

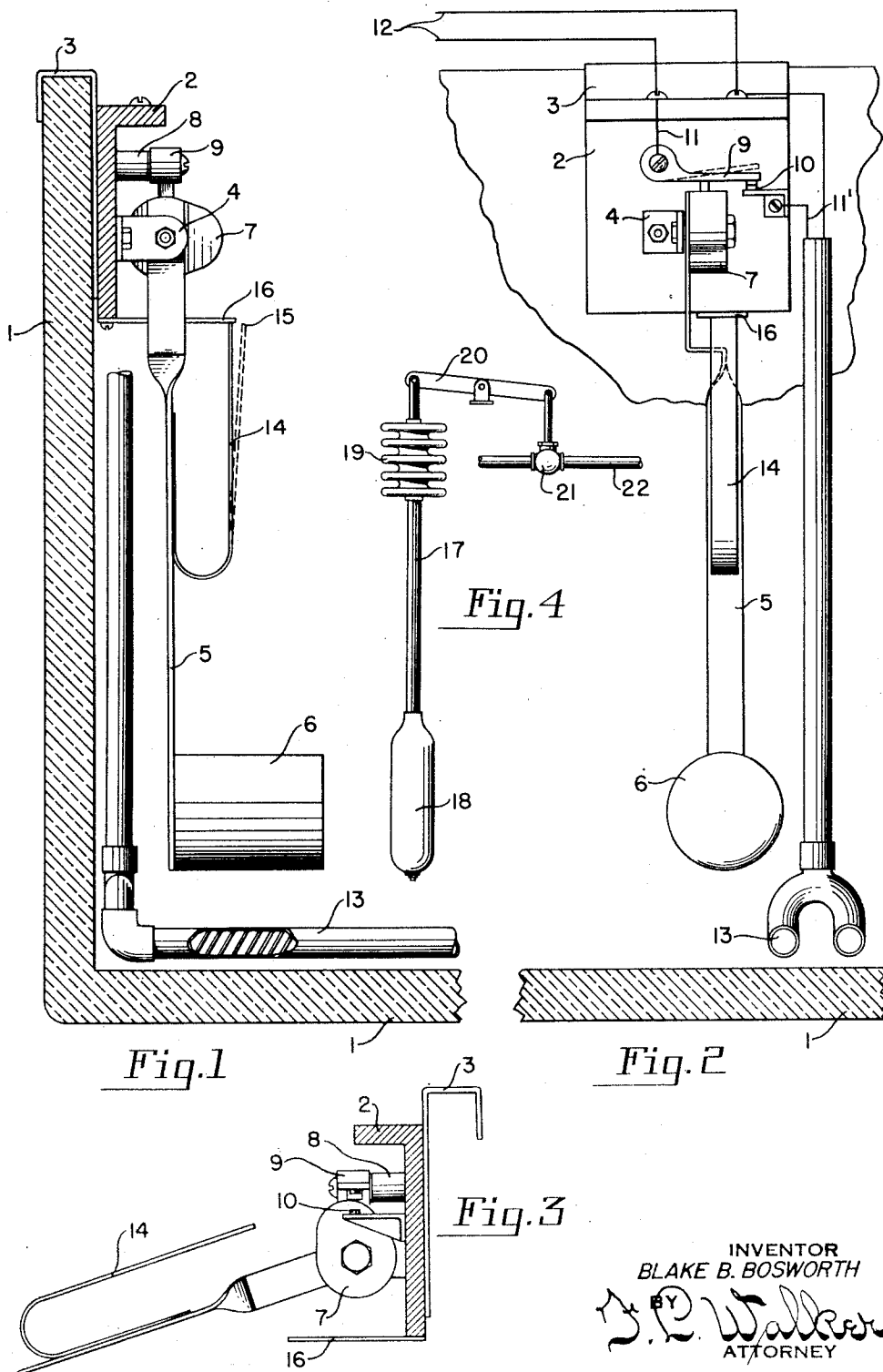
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TANK HEATER

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TANK HEATER

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This invention pertains to thermal control of the walls of containers, and more particularly to a heater apparatus for warming the contents of water closet tanks, and other containers, for automatic prevention of condensation of moisture from the surrounding air on the exterior of walls thereof, and consequent dripping of condensate.

This condition is more or less prevalent in localities where the water supplied to closet tanks is of low temperature, less than that of ordinary room temperature. This condition is most common in instances wherein the water is supplied from a private source or from a relatively deep well. As result the tank walls are chilled, or their temperature decreased, and the entrained moisture content of adjacent humid air contacting the cooled tank walls, particularly of a conventional water closet tank, is condensed thereon, and drains down such cold wall and drips upon the floor.

Such condensation can be prevented by warming the contents of the tank to maintain the temperature of the tank walls above the dew point at which precipitation or condensation of moisture occurs. Such tanks are ordinarily supplied through automatic valves which control the quantity of water supplied and arrest the supply when raised to a predetermined level. It is obvious that the cold water admitted can not be sufficiently warmed as rapidly as supplied.

In the present invention there is contemplated a water heater which will be automatically started upon the admission of a fresh supply of water, but its deenergization will be delayed until the water reaches a predetermined temperature. Obviously when the temperature of the water within a tank has once been brought to or above the surrounding room temperature, that of the water content will not ordinarily fall there below, even after a long period of time.

The object of the invention is to simplify the structure, as well as the means and mode of operation of automatic temperature control means for water tanks, or the like, which may not only be economically constructed, but will be efficient in use, automatic in operation, uniform in action, having minimum number of working parts, and be unlikely to get out of repair.

A further object of the invention is to provide a thermal control apparatus for water tanks which may be easily and quickly installed by an unskilled mechanic without in any way disturbing or modifying the tank installation.

A further object of the invention is to provide

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means for automatically maintaining the water heating apparatus in continuing operation until the temperature has been raised to a predetermined degree, regardless of the length of time required, and then effect instant discontinuation thereof.

A further object of the invention is to provide a thermal control apparatus for water tanks, possessing the advantageous structural features, the inherent meritorious characteristics, and the mode of operation herein described, or their equivalents.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof, and the mode of operation, as hereinafter described or illustrated in the accompanying drawings or their equivalents.

In the drawings, wherein is illustrated the preferred, but not necessarily the only form of embodiment of the invention,

Fig. 1 is a side elevation of a thermal control apparatus embodying the present invention while the water heater is energized, mounted on a fragmentary portion of a water tank.

Fig. 2 is a front elevation of the thermal control apparatus in the condition shown in Fig. 1.

Fig. 3 is a further side elevation of the same apparatus, partly broken away, after its automatic operation to deenergize the water heater.

Fig. 4 is a detail view of a conventional thermal responsive switch or valve operator.

Like parts are indicated by similar characters of reference throughout the several views.

While the present apparatus is primarily intended for controlling the temperature of the contents of conventional water closet tanks, for prevention of moisture condensation on the exterior walls thereof and consequent drippage, it is obvious that it may be applied to various other tanks and containers, as for example, warming stock watering troughs, the temperature control of contents of bath tubs, chemical mixtures, and various other purposes. Therefore it is not intended that the scope and application of the invention shall be unduly restricted to those herein shown and described, for illustrative purposes, but shall be deemed applicable to other uses and purposes, and to include other embodiments.

Referring to the drawings, 1 indicates portions of the side and bottom walls of a conventional water tank to which a quantity of cold water is intermittently admitted. Suspended from the top

margin of the side wall 1 of the tank is a bracket 2, preferably of non-electro conductive material, but which may be a metal bracket from which the various electrically connected elements are individually insulated. The bracket is detachably engaged over the margin of the tank wall 1 by a hanger hook 3. Pivotaly mounted upon a supporting arm 4 attached to the bracket 2 is an oscillatory float arm 5, carrying at its extremity a float 6 which may be of any suitable type or shape.

Attached to the opposite, or pivotal end, of the float arm 5 is a cam or eccentric 7 which oscillates in unison with the float arm. Mounted on a stud 8 projecting from the bracket 2 is a contact arm 9, which may be yielding or resiliently mounted for make and break contact engagement with a companion stationary contact 10 so long as the float remains in its down position of Figs. 1 and 2, and the cam 7 retracted. The electrical contacts 9 and 10 control an electrical circuit 11—11' leading from power supply lines 12 to a conventional electrical submersion heater 13 immersed within the water content of the tank 1. As the water is exhausted from the tank 1 the float 6 descends with the water level, causing the float arm 5 to turn the cam or eccentric 7 to the position shown in Figs. 1 and 2, wherein the contact arm 9 is permitted to descend into engagement with the companion contact 10 to close the circuit 11—11' and thus energize the electrical heater 13. As the tank refills with cold water, which ordinarily occurs automatically, the float arm 5 is held down by a thermostatic detent blade 14, and the heater 13 continues to be energized. The detent blade 14 is attached to the oscillatory float arm 5, and the free end 15 thereof temporarily engages beneath a plate or ledge 16 projecting from the supporting bracket 2. The thermostatic detent blade 14 continues to hold the float arm depressed and the cam 7 in position to permit the contact arm 9 to continue in engagement with the contact 10 to maintain the heater unit 13 energized, until the temperature of the fresh water supply is again raised to a predetermined degree equal to, or slightly above, that of the surrounding room temperature. Quite naturally, so long as the walls 1 of the tank are maintained at or slightly above the surrounding atmospheric temperature incident to the warm condition of the water therein no moisture condensation will occur on the exterior of the walls 1 of the tank, prevention of which is the primary objective of the instant invention.

It is obvious that the dominating conception of the instant invention may be variously embodied. For example in lieu of the float lever operation switch illustrated, a conventional submersion type thermostatic electric switch operator of the type illustrated in Fig. 4 may be employed. In such installation, a tube 17 having at one end a bulb 18 submerged in the water, is filled with a thermally expansive and contractive fluid, which controls a communicating bellows or "siphon" 19 above the level of the water. The expansion and contraction of the bellows or "siphon" 19, in accordance with fluctuations of temperature of the water accordingly opens and closes an electric make and break circuit controller to energize and deenergize the submerged heater 13. Likewise in lieu of the electrical heater 13, the tank 1 may be equipped with an exterior heater, as for example a gas burner or hydrocarbon fuel burner having a pilot light. A thermostatic valve control element such as indicated in

Fig. 4 may be utilized to open and close a fluid supply valve to regulate the operation of such exterior burner. This is one of those instances wherein the problem having been recognized and its solution visualized, upon disclosure of its conception, many manners of utilizing existing structures for accomplishment of the desired result, will readily occur to the mind of an ingenious mechanic. Hence the invention is not limited to the specific embodiment shown.

In the structure as illustrated in the drawings, the detent blade 14 is of spring tension. As the float arm 5 reaches the limit of its range of descent, the cam head 7 is turned to a position to permit the descent of the contact 9 into engagement with the stationary contact 10 to energize the heater 13. In such position of the float arm 5, the spring detent blade 14, under inherent tension of the blade will project its free end 15 beneath the stop plate 16, and so temporarily lock the float arm and cam head 7 in their retracted inoperative positions maintaining the heater 13 energized. In the meantime the tank may continue to fill with cold water. When the temperature of the contents of the tank has been raised sufficiently to warm the exterior surfaces thereof to a predetermined temperature, equal to or slightly above that of the dew point of the surrounding atmosphere, the detent blade 14 which is of substantially U shape, and of bimetallic thermostatic material, will respond to the increased temperature of the water in which it is submerged, and will expand sufficiently to disengage the end 15 of the detent blade 14 from under the stop plate 16. Thereupon the buoyancy of the float 6 will immediately elevate the float arm 5 and partially turn the cam head 7, to raise the contact 9 and thereby break the energizing circuit of the heater 13 which will thereby be deenergized. The modification, Fig. 4 shows a thermostatic unit comprising the tubular stem 17 having a terminal bulb 18 filled with thermally expansive fluid expands a "siphon" 19 to oscillate a valve operating lever 20 to shut off a valve 21 controlling a fuel supply conduit 22 leading to a heater burner exteriorly of the tank. Obviously the thermostatic unit shown in Fig. 4 might be utilized to control the contacts 9—10 of circuit 11—11' controlling the electrical heater 13, thereby eliminating the float arm and cam head. Such modified thermostatic apparatus might likewise be utilized to control a conventional electrically actuated valve 21 to regulate a fuel supply through the conduit 22.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise the preferred form of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. A means for minimizing the condensation of moisture from surrounding atmosphere and resulting drip from exterior surfaces of tanks and containers, including an oscillatory float arm therein, a cam movable therewith, an electrically energized heater element submerged in the contents of the tank or container, an electrical energizing circuit therefor, a pair of make and break contacts included in the circuit, one of which is movable relative to the other contact in accordance with the fluctuations of the float arm to open and close the energizing electrical circuit, and a thermally responsive detent member carried by the float arm and detachably engageable with a stop to temporarily maintain the float arm in circuit closing relation until released by the influence of increased temperature of the contents of the tank or container upon the thermally responsive detent member to permit movement of the float arm to effect opening of the make and break contact of the circuit to deenergize the heating element.

2. A means for preventing condensation of moisture from surrounding atmosphere on the exterior surface of a water closet tank or the like, and resulting drainage of precipitation onto a floor, wherein the contents of the tank are intermittently discharged therefrom and a fresh supply of cold water admitted, including a heater for warming the newly admitted water supply, control means for automatically initiating the operation of the heater upon discharge of the preceding charge of water and admission of a fresh charge thereto, a deferred action device for maintaining the heater in operation until the temperature of the newly supplied charge of water is warmed sufficiently to raise the exterior surfaces of the tank to a predetermined temperature sufficient to prevent condensation of moisture thereon, and means responsive to the increased temperature of the contents of the tank to effect deenergization of the heater.

3. A means for preventing condensation of moisture from surrounding atmosphere on the exterior surface of a water closet tank or the like, and resulting drainage of precipitation onto a floor, wherein the contents of the tank are intermittently discharged therefrom and a fresh supply of cold water admitted, including a heater element for warming the newly admitted water supply, an electrical circuit controlling operation of the heater, a make and break contact in the circuit, an actuator effecting closing of the make and break contact substantially coincident with the admission of the fresh charge of cold water to the tank, to initiate operation of the heater, control means maintaining the make and break contact closed until the temperature of the newly admitted charge of water is raised to a predetermined temperature and make and break contact release means responsive to the increased temperature of the water effective to open the circuit and terminate influence thereon of the heater.

4. An apparatus for minimizing the condensation of moisture from surrounding atmosphere upon the exterior of walls of a tank, including a submersion type electrical heater immersed within the contents of the tank, an oscillatory float arm pivoted therein, an electrical switch controlling the electrical heater, an energizing electrical circuit therefor, a make and break contact therein opened by the rise of the float arm incident to the elevation of the level of contents of the

tank and closed by the descent of the float arm incident to lowering of the level of content, and a thermostatically controlled delayed action latch maintaining the make and break contact closed and the heater element energized for an appreciable time after the content level has been elevated.

5. An apparatus for minimizing the condensation of moisture from surrounding atmosphere on the exterior of walls of a container, including a heater for the contents of the container, a float operated regulator for the heater responsive to fluctuations of the fluid level of the contents of the container, and a delayed action detent for the regulator maintaining the heater in operation through an extended period until the temperature of the exterior walls of the container have been raised to a predetermined temperature sufficient to prevent condensation of moisture thereon.

6. A means for minimizing the condensation of moisture from surrounding atmosphere and resulting drip from exterior surfaces of tanks and containers, including a heater element, a float operated regulator which by its movement initiates and terminates the influence of the heater, a delayed action detent for the float deferring the operation of the float to decrease the influence of the heater element until the temperature of the exterior surfaces of the tank have been raised to a predetermined temperature above the point of precipitation of moisture thereon, and a thermostatic release for the float whereupon the float becomes operative to terminate the heater influence.

7. A means for minimizing the condensation of moisture from the surrounding air upon exterior surfaces of a tank or container, including a heating element associated therewith, a float operated regulator therefor adapted to alternately initiate and terminate the operation of the heater element, a detent for maintaining the regulator in condition to continue the heater element in operation until the temperature of the contents of the tank or container is raised to a predetermined temperature by which the exterior surfaces of the tank or container are warmed sufficiently to prevent condensation thereon of moisture from the surrounding atmosphere, and thermostatic means responsive to the increased temperature of said contents effective to terminate further operation of the heater unit.

8. An apparatus for minimizing the condensation of moisture from surrounding atmosphere upon the walls of a container and its drip therefrom, including a heater element for the contents of the container, a lever operated control mechanism for the heater, and thermostatic control means for the lever responsive to fluctuations of the temperature of the contents of the container whereby the temperature of the latter is maintained substantially constant at a predetermined degree sufficient to prevent condensation of moisture from the surrounding atmosphere.

9. Means for minimizing the condensation of moisture from surrounding atmosphere upon exterior surfaces of a water tank, and the subsequent drip of condensate upon a floor, including a heater for the contents of the tank, an electrical control circuit for the heater, a make and break contact for said circuit, a detent automatically maintaining the make and break contact closed and the heater energized, a thermostatic release for the detent responsive to the increased temperature of the contents of the tank enabling

opening of the make and break contact and de-energization of the heater, the construction and arrangement being such that the temperature of the water content of the tank is raised sufficiently to warm the exterior surfaces of the tank to a predetermined degree sufficient to prevent condensation thereon of moisture from the surrounding atmosphere.

10. Means for minimizing the condensation of moisture from surrounding atmosphere upon exterior surfaces of a water tank, and the subsequent drip of condensate upon a floor, including a heater for the contents of the tank, a control device for automatically initiating and halting operation of the heater, and a regulating device for continuing the operation of the heater until the temperature of the contents of the tank is raised to a predetermined degree such that the temperature of the exterior surfaces of the tank is increased sufficiently to prevent condensation of moisture thereon.

11. The herein described method of eliminating condensation upon the exterior of water tanks and the objectionable dripping thereof, including energizing a heater upon receipt of a new supply of water within the tank, to the influence of which heater the new supply of water is subjected and maintaining energization of the

heater until the new supply of water is warmed to a predetermined temperature in excess of that at which condensation of moisture will take place.

12. The herein described method of eliminating objectionable condensation and drippage from the exterior of a water tank, including warming an incoming supply of water to a predetermined temperature in excess of that at which condensation of moisture will take place, and thereafter halting the warming influence until the tank has been emptied and a new supply of water received.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,158,586	Thornton, Jr.	Nov. 2, 1915
1,764,139	Alex	June 17, 1930
1,791,254	Von Brockdorff	Feb. 3, 1931
1,909,464	Gumsheimer	May 16, 1933
1,915,704	Warren	June 27, 1933
1,922,927	Burnside	Aug. 15, 1933
1,933,173	Hunt	Oct. 31, 1933