No. 741,610.

PATENTED OCT. 20, 1903.

LA FAYETTE ALDRICH & W. GRANGE.

HEAT REGULATOR.

APPLICATION FILED JULY 14, 1902.

NO MODEL.

Fig. 1.

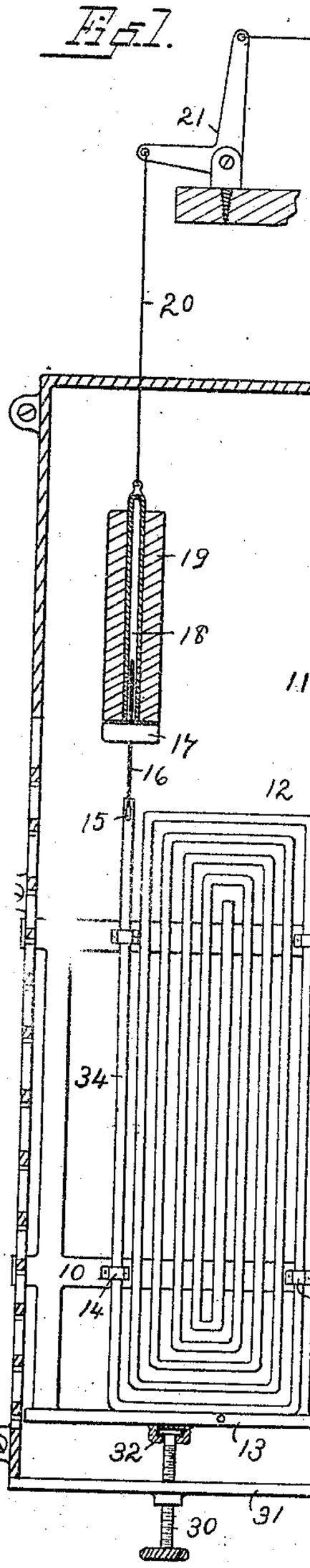


Fig. 4.

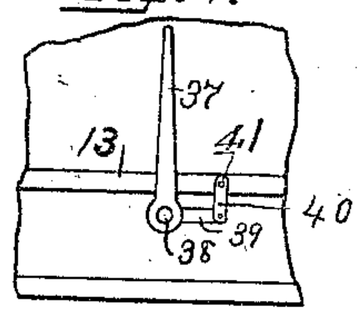


Fig. 5.

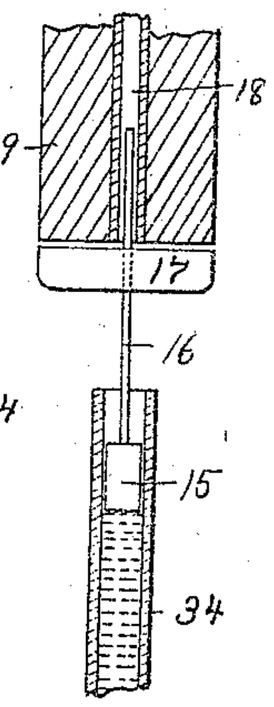


Fig. 2.

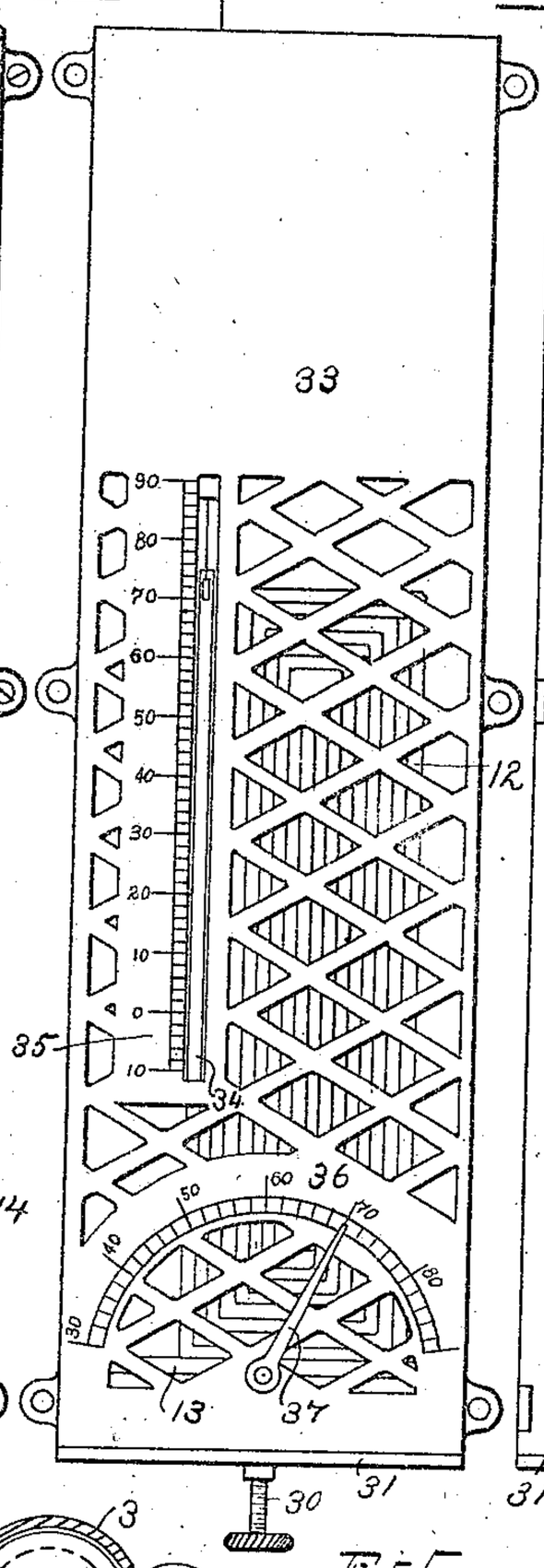


Fig. 3.

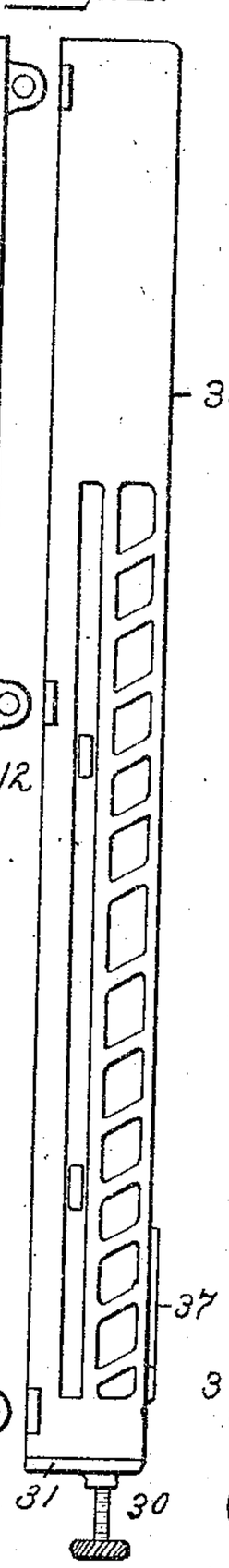
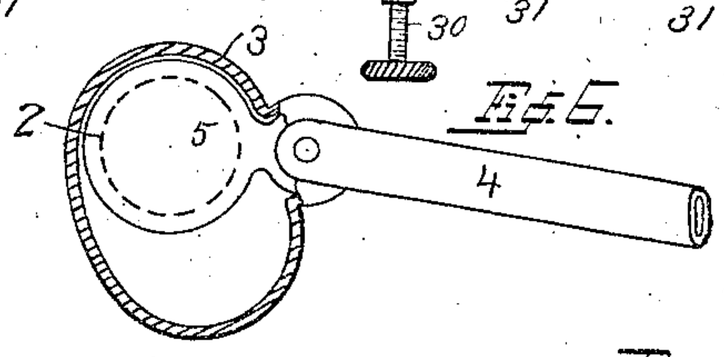


Fig. 6.



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No. 741,610. Patented October 20, 1903.

UNITED STATES PATENT OFFICE.

LA FAYETTE ALDRICH AND WILLIAM GRANGE, OF MILWAUKEE, WISCONSIN.

HEAT-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 741,610, dated October 20, 1903.

Application filed July 14, 1902. Serial No. 115,419. (No model.)

To all whom it may concern:

Be it known that we, LA FAYETTE ALDRICH and WILLIAM GRANGE, citizens of the United States, residing at Milwaukee, county of Milwaukee, and State of Wisconsin, have invented new and useful Improvements in Heat-Regulators, of which the following is a specification.

Our invention relates to improvements in heat-regulating devices.

The object of our invention is to provide a form of thermostatic device capable of acting through direct mechanical connections to operate the steam-valve of a radiator.

In the following description reference is had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view of our invention, showing the radiator on a reduced scale and the thermostat with the face-plate removed. Fig. 2 is a front view of the thermostat. Fig. 3 is an edge view of the same. Fig. 4 is a detail showing the indicator-finger and its connections. Fig. 5 is a detail view of the fluid-controlled piston and weights, and Fig. 6 is a detail of the steam-valve and valve-actuating lever of the radiator.

Like parts are identified by the same reference characters throughout the several views.

1 is a radiator to which steam is supplied by means of a supply-pipe 2.

3 is the casing of a valve controlling the steam-supply, and 4 is a valve-actuating lever through the medium of which a slide-valve 5, Fig. 6, is manipulated.

6 is a hand-controlled valve also used for regulating the steam-supply independently of the thermostat. The valve-lever 4 is tubular and partially filled with mercury 9. In operating the valve the lever moves slightly above and below a horizontal plane, closing the valve during its downward movement. As the lever moves below the horizontal plane the mercury flows to its outer end and furnishes sufficient weight to insure an absolute closure of the valve.

The thermostat is mounted upon an adjustable skeleton frame 10, vertically movable on a fixed frame 11. A coiled pipe 12, filled with an expansible fluid, such as alcohol, is secured to the frame 10 and at its lower end is supported by an adjustable rest 13, which constitutes the lower bar of the frame 10, the coils being preferably secured to the frame 10 by means of suitable fastenings 14. The outer leg or final reach 45 of the coiled pipe is straight and open-ended. A piston or plunger 15 is fitted to the open end of the pipe, as shown in Figs. 1 and 5, and is provided with an upwardly-projecting piston-rod 16, to which a weight 17 is secured. The rod 16 projects through the weight 17 into a socket 18 in a weight 19. The latter serves as a counterweight for the valve-lever 4, with which it is connected by a cord 20, elbow-lever 21, cord 22, elbow-lever 23, and cord 24. The cord 24 is secured to the lever 4 at 25 near its fulcrum. The weight 19 is sufficiently heavy to actuate the valve-lever 4 from any point of adjustment except that which the valve occupies in its extreme open position. The valve will therefore always be in open position except when closed by the expansion of the liquid in the coiled pipe 12 operating against the piston to lift the weight 19 through the medium of the piston-rod. When this is done, the weight of the valve-lever 4 is operative to close the valve gradually in accordance with the gradual upward movement of the weight 19 as the liquid expands. The weight 17 is sufficient to overcome the friction of the piston in the pipe 12, the function of this weight being to keep the piston in continuous contact with the liquid in the pipe 12 even though said liquid continues to contract after the weight 19 has reached the limit of its downward movement. With this construction there is no tendency to form a partial vacuum between the upper surface of the liquid in pipe 12 and the piston, which vacuum, if permitted to be formed, might become filled with gas, vapor, or air, and thereby render the thermostatic action of the device irregular.

Referring again to the connections between the weight 19 and the valve-lever 4, it will be observed that a branch cord 26 is connected with the cord 24 at 27 and with the outer end of the lever 4 at 28. The point of attachment of cord 26 being farther from the fulcrum than the point of attachment of cord 24,

it is obvious that the downward movement of the lever 4 will tend to throw its weight upon cord 26, while the upward movement of the lever will permit cord 26 to slacken, as the distance between its point of attachment to the lever and the point 27 shortens more rapidly than that between the corresponding points of attachment of cord 24. The length of the cords 24 and 27 is so proportioned that when lever 4 moves downwardly to its extreme position the weight of the lever will be thrown largely upon cord 26, while cord 24 is permitted to slacken, so that it is deflected from a straight line, as indicated in Fig. 1. The initial upward pull upon cord 24 is therefore exerted upon the outer end of lever 4 through the medium of branch cord 26 until cord 24 is drawn to a straight line, when the continued upward movement of lever 4 permits cord 26 to slacken, the lever being then actuated entirely by cord 24. The object of this arrangement is to overcome the initial resistance and inertia of the valve and its actuating-lever. The valve being normally closed, it frequently sticks to a certain degree by reason of corrosion or for other causes. Hence it requires force to start it from that position. Also the provision of a peculiar form of lever herein shown, whereby mercury is caused to flow to the outer end of the lever as the valve is closed, makes it necessary to use additional force during its initial upward movement. After the valve is started, however, from its normal position it is desirable that it should move as rapidly as possible. Hence the connection of cord 24 at a point near the fulcrum is also desired.

The term "cord" is used in its broad sense to cover any suitable flexible connection, whether consisting of twine, wire, chain, or linked rods. To adjust the thermostatic coil 12, I use an adjusting-screw 30, which engages in screw-threaded bearings in the base 31 of the frame 10 and is swiveled to the under surface of the bar 13 at 32, whereby the thermostatic coils 12 may be raised or lowered by turning the screw 30.

33 is a face-plate, the lower portion of which is latticed to permit a free circulation of air to and around the coils 12. The final reach 34 of the coils is covered by an indicator-plate 35, Fig. 2, similar in form to that used in an ordinary thermometer.

To facilitate adjusting the coil 12 to the required position, I have provided a sector-shaped gage-plate 36 and a pointer 37, motion being communicated to the latter from the bar 13 through the medium of the pivot-rod 38, arm 39, and link 40, the latter being connected with bar 13 by a pivot-pin 41. When the coil is raised, the pointer-arm 37 will be moved to the left, and when lowered it will be moved to the right.

The markings on the gage-plate 36 are so arranged that when the coil-supporting bar 13 is adjusted with the pointer in registry with one of the marks such mark will indicate the degree of temperature at which the valve will be closed. As the temperature decreases from such degree the valve will gradually open, and when it again increases (with the admission of steam to the radiator) the valve will gradually move to closed position.

In Fig. 1 the valve 5 is in its closed position, cutting off the supply of steam to the radiator 1, the valve-lever 4 being depressed. In Fig. 2 the coil is shown adjusted with the pointer indicating 70° on the gage plate or dial. As the temperature of the room decreases below 70° Fahrenheit the contraction of the fluid in the coils 12 removes the support of the weights 17 and 19 and permits them to descend by gravity, whereupon motion is communicated from the weight 19 through the intervening connections to lift the valve-lever 4, the initial lifting movement being accomplished by means of a branch connection 26, until the mercury 9 shifts in the lever 4 and relieves part of the weight of the outer end of the lever, when a more rapid movement is communicated to the lever through the medium of the connection 24. When the valve is adjusted to its open position, admitting the steam to the radiator and before the room has had time to become reheated, the fluid will continue to contract in the coils 12, whereupon the weight 17 will move downwardly away from the weight 19, thus causing the piston 15 to follow the contracting fluid. As the room becomes heated the initial expansion of the fluid will not operate the valve until the weight 17 is again brought into contact with the weight 19, when by lifting the latter the valve-lever 4 is permitted to descend by gravity to again close the valve. By adjusting the supporting-bar 13 vertically the weight 17 may be made to contact with the weight 19 at any desired temperature.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination with a steam-controlling valve of a radiator; of a weighted valve-lever therefor; a counterweight connected with the lever; a tube filled with expansible fluid; a weight-actuating rod; and means for actuating said rod from said fluid.

2. The combination with a steam-controlling valve of a radiator; of a weighted valve-lever therefor; a counterweight connected with said lever; a tube filled with expansible fluid, and provided with a piston-operated rod projecting from the tube; a weight located on said rod, and supported thereby in the path of said counterweight; together with means for adjusting the tube.

3. The combination with a steam-controlling valve of a radiator; of a weighted valve-lever therefor; a counterweight connected with said lever; a coiled tube filled with expansible fluid, and provided with a piston-rod

projecting from the tube; a weight located on said rod and supported thereby in the path of said counterweight.

4. The combination with a fluid-containing tube, filled with an expansible fluid; a weighted piston located in said tube; a valve-controlling counterweight; a connection for the piston in movable engagement with the counterweight; and a device, connected with the piston, for engaging and lifting the counterweight during the movement of the piston in one direction.

5. The combination of a fluid-containing tube containing an expansible fluid; a piston located in said tube; a valve-controlling weight, and a connection for the piston in movable engagement with the weight, said connection being adapted to actuate the weight when moved in one direction.

6. The combination with a fluid-containing tube filled with a sensitive, expansible fluid, such as alcohol; a weighted piston located in said tube; a valve-controlling weight; a connection for the piston in movable engagement therewith; a device, connected with the piston, for engaging and lifting the weight during the movement of the piston in one direction; a valve-controlling lever; actuating connections therefor secured to the lever in proximity to its fulcrum; and flexible branch connections secured to the lever at a more distant point, said flexible connections being adapted to draw upon the lever when the latter is at the limit of its movement in one direction.

7. The combination with a steam-controlling valve of a radiator; of a tubular valve-actuating lever connected therewith, and adapted to be oscillated above and below a horizontal plane; liquid of high specific gravity in said tube; a counterweight connected with the lever; and a thermostatic device for lifting said counterweight.

8. The combination with a steam-controlling valve of a radiator; of a tubular valve-actuating lever connected therewith, and adapted to be oscillated above and below a horizontal plane; liquid of high specific gravity in said tube; a counterweight connected with the lever; a thermostatic device; a weight-actuating element connected therewith, and adapted to engage and lift said counterweight.

9. The combination with a steam-controlling valve of a radiator; of a tubular valve-actuating lever connected therewith, and adapted to be oscillated above and below a horizontal plane; liquid of high specific gravity in said tube; a counterweight connected with the lever; a thermostatic device; a weight-actuating element connected therewith, and adapted to engage and lift said counterweight, said thermostatic device being mounted on an adjustable support.

10. The combination with a steam-controlling valve of a radiator; of a tubular valve-actuating lever connected therewith, and adapted to be oscillated above and below a horizontal plane; liquid of high specific gravity in said tube; a counterweight connected with the lever; a thermostatic device; a weight-actuating element connected therewith, and adapted to engage and lift said counterweight, said thermostatic device being mounted on an adjustable support; together with an indicating-finger, connected with said adjustable support and adapted to be actuated thereby; and an indicator-plate in coöperative relation to such finger.

11. The combination with a series of interconnected fluid-containing tubes filled with a sensitive expansible fluid; a movable supporting-frame therefor; a fixed supporting-frame loosely connected with the movable frame; an adjusting-screw for regulating the position of the movable frame on the fixed frame; a piston located in one of said tubes, and having an exteriorly-projecting piston-rod; a weight located on said rod; a valve-controlling counterweight in the path of the rod-supported weight; and a valve-controlling lever, operatively connected with the counterweight.

In testimony whereof we affix our signatures in the presence of two witnesses.

LA FAYETTE ALDRICH.
WILLIAM GRANGE.

Witnesses:
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