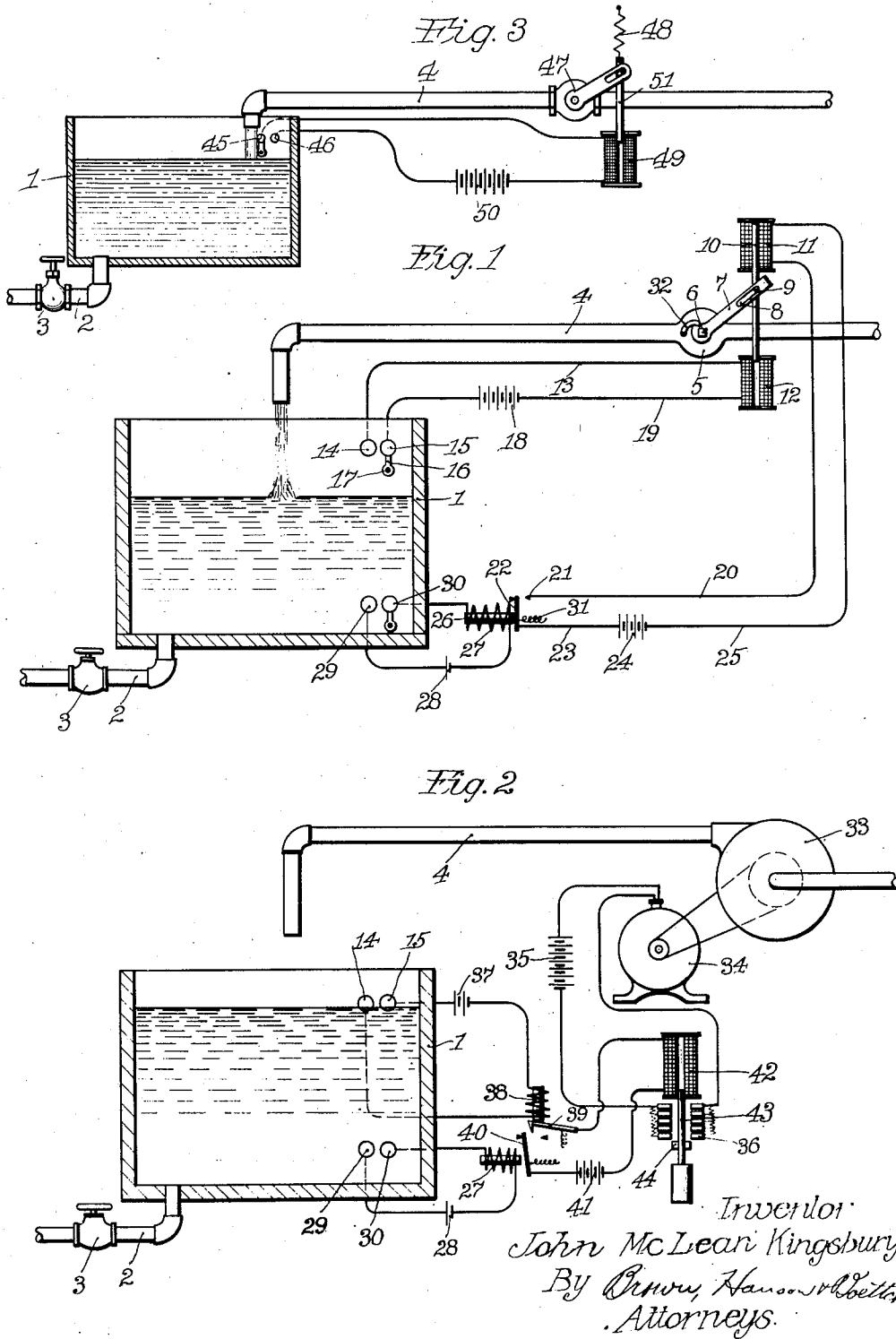


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 FLUID FLOW CONTROL MECHANISM.
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To all whom it may concern:

Be it known that I, JOHN McLEAN KINGSBURY, a citizen of the United States, residing at New York, in the county of New York and the State of New York, have invented a certain new and useful Improvement in Fluid-Flow-Control Mechanism, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to fluid flow controls and is concerned with the automatic governing of a flow of liquid to a vessel to stop the flow when the level of liquid in the vessel has reached a certain height, or to start the flow when the level of liquid in the vessel has dropped to a certain point, or both.

It will appear to those skilled in the art that my invention may have wide application and many and diverse uses, and I desire that the scope of my invention shall be determined by the appended claims, regardless of the particular use to which the combination may be put. In the accompanying drawings I illustrate exemplary forms of my invention so that those skilled in the art may be properly instructed in the use thereof, and I shall refer to these drawings specifically by reference characters in the following description of these specific embodiments of my invention.

In the drawings—

Figure 1 illustrates more or less diagrammatically a form of my invention whereby the flow of liquid is controlled by a valve;

Fig. 2 illustrates more or less diagrammatically the form of my invention wherein the flow of liquid is controlled by the stopping and starting of a pump; and

Fig. 3 illustrates diagrammatically means for maintaining the liquid at a substantially constant level.

Referring first to Fig. 1, it will be seen that I provide a vessel 1, which has an outlet 2, controlled by a valve 3. An inlet pipe 4 leads to the vessel from a suitable source of supply and a valve 5 is connected to this inlet pipe. The valve stem 6 carries an arm 7, which, by means of a slot 8 and a pin 9, is mechanically connected with a vertically reciprocating armature member 10, the upper end of which forms the armature core for a solenoid winding 11 and the lower end of which forms the armature core for a solenoid winding 12. The winding 12

is connected at one end by means of a conductor 13 with a contact terminal 14 disposed at a suitable point in the vessel 1, either in the wall thereof or hung in any convenient manner. Associated with the contact terminal 14 is another contact terminal 15 which is preferably adjustably mounted. As an example I illustrate the contact terminal 15 mounted upon an arm 16 which is secured in any adjusted position by means of a screw 17 and which may be swung about the screw 17 so that the distance between the contact terminals 14 and 15 may be adjusted. The terminal 15 is connected with one pole of a battery 18, and the other pole of the battery is connected with the remaining end of the solenoid winding 12 by means of a conductor 19. The two terminals are disposed approximately at the level which is desired as the maximum level of the liquid in the vessel.

One terminal of the solenoid winding 11 is connected by means of a conductor 20 with a contact point 21 adapted to be engaged by the armature 22 which is connected by means of a conductor 23 with one pole of its battery 24, the other pole of this battery being connected, by means of a conductor 25 with the remaining terminal of the solenoid winding 11. The armature 22 is associated with the core 26 of a relay winding 27 which, with a battery 28 is connected between two contact terminals 29 and 30 disposed at the desired minimum level for the liquid in the vessel. The contact terminals are mounted in any suitable manner within the vessel, as described above relative to the contact terminals 14 and 15, and the terminal 30 is preferably mounted adjustably in the way that the terminal 15 is mounted. The energization of the winding 27 attracts the armature 22, breaking the circuit at 21. The deenergization of this winding allows the retracting spring 31 to pull back the armature 22 into engagement with the contact 21. The arrangement at the valve 5 is such that the valve will remain in either position in which it is thrown by the energization of either the winding 11 or the winding 12, a snap spring 32 being provided for this purpose, as an example.

In describing the operation of the structure of my invention, it may be assumed that, if desired, the liquid in the vessel 1 be maintained between two definite limits,—be-

tween the desired maximum level as determined by the position of the terminals 14 and 15, and the desired minimum level as determined by the terminals 29 and 30. When the arm 7 is in its upper position, as illustrated in Fig. 1, the valve 5 is open and the flow from the inlet pipe 4 into the vessel takes place, as illustrated.

As shown, the vessel is being filled, and the level gradually approaches the contact terminals 14 and 15.

It is assumed that the liquid which flows has a certain co-efficient of conductivity, and the contacts 14 and 15 and the contacts 29 and 30 are so adjusted relatively to each other, that when they are untouched by the liquid, no current flow will take place, and when they are both touched by the liquid, current flow will take place due to the closure of the circuit through the body of the liquid, therefore, when the level of the liquid in the vessel reaches the plane of the terminals 14 and 15, the circuit of the solenoid winding 12 and the battery 18 will be closed, and the energization of the winding 12 will cause the armature core member to be drawn downwardly and with it the arm 7, resulting in throwing the valve 5 into closed position. This stops flow of liquid, and withdrawal of liquid may take place. It will be seen that normally there is always current flowing through the relay winding 27 and consequently the armature 22 is normally attracted. Assuming now that liquid is withdrawn from the vessel 1, a time will be reached when the level of the liquid will drop below the terminals 29 and 30 and will break the circuit at that point. This de-energizes the winding 27 and allows the armature 22 to contact with the contact 21, thus closing the circuit of the winding 11 and the battery 24. This will cause the energization of the winding 11 and consequently the armature core member 10 will be drawn into its upward position and with it the arm 7, thus throwing the valve 5 again into open position, so that the flow may take place, and the vessel filled to the maximum level, as before described.

In Fig. 2 I show a somewhat different arrangement and for simplicity in description, I have utilized the same reference characters, so far as they apply. Instead of the valve 5 in the inlet pipe 4, however, I provide a pump 33 which is operated by an electric motor 34, the circuit of this motor including a source of current 35, and a rheostat 36. In this form of my invention, the terminals 14 and 15 control the circuit of a battery 37 and a relay 38, the armature of this relay, indicated at 39, being a catch armature adapted to cooperate with the armature 40 of the relay 27. When the level of liquid in the vessel 1 is at its maximum, the relay 38 is energized and its armature 39 is

attracted. The armature 40 is also attracted, and the circuit of the battery 41 and winding 42 is open. When the level of liquid drops, the circuit is broken at the terminals 14 and 15, and the armature 39 drops. This puts the circuit of the winding 42 and battery 41 in condition to be closed by the release of the armature 40, and this release takes place when the level of the liquid in the vessel 1 has reached the point of breaking the circuit between the terminals 29 and 30. When this release takes place, as will be seen from the diagram, the armatures 39 and 40 contact to close the circuit through the battery 41 and winding 42, thus energizing the winding 42 to raise the armature core 43. By means of the contact blade 44 carried on the armature core 43, the motor circuit will be closed and the pump 33 will be started. Consequently, the inlet flow takes place, and the level will rise until contact is made between the terminals 14 and 15. At that time, the relays 38 will be energized and will release the armature 40, which at that time, is subject to the attraction of the energized relay 27. The mechanical arrangement is such that when the armature 39 is in its lower position, the armature 40 can latch under it, and so that when once the armature 40 is latched under the armature 39 it cannot be released until the armature 39 has been raised.

In Fig. 3 I have illustrated mechanism for maintaining a substantially constant level. The vessel 1 is provided with a pair of electrodes 45-46 which are placed at the level which it is desired to maintain. These electrodes are also separated a slight distance and are connected conductively by the liquid which is supplied through the valve 47 in the pipe 4. The valve is provided with a spring 48 which tends normally to open the same. When the level rises so that the liquid comes in contact with the electrodes 45, 46, the circuit for the solenoid 49 is closed and the battery 50 energizes the solenoid to attract its core 51. This movement of the core 51 closes the valve 47. As soon as the level drops to the point of breaking contact at the electrodes 45, 46 the solenoid 49 is deenergized. The spring 48 then automatically opens the valve and starts to restore the level.

It will be clear to those skilled in the art that the automatic means for starting the flow of liquid might be employed without the automatic means for stopping the flow of liquid, and vice versa, and that on the other hand, both means could be provided together, as shown, to control automatically the maintenance of a level of liquid between definite limits. In view of this, I have drawn the appended claims accordingly.

I claim:

1. In combination, a vessel, means for

feeding a conducting liquid to said vessel, electrical means for controlling the feed of said liquid, and electric circuits including said electrical means, a source of current, 5 separated stationary terminals disposed within said vessel at the desired minimum level and separated stationary terminals at the desired maximum level, the circuits between said terminals being adapted to be 10 closed by said liquid acting as part of the circuit.

2. In combination, a vessel, means for feeding a conducting liquid to said vessel, electrical means for controlling the feed of 15 said liquid, an electric circuit including said electrical means, a source of current, and relay contacts, and a circuit for said relay including a source of current and stationary terminals disposed within said vessel at the 20 desired minimum level, the circuit between said terminals being adapted to be closed by said liquid acting as part of the circuit, and stationary terminals disposed within 25 said vessel at the desired maximum level, said terminals having connection with said electrical means for determining the maximum level in said vessel.

3. In combination, a vessel, means for feeding a conducting liquid to said vessel, 30 electrical means for starting the flow of liquid, electrical means for stopping the flow of liquid, an electric circuit arrangement for each of said electrical means, the circuit arrangement for the starting means 35 terminating in two stationary separated ter-

minals disposed at the desired minimum level in said vessel, and the circuit arrangement for the stopping means terminating in two stationary separated terminals at the 40 desired maximum level in said vessel, the respective circuits being closed by the contact of the liquid with said terminals, the liquid acting as part of the circuits.

4. In combination, a vessel, means for feeding a conducting liquid to said vessel, 45 electrical means for controlling the feed of said liquid, contact terminals disposed within said vessel at the desired maximum level, contact terminals disposed within said vessel at the desired minimum level, and elec- 50 tric circuit connections between said terminals and said electrical control means, whereby said liquid is maintained between the levels of said first and said second contact terminals. 55

5. In combination, a vessel, means for feeding a conducting liquid to said vessel, electrical means for controlling the feed of 60 said liquid and an electric circuit including said electrical means, a source of current and separated contact terminals disposed within said vessel at the predetermined level 65 of said liquid, one of said terminals being mounted on a pivoted arm whereby it may be turned to and from the other terminal, and means for holding the pivoted arm in an adjusted position.

It witness whereof I hereunto subscribe my name this 1st day of February, 1916.

JOHN McLEAN KINGSBURY.