Aug. 7, 1923. 1,463,986

H. L. WHERLAND

APPARATUS FOR MAINTAINING A SUBSTANTIALLY CONSTANT LEVEL OF WATER IN TANKS

Filed April 7, 1922 2 Sheets-Sheet 1

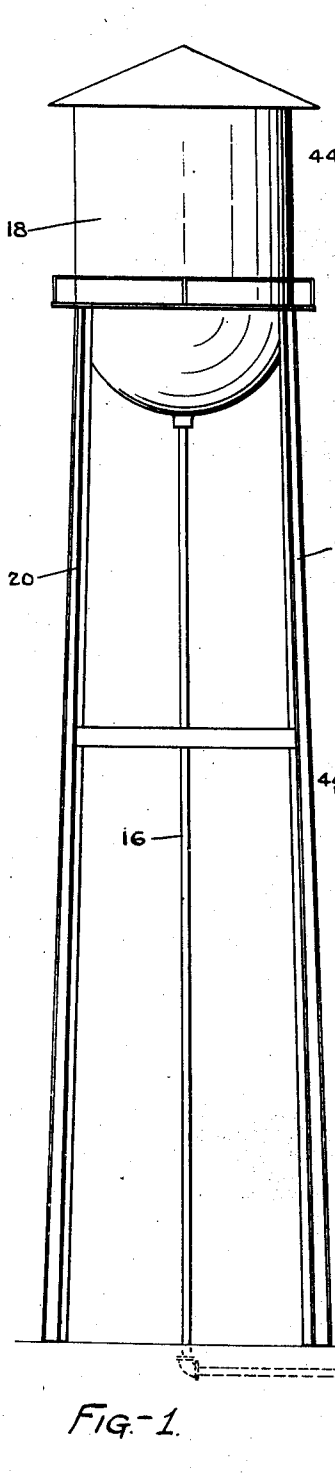


FIG. 1.

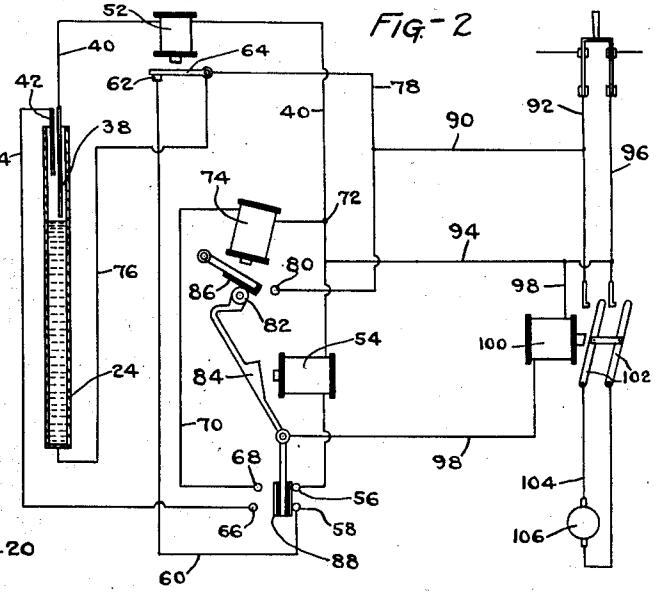


FIG. 2.

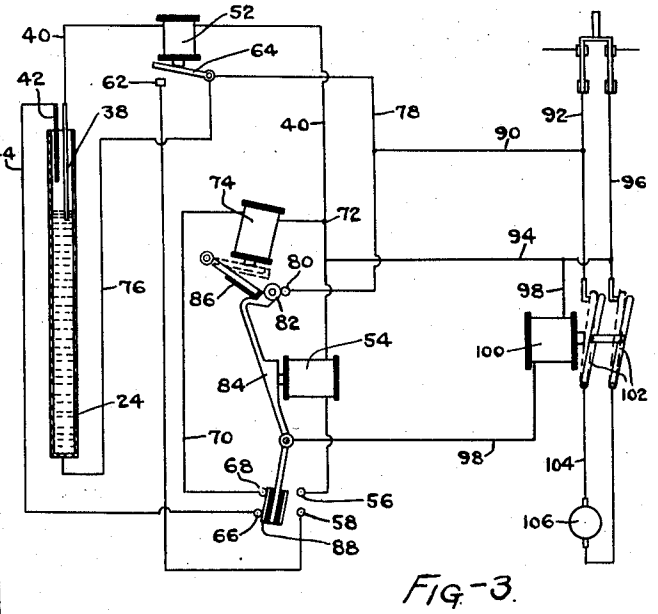


FIG. 3.

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Filed April 7, 1922 2 Sheets-Sheet 2

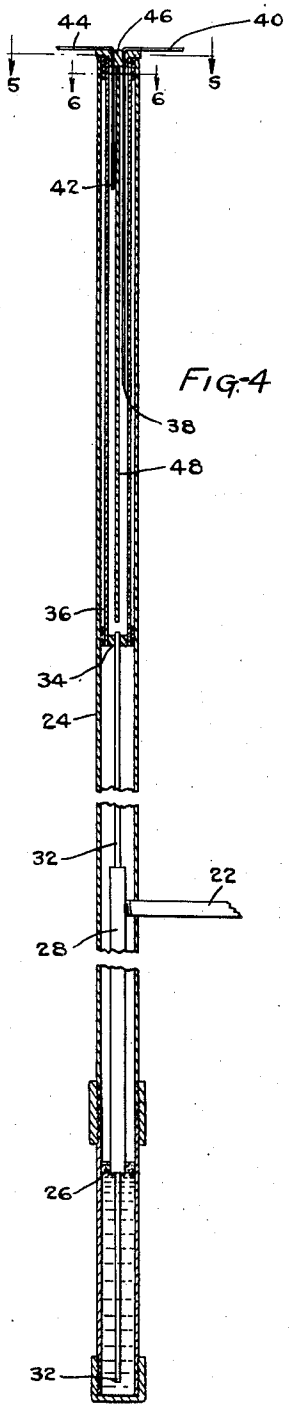


FIG-4

FIG-5.

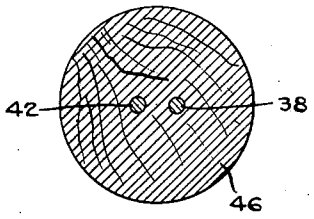


FIG-6

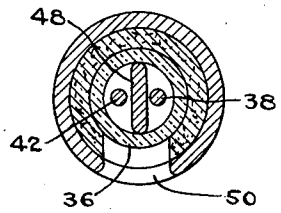
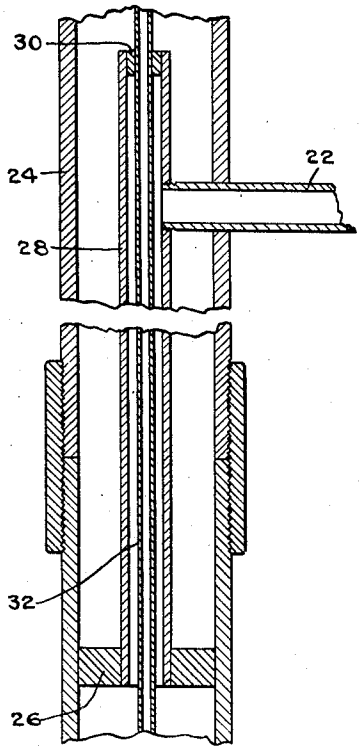


FIG-7



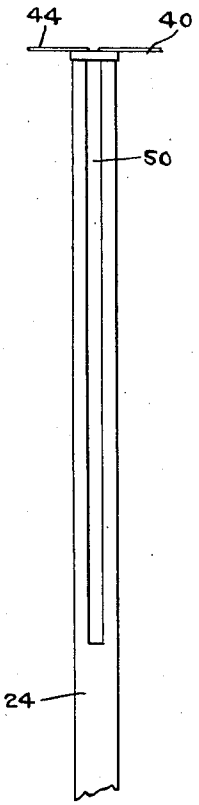


FIG-8.

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Patented Aug. 7, 1923.

1,463,986

UNITED STATES PATENT OFFICE.

HERBERT L. WHERLAND, OF LAMBERTON, MINNESOTA.

APPARATUS FOR MAINTAINING A SUBSTANTIALLY CONSTANT LEVEL OF WATER IN TANKS.

Application filed April 7, 1922. Serial No. 550,542.

To all whom it may concern:

Be it known that I, HERBERT L. WHERLAND, a citizen of the United States, residing at Lamberton, in the county of Redwood and State of Minnesota, have invented certain new and useful Improvements in Apparatus for Maintaining a Substantially Constant Level of Water in Tanks, of which the following is a specification.

My invention relates to apparatus for maintaining a substantially constant level of water in tanks. It relates particularly to apparatus for use in connection with water towers of water supply systems. An object is to provide an efficient apparatus for this purpose which will operate to start a motor connected with the pump when water in the tank falls below a predetermined desirable minimum level and will stop the motor when the water reaches a predetermined desirable level. Another object is to provide a device of this character in which the pressure of the water in the tank acts upon a controlling device to start and stop the motor at proper times.

The full objects and advantages of my invention will appear in connection with the detailed description, and the novel features embodied in my inventive idea will be particularly pointed out in the claims.

In the accompanying drawings which illustrate the apparatus in one form, Fig. 1 is an elevational view showing the application of my invention to a water tower. Fig. 2 is a wiring diagram. Fig. 3 is a wiring diagram showing certain parts moved into a different position. Fig. 4 is a sectional view of a controlling device including a tube partly filled with mercury. Fig. 5 is a view in section on the line 5—5 of Fig. 4. Fig. 6 is a view in section on the line 6—6 of Fig. 4. Fig. 7 is an enlarged fragmentary sectional view of a portion of the controlling device. Fig. 8 is an elevational view of the upper portion of the controlling device.

As shown in Fig. 1, a pump 10 draws water through a pipe 12 from the source of supply and delivers it through a pipe 14 connected with the mains of the water supply system, and also connects through a riser pipe 16 with a tank 18 mounted on a framework 20 to constitute a water tower. A branch pipe 22 is connected with the interior of a metallic tube 24, the lower portion of which below a partition 26 is filled with mercury. The pipe 22 is so connected as to be in communication with the interior of a tube 28, the upper end of which is closed by a plug 30 and the lower end of which is open and extends through the partition 26 so that the pressure of the water is communicated to the mercury contained in the lower portion of the tube 24. A tube 32 extends from the mercury in the tube 24 up through the tube 28 and its upper end projects through a plug 34 in the lower end of a glass tube 36 positioned within the upper portion of the tube 24. A contact member 38 extends down into the tube 36, the upper end of this contact member being connected to a wire 40. A short contact member 42 also extends down into the tube 36, the upper end of this contact member being connected to a wire 44. The upper end of the tube 24 is provided with a plug 46, while the contact members 38 and 42 are separated by a strip 48 of suitable material. The upper end of the tube 24 is provided with a slot 50 to constitute a sight opening so that the condition of the mercury in the tube 36 may be observed. The wire 40 includes the coils of relays 52 and 54 and its outer end is connected to a contact post 56. Spaced from the contact post 56 is a contact post 58 which is connected by a wire 60 with a contact post 62 which is engaged by the armature 64 of the relay 52 when the latter is deenergized. This wire is connected at its outer end to a contact post 66 which is opposite the post 58. Spaced from the contact post 66 is a contact post 68 which is connected by a wire 70 to the wire 40 at the point 72 between the relays 52 and 54. The wire 70 includes the coil of a relay 74. The armature 64 is connected by a wire 76 to the lower end of the metal tube 24 and is also connected by a wire 78 to a contact post 80, the latter being engaged by a contact member 82 carried by the armature 84 when the latter is held up to the relay 54. The armature 86 of the relay 74 serves as a latch when the relay is not energized and holds the contact 82 against the contact 80 when the armature 84 has been drawn up by the momentary energization of the relay 54. Connected with the armature 84 is a

bridging member 88 which bridges the contacts 56 and 58 when the armature is held up to the relay 54 and which bridges the contacts 66 and 68 when the armature has been released. The wire 78 is connected by a wire 90 with the supply wire 92 and the wire 40 is connected by a wire 94 to the wire 96. The wire 94 is connected by a wire 98 with the bridging member 88 and the wire 94 includes the coil of a relay 100 which, when energized attracts a double pole switch 102 and causes current to flow through a circuit 104 in which is included an electric motor 106 connected up with the pump 10. When the relay 100 is not energized the double pole switch 102 is automatically moved away from the relay so that no current will flow through the circuit 104.

The operation and advantages of my apparatus will be readily understood in connection with the foregoing description. When the level of water in the tank 18 falls so that there is not sufficient pressure to maintain the mercury above the lower end of the contact 38, the relay 52 is de-energized and the armature 64 comes into engagement with the contact 62. This causes current to flow from the supply wire 92 through the wires 90, 78, 60 and 94, thereby momentarily energizing the relay 54 and attracting the armature 84 and also causing the bridging member 88 to move from the position shown in Fig. 2 to that shown in Fig. 3 in which latter position it is held by the latching armature 86 so that contacts 66 and 68 are bridged. Current now flows from the supply wire 92 through the wire 90, the wire 78, the contacts 80 and 82 and the wire 98, thereby energizing the relay 100, and closing the switch 102 to cause current to flow through the motor and start the pump. As soon as the mercury rises on account of the pressure of the water to the lower end of the contact 38, then current flows from the supply wire 92 through the wire 90, the wire 78, the wire 76, the mercury in the tube, the contact 38 and the wire 40, thereby energizing the relay 52 and attracting the armature 64. When the tank has been filled to a predetermined level, the pressure of water causes the mercury to rise to the lower end of the contact member 42. Current now flows from supply wire 92 through the wire 90, the wire 78, the wire 76, the mercury in the tube 24, the contact 42, the wire 44, the bridge 88, the wire 70 and the wire 94, thereby energizing the relay 74 lifting the latching armature 86 and allowing the armature 84 to move away from the relay 54 and moving the bridge 88 from the contacts 66 and 68 to the contacts 56 and 58 so that the relay 100 is de-energized and the motor 106 is stopped. The armature 64 is held up to the relay 52 at certain times so that the motor will not start until the mercury falls below the contact 38.

I claim:

1. In a device of the class described, a tank, a pump for supplying liquid to said tank, an electric motor for driving said pump, a tube containing mercury, the interior of which is in communication with the liquid supply, and means associated with said tube and the mercury therein for causing current to be supplied to said motor when the liquid in said tank falls below a predetermined level and for causing current to be cut off from said motor when the liquid in said tank rises to a predetermined level.

2. In a device of the class described, a tank, a pump for supplying liquid to said tank, an electric motor for driving said pump, a tube containing mercury, the interior of which is in communication with the liquid supply, a contact member extending into said tube, connections with said contact member which cause current to be supplied to said motor when the liquid in said tank falls below a predetermined level, a second contact member extending into said tube, and connections with said second contact member which cause current to be cut off from said motor when the liquid in said tank rises to a predetermined level.

3. In a device of the class described, a tank, a pump for supplying liquid to said tank, an electric motor for driving said pump, a tube containing mercury, the interior of which is in communication with the liquid supply, a contact member extending into said tube, connections with said contact member which cause current to be supplied to said motor when the mercury in said tube falls below the lower end of said contact member, a second contact member extending into said tube and the lower end of which is above the lower end of said first contact member, and connections with said second contact member which cause current to be cut off from said motor when the mercury in said tube rises to the lower end of said second contact member.

4. In a device of the class described, a tank, a pump for supplying liquid to said tank, an electric motor for driving said pump, a switch for the circuit of said motor, a tube containing mercury, the interior of which is in contact with the liquid supply, a contact member extending into said tube, connections with said contact member which cause said switch to be closed when the mercury in said tube falls below the lower end of said contact member, a second contact member extending into said tube and the lower end of which is above the lower end of said first contact member, connections with said second contact member which

permit said switch to open when the mercury in said tube rises to the lower end of said second contact member, and means for preventing said switch from again closing until the mercury in said tube falls below the lower end of said first contact member.

5. In a device of the class described, a tank, a pump for supplying liquid to said tank, an electric motor for driving said pump, a metal tube containing mercury, the interior of which is in communication with the liquid supply, a contact member extending into said tube, a relay, the coil of which is included in a connection from said contact member to the return wire of a source of electrical energy, a contact element with which the armature of said relay engages when the latter is deenergized, a connection from said armature to the supply wire of said source of electrical energy, a connection from said armature to said metal tube, two pairs of contact posts spaced from each other, a connection between said contact element and a post of one of the pairs of posts, a second relay, the coil of which is included in a connection between the other post of said pair and the connection which includes the coil of said first relay, an armature for said second relay, a bridging member carried by said armature and adapted to be moved thereby from said pair of contact posts to the other of said pair of contact posts, a second contact member extending into said metal tube, a connection between said second contact member and one of said last mentioned pair of contact posts, a third relay, the coil of which is included in a connection between the other of said last mentioned pair of contact posts and connection which includes the coil of said first relay, an armature for said third relay which when the latter is deenergized is adapted to constitute a latch for holding the armature of said second relay up to the latter, a contact carried by the free end of said last mentioned armature, a contact engaged by said last mentioned contact when said armature is thus held, a connection between said last mentioned contact and the connection which is connected with the armature of said first mentioned relay, a fourth relay, the coil of which is included in a connection between the armature of said second relay and the return wire, and a double pole switch which, when said fourth relay is energized, closes a circuit for said electric motor and which, at other times, breaks said circuit.

In testimony whereof I hereunto affix my signature.

HERBERT L. WHERLAND.