No. 607,036. Patented July 12, 1898.

E. G. HARRIS.

ELECTRIC CONTROLLING APPARATUS FOR SWITCH VALVES.

(Application filed Sept. 25, 1897.)

(No Model.) 3 Sheets—Sheet 1.

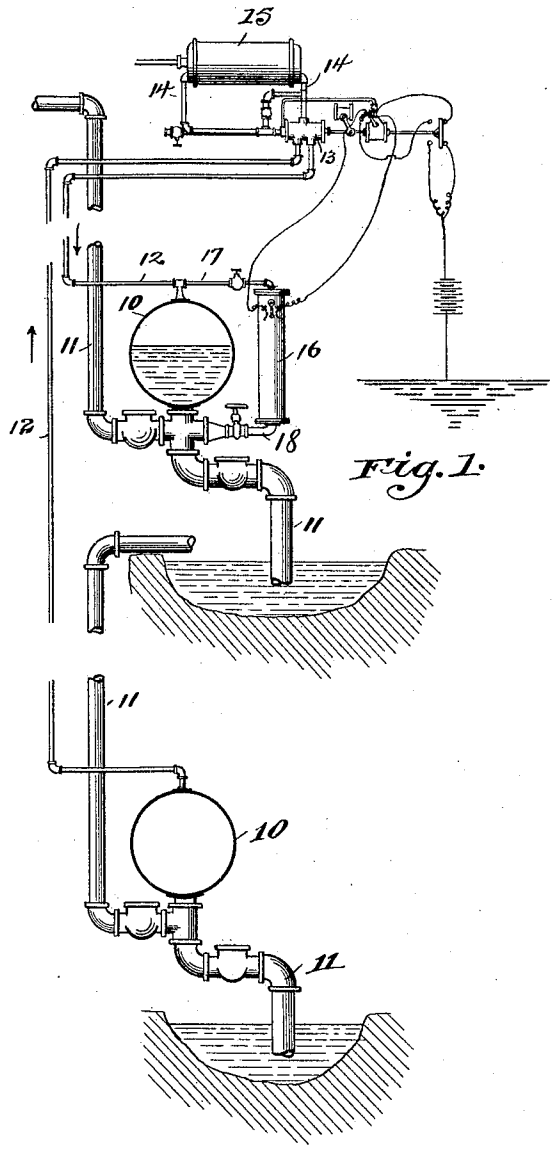


Fig. 1.

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Fig. 2.

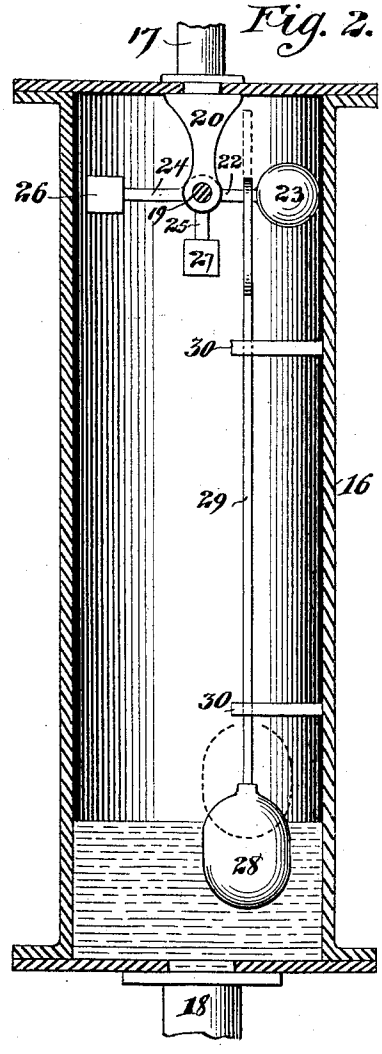
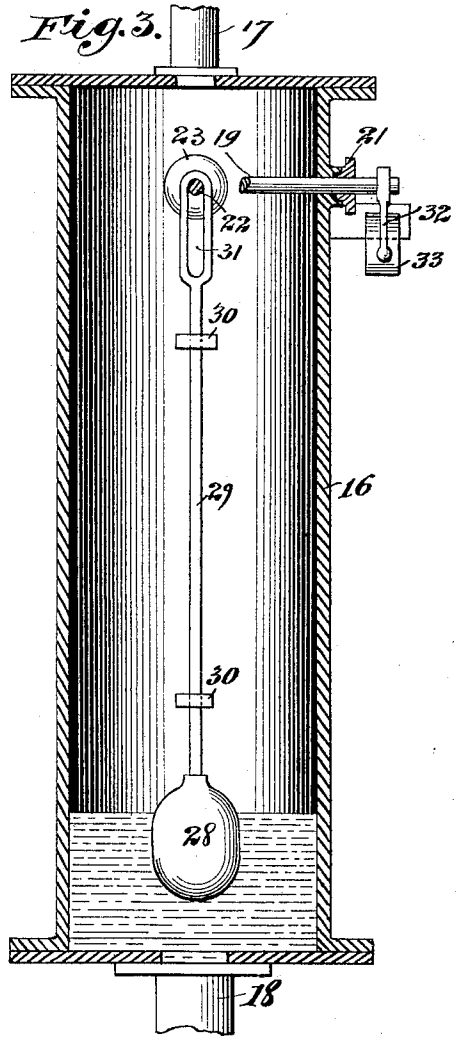


Fig. 3.



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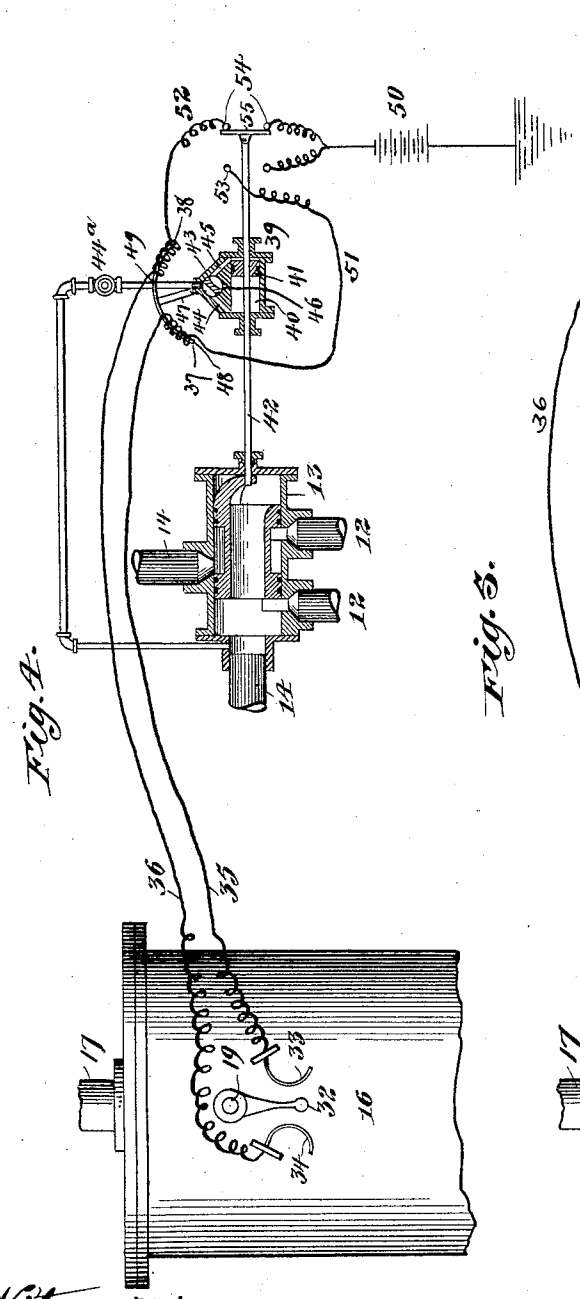


Fig. 4.

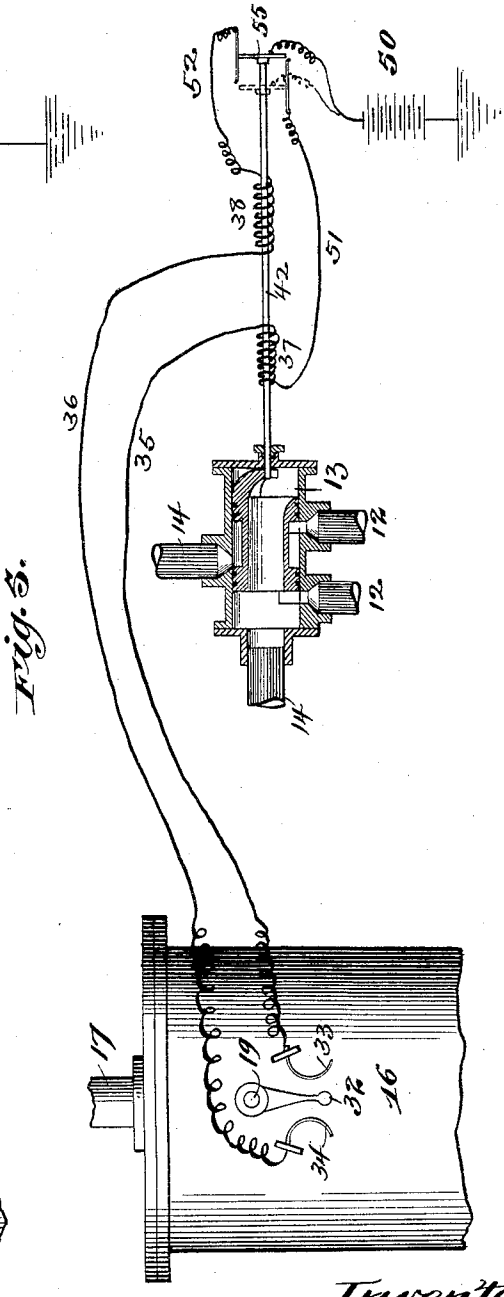


Fig. 5.

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UNITED STATES PATENT OFFICE.

ELMO G. HARRIS, OF ROLLA, MISSOURI.

ELECTRIC CONTROLLING APPARATUS FOR SWITCH-VALVES.

SPECIFICATION forming part of Letters Patent No. 607,036, dated July 12, 1898.

Application filed September 25, 1897. Serial No. 653,008. (No model.)

To all whom it may concern:

Be it known that I, ELMO G. HARRIS, of Rolla, Phelps county, Missouri, have invented certain new and useful Improvements in Electric Controlling Apparatus for Switch-Valves, of which the following is a specification.

This invention relates to electric controlling apparatus for switch-valves, it being designed and particularly adapted for use in connection with a water-elevating system such as is set forth in Letters Patent No. 580,687, granted to me April 13, 1897, although my present apparatus may be used in other connections.

It has for its object to provide an electrically-operated controlling mechanism whereby the variations in the pressure of the air, and consequently the height of the water at a suitable point in the system, may be made to operate the controlling or switch valve of the system in the desired manner.

To these ends my invention consists in certain novel features, which will be hereinafter described, and then particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is an elevation, partly in section, of a structure, showing a system such as is set forth in my Letters Patent hereinbefore referred to having my improvements applied thereto. Fig. 2 is a vertical central sectional view, on an enlarged scale, through the gage-tank. Fig. 3 is a similar view taken in a plane at a right angle to that of Fig. 2. Fig. 4 is a diagrammatic view showing a portion of the gage-tank in elevation, the switch-valve and its motor in section, and the connections. Fig. 5 is a similar view illustrating a modification.

In the said drawings for purposes of illustration I have shown, in Fig. 1, an apparatus such as is set forth in my Letters Patent hereinbefore referred to, in which 10 are the tanks, 11 the water-pipes, and 12 the air-pipes, leading from the tanks to the switch-valve 13, which latter is connected by the pipes 14 with the receiving and discharge ends of the compressor-cylinder 15. I may place the float mechanism strictly in one of the tanks 10; but I prefer to employ a separate gage-tank 16 in connection with one of said tanks, and, preferably, in connection with the uppermost tank, the connection being by means of an air-pipe 17 at the top and a water-pipe 18 at the bottom. Within the tank 16, near the top thereof, is a rock-shaft 19, supported at its inner end in a bracket 20 and extending outward through the cylinder-wall, which is there provided with a suitable stuffing-box 21. On the shaft 19 is an arm 22, which carries a float 23, and also arms 24 and 25, carrying counter and balance weights 26 and 27. In the lower part of the tank is located a float 28, connected to the lower end of a rod 29, which passes through guides 30 and is provided at its upper end with a slot 31, through which the arm 22 passes. The projecting end of the shaft 19 is provided with an arm 32, which is electrically connected with the ground or with the battery or other source of electricity in any suitable manner.

Adjacent to and located one on each side of the arm 32 are two suitably-insulated contacts 33 and 34, which are respectively connected by means of wires 35 and 36 with oppositely-wound solenoids 37 and 38, by means of which the position of the switch-valve 13 is controlled. In the construction shown in Figs. 1 to 4 the switch-valve 13 is actuated by a motor 39, as in my Letters Patent hereinbefore referred to, said motor comprising a cylinder 40, containing a piston 41, secured to the stem 42 of the switch-valve, and a controlling-valve 43, by means of which the fluid-pressure or exhaust pipe 44ª may be placed in communication with either of the ports 44 and 45, which lead to opposite ends of the cylinder 40, the other one of said ports communicating with a port 46, which leads to the atmosphere. The motor-valve 43 is provided with an operating-arm 47, to which the armatures 48 and 49 of the respective solenoids 37 and 38 are attached. These latter are connected to a battery 50 or other suitable source of electricity by means of conductors 51 and 52, and said battery is suitably connected to the earth or to the arm 32 in order to complete the circuit.

In order to prevent waste of current, each conductor 51 and 52 is interrupted between its solenoid and the battery, the terminals 53 and 54 being adapted to be alternately electrically connected to complete the circuit by means of a bridge-plate 55, attached to the valve-stem 48 or to some other part moving

with the switch-valve or its motor and adapted when the parts are at their limit of motion in one direction to electrically connect the terminals 54 and to similarly connect the terminals 53 when the parts are at their limit of motion in the opposite direction.

It will be understood, of course, that the motor 39 may actuated by fluid pressure of any kind, such as steam or compressed air, or it may be actuated by atmospheric pressure in conjunction with a partial vacuum, and in the drawings I have shown the motor as connected, by means of the pipe 44ª, to the exhaust side of the compressor, so as to operate by atmospheric pressure in conjunction with a partial vacuum.

The operation is as follows: Except when the water in the vessel 10 and gage-tank 16 is at its upper or lower limit, the shaft 19 is in the position shown in Figs. 2, 3, and 4, the weight 26 counterbalancing the float 23 and the weight 27 holding the arm 32 in the intermediate position, (shown in Fig. 4,) so that no electric circuit is formed. As the water passes out of the vessel 10 and gage-tank 16, as it will when the switch-valve is in the position shown in Fig. 4, the shaft 19 and arm 32 will remain in this position, the float 28 being held in the raised position, (shown in dotted lines in Fig. 2,) the lower guide 30 acting as a stop to prevent the lower end of the slot 31 acting on the arm 22. When the water-level is lowered far enough to coincide with the normal line of flotation of the float 28, said float begins to descend, carrying down with it the rod 29, until, as shown in full lines in Figs. 2 and 3, the upper end of the slot 31 rests on the arm 22. As the water continues to be lowered the weight of the float 28 and rod 29 comes upon the arm 22 and rotates the shaft 19, so as to bring the arm 32 to bear against the contact 34. A circuit is thus formed through the wire 36, solenoid 38, and wire 52, by reason of which the solenoid 38 is energized and its armature 49 attracted, thereby shifting the valve 43 through the medium of the arm 47 and establishing a connection between the exhausted pipe 44ª and the port 44 and admitting air at atmospheric pressure through the ports 46 and 45. This causes the piston 41, acting through the stem 42, to shift the switch-valve 13, and thereby connect the vessel 10 and gage-tank 16 with the exhaust side of the compressor, so that it will again begin to fill with water. As the water enters the tank 16 the float 28 will again rise; but as the contact between the arm 32 and contact 34 will continue for some little while, I avoid the waste of current which would result from this by providing the circuit-breaking devices in each circuit, whereby as soon as the valve 43 has been shifted and the piston 41 begins to move the bridge-plate 55 breaks the electrical connection between the terminals 54, and since the circuit in which the terminals 53 are located is broken at the gage-tank, the contact of the bridge-plate 55 with the terminals 53 when the motor reaches the end of the stroke does not reëstablish a circuit. As the float 28 rises in the manner aforesaid the arms 22 and 24 assume their normal horizontal position under the influence of the weight 27 and the arm 32 again becomes vertical, breaking the contact at 34. When the water has risen to the necessary height, the float 23 is raised, thus rotating the shaft 19 in the direction opposite to that already described, until the arm 32 bears upon the contact 33 and a circuit is established through the wires 35 and 51 and the solenoid 37, and the valve 43 is shifted so as to connect port 45 and pipe 44ª and also ports 44 and 46. The motor 39 then shifts the switch-valve back into the position shown in the drawings, and the emptying of vessel 10 and gage-tank 16 proceeds as before.

It is obvious that various modifications in the details of construction may be made without departing from the principle of my invention. For instance, instead of employing the solenoids for the purpose of controlling the valve of a motor which moves the switch-valve the solenoids may directly control the switch-valve itself, and in Fig. 5 I have illustrated such a construction in which the solenoids 37 and 38 are wound directly, but reversely, around the valve-stem 42, which forms the armatures and which is actuated in opposite directions to shift the switch-valve 13 in a manner which will be readily understood in connection with the preceding description of the operation of the apparatus shown in Figs. 1 to 4. Other modifications will readily suggest themselves, and I therefore do not wish to be understood as limiting myself to the precise construction hereinbefore set forth, and shown in the drawings.

I claim—

1. In an apparatus of the character described, the combination, with a vessel or tank, of a switch-valve controlling the admission and discharge of water and air to and from said tank, oppositely-acting solenoids controlling the position of the switch-valve, a battery or other source of electricity having a circuit through each of said solenoids to suitable contacts adjacent to the vessel or tank, and an arm controlled by floats in said vessel or tank and adapted to engage one of said contacts when the vessel or tank is substantially empty, and the other of said contacts when it is full, substantially as described.

2. In an apparatus of the character described, the combination, with a vessel or tank, of a switch-valve controlling the admission and discharge of air and water to and from said tank, a motor to actuate the switch-valve, a valve controlling said motor, oppositely-acting solenoids for actuating the motor-controlling valve, a battery or other source of electricity having a circuit through each of said solenoids to suitable contacts adjacent to said vessel or tank, and an arm controlled

by floats in said vessel or tank and adapted to engage one of said contacts when the vessel or tank is substantially empty, and the other of said contacts when it is full, substantially as described.

3. In a machine of the character described, the combination, with a vessel or tank having a vibrating arm and floats for actuating the same, contacts in the path of said arm, circuits extending from said contacts to a battery or other source of electricity, and oppositely-acting solenoids in said circuits respectively, circuit-breaking devices for each circuit, a switch-valve, and a motor for said switch-valve having a controlling-valve actuated by the solenoids, said circuit-breaking devices being connected to and actuated by a part moving with the switch-valve and motor, substantially as described.

4. In an apparatus of the character described, the combination, with a switch-valve, solenoids controlling said valve, a battery or other source of electricity, and circuits including the solenoids and having terminal contacts adjacent to each other, of a tank having an air-inlet above and a water-inlet below, a rock-shaft in said tank having an external arm adapted to engage either of said contacts, and internal arms carrying a float and counter and balance weights, and a second float located near the bottom of the tank and having a slotted rod whereby it is connected with one of the arms of the rocker-shaft, substantially as described.

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