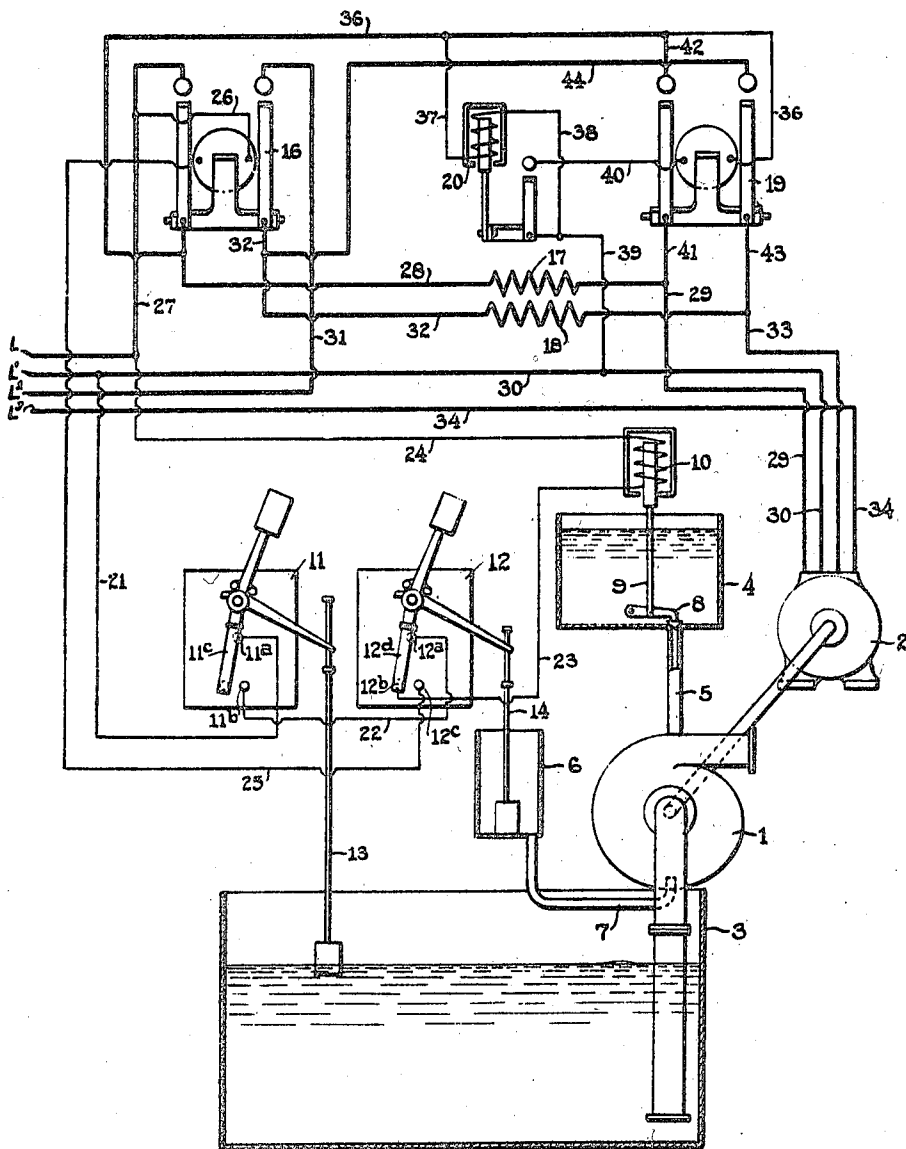


E. T. FOOTE.
PUMP CONTROLLER.
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PUMP-CONTROLLER.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, EDWARD T. FOOTE, a citizen of the United States, residing at Montclair, in the county of Essex and State of New Jersey, have invented new and useful Improvements in Pump-Controllers, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

This invention relates to controllers for power-driven pumps and is particularly advantageous for motor driven centrifugal pumps of sump pumping systems and the like.

The invention has among its objects to provide automatic priming means for a centrifugal pump and in conjunction therewith automatic starting and stopping means for the driving motor of the pump.

Other objects and advantages will hereinafter appear.

The accompanying drawing schematically and diagrammatically illustrates one embodiment of the invention which will now be described, it being understood that the invention may be embodied in other forms falling within the scope of the appended claims.

Referring to the drawing, the same illustrates a centrifugal pump 1 driven by a motor 2 to discharge the contents of a sump, receptacle or tank 3. The pump is provided with a priming tank 4 connected thereto by a pipe 5 and an auxiliary tank 6 connected thereto by a pipe 7, said auxiliary tank being so arranged as to drain when the pump is idle and to fill, or partially fill, when the pump is primed. Further, the auxiliary tank is so arranged that the pressure thereon when the pump is in operation will equal the discharge pressure of the pump thereby maintaining a substantially constant fluid level in said auxiliary tank throughout the operation of the pump. The priming tank, which may be kept filled by any suitable means, is provided with a valve 8 to normally close the discharge pipe connecting the same to the pump and said valve is operable through a rod 9 by a solenoid 10 to open said discharge pipe for priming of the pump.

The solenoid 10 of the priming device is automatically controlled by two float switches 11 and 12 which, as will hereinafter appear, also control the starting and stop-

ping means for motor 2. The float switch 11 has a float actuating member 13 responsive to variations in the fluid level of tank 3, while the switch 12 has a float actuating member 14 responsive to variations in fluid level of the auxiliary tank 6. The switch 11, which includes two contacts 11^a, 11^b and a bridging member 11^c, is biased to circuit interrupting position and upon a given rise in the fluid level of tank 3 operates to energize solenoid 10 to effect priming of the pump as above described. The switch 12, which has contacts 12^a, 12^b, 12^c and a bridging member 12^d, is biased to a position wherein member 12^d bridges contacts 12^a and 12^b. The circuit connections, as will appear, are such as to necessitate positioning of switch 12 as just mentioned to render switch 11 effective to energize solenoid 10, and upon a given rise in fluid level of the auxiliary tank 6, switch 12 is actuated to break circuit between contacts 12^a and 12^b to thereby deenergize solenoid 10. Further, when switch 12 is actuated as just mentioned, its member 12^d is caused to bridge contacts 12^a and 12^c to thereby close a circuit for the motor control means.

The motor 2 is illustrated as of the two phase A. C. type supplied from a four wire circuit L, L', L², L³. The control means for the motor includes a double pole electro-responsive switch 16 controlling one side of each phase of the motor circuit, resistances or other voltage reducing means 17 and 18 for the two phases of the motor circuit, and a double pole electro-responsive switch 19 controlling said resistances. Still further, the motor control means includes an electro-responsive relay switch 20 controlled by the switch 16, as hereinafter set forth, to in turn control switch 19.

The connections are such that upon closure of float switch 11 a circuit will be closed from line L' by conductor 21 through said float switch, by conductor 22 through contacts 12^a, 12^d and 12^b of switch 12, by conductor 23 through the winding of solenoid 10, by conductor 24 to line L. This will effect operation of the valve 8 to prime the pump. When the pump is primed, thereby filling the auxiliary tank 6, switch 12 will interrupt the circuit just described thereby deenergizing solenoid 10 while circuit will be completed from line L' to contact 12^a, by contact 12^d to contact 12^c, by conductor 25

through the winding of switch 16, by conductors 26 and 27 to line L. The establishment of this circuit effects energization of switch 16 to complete the circuit of motor 2.

5 With switch 16 closed one phase of the motor circuit may be traced from line L by conductor 27 through the left hand pole of switch 16, by conductor 28 through resistance 17, by conductor 29 to the extreme left
10 hand terminal of the motor, while the return circuit may be traced from the next adjacent terminal of the motor by conductor 30 to line L'. The other phase of the motor circuit may be traced from line L² by conductor 31
15 through the right hand pole of the switch 16, by conductor 32 through resistance 18, by conductor 33 to a third terminal of the motor, while the return may be traced from the extreme right hand terminal of the motor
20 by conductor 34 to line L³.

Immediately upon closing of switch 16 it further completes a circuit from line L to conductor 28 as already traced, by conductors 36 and 37 through the winding of relay
25 switch 20, by conductors 38, 39 and 30 to line L'. This effects energization of relay switch 20 which upon responding completes the energizing circuit of switch 19. This circuit may be traced from line L through
30 switch 16 to conductor 36, as already described, thence through the winding of switch 19 by conductor 40 through relay switch 20, by conductors 39 and 30 to line L'. Switch 19 is thereby energized and upon
35 responding excludes the resistances 17 and 18 from the motor circuit.

The motor connections with the switch 19 closed are as follows: The extreme left hand terminal of the motor is connected by
40 conductors 29 and 41 through the left hand pole of switch 19, by conductor 42 to conductor 36 and thence through the left hand pole of switch 16, by conductor 27 to line L. The return for this phase of the circuit is
45 direct from the next adjacent motor terminal to line L' as previously traced. The next motor terminal to the right is connected by conductors 33 and 43 through the right hand pole of switch 19, by conductors 44
50 and 32 through the right hand pole of switch 16, by conductor 31 to line L², while the return for this phase of the motor circuit is direct from the extreme right hand motor terminal by conductor 34 to line L³.

55 When the motor is thus started and accelerated it will continue to operate to drive the pump until it reduces the height of fluid in tank 3 to such a degree as to open float switch 11. When this occurs switch 11
60 opens the energizing circuit of main switch 16 thereby interrupting the motor circuit and further interrupting the energizing circuits of relay switch 20 and accelerating switch 19. The motor will thus be
65 brought to rest and its control means re-

stored to normal starting position and as soon as the pump ceases to operate the auxiliary tank 6 will drain. When the auxiliary tank is drained switch 12 will return to its biased position and the entire system will
70 be in condition for a repetition of the cycle of operation above described.

Thus it will be observed that two float switches serve to direct the operation of the entire system in accordance with both the
75 work and priming conditions and moreover insure against starting of the pump until adequately primed.

What I claim as new and desire to secure by Letters Patent is:

1. In combination, a fluid receptacle, a power driven pump connected thereto to act thereon, an auxiliary fluid receptacle connected to said pump for variation of its fluid
80 level by the priming and emptying of said pump, electro-responsive priming means for said pump, electro-responsive starting means for said pump, and automatic means responsive to variations in the fluid levels of said
85 receptacles for controlling both of said former means to render energization of said starting means dependent upon prior action of said priming means and to insure de-energization of said priming means upon en-
90 ergization of said starting means.

2. In combination, a fluid receptacle, a power driven pump connected thereto to act thereon, an auxiliary fluid receptacle connected to said pump for variation of its
100 fluid level by the priming and emptying of said pump, electro-responsive priming means for said pump, electro-responsive starting means for said pump, a device responsive to fluid level variations in said first mentioned receptacle to energize said
105 priming means under certain conditions, a device responsive to fluid level variations in said auxiliary receptacle to energize said starting means under certain conditions, said devices coacting whereby said
110 latter device deenergizes said priming means upon energization of said starting means and said former device deenergizes said starting means when the fluid in said first mentioned receptacle falls to a predeter-
115 mined level.

3. In a priming and control system for power driven pumps, in combination, priming means, starting means and automatic control means for both including a device
120 operable to effect action of said priming means and a second device dependent upon the action of said priming means to render said starting means effective and to effect resetting of said priming means.

4. In a priming and control system for power driven pumps, in combination, electro-responsive priming means, electro-responsive starting means and automatic means to control both of said former means
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to effect energization thereof progressively and to render energization of said starting means dependent upon prior action of said priming means.

5 5. In a priming and control system for power driven pumps, in combination, electro-responsive priming means, electro-responsive starting means, an automatic device to energize said priming means and a second automatic device to energize said starting device but subject to prior action of said priming means.

10 6. In a priming and control system for power driven pumps, in combination, electro-responsive priming means, electro-responsive starting means, an automatic device to energize said priming means and a

second automatic device to deenergize said priming means and to energize said starting means but subject to definite action of said priming means while energized, said first mentioned device further acting to deenergize said starting means under certain conditions.

7. In combination, a power driven pump, a fluid receptacle to be served by said pump, an auxiliary fluid receptacle connected to said pump, electro-responsive priming means for said pump and control means for said priming means responsive to variations in the fluid content of said two receptacles.

In witness whereof, I have hereunto subscribed my name.

EDWARD T. FOOTE.