A. A. FROEHLICH.

THERMOSTAT.

APPLICATION FILED JAN. 18, 1913.

1,120,707.

Patented Dec. 15, 1914

Fig. 2.

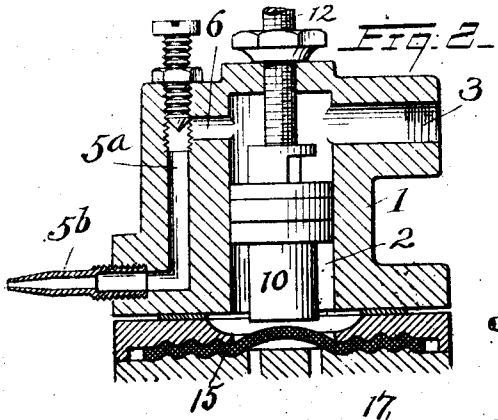
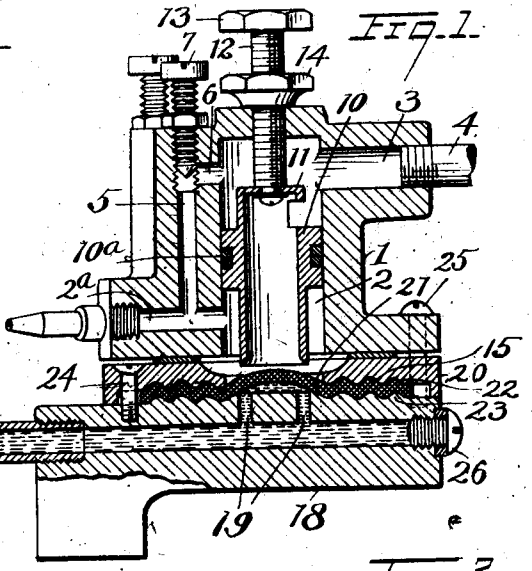


Fig. 1.



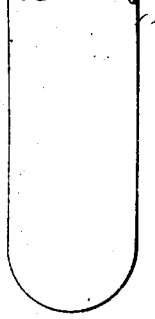


Fig. 4.

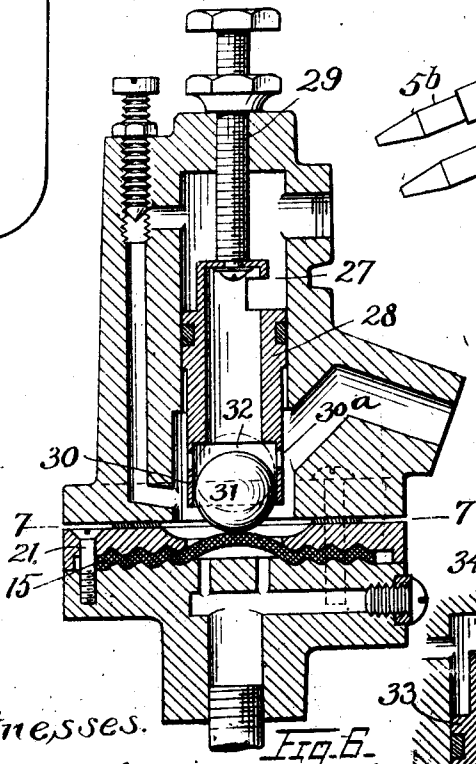


Fig. 3.

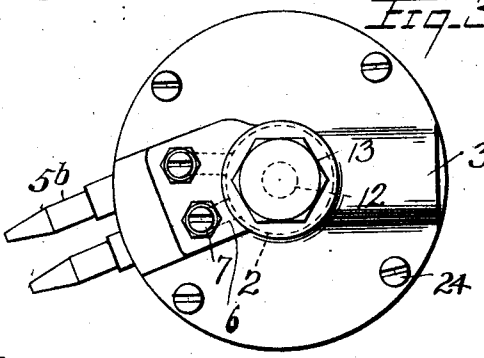
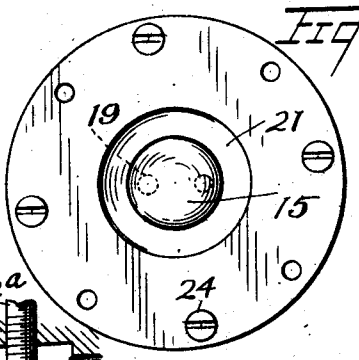


Fig. 7.



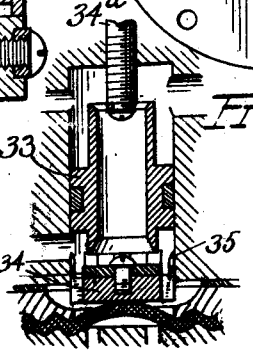
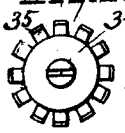


Fig. 6.



Witnesses.

E. B. Gilchrist.

H. C. Hubbard.

Fig. 5. Inventor

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by

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attys.

UNITED STATES PATENT OFFICE.

ALBERT ANTON FROEHLICH, OF TOLEDO, OHIO.

THERMOSTAT.

1,120,707. Specification of Letters Patent. Patented Dec. 15, 1914.

Application filed January 18, 1913. Serial No. 742,894.

To all whom it may concern:

Be it known that I, ALBERT ANTON FROEHLICH, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented a certain new and useful Improvement in Thermostats, of which the following is a full, clear, and exact description.

This invention relates to thermostatic devices and more particularly to a valve construction which governs the flow of the fluid whose movement is to be regulated.

More particularly, the purpose of the invention is to provide a valve construction and operative adjuncts which will be sensitive to changes of the thermostatic element and thereby give quick adjustment of the valve.

Generally speaking, the invention comprises the elements and combinations thereof set forth in the accompanying claims.

Reference should be had to the accompanying drawings, forming a portion of this specification, in which—

Figure 1 is an elevation, partly in section of one form of the thermostatic device and the valve casing showing the valve in place; Fig. 2 is a sectional elevation showing the same construction of the valve; Fig. 3 is a top plan view of the valve casing; Fig. 4 is a vertical sectional elevation of a modified form of valve; Fig. 5 is also a sectional elevation of a still further modified form of valve; Fig. 6 is a plan view of a part of the valve shown in Fig. 5; and Fig. 7 is a section on line 6—6 of Fig. 4 in direction of the arrow.

The construction herein outlined is more particularly intended to govern the flow of fuel gas to be turned beneath a receptacle containing some substance in which a thermostatic element is immersed.

Referring to the construction shown in Figs. 1 and 2, 1 indicates the casing which is provided with a central hollow chamber 2, from which is a passageway 3, communicating with the central chamber 2 near the upper end thereof. Communicating with this passageway 3 is a pipe 4, by which the gas is supplied to the interior of the valve casing. The passageway 2^a serves to conduct gas to a pilot burner situated beside the main burner. There is a bypass 5 which communicates with the chamber through a passage 6. This bypass is controlled by a threaded valve stem 7 which is provided with a suitable head, it being understood that the position of this valve stem in the bypass 5 determines the quantity of gas which may pass from the chamber to the bypass. Within the central chamber 2 there is a piston valve 10 which is provided with a packing strip indicated at 10^a. This valve 10 has a close fit with the walls of the chamber so that no gas may escape from above the valve to the portion of the chamber below the valve around the outside of the valve itself. This valve has a hollow interior portion and has an upwardly extending part 11 which is hollow and is partially open so as to permit gas within the upper part of the chamber 2 to pass through the center of the valve 10. To the projecting portion 11 there is secured a threaded rod 12, the rod having a swivel connection with the portion 11. This rod extends through the top part of the casing 1, and has a threaded engagement with the opening through which it extends. The upper part of the rod 12 is provided with a nut 13, or other suitable means to turn it, and there is also upon this rod a nut 14 by which the rod may be locked in its adjusted position. From the lower part of the valve disk 10 there is a circular skirt depending, the low edge of the skirt being reduced in area so as to form a blunt edge. The blunt edge just referred to is adapted to coöperate with a flexible diaphragm 15, which diaphragm forms a part of a receptacle which is adapted to hold some readily expansible substance such as mercury. In the present instance, the thermostat comprises a bulb 16 having a pipe 17 extending therefrom. This pipe communicates with a casing 18 which has a hollow exterior, and one or more holes 19 which extend from the interior of the casing to an outer surface thereof against which surface the flexible diaphragm 15 is adapted to lie. The function of the receptacle 16, pipe 17 and casing 18, forming as they do a thermostatic device, is well known and needs no amplification. The diaphragm 15 may be secured upon the casing 18 in any desirable manner, it being simply necessary that the diaphragm be rigidly held at the peripheral portions and free to extend and contract to coöperate with the valve 10. A very desirable way of securing the diaphragm in proper position is by means of a ring 20 which is provided with a central opening indicated at 21, through

which the central portion of the diaphragm may extend. The ring is provided with a series of concentric ribs 22 upon its lower side, while the adjacent face of the casing 18 is also provided with ribs 23 which are concentric. The ribs 23 are so positioned as to be disposed opposite to the grooves between the ribs 22 when the casing 18, and the ring 20 are secured together. The diaphragm is engaged by the ribs upon the members 18 and 20, and when these members are secured together, the diaphragm is very tightly held and prevents any creeping. The ring 20 and casing 18 may be secured together in any desired manner, and for the purpose I have indicated screws, one of which is seen at 24. The ring 20 is secured to the casing 1 in any preferred manner, and for this purpose I have indicated screw bolts, one of which is indicated at 25. It will be apparent from the construction illustrated that the ring 20 and casing 18 may be removed from the valve casing without in any way disturbing the expansible material which is within the thermostatic device, which is quite a desirable feature, inasmuch as it is frequently desirable to disassemble the mechanism, and it is quite inconvenient for the thermostatic device and the expansible material which it contains are in danger of escaping. A packing 25^a is inserted between the ring and the valve casing to prevent the escaping of gas. The chambered interior portion of the receptacle 18 is closed in one portion thereof by a threaded screw 26. This permits the introduction of the mercury for instance, so that the whole system, receptacle 16, pipe 17 and receptacle 18 may be completely filled with the mercury.

It will be appreciated that the dependability of a thermostatic device employing mercury assumes that the expansion of the mercury is relied upon and that air is substantially all removed from the device. In a thermostatic device used in such connection as herein disclosed, it is difficult to remove the pocket of air which lies beneath the diaphragm. To fill the thermostatic device with mercury as shown in Fig. 1, the same is turned 90 degrees so that the screw plug 26 is uppermost, the plug 26 removed and mercury poured in. It will be clear that the device turned as suggested, brings the openings 19, one above the other. Therefore, in filling the mercury flows through the lower opening, to the space beneath the diaphragm and as it rises therein, it displaces the air and results in the thermostatic device being completely filled with mercury. Preferably two or more holes, such as represented at 19 are provided, thus insuring quick action of the mercury upon the lower portion of the diaphragm 18. As heretofore explained, the valve 10 coöperates with the flexible diaphragm 15. The diaphragm is pushed upward by the expansion of the mercury and according to the degree of expansion of the mercury, will approach the valve 10 and eventually seat itself against the valve to close the passage of gas. It will be understood that regulation of the position of the valve 10 in the chamber will effect a variation in the relationship between the valve and the diaphragm 17. That is to say, the valve will be closed upon a greater or less expansion of the mercury, according to the adjusted position of the valve 10. In this manner, the regulation of the valve may be affected to regulate or stop the flow of gas in accordance with the condition it is desired to maintain.

In Fig. 2 at 5^a there is indicated a bypass which supplies gas in limited quantities to a pilot burner indicated at 5^b. The flow of gas is regulated by a valve as indicated. A very sensitive form of valve is shown in Fig. 4. The form of casing and the other adjuncts such as the flexible diaphragm are as substantially shown in Figs. 1 and 2. Within the central valve chamber 27 there is a hollow piston 28 which engages with the side walls of the chamber. This hollow piston is supported by a rod 29 in a manner similar to that previously described with respect to the other valves. The gas within the chamber may pass through the hollow piston in the same manner as with the valve 10. The lower portion of the valve 32 is provided with a depending skirt 30 which surrounds and partially incloses a ball 31. This skirt 30 is provided with openings 30^a near the upper portion thereof, which will permit the escape of gas from the space within the valve above the ball. The ball 31 rests upon the diaphragm 15 and will be raised and lowered as the diaphragm is expanded and contracted, due to the expansion and contraction of the mercury. When the ball is raised the proper amount, it will seat against a ledge 32 which is formed within the valve 28 and in so seating, it will shut the valve and discontinue the flow of gas through the valve. This particular form of valve is very sensitive, inasmuch as the contact between the ball and the diaphragm is a single point, and furthermore, this point is substantially at the highest portion of the expansion of the diaphragm. Consequently, it will very readily and quickly respond to the pressure changes of the mercury.

In the form of the valve shown in Fig. 5 the central chamber 26 is provided with a sliding piston valve 33 which is hollow and is supported by a threaded rod 34 which engages with a threaded opening in the casing in the same manner as has been described with respect to the rod 12. Below the piston valve 33 and within the chamber of the casing, is a second valve member, the same comprising a central body portion 34 from

which radiate arms 35ª having curved surfaced portions, which bear against the sides of the wall of the chamber. These arms are spaced apart so as to permit the flow of gas between the same when the valve is open. The valve member 34 will rest upon the diaphragm 15 and will be raised and lowered as the diaphragm expands and contracts. Upon the lower part of the piston valve is a depending skirt having a blunt edge. This edge is adapted to seat against a washer carried upon the upper part of the valve member 34, and thereby discontinues the flow of gas through the valve 33.

Having described my invention, I claim:

1. In a thermostatic fuel regulator, a casing having a chamber therein, provided with openings at the upper and lower ends, a flexible diaphragm closing with one end of said chamber, a fluid pressure thermostat operating against one face of said diaphragm, a valve mechanism within the chamber of the casing, said valve mechanism comprising a piston member which engages with the wall of the casing, said piston being hollow and having openings at both ends thereof, a ball engaging with the diaphragm and adapted to engage with and seat against the said piston member to close the opening therethrough, and a thermostatic device engaging the face of the diaphragm.

2. In a thermostatic fuel regulator, a casing having a chamber therein, there being openings to said chamber at the upper and lower portions thereof, a flexible diaphragm coöperating with said chamber, a fluid pressure thermostatic device pressing against one face of the diaphragm, a valve mechanism within said chamber comprising a piston which engages the chamber walls, said piston being hollow and open at both ends, a flange depending from said piston, a ball encircled by the flange, said ball engaging with the flexible diaphragm, the ball being adapted to engage with a portion of the piston to close the opening therethrough, and a thermostatic device engaging a face of the diaphragm.

3. In a thermostatic fuel regulator, a casing having a chamber therein, provided with openings at the upper and lower ends, a flexible diaphragm closing with one end of said chamber, a fluid pressure thermostat operating against one face of said diaphragm, a valve mechanism within the chamber of the casing, said valve mechanism comprising a piston member which engages with the wall of the casing, said piston being hollow and having openings at both ends thereof, a ball engaging with the diaphragm and adapted to engage with and seat against the said piston member to close the opening therethrough and a fluid pressure thermostat engaging the opposite face of the diaphragm.

4. In a thermostatic fuel regulator, a casing having a chamber therein, there being openings to said chamber at the upper end lower portions thereof, a flexible diaphragm coöperating with said chamber, a fluid pressure thermostatic device pressing against one face of the diaphragm, a valve mechanism within said chamber comprising a piston which engages the chamber walls, said piston being hollow and open at both ends, a flange depending from said piston, a ball encircled by the flange, said ball engaging with the flexible diaphragm, the ball being adapted to engage with a portion of the piston to close the opening therethrough, and a fluid pressure thermostat engaging the opposite face of the diaphragm.

5. A thermostatic fuel regulator comprising a casing having a chamber therein, openings communicating with the said chamber adjacent both ends thereof, a flexible diaphragm coöperating with said chamber, a fluid pressure thermostatic device exerting pressure upon one face of the diaphragm, a valve mechanism within the chamber, said valve mechanism comprising a hollow piston which is open at both ends and formed with a circular seat, a ball adapted to engage with said seat to close the passage through the piston, said ball also engaging with the diaphragm, the piston being provided with a depending skirt which encircles the ball, said skirt having openings formed in said skirt near the upper portion thereof to permit the escape of fuel when the ball is not seated, and a fluid pressure thermostat engaging the opposite face of the diaphragm.

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

ALBERT ANTON FROEHLICH.

Witnesses:

F. L. Basey,

George E. Mayers.