E. L. SMITH & N. HOFSTAD.

VALVE.

APPLICATION FILED SEPT. 9, 1911.

1,045,902. Patented Dec. 3, 1912.

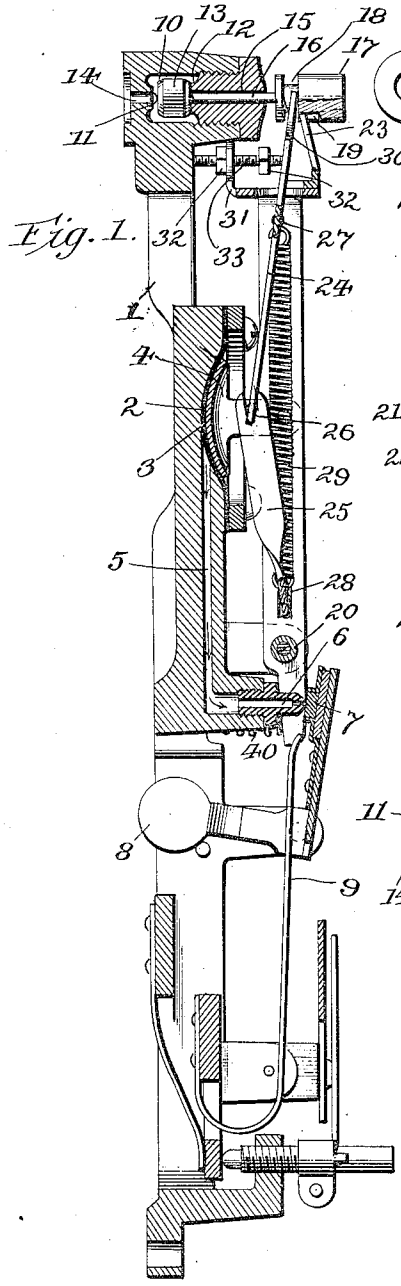

Fig. 1.

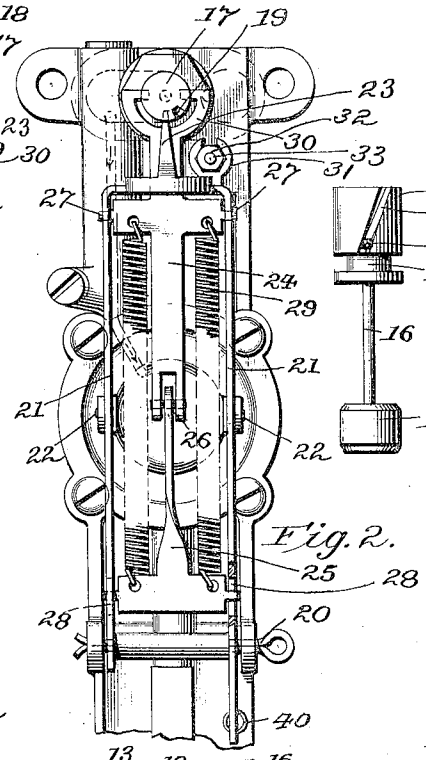

Fig. 2.

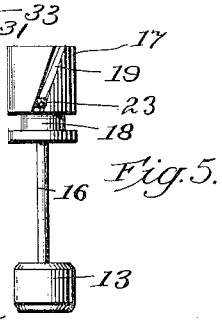

Fig. 5.

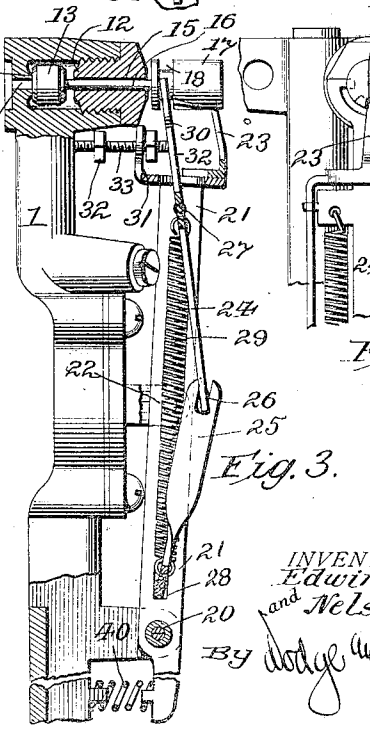

Fig. 3.

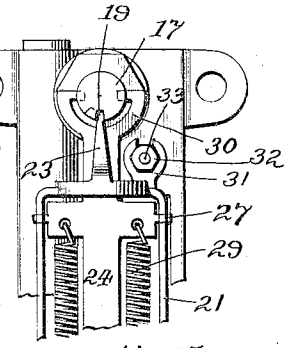

Fig. 4.

WITNESSES

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UNITED STATES PATENT OFFICE.

EDWIN L. SMITH, OF MILWAUKEE, WISCONSIN, AND NELS HOFSTAD, OF CHICAGO, ILLINOIS, ASSIGNORS TO JOHNSON SERVICE COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

VALVE.

1,045,902. Specification of Letters Patent. Patented Dec. 3, 1912.

Application filed September 9, 1911. Serial No. 648,508.

To all whom it may concern:

Be it known that we, EDWIN L. SMITH, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, and NELS HOFSTAD, a citizen of the United States, and residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Valves, of which the following is a specification.

This invention relates to an improvement in thermostatic valves for temperature regulating systems and particularly to valves of the general type illustrated in United States Patent #542,733, granted to Warren S. Johnson, July 16, 1895. In the system illustrated in that patent the primary motor which controls the action of the heating plant is itself controlled by a so called "secondary valve" whose function is to admit fluid to and release it from the primary motor. This secondary valve is operated by a "secondary motor" through the agency of a quick throw toggle lever mechanism designed to secure movement instantly between admission and release positions. Finally the secondary motor is subject to control by a thermostatic valve. All these features are characteristic of the well known Johnson system of regulation and need no further explanation.

The present invention resides in improvements to the secondary valve and its associated toggle lever mechanism, designed to produce a slight rotation of the valve prior to its movement from its seats so as to avoid any possibility of its sticking, thus insuring the certain operation of the valve even after a long period of disuse.

The invention, as applied to one of the commercial forms of the Johnson valves is illustrated in the accompanying drawings, in which:—

Figure 1 is a central vertical section showing admission position of the secondary valve; Fig. 2 is a front elevation of the upper portion of the same; Fig. 3 is a view similar to the upper portion of Fig. 1 and showing the secondary valve in release position; Fig. 4 is a front elevation of the mechanism as shown in Fig. 3; and Fig. 5 is an elevation of the secondary valve.

In the drawings, no attempt is made to show the arrangement of ports, passages, &c., in full, the arrangement of accessory parts being purely illustrative. The invention resides solely in the construction of the secondary valve and the lever mechanism.

The base frame 1 may be of any suitable form, various ports and the chamber 2 for the primary motor being formed in the frame itself. This primary motor consists of the chamber 2 covered by a rubber diaphragm 3 having a diaphragm bearing plate 4. From the chamber 2 leads the usual discharge passage 5 to the vent nozzle 6. This vent nozzle is alternately opened and closed by valve plate 7 swinging under the opposing influences of the counterweight 8 and the bimetallic bar 9, all as well known in the art.

The secondary valve chamber 10 is also formed in the frame 1 and is provided with valve seats 11 and 12 against which the secondary valve 13 seats alternately to control the inlet and exhaust of fluid to and from the primary motor (not shown). When against seat 11 the valve 13 closes the supply port 14 and opens the exhaust port 15, around stem 16. When against seat 12 it opens port 14 and closes port 15.

The valve 13 is moved by a stem 16 which carries at its opposite extremity a head 17 having a circumferential groove 18 and a helical groove 19.

Pivoted at 20 to the main frame 1 is the main lever 21 of the general form shown in the drawings, and to this lever is pivotally connected at 22 the diaphragm plate 4 so that the movement of the diaphragm imparts movement to the lever. A spring 40 acts on the lever in opposition to the diaphragm. The lever 21 carries a finger or lug 23 which engages the helical groove 19 so that movement of the lug in the groove imparts a slight rotary movement to the valve.

The main lever 21 carries a toggle mechanism consisting of two arms 24 and 25 of the form clearly shown in the drawings, pivoted together at 26. The arm 24 is pivoted at a point between its ends to the main lever 21, such pivotal bearings being marked 27. The end of the arm 25 remote from pivot 26 is guided and turns in longitudinal slots 28 in lever 21 and springs 29 are connected to the two arms 24 and 25 at points adjacent their ends, so that the two arms

form a toggle tending to break to positions on opposite sides of the alined position of the two arms.

The end of arm 24 extending beyond the pivot 27 terminates in a fork or yoke 30 engaging the circumferential groove 18 in the head 17. To limit and adjust the range of movement of the main lever 21 a lug 31 is formed on the lever and swings between adjustable stops. These may consist of nuts 32 threaded on a rod 33 supported by the main frame.

Considering the mechanism in the position shown in Fig. 1 assume that pressure is gradually built up in chamber 2. Diaphragm 3 and plate 4 move to the right gradually, thus swinging lever 21 to the right. Valve 13 is in its extreme right hand position, so that the movement of lever 21 simultaneously turns the valve on the seat 12 through the interaction of lug 23 and slot 19, and stresses springs 29 as the arms 24 and 25 approach alinement. The movement of the lever 21 continuing, the arms are forced past their alined position and the toggle breaks in the opposite direction suddenly moving valve 13 to the left against seat 11 when it is held by the action of springs 29. Upon the reverse movement of the lever 21 an exactly similar sequence of events takes place. The valve mechanism is then in the position of Fig. 3. Thus valve 13 is first turned on the seat 11 through the action of lever 21 and then snapped to the right against the seat 12.

It is apparent that the turning of valve 13 is effected directly by lever 21 and not by the comparatively weaker action of the toggle mechanism, and also that such rotation occurs before any tendency exists to move the valve away from its seat. Thus considerable force is available to free the valve in the event that it sticks, and the valve will be turned and properly freed prior to the time at which the opening or closing movement should take place. The action of the valve is consequently neither prevented nor delayed by sticking such as may be induced by a long period of disuse.

The invention is obviously applicable to a considerable range of devices and although we show it as applied to a heat regulating device and contemplate its use principally in that connection, we do not limit ourselves to that field except as expressly stated in the claims.

Having thus described the invention, what we claim is:—

1. The combination of a valve casing having a seat; a valve movable toward and from said seat; an operating motor; mechanism in operative relation with the motor and valve whereby the operation of the motor moves the valve on its seat to free the valve; and a mechanism actuated by the continued operation of the motor and adapted to move the valve from its seat.

2. The combination of a valve casing having a pair of oppositely disposed seats; a valve movable to close against either of said seats; an operating motor; mechanism in operative relation with the motor and valve whereby the motor is adapted to move the valve on either seat to free the valve; and a mechanism actuated by the continued operation of the motor to move the valve from one seat to the other.

3. The combination of a valve casing having a seat; a valve movable toward and from said seat; an operating motor; mechanism in operative relation with the motor and valve whereby the operation of the motor moves the valve on its seat to free the valve; and a quick throw mechanism actuated by the continued operation of the motor and adapted to move the valve from its seat.

4. The combination of a valve casing having a pair of oppositely disposed seats; a valve movable to close against either of said seats; an operating motor; mechanism in operative relation with the motor and valve, whereby the motor is adapted to move the valve on either seat; and a quick throw mechanism actuated by the continued operation of the motor to move the valve suddenly from one seat to the other.

5. The combination of a valve casing having a seat; a valve movable toward and from said seat; a lever; means for moving the lever; a member carried by the lever and adapted to engage the valve and rotate the latter on its seat as the lever moves; and a quick throw mechanism adapted to be operated by the continued movement of the lever to move the valve from the seat.

6. The combination of a valve casing having a seat; a valve movable toward and from said seat; a head connected to said valve and provided with a cam groove; a lever having a lug entering said groove and adapted to rotate the valve on the seat as the lever moves; and a quick throw toggle mechanism actuated by the movement of the lever and adapted to move the valve suddenly toward or away from its seat.

7. The combination of a valve casing having a pair of oppositely disposed seats; a valve movable to close against either seat; a head connected to the valve and provided with a cam groove; a lever having a lug entering said cam groove and coacting therewith to rotate the valve on either valve seat as the lever moves; and a quick throw toggle mechanism actuated by the movement of the lever and adapted to move the valve suddenly alternatively against one or the other seat.

8. The combination of a valve casing having a seat; a valve movable toward and from said seat; a head connected to said valve and

provided with a cam groove; a lever having a lug entering said groove and adapted to rotate the valve on the seat as the lever moves; and a quick throw toggle mechanism mounted in the lever and actuated by the continued movement thereof and adapted to move the valve suddenly alternatively toward or away from its seat.

9. The combination of a valve casing having a pair of oppositely disposed seats; a valve movable to close against either seat; a head connected to the valve and provided with a cam groove; a lever having a lug entering said cam groove and coacting therewith to rotate the valve on either seat as the lever moves; and a quick throw toggle mechanism mounted in the lever and actuated by the continued movement thereof and adapted to move the valve alternatively against one or the other of its seats.

10. The combination of a thermostatic control valve; an operating motor controlled thereby; a secondary control valve casing having oppositely disposed valve seats; a valve movable to close against either of said seats; a head connected to the valve and provided with a cam groove; a lever adapted to be moved by the motor and having a lug coacting with the cam groove to rotate the valve on either seat; and a quick throw toggle mechanism actuated by the continued movement of the lever to move the valve alternatively against its seats.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

EDWIN L. SMITH.
NELS HOFSTAD.

Witnesses as to the signature of Edwin L. Smith:

W. C. BRUSH,
H. B. IBSEN.

Witnesses as to the signature of Nels Hofstad:

H. W. ELLIS,
MAYGENE FITTS.