F. C. GOFF.

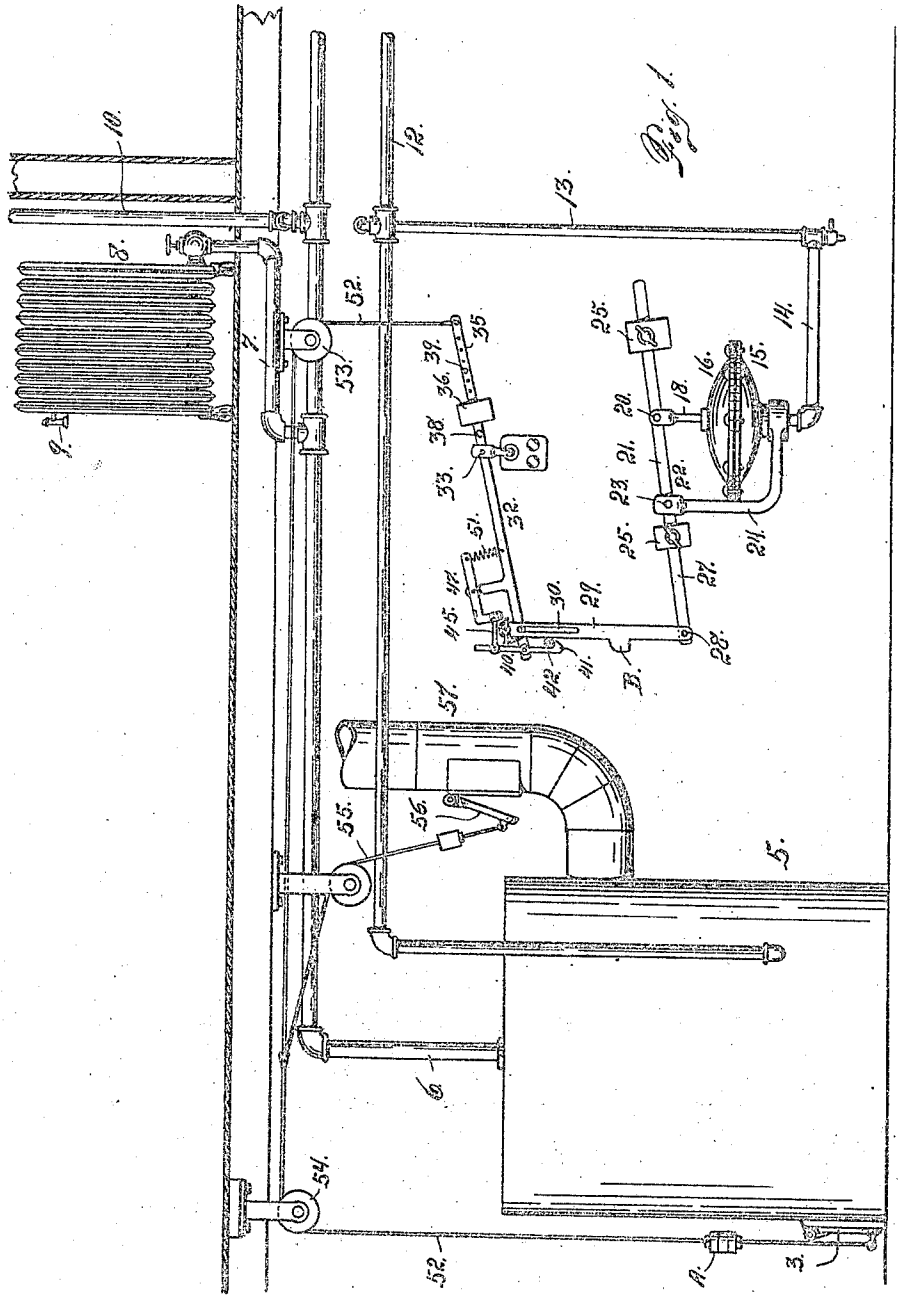
HEATING SYSTEM.

APPLICATION FILED FEB. 28, 1903.

957,156.

Patented May 3, 1910.

3 SHEETS—SHEET 1.



Witnesses

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3 SHEETS—SHEET 2.

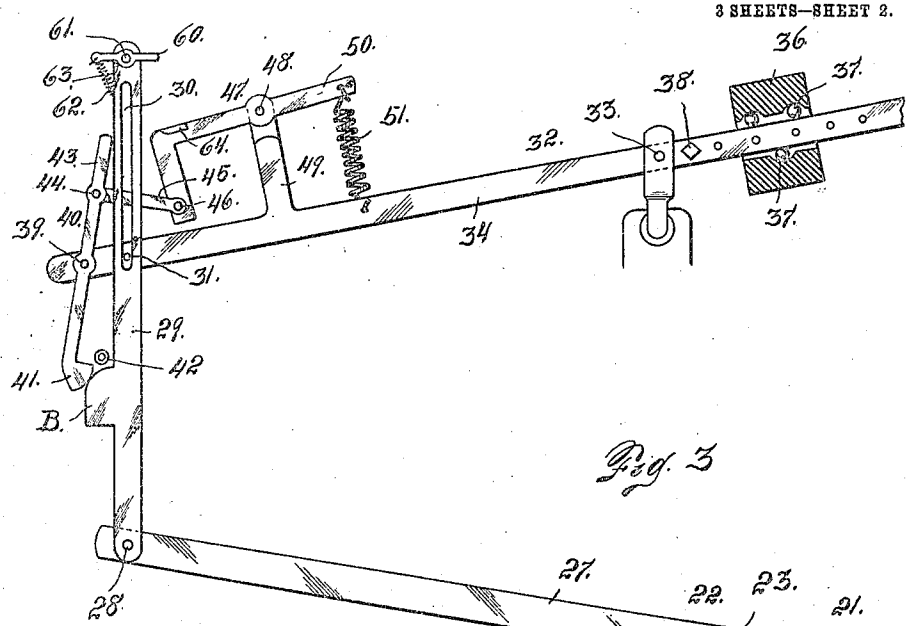

Fig. 3

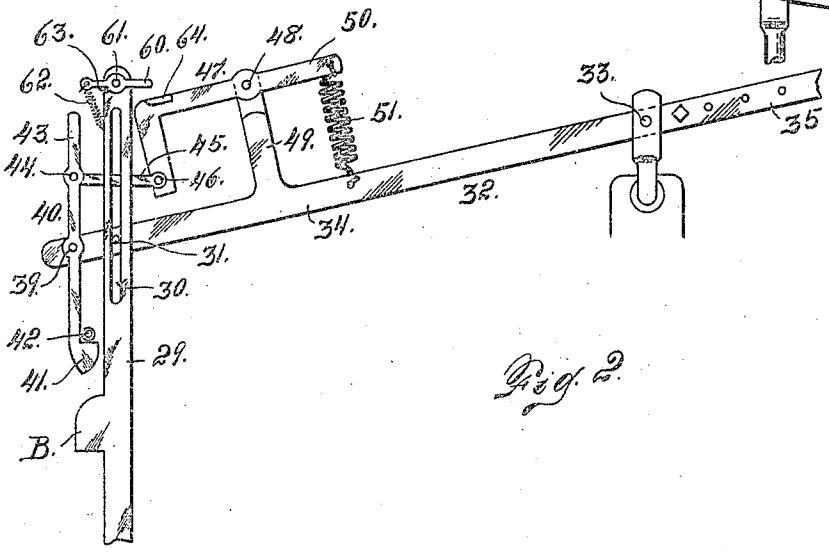

Fig. 2.

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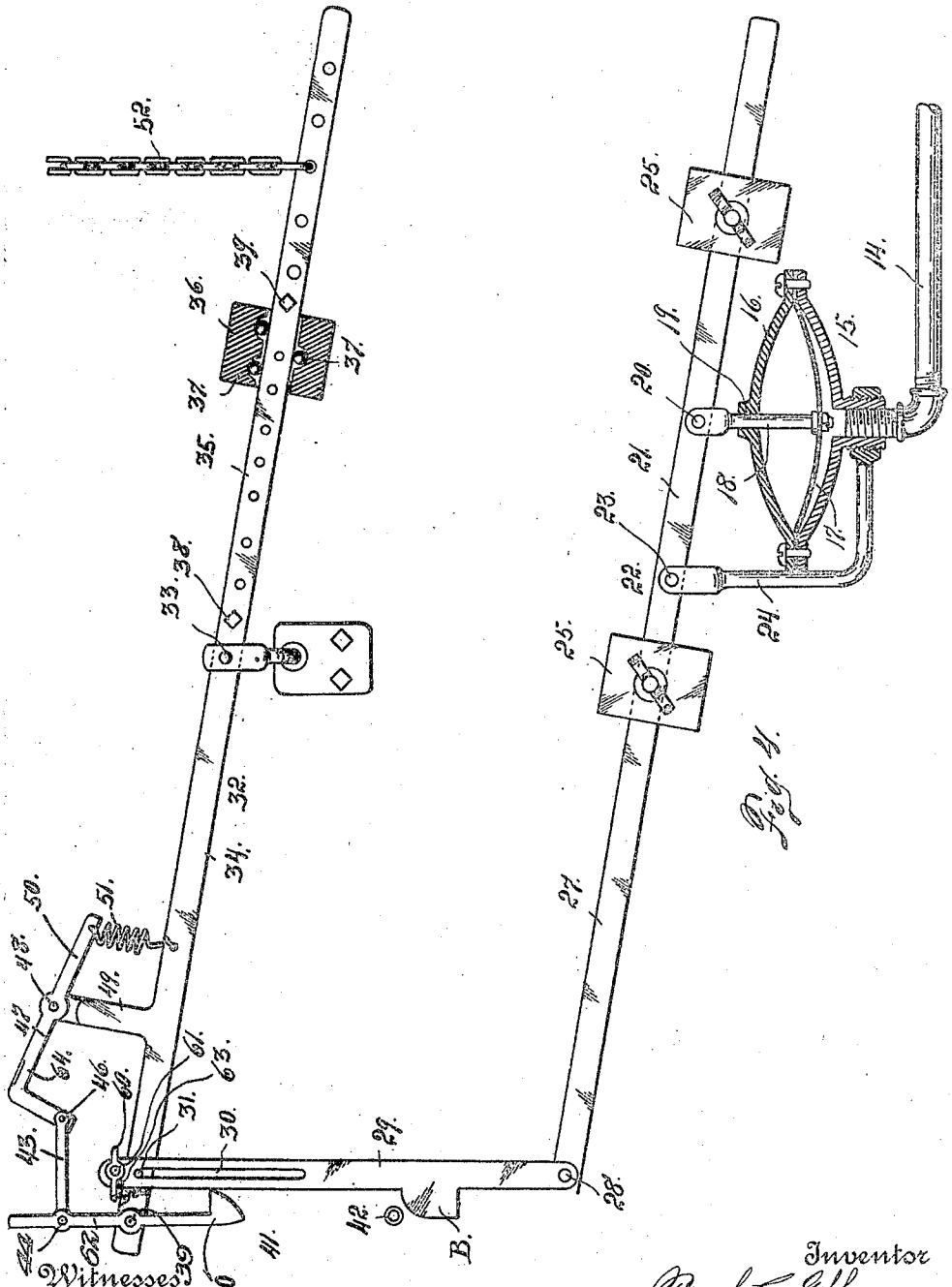

Fig. 1.

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UNITED STATES PATENT OFFICE.

FRANK C. GOFF, OF DENVER, COLORADO.

HEATING SYSTEM.

957,156. Specification of Letters Patent Patented May 3, 1910.

Application filed February 28, 1908. Serial No. 418,251.

To all whom it may concern:

Be it known that I, FRANK C. GOFF, a citizen of the United States, residing at the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Heating Systems; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates generally to improvements in heating systems but more specifically to means operated by the pressures within the system for automatically controlling the supply of the heating agent. The said means may be connected with the furnace which supplies the steam, hot water or other agent, whereby the dampers are automatically adjusted both for the purpose of increasing as well as for the purpose of diminishing the draft of the furnace. In other words the said controlling means may be so connected as to automatically open and close the dampers whenever these operations are necessary. In my improved construction as illustrated in the drawing, a motor device is employed, the same being provided with a diaphragm which after the air is driven out of the radiators of the heating system, and the pressure increases above atmospheric pressure owing to the fact that the air valves are closed, this pressure acts upon the diaphragm of the motor device which is connected with the dampers of the furnace, whereby the front damper is closed and the rear damper or the air check opened. Again when the system becomes cooled and the condensation within the radiators is sufficient to produce a partial vacuum, the vacuum pull acts upon the diaphragm of the motor device to move the same in the opposite direction, whereby the front damper is opened and the rear damper or air check closed.

Having briefly outlined my improved construction, I will proceed to describe the same in detail reference being made to the accompanying drawing in which is illustrated an embodiment thereof.

In this drawing, Figure 1 is a side elevation of a furnace and boiler shown in connection with the heating system, my improved devices being connected therewith in operative relation. Fig. 2 is a fragmentary view of the operating devices shown in a different position from that disclosed in Fig. 1 and on a larger scale. Fig. 3 is a similar view of the same showing the operating devices in still a different position. Fig. 4 is still another view illustrating the operating devices shown in connection with the motor device. In this view the parts are shown in the position when there is a vacuum within the heating system, the diaphragm of the motor device being actuated to open the dampers of the furnace.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate the furnace and boiler for supplying the heating agent to a system. It may be assumed that the heating agent whether steam or hot water passes from the furnace through a pipe 6 which may be termed the supply pipe. A branch pipe 7 leads from the pipe 6 to each radiator 8, the latter being provided with an automatic air valve 9. As shown in the drawing a branch pipe 10 extends upwardly from the supply pipe whereby the heating agent may be carried to floors above that upon which the radiator 8 is located. The pipe 6 is broken away in Fig. 1 to indicate that it may be of indefinite length. The heating agent after extending the entire length of the system, returns by way of a pipe 12 through the furnace. Leading downwardly from this pipe 12 is a branch pipe 13 having a section 14 communicating with a motor device 15 which consists of a casing 16 in which is located a flexible diaphragm 17 connected with one extremity of a stem 18, the said stem being slidable in an opening 19 formed in the top of the casing, its outer extremity being pivotally connected at 20 with the arm 21 of a lever 22 which is fulcrumed at 23 on a stationary bracket 24. The arms 21 and 27 of the lever 22 each carries an adjustable weight 25. The arm 27 of the lever 22 is on the opposite side of the fulcrum from the arm 21 and is pivotally connected at 28 with a link 29 having a slot 30 through which passes a pin 31 connected by the lever 32. The lever 32 is fulcrumed at 33 and has arms 34 and 35 extending on opposite sides of the said fulcrum. Upon the arm 35 is movably mount-

ed a weight 36 provided with ball bearings 37 to facilitate its movement upon the lever arm, the latter being provided with stops 38 and 39 to limit the movement of the weight in opposite directions. The pin 31 is attached to the arm 34 of the lever. Upon the extremity of the lever arm 34 is pivoted as shown at 39, a trigger 40 having a hook-shaped lower extremity 41 adapted to engage a stationary pin 42. To the upper arm 43 of this trigger is pivotally connected as shown at 44, to one extremity of a link 45, the opposite extremity of the latter being connected as shown at 46 with one arm of an angle-shaped lever 47 fulcrumed as shown at 48 on an upward projection 49 of the arm 34 of the lever 32. The arm 50 of the lever 47 is connected with a lever arm 34 by a coil spring 51 which is normally under tension to hold the trigger 40 in the locked position or the position in engagement with the stud 42 as shown in Figs. 1 and 2, through the medium of the link 45.

The arm 35 of the lever 32 is connected by means of a flexible device 52 with a damper 3 of the furnace 5. The flexible device 52 passes over guide pulleys 53 and 54 mounted on suitable stationary supports. A flexible device 55 is connected with the device 52 at one extremity and with an air check 56 at its opposite extremity, the said check being hinged to the smoke flue 57 leading from the rear of the furnace 5.

The operation of my improved devices may be explained as follows: I will assume that the heating agent from the furnace 5 passes into the radiator 8 through the pipes 6 and 7. The first action of this agent assuming that the radiator is filled with air, is to drive out this air through the automatic air valve 9. As soon as the air is driven out the air valve will close to prevent the escape of the heating agent which in this case is assumed to be steam. As soon as the air valve closes, the pressure within the system increases and immediately begins to act upon the diaphragm 17 causing it to move upwardly. This upward movement of the diaphragm acts through the stem 18, to lift the arm 21 of the lever 22 upwardly and move the arm 27 downwardly. This movement of the lever 22 acts on the lever 32, to move its arm 34 downwardly and raise its arm 35 upwardly. This slackens the flexible device 52, whereby the damper 3 is allowed to close. During this movement of the last named damper, the air check 56 is opened through the medium of the flexible device 55 acted upon by a weight A connected with the flexible device 52. The mechanism will remain in this position, until the system cools sufficiently to produce a vacuum within the radiators, in which event the vacuum pull will act upon the diaphragm 17 to move the latter downwardly to the position shown in Fig. 4. This downward movement of the diaphragm acting through the stem 18, reverses the position of the levers 22 and 32, whereby the link 29 is thrust upwardly until a lug B thereon engages the lower extremity 41 of the trigger 40 and disengages the same from the stud 42. As soon as this occurs, the arm 35 of the lever 32 will move downwardly under the influence of its weight 36, and as soon as the lever has assumed a suitable position of inclination, the weight 36 will run outwardly away from the fulcrum (see Fig. 4) giving sufficient power to the lever arm, to open the damper 3, which movement will slacken the flexible device 55 and allow the air check to close. This operation of course will be repeated whenever the pressure within the system vary sufficiently to accomplish the purpose. It will be understood that after the devices are thrown to the position shown in Fig. 4 and the pressure rises within the system sufficiently to throw the levers 22 and 32 to the position shown in Fig. 1, the hook extremity 41 of the trigger will engage the stud 42 in the locking relation owing to the tension of the spring 57 whose tendency is to actuate the lever 47 to cause the trigger to engage the said stud.

If for any reason the vacuum is broken within the system before the link 29 has moved upwardly sufficiently to disengage the trigger 40 from the stud 42, but has moved far enough to bring the upper extremity of the link above the lever 47, I have made provision for unlocking the trigger 40 as the link and its connections move downwardly. Upon the upper extremity of the link 29 is pivotally mounted as shown at 61, an arm 60, which is held by a spring 62 in a horizontal or approximately horizontal position. The link is provided with a stop 63 which prevents the spring from throwing the pivoted arm out of the horizontal position. The arm of the lever 47 adjacent the link 29, is provided with a lug 64 which lies in the path of one extremity of the arm 60 when the link 29 moves downwardly, and the movement of the lever incident to this engagement, will actuate the trigger 40 sufficiently to disengage it from the stud 42, and allow the mechanism to assume the position shown in Fig. 4 whereby the damper 3 is opened and the air check closed through the agency of the flexible devices 52 and 55.

The necessity for the mechanism just explained, will only arise in case the vacuum in the system is broken by the entrance of fluid as air, other than the heating agent. In other words when the vacuum is broken without raising the temperature of the system, the damper 3 would still remain closed and the air check 56 opened which would allow the furnace fire to go out under the

aforesaid circumstances. Hence the mechanism in question is intended to prevent this difficulty.

Having thus described my invention, what I claim is:

1. In means for regulating heating systems, the combination of a motor, constantly controlled by the system pressure, regulating devices, a suitable connection between the said devices and the motor, whereby the devices are given a predetermined movement when the system pressure acting on the motor, reaches a predetermined degree, means for locking the regulating devices in the said position, and connections between the motor and the said regulating devices, whereby when the pressure within the system reaches a predetermined lower degree, the regulating devices are actuated to trip the locking means, whereby the aforesaid movement of the regulating devices is reversed.

2. In means for regulating heating systems, the combination of a motor constantly controlled by the system pressure, regulating devices, a suitable connection between the said devices and the motor, whereby the devices are given a predetermined movement when the system pressure acting on the motor reaches a predetermined degree above atmospheric pressure, means for locking the regulating devices in the said position, and connections between the motor and the said regulating devices, whereby when the pressure within the system reaches a predetermined degree below atmospheric pressure, the regulating devices are actuated to trip the locking means whereby the aforesaid movement of the regulating devices is reversed, and a connection between the locking means and the regulating devices, whereby when the system pressure acting on the motor fluctuates between atmospheric pressure and the said predetermined degree below atmospheric pressure, the regulating devices are actuated to trip the locking means, whereby the aforesaid predetermined movement of the regulating devices is reversed.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK C. GOFF.

Witnesses:
DENA NELSON,
A. J. O'BRIEN.