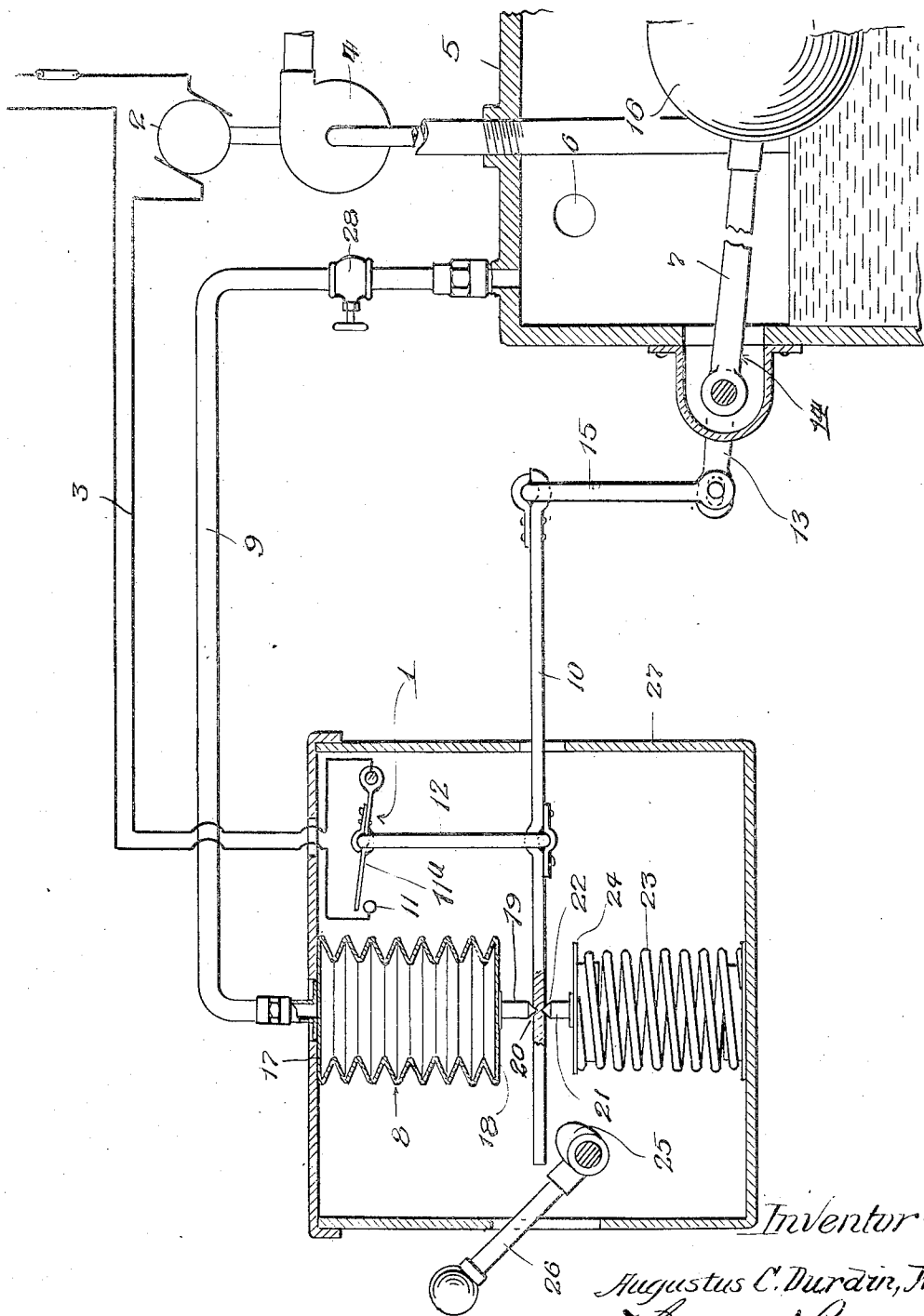


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ELECTRIC SWITCH MECHANISM

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ELECTRIC SWITCH MECHANISM

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This invention relates to electric switch mechanism, and its principal object is to provide switch mechanism capable of being actuated as a result of variations of the volume of liquid in a tank or other receptacle, and also capable of being actuated by variations of pressure therein. In vacuum condensation apparatus, and in various other pumping apparatus, which employ electric motor operated pumps for moving liquid through a tank or other receptacle, applying pressure in the tank or creating a vacuum therein, a separate float switch and pressure or vacuum switch is employed for starting and stopping the motor when the level of the liquid reaches predetermined points or the pressure or vacuum reaches predetermined points. This necessitates installing and connecting up two separate electric switches for the motor, which entails considerable expense.

In accordance with the present invention, I have provided a single switch for the circuit to the electric motor, which switch is arranged to be operated by float mechanism and by a pressure or vacuum device, each of which operates independently of the other. In vacuum condensation apparatus, it is sometimes desirable to render the vacuum switch inactive at night, although the float switch continues to operate, whereby the pump may discharge accumulated water of condensation from time to time back into the boiler or other suitable place, and the present invention includes means for accomplishing this result.

The invention consists, therefore, in electric switch mechanism embodying stationary and movable elements of an electric switch, together with float operated means and pressure or vacuum operated means connected with the movable element of the switch and each operating independently of the other to open and close the switch. It further consists in electric switch mechanism embodying an electric switch, and a switch actuating lever therefor, together with float mechanism connected to said lever and an independently operating pressure or vacuum device connected to said lever. It further consists in electric switch mechanism having means for rendering the pressure or vacuum device inactive at will, whereby the float mechanism only will open and close the switch.

The invention further consists in the several novel features hereinafter fully set forth and claimed.

The invention is clearly illustrated in the drawing accompanying this specification in

which the figure is a diagrammatic view illustrating the invention.

Referring to said drawing, which illustrates one embodiment of the invention, the reference character 1 designates an electric switch which may be of any suitable construction having a stationary element 11, and a movable element 11^a, and 2 designates an electric motor which is connected to the switch 1 by the wires 3 of an electric circuit. The motor 2 may be employed for driving a combined vacuum and water pump 4 connected to a tank or other receptacle 5 and arranged to exhaust liquid and air or other gases therefrom. The inlet 6 to the tank or other receptacle 5 may be connected to any suitable source from which water or other liquid and air and other gases may flow into the tank, as, for instance, it may be connected to the returns of a steam heating plant and the discharge side of the pump may be connected to the boiler or other place where it is desired to discharge the water or other liquid.

The switch 1 is arranged to be operated by float mechanism 7 contained in the tank or other receptacle 5 and by a pressure or vacuum device 8, which is connected to the tank or receptacle 5 by an air pipe 9. As applied to a vacuum condensation apparatus, the float mechanism 7 is arranged to close the switch 1 when the liquid in the tank or other receptacle 5 reaches a predetermined high level and thereby start the pump to discharge the liquid from the tank or other receptacle 5 and to open the switch 1 when the level of the liquid in the tanks falls to a predetermined low point. The vacuum device 8 is arranged to close the switch 1 and thereby start the pump to exhaust the air and other gases from the tank 5 whenever the pressure in said tank reaches a predetermined point and to open the switch whenever the vacuum in the tank has been built up to normal.

A simple form of connecting mechanism between the electric switch 1 and the float mechanism 7 and vacuum device 8 is illustrated. As shown, the connecting mechanism between the switch 1 and the float mechanism 7 comprises a lever 10 connected to the movable element 11^a of the switch 1 by a link 12 and connected to the arm 13 of the lever 14 of the float mechanism by a link 15. The lever 14 of the float mechanism has a float 16 upon the end contained in the tank 5, which float raises and lowers with the level of the water and raises and lowers one end of the lever 10, thereby actuating the movable element 11^a of the switch 1.

The vacuum device 8 is shown in the form of a "syphon" diaphragm device, one end wall 17 being stationary and one end wall 18 being movable towards and away from the stationary end.

Upon the movable end is a stem 19, the free end of which is seated in a recess 20 formed in the lever 10, and on the opposite side of said lever 10 is a stem 21, the free end of which is seated in a recess 22 in the lever 10 and is held in engagement with said lever by a coiled compression spring 23, one end of which is stationarily mounted and the other of which bears against a plate 24 upon which the stem 21 is secured.

The spring 23 acts to yieldingly hold one end of the lever 10 in engagement with the stem 19 of the syphon, whereby the expansion and contraction of the syphon may effect the raising and lowering of the end of the lever 10 connected thereto. It will be seen, therefore, that the lever 10 is fulcrumed at two places upon movable fulcrums, the one fulcrum being at the point of connection between the lever 10 and link 15 and the other at the point of connection between the lever 10 and the stem of the syphon. In the drawing, the switch 1 is shown in open position, and when either end of the lever 10 is moved downward sufficiently, the switch is closed thereby.

In order to render the vacuum device inactive so that the switch may be operated solely by the float mechanism, means are provided for preventing the end of the lever 10, which is connected to the vacuum device, from moving in a direction to close the switch. As shown, said means comprises a cam or arm 25 arranged to be brought into or out of engagement with the lever 10 and a handle 26 connected to the cam or arm 25, whereby the cam or arm is moved into or out of engagement with the lever 10.

A suitable box or case 27 may be provided around the switch mechanism, and the several elements thereof may be suitably mounted in the box. In place of the means for preventing movement of the end of the lever 10, connected with the vacuum device 8, a valve 23 may be provided in the air pipe 9 which, when closed, prevents operation of the vacuum device.

In operation, and assuming the switch mechanism to be connected with a vacuum condensation apparatus for a heating plant, the main switch for the motor circuit being closed, and assuming that the vacuum in the tank is normal, the pump motor will remain idle until the liquid in the tank 5 raises the float 16 sufficiently to depress the lever 10 and close the switch 1, thereby starting the pump motor 2. The switch 1 will remain closed until the level of the liquid in the tank 5 is lowered sufficiently to raise the end of the lever 10 connected with the float mechanism far enough to open the switch 1, but if the required vacuum has not been built up in the tank 5, the vacuum device 8 will remain in its expanded condition, thereby holding the end of the lever 10 connected with it in a depressed condition, and, consequently, the switch 1 will remain closed until sufficient vacuum is built up in the tank 5 to collapse the vacuum device 8, whereupon the end of the lever 10, connected with the vacuum device, will move upward under the influence of the spring 23 and open the switch 1, thereby stopping the pump motor.

In case the level of the liquid in the tank or other receptacle 5 remains at a low point, but the low pressure therein increases above normal, the vacuum device 8 expands, thereby depressing

the end of the lever 10, connected with it, closing the switch 1, thus starting the pump motor and again building up vacuum in the tank 5, and when the required low pressure in the tank has been reached, the vacuum device is again collapsed and the switch opened. In case the required low pressure is being maintained in the tank, but the liquid therein rises sufficiently to raise the float to its high point, the switch 1 is closed and the pump motor started, thereby exhausting the liquid from the tank.

To prevent the vacuum device from closing the circuit to the motor, as, for instance, when the heating plant is shut down at night, the lever 26 is swung down, thereby swinging the cam 25 into engagement with the lever 10 and preventing downward movement of the end of the lever which is connected to the vacuum device 8. When the pressure in the tank 5 rises above the required amount, the cam 25, being in engagement with the lever 10, prevents the vacuum device 8 from expanding, and, consequently, from depressing the end of the lever 10 connected with it. The float mechanism, however, continues to operate, thereby starting and stopping the pump motor as the tank is filled with liquid and emptied. By closing the valve 28, the vacuum device 8 can be thrown out of operation, as has been above set forth.

While the invention has been particularly shown and described in connection with a vacuum condensation apparatus of a steam heating plant, it is to be understood that its use is not limited thereto, but that with slight changes, the switch mechanism may be employed to control the operation of an electric pump motor of any system handling liquids and gases. It is to be understood that the drawing is merely schematic for the purpose of illustrating the invention.

More or less variation of the exact details of construction is possible without departing from the spirit of this invention. I desire, therefore, not to limit myself to the exact form of the construction shown and described, but intend, in the following claims, to point out all of the invention disclosed herein.

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

1. Electric switch mechanism comprising an electric switch, an actuating member therefor having, intermediate its ends, a connection with said switch, float mechanism operatively connected to one end of said actuating member and a syphon device operatively connected to the other end of said actuating member, each connection between said actuating member and the float mechanism and the syphon device forming a movable fulcrum for said actuating member.

2. Electric switch mechanism comprising an electric switch, an actuating lever having, intermediate its ends a connection with said switch, float mechanism operatively connected to one end of said lever, a pressure operated switch actuating device operatively connected to the other end of the lever, and means for rendering said pressure operated device inactive, whereby when said last mentioned means is set, the float mechanism only controls the switch.

3. Electric switch mechanism comprising an electric switch, an actuating lever connected intermediate its ends with said switch, float mechanism operatively connected to one end of said lever, a pressure operated switch actuating device operatively connected to the other end of the lever, and means arranged to engage the end

of the lever connected with the pressure operated device for rendering said pressure operated device inactive, whereby when said last mentioned means is set, the float mechanism only controls the switch.

4. Electric switch mechanism comprising an electric switch, an actuating lever connected intermediate its end with said switch, float mechanism operatively connected to one end of said lever, a pressure operated switch actuating device operatively connected to the other end of the lever, a stop member adapted to be moved into contact with the end of the lever which is connected to the pressure operated device, whereby the latter is rendered inactive without affecting the operation of the switch by the float mechanism, and a handle for said stop member.

5. Electric switch mechanism for controlling the pump motor of a condensation pump comprising an electric switch interposed in the circuit to the motor, a lever connected intermediate its ends with said switch, float mechanism con-

tained in the condensation tank and operatively connected to one end of the lever, a siphon device having a vacuum pipe leading to said condensation tank and having a movable end wall provided with a stem engaging one side of said lever at the other end thereof, and a coiled compression spring having a stem thereon engaging the opposite side of the lever.

6. Electric switch mechanism for controlling a pump motor comprising in combination an electric switch, float mechanism having a float contained in a tank, a pressure operated element communicating with said tank, operative connections between said float mechanism and said switch mechanism and between said pressure operated element and said switch mechanism, and manually operated means for locking the pressure operated element against movement, whereby the float mechanism only may remain operative for actuating the switch.

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