May 18, 1943 K. R. LUNG 2,319,509

PUMP STARTING CONTROLLER

Filed June 23, 1941

FIG. 1

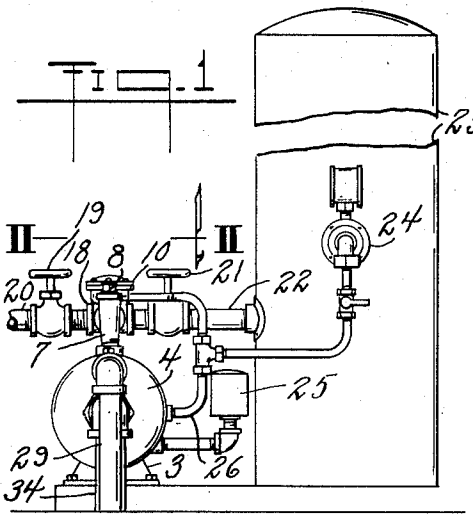


FIG. 2

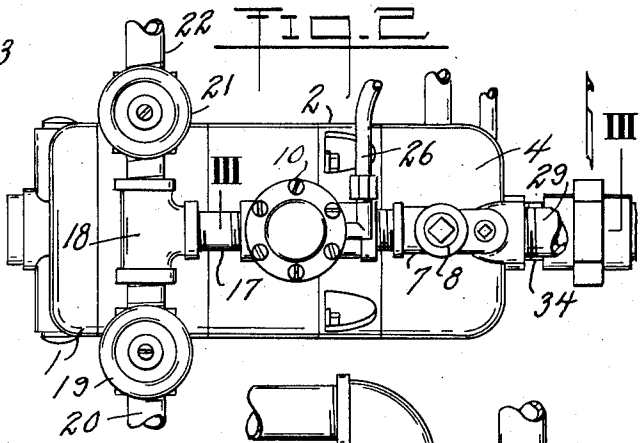


FIG. 3

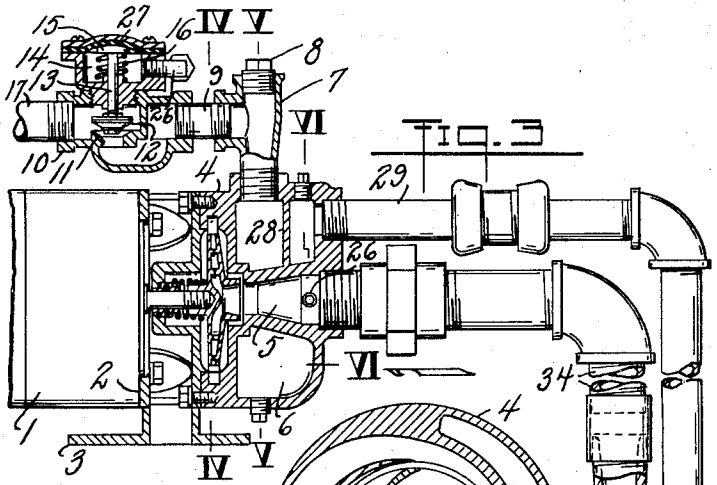


FIG. 4

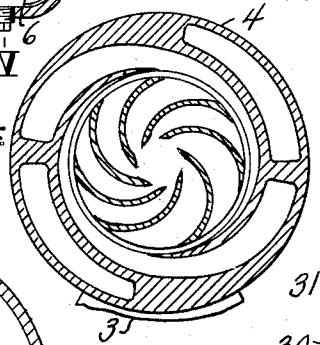


FIG. 5

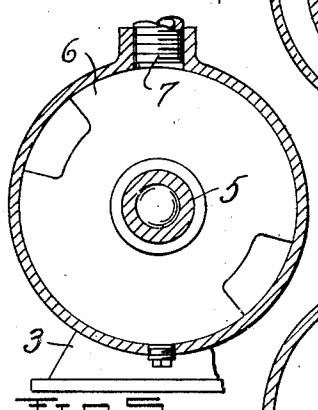
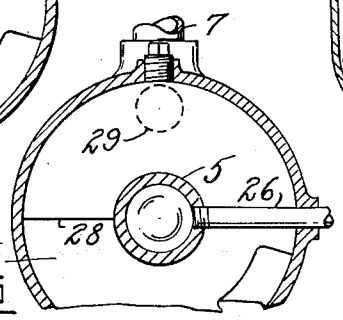


FIG. 6



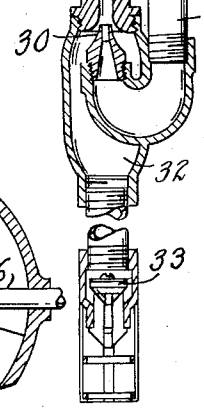
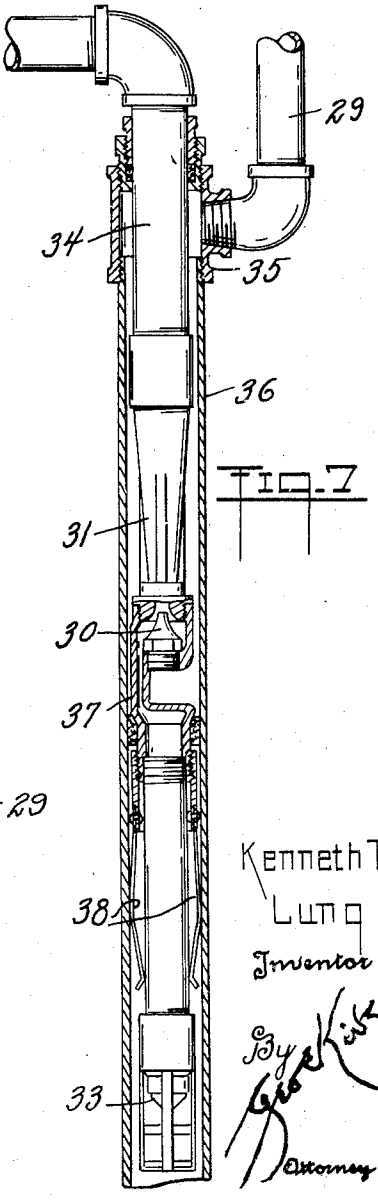


FIG. 7



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PUMP STARTING CONTROLLER

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Application June 23, 1941, Serial No. 399,319

2 Claims. (Cl. 103—5)

This invention relates to establishing a range for automatic functioning in pump operation.

This invention has utility when incorporated in a delivery pump having an intake and discharge, with an automatic control for the discharge having a response connection thereto from the intake.

Referring to the drawing:

Fig. 1 is a side elevation, with parts broken away, of an embodiment of the invention in a unit installation adapted for tank or flow service;

Fig. 2 is a plan on the line II—II, Fig. 1, showing features of the assembly;

Fig. 3 is a section on the line III—III, Fig. 2, showing the delivery line control valve as connected for actuation from the suction intake, with additional features partly broken away of the injector pump;

Fig. 4 is a section on the line IV—IV, Fig. 3, of the impeller pump;

Fig. 5 is a section on the line V—V, Fig. 3, of the discharge from the impeller pump;

Fig. 6 is a section on the line VI—VI, Fig. 3, showing the chamber portion for pressure flow to the injector pump; and

Fig. 7 is a variant from the injector pump adapted to be of a single pipe system.

An electric motor 1 exceeds to a spacer 2 having mounting foot 3. This spacer 2, which has the motor 1 at one side thereof, at the opposite side carries an impeller pump 4 having a suction intake chamber 5 and a pressure discharge chamber 6. This pressure discharge chamber has a fitting 7 therefrom with a plug 8 for priming. From this fitting 7 extends a line 9 to a fitting 10 having a valve seat 11 for a disk valve 12, from which extends a stem 13 into a chamber 14. The stem 13, remote from the disk valve 12, has a head 15 engaging a helical compression spring 16, thereby normally to unseat the valve 12 when atmospheric conditions prevail in the discharge line 9, for unobstructed flow therefrom by a pipe 17 to a T 18, wherein past a valve 19 there may be continuous flow say through a pipe 20 as for irrigation, water tanks, or like purposes. In the event the valve 19 be closed, a valve 21 may be open, and by way of a line 22 a storage tank 23 may be charged say for a given pressure, even with diaphragm type of air pump device 24 and a pressure cut-off control 25 for the motor 1.

The intake chamber 5 has connection by a duct 26 to the chamber 14 as closed by a flexible diaphragm 27. This means that, with the rotary impeller pump 4 started after the chamber 6 has been primed, suction is created in the intake 5 producing pressure drop in the chamber 14 so that the flexible diaphragm 27 overcomes the normal opening tendency of the helical spring 16 as to the valve 12. In this actuator operation the flexible diaphragm 27 collapses or moves against the head 15 and thus causes the valve 12 to engage the seat 11. This shuts off delivery from the pump 4 as to the duct 17. The operation of the pump accordingly is then effective to build up pressure in the chamber 4.

Protected by a baffle 28 there may be flow from this chamber 6 by way of a duct 29 to an injector nozzle 30 into a venturi 31, thereby effective to draw liquid, as water, from a chamber 32 therebelow as a check valve 33 is unseated, in allowing such liquid to ascend into this chamber 32. This injector thereby takes some of the delivery from the pump 4 and, by this injector pump in series therewith, causes such liquid through the nozzle 30 and venturi 31 to flow by way of a pipe 34 to the intake 5.

In the set-up herein, efficiency is developed in having the capacity of this injector pump in full response to the normal capacity of the impeller pump as to volume of liquid handled. It thus follows that, as the injector pump crowds liquid toward the intake 5, there is reduction of suction or vacuum in the duct or passage 26 and the diaphragm 27 releases the valve 12 for being unseated by the discharge or flowing pressure as assisted by the spring 16.

Accordingly, as soon as the pump operation really picks up, this valve 12, from normally open, has passed through an interval of closing until the injector pump is in service, and then there is effected hereunder, in the range of different lift conditions, a delivery, say in a single stage, small diameter rotary pump, which may in practice have a lift of 20 feet, to have such exert a discharge pressure of 40 or 45 pounds. This means that occasion may be taken for locating the injector pump, whether of double or single pipe type, at a desired range of depth. When of single pipe type, the discharge line 29 from the chamber 6 may be connected to a fitting 35 in the pipe 36 for flow to the nozzle 30 having discharge into the venturi 31 and flow thence by way of the discharge duct 34 extending to the intake 5. This nozzle 30 in the pipe 36 may be located with a fitting 37 and centering springs 38 in its extent to a foot check valve 39.

In the operation hereunder, there is provided a compact motor pump unit having in the take-off line therefrom a control connected, independent

of flow circuit through this discharge line, by an actuator connection from the intake to the pump. This control is suction responsive to close the discharge as the rotary or reciprocating pump starts. This means a build up of pressure in the discharge line.

The spring 16 not only holds the valve 12 open at atmospheric pressure, but, as soon as the impeller pump 4 starts delivering liquid, there is intake suction to seat or close the valve 12, with almost instantaneous supply of liquid to the chamber 5 from this injector 31. Then the spring 16 unseats the valve 12 as to the seat 11 even below atmospheric pressure in the intake chamber 5. There is advantageous functioning of the impeller pump 4 when the injector 31 is so operating that the effective lift of the impeller pump 4 may be say in the range of 15 to 20 feet. Accordingly, the spring 16 is normally selected so that the valve 12 will unseat in this range of 7 to 8 pounds negative pressure. The discharge line from the impeller pump 4 by way of the chamber 6 and past the valve 12 is unrestricted or fully opened, over practically the full range for operation of the pump 4 for full discharge to the line 17. This means that in practice when the valve 12 is open it provides an unobstructed passage for the discharge from the pump. The by-pass by way of the line 29 to the injector 31 is desirably of just sufficient proportion for the injector 31 to respond for the range of say less than 9 pounds negative pressure in the chamber 5. The impeller pump 4 is thereby effective due to this unobstructed passage provided by way of the valve 12 for full range of discharge in its gallons per hour rate almost immediately at starting and so to continue, whether there be discharge direct to atmosphere or a build-up of back pressure under head or in a tank. As the back pressure in the chamber 6 builds up, the intake 5 reaches and may even exceed atmospheric. The impeller pump 4 is efficient to do its work of creating a discharge pressure in the chamber 6 above its intake pressure in the chamber 5, which differential may approach a constant. In the event the effective lift or vacuum pull at the chamber 5 be 7 pounds below atmospheric and the delivery chamber 6 has a discharge pressure 20 in a desired volume, then as the pressure in the chamber 6 builds up to say 40 pounds, the pressure in the chamber 5 may be around 10 to 15 pounds above atmosphere.

The relatively small unit herein may be in a single or multiple stage impeller pump in a range of 3 to 5 inches in diameter and 3400 R. P. M.

What is claimed and it is desired to secure by Letters Patent is:

1. An impeller pump having a discharge therefrom, a suction intake thereto, a supply extension for the intake including an injector, a line from the discharge to operate the injector, said discharge having a delivery duct, a valve in said duct, a spring normally holding the valve open to provide an unobstructed passage for the pump discharge and maintained against disturbance at normal atmospheric pressure, a chamber provided with a diaphragm to oppose the spring, and a connection from the intake to the chamber, adapted in the interval of pump starting, for suction actuation of the diaphragm to close the valve.

2. An impeller pump for liquid having a discharge therefrom, a suction intake thereto, a supply extension for the intake including an injector pump of full response to the capacity of the impeller pump, a line from the discharge to operate the injector, said discharge having a delivery duct, a valve in said duct, a spring normally holding the valve open to provide an unobstructed passage for the pump discharge at atmospheric pressure, a chamber provided with a diaphragm to oppose the spring, and a connection from the intake, adapted in the interval of pump starting, for suction actuation of the diaphragm to close the valve during the starting of the pump and responsive to pump discharge liquid to fully open the valve.

KENNETH R. LUNG.