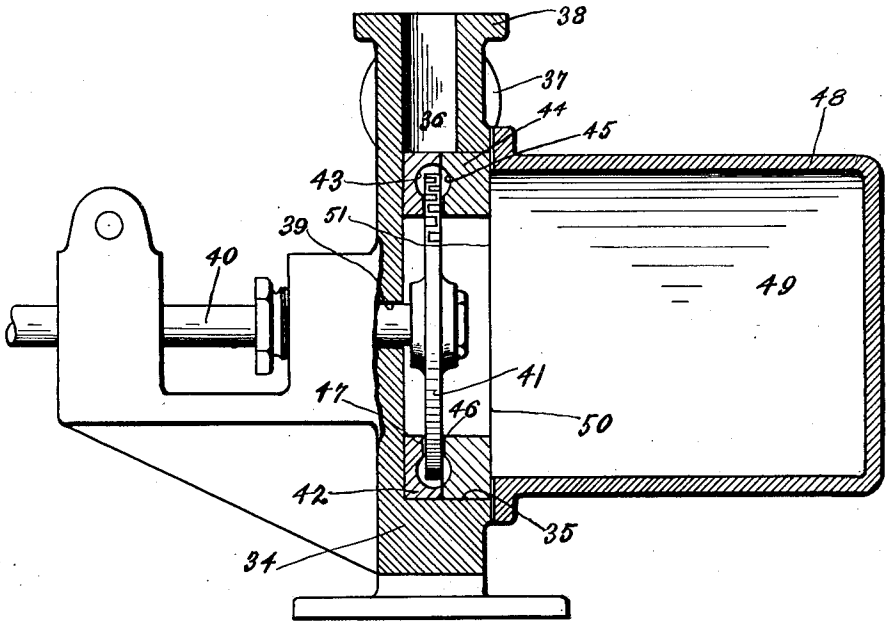


Fig. 4

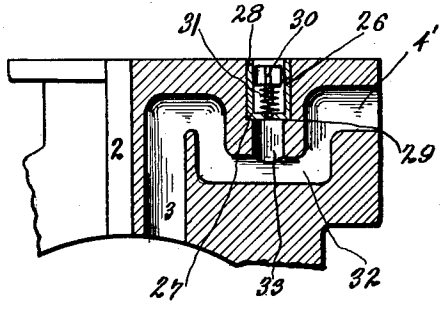


Fig. 3

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UNITED STATES PATENT OFFICE

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PRIMING MEANS FOR CENTRIFUGAL PUMPS

Application filed December 12, 1927. Serial No. 239,366.

The present invention, as indicated, relates to priming means for centrifugal pumps or the like, and the prime object thereof is to provide improved means for priming such pumps. To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

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 transverse section through a pump of the type contemplated by the present invention; Fig. 2 is a section on the line 2—2 of Fig. 1; Fig. 3 is a segmental section of a modification; and Fig. 4 is a section similar to Fig. 1 and illustrating a modified form of priming chamber.

Referring more particularly to the modification disclosed in Figs. 1 and 2, the reference numeral 1 indicates generally a casing comprising an impeller chamber 2, and priming chamber 3, inlet and outlet passages 4 and 5 respectively and a cover plate 6 for said impeller chamber. The outer ends of the passages 4 and 5 are flanged as at 7 and 8 respectively for connection to conduits, but it is to be understood that any other form of connecting means may be used as well.

The casing 1 is formed with bearing apertures 9 receiving a bushing 9′ in which is journalled an impeller shaft 10 mounting in the impeller chamber 2 an impeller 11 provided on its periphery with impeller buckets 12. Within said impeller chamber 2 there is mounted a pump ring 13 provided on its inner face with an annular projection 14 adapted to seat against the inner surface of the chamber 2 to provide a clearance 15 between said ring and said chamber surface. The ring 13 is formed on its outer surface with an annular groove 16. A second pump ring 17 is seated in said chamber with its inner face abutting against the outer face of the ring 13, and is provided on its inner face with a groove 18 adapted to register with the groove 16 to provide a pump channel. The channel is provided with inlet and outlet openings 19 and 20 respectively.

It will be noted that a slight clearance is present as at 21 between the impeller 11 and the ring 13, and as at 22 between the impeller 11 and the ring 17. This combined clearance is very slight, amounting only to about .005 of an inch. It will be apparent that a space 23 is bounded by the rings 13 and 17, the cover plate 6 and the wall 24 separating such space from the priming chamber 3, and that such space is in constant communication with the priming chamber 3 through apertures 25 formed in said wall 24 and communicating directly with the chamber 3 and space 15.

The passage 4 is adapted to be connected with a suitable source of liquid supply and the passage 5 is adapted to be connected with a liquid reservoir (not shown). Formed in the upper end of the casing and communicating with the inlet passage 4 is a conduit 26 adapted to be connected at its upper end with such reservoir. The conduit 26 is reduced in diameter at its lower end to form a shoulder 27 on which is seated a valve casing 28 provided at its lower end with a valve seat 29 with which is adapted to cooperate a valve 30 urged to open position by means of a compression spring 31.

Assuming that the chamber 3 is full of liquid, that the reservoir is empty, and that the check valve provided in the supply line (not shown) has leaked to permit the fluid in said supply line to fall to a level considerably below the pump level, the operation of the device is as follows: The space 23 will be full of liquid because of its communication with the priming chamber 3 through the apertures 25 and the clearance 15. If, now, the shaft 10 be rotated at high speed, the impeller 11 will set up a swirling of the liquid in the space 23, and the resultant centrifugal effect will force such liquid through the clearances 21 and 22 throughout the whole periphery of the chamber 23 and into the pump channel. Liquid will flow from the chamber 3 to replace the liquid forced into the pump channel, and the

liquid forced into the pump channel will seal or prime the pump to enable the pump to effect a partial vacuum in the inlet passage 4 and connected supply pipe. A certain amount of the liquid fed from the priming chamber 3 will be forced into the reservoir, and during this time the pump will be drawing a mixture of liquid and air, the liquid entering the pump through the clearances 21 and 22 and the air entering through the inlet passage 4. The air, of course, will rise through the outlet passage 5 and into the reservoir even though no liquid is forced through the outlet 5. Meanwhile, the liquid supplied by the chamber 3 will furnish a constant prime for the pump, thus permitting the pump to draw the air from the inlet passage 4 and the inlet supply pipe until the liquid in the supply pipe has been elevated to the level of the inlet passage 4, when such liquid will be drawn into the pump and the regular operation of the pump will be started.

Of course it is to be understood that, as soon as any liquid is forced into the reservoir, it will begin to flow into the inlet passage 4, past the valve 30, and this flow will aid the liquid in the priming chamber 3 and impeller chamber 23 in sealing and priming the pump during the air exhausting period. The valve 30 is normally held off its seat by spring 31, and it will remain in this open position until such time as the pressure in the reservoir has been bult up to a predetermined value, dependent upon the strength of the spring 31. As will be obvious, an increase in pressure causes an increase in the velocity of flow past the valve 30, and when such velocity attains a predetermined value, the force exerted upon the valve 30 thereby will overcome the strength of the spring 31 and close the valve 30. After such closure, the difference in pressure on opposite sides of the valve will hold the valve closed until the pressure in the reservoir has dropped materially.

Fig. 3 represents the inlet portion of a pump of the type indicated in which the inlet passage 4′ is formed with a trap 32. The passage 33 leads from the valve seat 29 to the base of the trap, so that liquid supplied to the inlet passage from the reservoir enters such trap. This construction provides for an intermittent supply of priming liquid to the pump from the reservoir, it being quite obvious that, due to the relatively small cross-section of the passage 29 with respect to the inlet passage 4′, liquid supplied from the reservoir will slowly fill the trap 32 and then will be suddenly carried over by the pump suction as a slug of liquid, forcing a slug of air in advance of itself through the pump.

Fig. 4 illustrates a modified form of pump casing in which the priming chamber is formed in the cover member. The casing 34 includes an impeller chamber 35, an inlet passage (not shown), an outlet passage 36, and a cover member 48. The inlet and outlet passages are flanged at 37 and 38 respectively. The impeller chamber 35 is open at its outer end and is provided with an aperture 39 at its opposite end providing a journal for the shaft 40 which carries the impeller member 41. A ring 42 is seated snugly in the impeller chamber 45 and is provided in its outer face with an annular groove 43. A similar ring 44 is also snugly seated in the chamber 35 and is provided in its inner face with an annular groove 45 cooperating with the groove 43 to form a pump channel. Clearances 46 and 47 are provided between opposite sides of the impeller 41 and the rings 44 and 42 respectively. The cover member 48 is formed to provide a chamber 49 open at its inner end 50 and registering with the open end 51 of the impeller chamber 35. The operation of the device illustrated in Fig. 4 is identical with that of the device illustrated in Figs. 1 and 2.

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 pump, a casing comprising a priming chamber, and an impeller chamber in communication with each other, mating pump rings in said impeller chamber providing a pump channel therebetween, and an impeller mounted in said impeller chamber between said rings and extending into said channel, there being a slight clearance between said impeller and said rings whereby said impeller is enabled to force liquid from the interior of said chamber through such clearance and into said pump channel.

2. In a pump, a casing comprising a priming chamber, an impeller chamber, said priming chamber and impeller chamber being in communication, a pair of mating rings mounted in said impeller chamber and provided with registering grooves forming a pump channel, said casing being formed with inlet and outlet passages opening directly into said pump channel, means for establishing communication between said inlet and outlet passages, and means for forcing liquid from said impeller chamber into said pump channel.

3. In a pump, a casing comprising a priming chamber, an impeller chamber, said priming chamber and impeller chamber being in communication, a pair of mating rings mounted in said impeller chamber and provided with registering grooves forming a pump channel, said casing being formed with inlet and outlet passages opening directly into said pump channel, means for establishing

communication between said inlet and outlet passages, and means for forcing liquid from said impeller chamber into said pump channel and for drawing liquid from said inlet passage and forcing it into said outlet passage.

4. In a pump, a casing comprising a priming chamber, an impeller chamber, said priming chamber and impeller chamber being in communication, a pair of mating pump rings mounted in said impeller chamber and provided with registering grooves forming a pump channel, said casing being formed with inlet and outlet passages opening directly into said pump channel, means for establishing communication between said inlet and outlet passages, and an impeller mounted in said impeller chamber between said rings and extending into said pump channel, there being a slight clearance between said impeller and said rings.

5. In a pump organization, a casing comprising a priming chamber, an impeller chamber, means in said impeller chamber forming a pump channel, an inlet passage and an outlet passage opening directly into said pump channel, said casing being formed to provide continuous direct communication between said priming chamber and said impeller chamber, and said inlet passage being directly connected to a source of liquid supply.

6. In a pump organization, a casing comprising a priming chamber, an impeller chamber, an inlet passage and an outlet passage opening directly into said impeller chamber, said casing being formed to provide continuous communication between said priming chamber and said impeller chamber, said inlet passage being directly connected to a source of liquid supply and said outlet passage being connected to a reservoir, and means providing communication between said reservoir and said inlet passage.

7. In a pump organization, a casing comprising a priming chamber, an impeller chamber, an inlet passage and an outlet passage opening directly into said impeller chamber, said casing being formed to provide continuous communication between said priming chamber and said impeller chamber, said inlet passage being directly connected to a source of liquid supply and said outlet passage being connected to a reservoir, a conduit providing communication between said reservoir and said inlet passage, and a valve mounted in said conduit.

8. In a pump organization, a casing comprising a priming chamber, an impeller chamber, an inlet passage and an outlet passage opening directly into said impeller chamber, said casing being formed to provide continuous communication between said priming chamber and said impeller chamber, said inlet passage being directly connected to a source of liquid supply and said outlet passage being connected to a reservoir, a conduit providing communication betwen said reservoir and said inlet passage, and a flow-controlled valve adapted to be closed by a high velocity flow from said reservoir to said inlet passage mounted in said conduit.

9. In a pump organization, a casing comprising a priming chamber, an impeller chamber, an inlet passage and an outlet passage, said casing being formed to provide continuous communication between said priming chamber and said impeller chamber, said inlet passage being directly connected to a source of liquid supply and said outlet passage being connected to a reservoir, a conduit providing communication between said reservoir and said inlet passage, and a flow-controlled valve adapted to be closed by a high velocity flow from said reservoir to said inlet passage mounted in said conduit, a pair of mating rings in said impeller chamber and provided with registering grooves forming a pump channel, and an impeller mounted in said impeller chamber between said rings and extending into said pump channel, there being a slight clearance between said impeller and said rings.

10. In a pump organization, a casing comprising a priming chamber, an impeller chamber, an inlet passage and an outlet passage, said casing being formed to provide continuous communication between said priming chamber and said impeller chamber, said inlet passage being directly connected to a source of liquid supply and formed with a trap in its length, said outlet passage being connected to a reservoir, and means providing controllable communication between said reservoir and the base of said inlet passage trap.

11. In a pump organization, a casing comprising a priming chamber, an impeller chamber, an inlet passage and an outlet passage, said casing being formed to provide continuous communication between said priming chamber and said impeller chamber, said inlet passage being directly connected to a source of liquid supply and formed with a trap in its length, said outlet passage being connected to a reservoir, a conduit providing communication between said reservoir and the base of said inlet passage trap, and a flow-controlled valve mounted in said conduit.

12. In a pump organization, a casing comprising a priming chamber, an impeller chamber, an inlet passage and an outlet passage, said casing being formed to provide continuous communication between said priming chamber and said impeller chamber, said inlet passage being directly connected to a source of liquid supply and formed with a trap in its length, said outlet passage being connected to a reservoir, a conduit providing communication between said reservoir and the base of said inlet passage trap, a flow-controlled valve mounted in said conduit, a

spring tending to maintain said valve in open position, said valve being adapted to be closed by a high velocity flow from said reservoir to said inlet passage, a pair of mating rings in said impeller chamber and provided with registering grooves forming a pump channel, and an impeller mounted in said impeller chamber between said rings and extending into said pump channel, there being a slight clearance between said impeller and said rings.

13. In a pump, a casing including an impeller chamber open at one end, a cover member formed to provide a priming chamber having an open end in registry with the open end of said impeller chamber, and inlet and outlet passages, means for establishing communication between said inlet and outlet passages, a pair of mating rings mounted in said impeller chamber and provided with registering grooves forming a pump channel, and means for forcing liquid from said impeller chamber into said pump channel and for drawing liquid from said inlet passage and forcing it into said outlet passage.

14. In a pump, a casing including an impeller chamber open at one end, a cover member formed to provide a priming chamber having an open end in registry with the open end of said impeller chamber, and inlet and outlet passages, means for establishing communication between said inlet and outlet passages, a pair of mating rings mounted in said impeller chamber and provided with registering grooves forming a pump channel, and an impeller mounted in said impeller chamber between said rings and extending into said pump channel, there being a slight clearance between said impeller and said rings.

Signed by me this 8th day of December, 1927.

GALE L. FERGUSON.