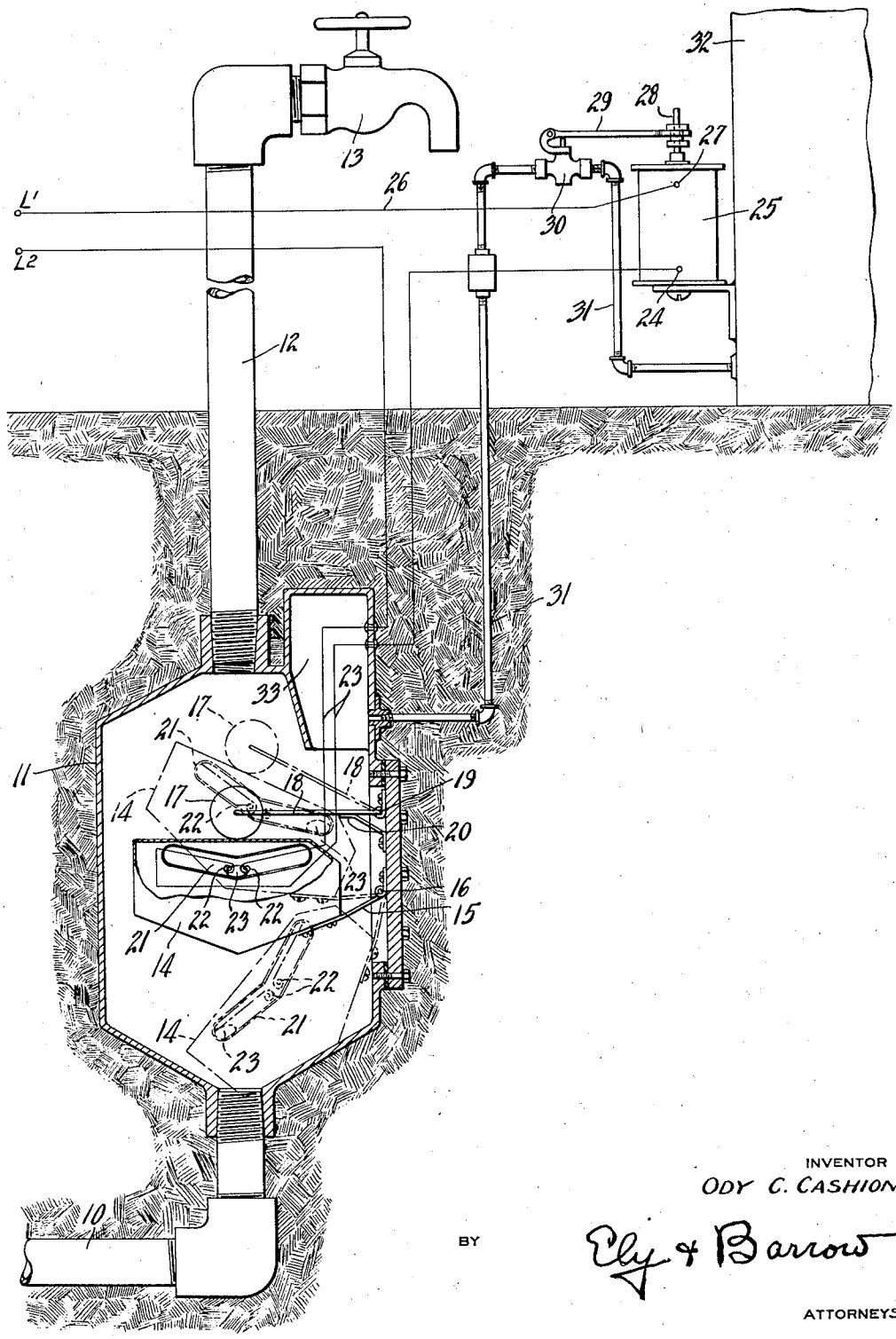
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AUTOMATIC CONTROL FOR WATER AND LIKE SYSTEMS

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AUTOMATIC CONTROL FOR WATER AND LIKE SYSTEMS

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This invention relates to control devices for fluid supply systems such as water systems and particularly to control devices for preventing freezing of the liquid in the system.

The general purpose of the invention is to provide a control device for holding the water or other liquid in a part of the system in which it is not exposed to freezing temperatures and for returning the liquid to that part of the system from a part of the system exposed to freezing temperatures. Therefore, control devices have been placed on the system automatically to drain the water therefrom to prevent freezing, but this is wasteful of water and the object of the present invention is to provide a control in which the exposed part of the system is kept free of the liquid except when a supply is to be drawn therefrom.

A further purpose of the invention is to provide such a control which will automatically respond to the opening of a faucet, tap or valve to permit the flow of water from the system.

The foregoing and other purposes of the invention are attained in the automatic control device illustrated more or less diagrammatically in the accompanying drawing and briefly described in the succeeding paragraphs hereof. It is to be understood that the invention is not limited to the specific form thereof illustrated and described.

The accompanying drawing is a diagrammatic elevation, partly in section, of a portion of a water system in which the improved control device is arranged.

Referring to the drawing, the numeral 10 designates a water supply line which, as indicated, is embedded in the earth in the usual manner below the lowest frost line to be expected under prevailing climatic conditions. Arranged in the supply line 10 also below the frost line is a vessel 11 to which the supply line is connected and through which the water may flow to a line 12 which may extend above the frost line and above the surface of the earth to a point of use such as at a faucet 13.

Within the vessel 11 there is provided a movable element responsive to changes in the direction of flow of the water and preferably comprising a float 14 which may be carried on an arm 15 pivoted in the vessel 11 at 16 whereby it may assume either of three positions—the intermediate full line position shown, a position shown in dotted lines downwardly thereof or one into which it moves from the intermediate position to an extreme position in a direction opposite to the normal flow of the water, and a position shown in dotted lines upwardly from said intermediate position or one into which the float moves from the intermediate position in the direction of flow of the water.

Yielding means such as a weight 17 is associated with the movable element 14 so as normally to hold the element 14 in its intermediate position when there is water in the system above the control device. The weight 17 may be carried on an arm 18 pivoted at 19 and a stop may be provided at 20 so that the float 14 will not be depressed by the weight below its intermediate position whereby the float will not move to its lowermost position until the water in the system is forced back into the protected part of the system beyond the control device leaving the unprotected part of the system free of water. The weight 17 is such that it is overcome by the flow of water from the system and allows the member or float 14 to assume its upper position to which it is moved by the pressure of the flowing water.

Associated with or responsive to movement of the member 14 is a suitable switch 21 which may be of the mercury contact type although it will appear that other types of switches may be arranged to be actuated by a movable element such as the element 14. The switch 21 may be mounted in the float 14 and the tube thereof may be of the shape shown to adapt it for effective use with the angularly movable float 14 with the contact points of the switch arranged at the center of the tube as at 22, 22 to be bridged by the globule of mercury 23 to make contact when the float 14 is in its intermediate position.

Leads 23, 23 in one or more suitable flexible water-proof cables may be extended from the vessel 11 to connect the switch 21 in one electrical power line terminal L_2 and to one terminal 24 of a solenoid 25 or other suitable electrically operable motor, the other power line terminal L_1 being connected by a lead 26 to the other terminal 27 of the solenoid 25. The actuator 28 of the solenoid may be arranged to operate a lever 29 controlling a valve 30 which may be arranged in a line 31 for connecting an air, or other non-freezing fluid, pressure supply in tank 32 to the inside of vessel 11. An air-trapping chamber 33 may be associated with or comprise part of vessel 11 and the electrical leads and the line 31 may be extended into or connected with the vessel 11 through the air-trapping chamber.

In operation, when water is being drawn from the line 12 as through the faucet 13, the flow of the water holds float 14 in its upper position, the force thereof overcoming weight 17. At this time

valve 30 is closed and the water flows freely through the control device. When the faucet 13 is closed, stopping the flow of water, the weight 17 depresses the float 14 to its intermediate position, the weight being sufficient to overcome the buoyancy of the float but not depressing it below its intermediate position because of the stop 20. This establishes electrical contact through the switch 21, opening valve 30 and connecting air under pressure from tank 32 to the system which forces the water from the unprotected part of the system back into the protected part beyond or below the control device. When the unprotected part of the system and the vessel 11 is thus emptied, the float 14 by reason of its weight falls to its lowermost position, causing the contact through switch 21 to be broken and allowing the actuator 28 to fall or be depressed so as to close the valve 30. The air trapped in the system in this way serves to hold the water in the system below the frost line. If the faucet 13 is then opened, this releases the air and allows the water to flow up through the part 12 of the system which swings the float 14 to its upper position, again allowing free flow of water through the control device.

The control device is effectively used in water systems in factories, shops, garages, service stations, parks, etc., in many of which places compressed air is already available, e. g. in service stations and garages for inflating tires, in factories and shops for operating or controlling machinery, etc. For ordinary residence installations it will be necessary to supply compressed air or other non-freezing fluid using a motor and compressor and possibly a compressed air tank, the switch 21 controlling either the motor directly or a valve on a compressed air tank. It will of course be apparent that the control device may be used universally on water supply systems having one or more outlets controlled by valves or faucets in part of the system which may be unprotected against freezing.

Modifications of the invention may be resorted to without departing from the spirit thereof or the scope of the appended claims.

What is claimed is:—

1. A liquid supply system including a part protected from freezing and a part exposed to freezing and having one or more outlets arranged to be closed, and means associated with said system and responsive to stoppage of the flow of liquid through the exposed part of the system when the same is closed for forcing the liquid in the exposed part of the system back into the protected part of the system, said means including means for forcing a non-freezing fluid into the exposed part of the system.

2. A liquid supply system including a part protected from freezing and a part exposed to freezing and having one or more outlets arranged to be closed, and means associated with said system and responsive to stoppage of the flow of liquid through the exposed part of the system when the same is closed for forcing the liquid in the exposed part of the system back into the protected part of the system, said means including means for forcing a non-freezing fluid into the exposed part of the system, said system being adapted to trap the non-freezing fluid therein to prevent flow of the liquid to the exposed part of the system until the system is opened to permit flow of liquid through and from the exposed part of the system.

3. A liquid supply system including a part protected from freezing and a part exposed to freezing and having one or more outlets arranged to be closed, and means associated with said system and responsive to stoppage of the flow of liquid through the exposed part of the system when the same is closed for forcing the liquid in the exposed part of the system back into the protected part of the system, said means including means for forcing a non-freezing fluid into the exposed part of the system, said means being disconnected from the system upon removal of the liquid from the exposed part of the system.

4. A liquid supply system including a part protected from freezing and a part exposed to freezing and having one or more outlets arranged to be closed, and means associated with said system and responsive to stoppage of the flow of liquid through the exposed part of the system when the same is closed for forcing the liquid in the exposed part of the system back into the protected part of the system, said means including means for forcing a non-freezing fluid into the exposed part of the system, said means being disconnected from the system upon removal of the liquid from the exposed part of the system, said system being adapted to trap the non-freezing fluid therein to prevent flow of the liquid to the exposed part of the system until the system is opened to permit flow of liquid through and from the exposed part of the system.

5. The combination with a liquid supplying system including a part protected from freezing and a part exposed to freezing, and having one or more outlets arranged to be closed, of a control device comprising an element movable to one position in the direction of flow of the liquid when flowing out of the exposed part of the system, movable to another position in the opposite direction when the exposed part of the system is empty and movable to an intermediate position when the exposed part of the system contains the liquid but the liquid is not flowing therefrom, and means operable by the element in the intermediate position thereof for forcing the liquid from the exposed part of the system back into the protected part of the system, said forcing means being disconnected from the system in the extreme positions of the element.

6. The combination with a liquid supplying system including a part protected from freezing and a part exposed to freezing, and having one or more outlets arranged to be closed, of a control device comprising an element movable to one position in the direction of flow of the liquid when flowing out of the exposed part of the system, movable to another position in the opposite direction when the exposed part of the system is empty and movable to an intermediate position when the exposed part of the system contains the liquid but the liquid is not flowing therefrom, and means operable by the element in the intermediate position thereof for forcing the liquid from the exposed part of the system back into the protected part of the system, said forcing means being disconnected from the system in the extreme positions of the element, said control device including a vessel in the system through which the liquid flows to the exposed part of the system and said element comprising a float in said vessel, a yielding means acting on the float to depress it to but not below said intermediate position when the exposed part of the system contains the liquid but the liquid is not flowing, said yielding means being adapted

to be overcome to allow the float to move upwardly from the intermediate portion under the action of the flow of water outwardly from the exposed part of the system, and said float being adapted to move downwardly when the liquid has been forced out of the exposed part of the system.

7. The combination with a liquid supplying system including a part protected from freezing and a part exposed to freezing, and having one or more outlets arranged to be closed, of a control device comprising an element movable to one position in the direction of flow of the liquid when flowing out of the exposed part of the system, movable to another position in the opposite direction when the exposed part of the system is empty and movable to an intermediate position when the exposed part of the system contains the liquid but the liquid is not flowing therefrom, and means operable by the element in the intermediate position thereof for forcing the liquid from the exposed part of the system back into the protected part of the system, said forcing means being disconnected from the system in the extreme positions of the element, said forcing means including apparatus for forcing a non-freezing fluid under pressure into the exposed part of the system.

8. The combination with a liquid supplying system including a part protected from freezing and a part exposed to freezing, and having one or more outlets arranged to be closed, of a control device comprising an element movable to one position in the direction of flow of the liquid when flowing out of the exposed part of the system, movable to another position in the opposite direction when the exposed part of the system is empty and movable to an intermediate position when the exposed part of the system contains the liquid but the liquid is not flowing therefrom, and means operable by the element in the intermediate position thereof for forcing the liquid from the exposed part of the system back into the protected part of the system, said forcing means being disconnected from the system in the extreme positions of the element, said control device including a vessel in the system through which the liquid flows to the exposed part of the system and said element comprising a float in said vessel, a yielding means acting on the float to depress it to but not below said intermediate position when the exposed part of the system contains the liquid but the liquid is not flowing, said yielding means being adapted to be overcome to allow the float to move upwardly from the intermediate portion under the action of the flow of water outwardly from the exposed part of the system, and said float being adapted to move downwardly when the liquid has been forced out of the exposed part of the system, said forcing means including apparatus for forcing a non-freezing fluid under pressure into the exposed part of the system.

9. The combination with a liquid supplying system including a part protected from freezing and a part exposed to freezing, and having one or more outlets arranged to be closed, of a control device comprising an element movable to one position in the direction of flow of the liquid when flowing out of the exposed part of the system, movable to another position in the opposite direction when the exposed part of the system is empty and movable to an intermediate position when the exposed part of the system contains the liquid but the liquid is not flowing therefrom, and means operable by the element in the intermediate position thereof for forcing the liquid from the exposed part of the system back into the protected part of the system, said forcing means being disconnected from the system in the extreme positions of the element, said forcing means including apparatus for forcing a non-freezing fluid under pressure into the exposed part of the system, said system being adapted to trap the non-freezing fluid in the system when the exposed part of the system is closed.

10. The combination with a liquid supplying system including a part protected from freezing and a part exposed to freezing, and having one or more outlets arranged to be closed, of a control device comprising an element movable to one position in the direction of flow of the liquid when flowing out of the exposed part of the system, movable to another position in the opposite direction when the exposed part of the system is empty and movable to an intermediate position when the exposed part of the system contains the liquid but the liquid is not flowing therefrom, and means operable by the element in the intermediate position thereof for forcing the liquid from the exposed part of the system back into the protected part of the system, said forcing means being disconnected from the system in the extreme positions of the element, said control device including a vessel in the system through which the liquid flows to the exposed part of the system and said element comprising a float in said vessel, a yielding means acting on the float to depress it to but not below said intermediate position when the exposed part of the system contains the liquid but the liquid is not flowing, said yielding means being adapted to be overcome to allow the float to move upwardly from the intermediate portion under the action of the flow of water outwardly from the exposed part of the system, and said float being adapted to move downwardly when the liquid has been forced out of the exposed part of the system, said forcing means including apparatus for forcing a non-freezing fluid under pressure into the exposed part of the system, said system being adapted to trap the non-freezing fluid in the system when the exposed part of the system is closed.

11. The combination with a liquid supplying system including a part protected from freezing and a part exposed to freezing, and having one or more outlets arranged to be closed, of a control device comprising an element movable to one position in the direction of flow of the liquid when flowing out of the exposed part of the system, movable to another position in the opposite direction when the exposed part of the system is empty and movable to an intermediate position when the exposed part of the system contains the liquid but the liquid is not flowing therefrom, and means operable by the element in the intermediate position thereof for forcing the liquid from the exposed part of the system back into the protected part of the system, said forcing means being electrically operable, and a switch controlling said forcing means and responsive to movement of said element.

12. The combination with a liquid supplying system including a part protected from freezing and a part exposed to freezing, and having one or more outlets arranged to be closed, of a con-

trol device comprising an element movable to one position in the direction of flow of the liquid when flowing out of the exposed part of the system, movable to another position in the opposite direction when the exposed part of the system is empty and movable to an intermediate position when the exposed part of the system contains the liquid but the liquid is not flowing therefrom, and means operable by the element in the intermediate position thereof for forcing the liquid from the exposed part of the system back into the protected part of the system, said forcing means being disconnected from the system in the extreme positions of the element, said control device including a vessel in the system through which the liquid flows to the exposed part of the system and said element comprising a float in said vessel, a yielding means acting on the float to depress it to but not below said intermediate position when the exposed part of the system contains the liquid but the liquid is not flowing, said yielding means being adapted to be overcome to allow the float to move upwardly from the intermediate portion under the action of the flow of water outwardly from the exposed part of the system, and said float being adapted to move downwardly when the liquid has been forced out of the exposed part of the system, said forcing means being electrically operable, and a switch controlling said forcing means and responsive to movement of said float.

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