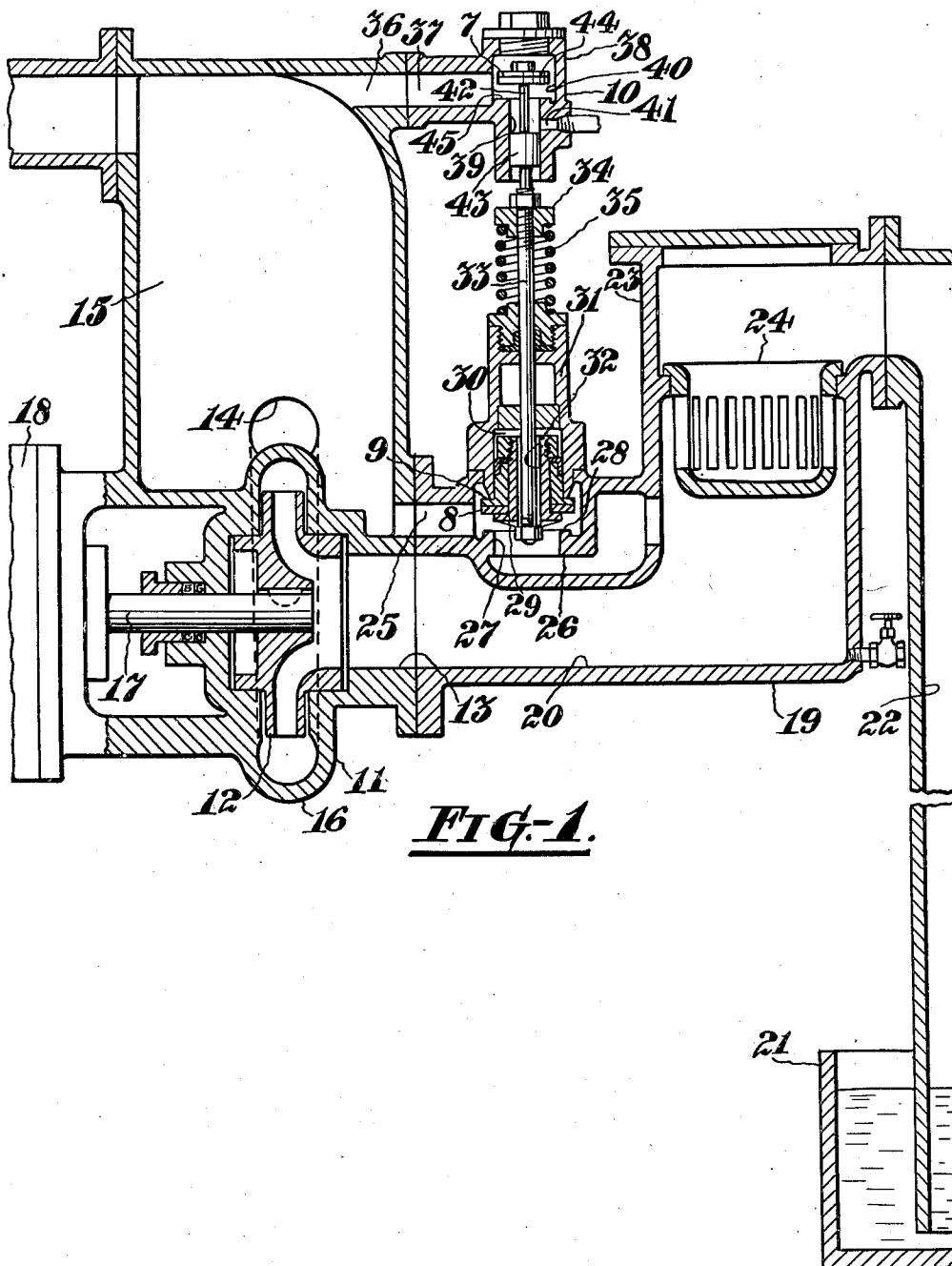


**1,997,418**

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2 Sheets-Sheet 1



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April 9, 1935.

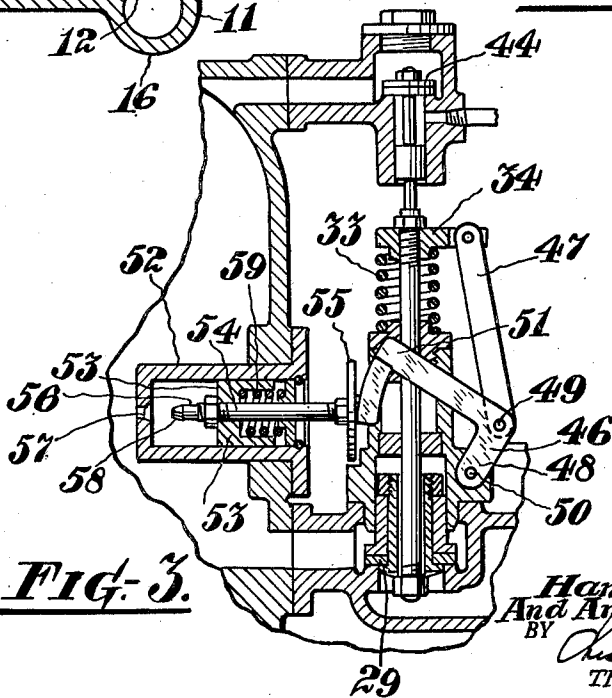
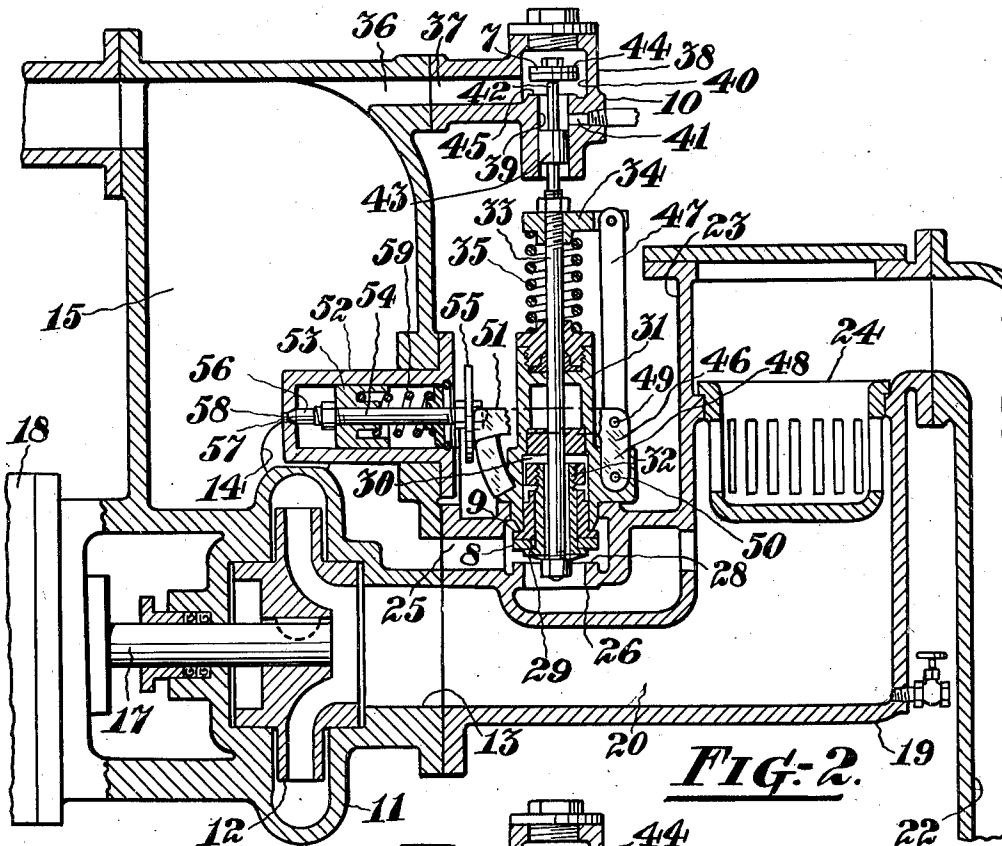
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PUMPING MECHANISM

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2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE

1,997,418

## PUMPING MECHANISM

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4 Claims. (Cl. 103—113)

This invention relates to pumping mechanism, and more particularly to a self-priming pumping mechanism.

One object of the invention is to minimize the period required for priming the pump.

Another object is to prevent air-lock on the discharge side of the pumping mechanism during the establishment of normal pumping conditions.

A further object is to cause automatic re-establishment of the parts to the positions which they occupy during normal pumping conditions after priming of the pump has been effected.

Other objects will be in part obvious and in part pointed out hereinafter.

In the drawings accompanying this specification and forming a part thereof and in which similar reference numerals refer to similar parts,

Figure 1 is a longitudinal sectional elevation of a pumping mechanism constructed in accordance with the practice of the invention,

Figure 2 is a similar view showing a modified form of the invention with the parts in the positions which they occupy during the priming of the pump, and

Figure 3 is a sectional elevation showing the position which the parts occupy during the normal pumping operation of the pump.

Referring more particularly to the drawings and at first to Figure 1, 10 designates a pumping mechanism comprising a centrifugal pump 11 having an impeller 12 for pumping water from an inlet opening 13 through a discharge opening 14 into a discharge chamber 15 which may, as illustrated, constitute an integral part of the casing 16 of the pump.

The impeller 12 is shown as being mounted directly upon the end of a shaft 17 which may be actuated in any well known manner, as for instance by a motor, of which only the casing 18 is indicated.

In accordance with the practice of the invention the pumping mechanism 10 is provided with a water trap 19 of which the interior or chamber 20 communicates directly with the inlet opening 13 and also with a source of liquid supply 21 through a pipe 22. The pipe 22 is preferably connected at its upper end to the top of an upwardly extending branch 23 of the water trap and containing a strainer 24 through which the water passes before entering the pump.

The proportions of the discharge chamber 15 and the water trap 19 as well as their arrangement with respect to the pump are such that a sufficient volume of water will be readily avail-

able in the water trap 19 for priming the pump at the beginning of a period of operation.

In order to effect such priming of the pump the water trap 19 and the portion of the casing 16 constituting the discharge chamber 15 are provided with a passage 25 which opens at one end into a low point of the discharge chamber and at its other end into the water trap. Within the passage 25 is a wall 26 having a port 27 constituting a portion of the passage 25, and on one side of the wall is a seat 28 for a valve 29 which controls the passage 25.

The valve 29 is reciprocable in a chamber 30 of a casing 31 disposed upon the water trap 19 and has a passage or passages 32 extending longitudinally therethrough to assure the exposure of equal areas of both ends of the valve 29 to the same pressure. On the front end of the valve is a lateral flange 8 having a pressure area 9 against which the water flowing through the passage 25 acts to assist in closing the valve.

In addition to the function described the casing 31 also serves as a guide for a rod 33 carried by the valve 29 and having attached to an intermediate portion thereof a seat 34 for an end of a spring 35 of which the opposite end seats against the casing 31.

In order to provide an escape for air existing in the chamber 15 and associated channels and also such air as may find entrance into the chamber during the priming operation the discharge chamber 15 is provided at its upper end with a vent 36. The vent opens into a passage 37 of a valve cage 38 which may be secured, in any suitable manner, to the casing 16. Within the valve cage 38 is a bore 39 which is coaxially aligned with the chamber 30 and communicates with the passage 37 through a valve chamber 40 in the cage 38. A port 41 in the cage 38 and intermediate the ends of the bore affords an outlet for air entering the bore 39.

Extending into the bore 39 is a reduced end 42 of the rod 33 and a piston 43 on the end 42 seals the lowermost end of the bore 39 and also serves as a guide for the end 42 of the rod. On the end of the rod 33 extending into the valve chamber 40 is a valve 44 adapted to seat upon a valve seat 45 in the chamber 40 to prevent communication between the passage 37 and the port 41. The outermost end of the valve 44 constitutes a pressure area 7 against which the liquid rising in the chamber 15 acts to close the said valve.

Preferably the rod 33 carrying the valve 44 and upon which the valve 29 is mounted is disposed

loosely slidable in the valve 29 so that full seating contact of both valves 44 and 29 with their respective seats will be assured. On the lower end of the rod 33 is a nut 5 to abut the end of the valve 29 for opening the said valve simultaneously with the opening of the valve 44.

The operation of the device is as follows: When the pump is set in operation the water initially present in the water trap 19 is pumped therefrom into the discharge chamber 15. The amount thus pumped at the beginning of the priming operation will be insufficient to disturb the positions of the valves 29 and 44. These valves will, therefore, be held in the opened positions by the spring 35. The passage 25 will then be open so that water pumped into the discharge chamber 15 may return into the water trap 19.

With the passage 25 of smaller area than that required to return the entire discharge output of the pump water will gradually accumulate in the discharge chamber 15 and the supply of fluid in the water trap 19 will, in consequence, be diminished, thus causing a partial vacuum within the trap and the elements connecting it with the source of water supply. Water will then flow into the water trap and increase the body of priming fluid.

Thereafter the water chamber 15 will become gradually filled, and as the water rises in the chamber 15 the air which it displaces flows through the vent 36 and associated passages to the atmosphere, or to such other point where-with the port 41 may be connected.

After the discharge chamber 15 becomes filled with water under pressure so that water flows through the passage 25 at greatly accelerated velocity the current of water will act against the pressure area 9 of the valve 29 and, by overcoming the force exerted by the spring 35, draw said valve to its seat. At the same time the pressure of the liquid in the discharge chamber 15 and associated passages will act against the pressure area 7 of the valve 44 and augment the pressure acting against the pressure area 9 of the valve 29 to overcome the lifting force of the spring 35. The valves 29 and 44 will then be closed and will remain in that position as long as the pressure of the liquid in the chamber 15 and associated passages exceeds that value at which the spring 35 is calibrated to act for opening the valves 29 and 44.

In the modified form of the invention illustrated in Figure 2 means are provided for positively maintaining the valves 29 and 44 in the opened positions during the priming of the pump. To this end a toggle 46 is disposed between the casing 31 and the spring seat 34 to prevent movement of the valves toward their seats before the pressure in the discharge chamber 15 approximates normal discharge pressure.

The toggle 46 comprises a link 47 and a bell crank 48, an end of the link 47 being pivotally connected to the angle of the bell crank 48, as at 49, and the opposite end of the link 47 being connected, in like manner, to the spring seat 34. The end of one arm of the bell crank 48 is mounted or connected to a pivot 50 seated in the casing 31, and the other end or arm 51 of the bell crank extends, in the operative position of the toggle, to a point adjacent the discharge chamber 15. The arrangement of the toggle 46 is such that when the spring 35 acts to open the valves 29 and 44 the link 47 and the bell crank 48 will also be moved into their operative positions for resisting

the force of the fluid acting against the pressure areas of the valves 29 and 44.

Disposed in the casing 16 is a cylinder 52 containing a piston 53 which carries a rod 54 for transmitting the movement of the piston 53 to the bell crank 48. The end of the rod 54 projecting from the cylinder 52 is preferably provided with a flange or plate 55 to assure an ample area of contact between the rod and the arm 51 of the bell crank. The opposite end of the rod 54, which extends beyond the piston 53, is in the form of a valve 56 for controlling a port 57 in the end of the cylinder 52 and through which discharge fluid may flow from the chamber 15 into the cylinder 52.

The end of the valve 57 constitutes a pressure area 58 which is constantly exposed to the pressure of the medium in the discharge chamber 15 for opening the valve 56, and a spring 59 in the cylinder 52 serves to close the valve 56 and maintain it closed at a certain predetermined pressure.

In the operation of this form of the invention, whenever the pressure in the discharge chamber 15 falls below that at which the spring 35 is intended to act, the said spring will open the valves 44 and 29. At the same time the toggle 46 is rocked into position to maintain the valves in the open positions. The arm 51 will then be moved into approximate abutment with the plate 55, thus as the pressure in the chamber 15 increases the liquid acting against the pressure area 58 will move the piston 53 toward the bell crank and the water then acting against the large area of the piston 53 will trip the bell crank out of its bracing position. Thereafter when the pressure within the chamber 15 and the velocity of the water through the passage 25 reach those values which may overcome the force of the spring 35 the valves 29 and 44 will be moved to their seats to cause the pump to operate normally.

We claim:

1. Pumping mechanism comprising a pump having a discharge chamber and a vent for the discharge chamber, a casing having a water trap constituting an inlet for the pump, said casing having a passage for conveying fluid from the discharge chamber to the water trap, a valve to control the passage and having equal opposed end areas subjected to the same pressure, a second valve for controlling the vent, a rod on said second valve extending slidably through the first said valve and being adapted to lift said first valve to its open position simultaneously with the opening of the second said valve, a spring on the rod to open the valves and hold both valves open during the priming of the pump, and a flange on the first said valve against which the current of fluid discharged by the pump acts for drawing the valves to their closed positions.

2. Pumping mechanism comprising a pump having a discharge chamber and a passage leading from the discharge to a source of priming fluid, a valve controlling the passage, a spring for opening the valve, toggle means for maintaining the valve open, a plunger actuated by discharge fluid for tripping the toggle means to release the valve, and a pressure area on the valve against which discharge fluid acts for closing the valve.

3. Pumping mechanism comprising a pump having a discharge chamber and a vent for the discharge chamber, means affording a passage for conveying priming fluid from the discharge chamber to a source of priming fluid, valves to control the passage and the vent, means connect-

ing the valves together in spaced relationship, a spring for opening the valves, toggle means for maintaining the valves open during the priming of the pump, means actuated by discharge fluid 5 for tripping the toggle means to release the valves, and pressure areas on the valves against which discharge fluid acts for closing the valves.

10 4. Pumping mechanism comprising a pump having a discharge chamber and a vent for the discharge chamber, means affording a passage for conveying priming fluid from the discharge chamber to a source of priming fluid, valves to

control the passage and the vent, means connecting the valves together in spaced relationship, a spring for opening the valves, toggle means for maintaining the valves open during the priming 5 of the pump and being actuated into operative position by the spring, means actuated by discharge fluid for tripping the toggle means to release the valves, and pressure areas on the valves against which discharge fluid acts for closing the valves.

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