(No Model.)

L. F. EASTON.

TEMPERATURE REGULATOR.

No. 472,256. Patented Apr. 5, 1892.

Fig. 1.

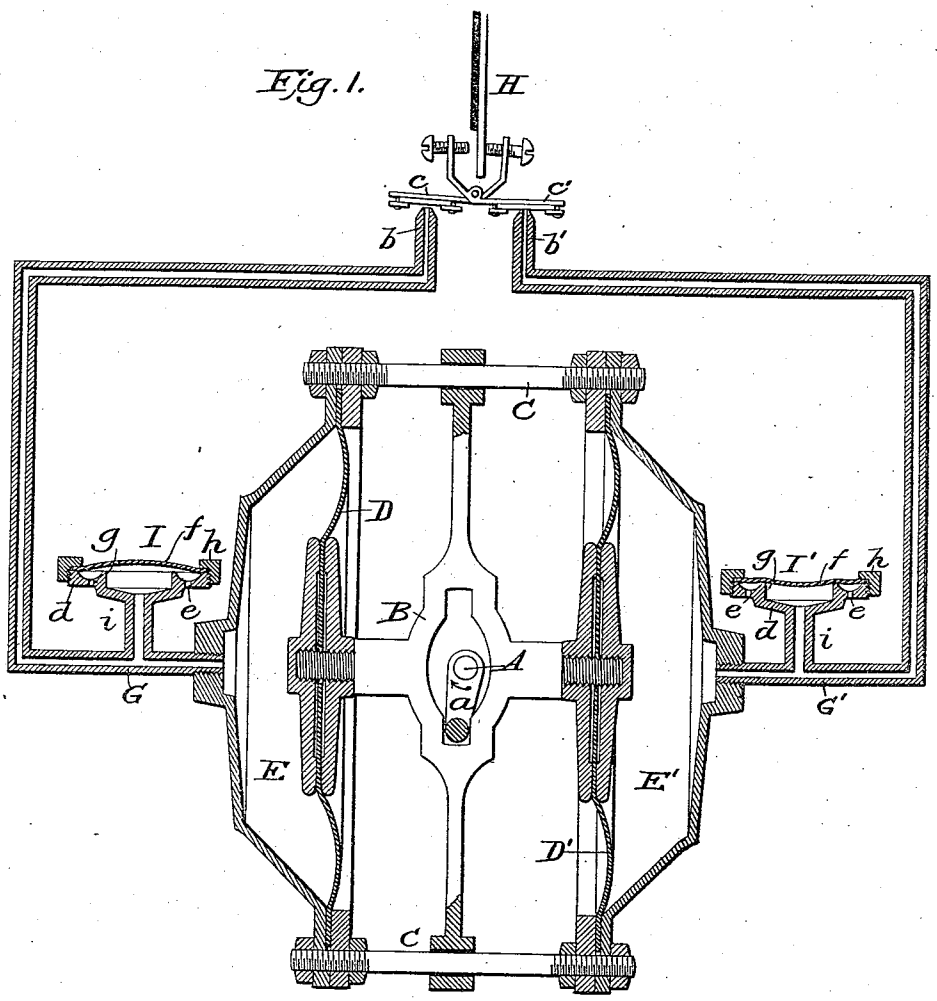
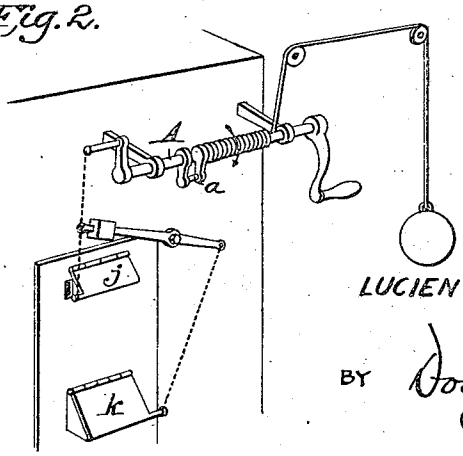


Fig. 2.



Witnesssss:
Horace A. Dodge.
James F. Duhamel.

LUCIEN F. EASTON,
Inventor,
BY Dodger Sons,
Attys.

UNITED STATES PATENT OFFICE.

LUCIEN F. EASTON, OF LA CROSSE, WISCONSIN.

TEMPERATURE-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 472,256, dated April 5, 1892.

Application filed April 4, 1891. Serial No. 387,648. (No model.)

To all whom it may concern:

Be it known that I, LUCIEN F. EASTON, a citizen of the United States, residing at La Crosse, in the county of La Crosse and State of Wisconsin, have invented certain new and useful Improvements in Temperature-Regulators, of which the following is a specification.

My invention relates to apparatus for automatically controlling dampers, drafts, valves, &c., through the agency of changes in temperature.

In Letters Patent No. 373,061, issued to me November 15, 1887, I showed a thermostat electrically controlling the motor for actuating the valve, damper, or like device; but in the present invention I dispense with such devices and use in lieu thereof an arrangement in which the thermostat controls the motor pneumatically.

In the drawings, Figure 1 is a vertical sectional view of my improved apparatus, and Fig. 2 a perspective view showing the connections between the shaft and the valves or dampers of a furnace.

A indicates a shaft mounted and arranged to rotate in any suitable frame and having wound upon it a rope or band which exerts a constant tendency to rotate the shaft in one direction, as is clearly shown and described in the above patent. Only a half-revolution of the shaft is allowed upon every rise of temperature to a predetermined point, and also upon every fall of temperature to a predetermined point another half-revolution is allowed.

Upon reference to Fig. 2 it will be seen that the connections between the shaft and the valves or dampers are such that when the shaft turns in the direction of the arrow the check-valve *j* will be closed and the main draft *k* opened, and that when the shaft makes another half-revolution the valve *j* will be opened and the valve *k* closed, so that as the shaft rotates a half-revolution at a time the drafts or dampers will be alternately opened and closed.

Before proceeding further I desire to state that I do not mean to limit myself to the arrangement of dampers and valves shown, which is given merely for convenience of illustration. For instance, it is not essential that there be two valves or dampers to be actuated, the main-draft valve being all that is ordinarily employed in most furnaces. Of course the changes in the number and positions of the valves and dampers will necessitate a change in the connections between the shaft and the valves or dampers, and as these changes will vary according to the character of the furnace employed and other circumstances illustration of the various plans is impracticable and considered unnecessary, as they are not specifically claimed.

Shaft A is provided with a crank *a*, working within a yoke or frame B, which latter is adapted to slide back and forth in a right line upon the rods or guides C. The yoke B is connected with the hubs of the flexible disks or diaphragms D D′, which act as covers for the air chambers or vessels E E′. Pipes G G′ connect, respectively, with the vessels or chambers E E′ and terminate in nozzles *b b′*, which are adapted to be covered or uncovered by a thermostat H, acting upon the hinged or pivoted valves or covers *c c′*. Each of the pipes G G′ is provided with a vent or check-valve I I′, which, as shown, consists of a shell or casing *d*, a flexible diaphragm or disk *f*, an annular raised flange *g*, openings *e* in the shell outside of the annular flange, and finally a retaining ring or cap *h*, screwing onto the shell and holding the flexible disk or diaphragm in place. When the valve or vent is closed to the outside air, the disk or diaphragm will be found to be resting upon the annular flange, thereby cutting off communication between the space into which openings *e* enter and the space at the center of the shell into which enters the branch pipe *i*, connecting the shell with the pipe G′, as shown at I′. When the valve or vent is opened to the outside air, the disk or diaphragm will be found to be raised off the annular flange and the central space of the shell thrown into communication with the space into which the openings *e* enter, as shown at I.

If now I take the apparatus to be in the position shown in Fig. 1 and suppose the damper to be closed, of course this checking of the draft will cause a lowering of the temperature in the room in which the thermostat is supposed to be situated. As soon as the temperature in the room falls to the predetermined point the thermostat will bend to the

left, first closing the left-hand nozzle *b* and then opening the nozzle *b'* on the right-hand pipe. Upon the opening of the right-hand pipe the external air will enter it, and passing to the right-hand chamber E' will destroy the partial vacuum therein created by the withdrawal of the diaphragm D', and as there is then nothing to oppose such withdrawal the cam-yoke will be forced to the left and allow a half revolution or rotation of the shaft. The crank-arm *a* will by this half-revolution of the shaft then be up and tending to move the cam-yoke to the right; but as the left-hand pipe G is closed by the thermostat and the air partially expelled from chamber E through its check-valve I by the forcing inward of the diaphragm D, and such check-valve being then closed, further rotation is prevented until air is admitted to the said chamber E and the partial vacuum created by the withdrawal of its diaphragm is destroyed.

As the damper or valve of the furnace is opened by the means above described to increase the draft and deliver more heat to the room or apartment in which the thermostat is located the parts will remain at rest during the period in which the temperature of the room is maintained between the predetermined extremes; but should the temperature rise too high an action the reverse of that above described would take place and the shaft would be permitted to make another half-revolution and cause the damper to be closed.

The description just given has been based upon the assumption that there was only one valve or damper to be opened and closed; but where a check-valve is applied to the furnace in addition to the main draft or damper, as illustrated in Fig. 2, of course the valves will be arranged to alternate in their movements. By the use of two valves or dampers a more perfect regulation of the heat is possible than where only one valve or damper is used.

The construction and arrangement hereinbefore described is designed to be employed in connection with a vacuum; but when compressed air is employed it will be necessary to make the check-valves open inward, when they will become suction-pipes, as it were, and the nozzles become outlets for the compressed air.

The particular form of thermostat and thermostatic valves shown is not essential, most any other of the ordinary forms now in common use being well adapted for the purposes of the present invention.

The chambers E E' and their diaphragms D D' act, essentially, in the same manner as cylinders and pistons and may be supplanted by the latter, if desired. The construction shown is preferred, however, because of its simplicity and cheapness.

The weight, spring, or other means employed for rotating the shaft must be so regulated as not to be powerful enough to overcome the vacuum, as otherwise the action of the air could not control the rotation of the shaft.

Although I have shown the reciprocation of the diaphragm and the operation of the dampers as caused by a rotary motor, it is obvious that any form of motor may be used which will produce such reciprocation and operation. In fine, any thermo-pneumatically-controlled motor operating valves or dampers will be within the scope of my invention, and I claim and consider such as equivalents.

The form of the yoke or frame connected with the movable part of the air-chamber may obviously be modified without in any manner departing from my invention; but the construction shown is preferred because of the simplicity and certainty of actuation.

While the check-valves are shown as applied to the pipes G G', it is obvious that they could be applied, if desired, to the vessels E E', or the special check-valve might be dispensed with and the thermostat-valves be made to perform that function as well.

Although I have shown the openings *e* to be through the body *d* of the check-valve I, such openings may as well be made through the diaphragm *f*, so long as such openings are without and beyond the raised valve-seat *g*.

Having thus described my invention, what I claim is—

1. In combination with a valve, damper, or like device, a shaft, a connection between the shaft and the valve-door or damper, means tending to rotate said shaft in one direction, a yoke or frame adapted to be moved laterally by the shaft-actuating mechanism, two air vessels or chambers located upon opposite sides of the shaft and having their movable walls or diaphragms connected with the yoke or frame, pipes extending from said vessels or chambers to the room or apartment the temperature of which is to be regulated or controlled, valves applied to said pipes, a thermostat adapted to actuate said valves alternately, and a check-valve for each of the chambers or their pipes, all combined and arranged for operation substantially in the manner shown and described.

2. In combination with a valve, damper, or like device, the regulating apparatus herein described, consisting of a shaft provided with a crank *a* and with means tending to rotate said shaft in one direction, an open yoke or frame B, embracing the crank portion of the shaft, vessels or chambers E E', provided with diaphragms D D', which latter are connected with the yoke or frame B, pipes G G', extending from the vessels E E' to the room the temperature of which is to be regulated, where they are provided with nozzles *b b'*, valves *c c'*, adapted to cover and uncover the nozzles, a thermostat H, adapted to actuate the valves *c c'*, valves I I', applied to the pipes G G' at a point between their ends, and a connection between the shaft and the valve, damper, or like device.

3. In a temperature-regulator substantially

such as shown and described, the check-valve I, comprising a body *d*, a raised rim or flange *g* at a distance from the edge of the body, one or more openings *e* between the edge of the body and the rim or flange, a flexible diaphragm *f*, applied to the upper face of the body, a clamping band or ring *h*, adapted to hold the diaphragm or disk in place, and a pipe *i*, communicating with the space within the rim or flange *g*.

4. In a temperature-regulator substantially such as shown and described, the check-valve I, comprising a body *d*, provided with a raised rim or seat *g* at a distance from the edge of the body and provided, also, with openings *e* to the space without the seat *g*, a flexible diaphragm *f*, fastened at its edges to the body and tending to close upon the seat *g*, and a pipe *i*, communicating with the space within the rim or seat *g*.

In witness whereof I hereunto set my hand in the presence of two witnesses.

LUCIEN F. EASTON.

Witnesses:
W. E. LOCKERBY,
G. N. EASTON.