C. F. JOHNSON.

THERMOSTAT AND LIKE DEVICE.

APPLICATION FILED OCT. 31, 1913.

1,109,993.

Patented Sept. 8, 1914.

3 SHEETS—SHEET 1.

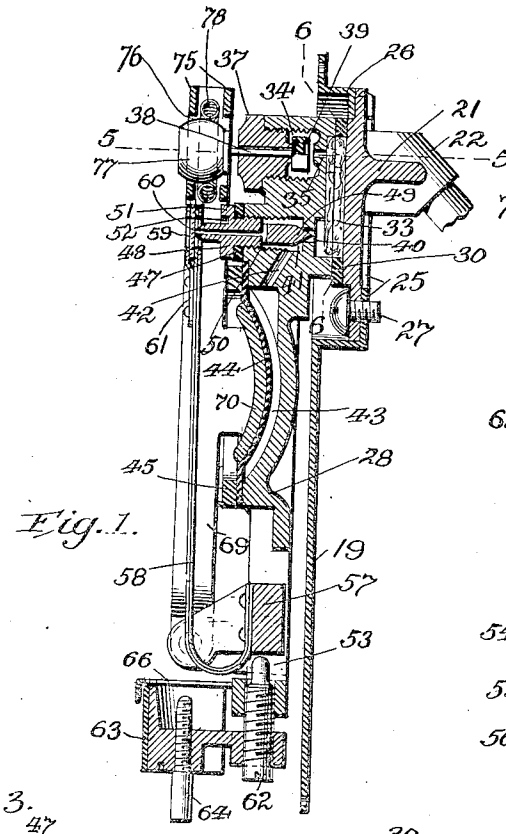


Fig. 1.

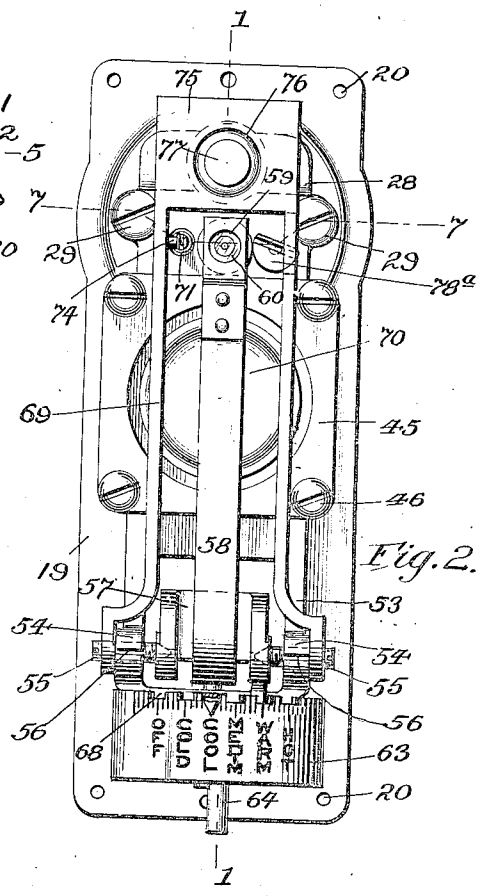


Fig. 2.

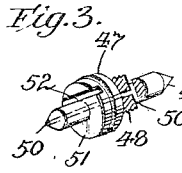


Fig. 3.



Fig. 4.

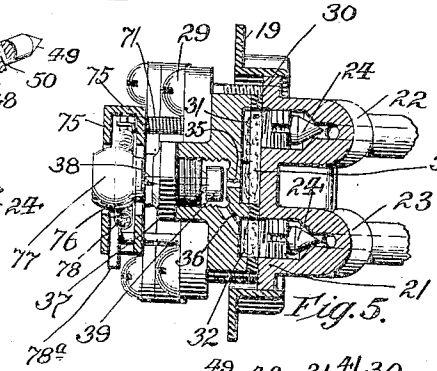


Fig. 5.

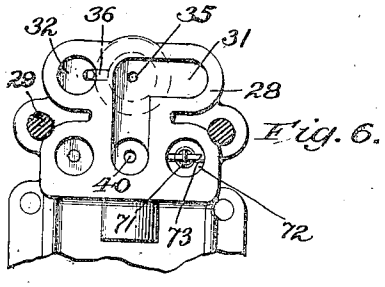


Fig. 6.

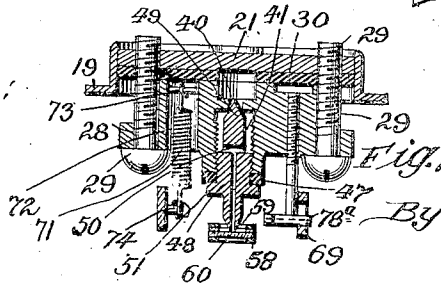


Fig. 7.

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3 SHEETS—SHEET 2.

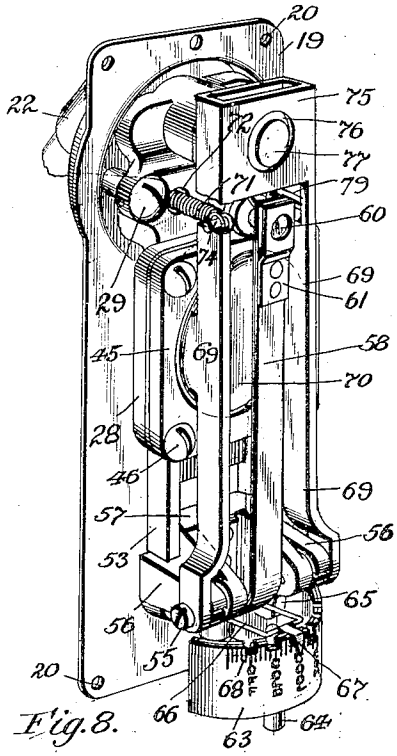


Fig. 8.

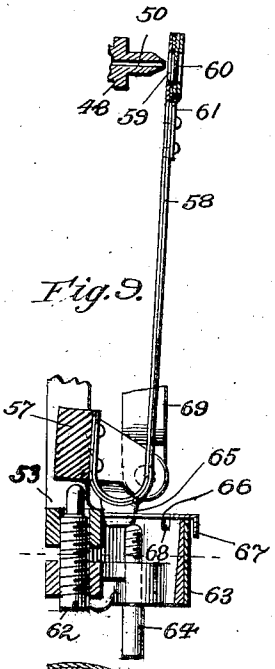


Fig. 9.

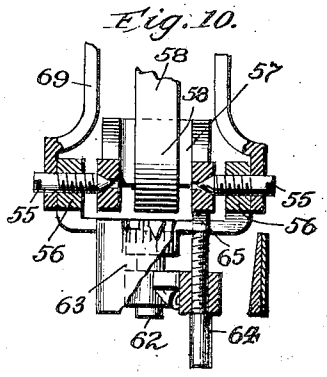


Fig. 10.

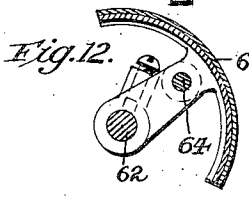


Fig. 12.

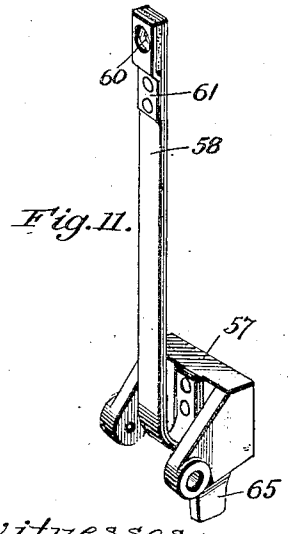


Fig. 11.

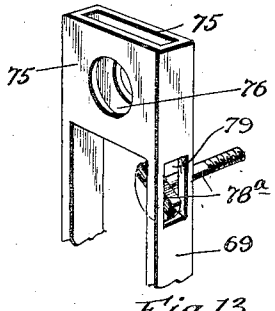


Fig. 13.

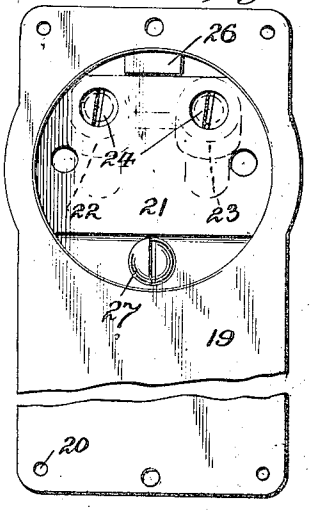


Fig. 14.

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Patented Sept. 8, 1914.

3 SHEETS—SHEET 3.

Fig. 15.

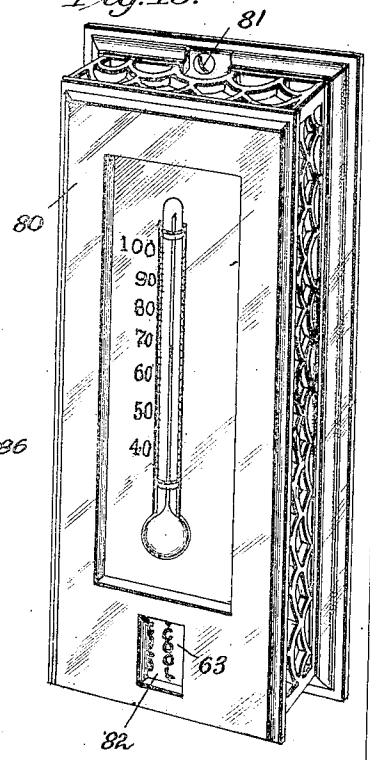


Fig. 16.

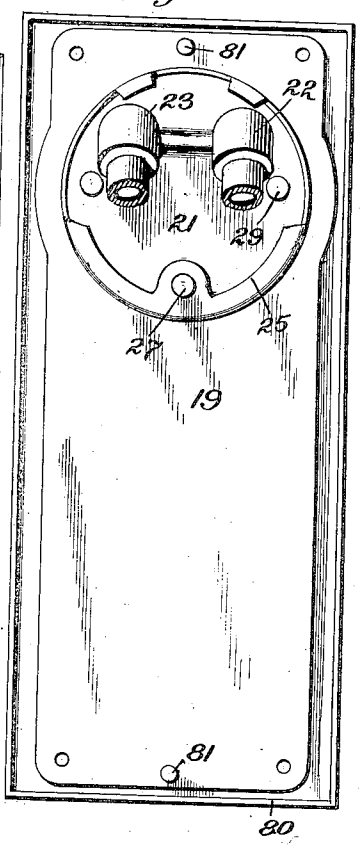
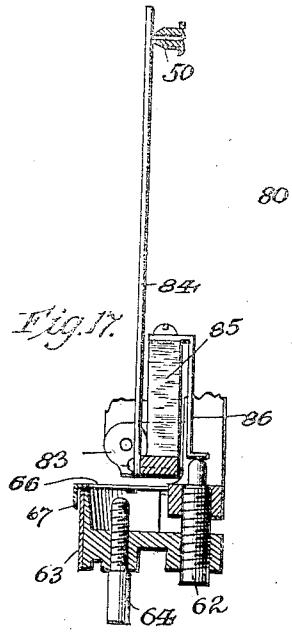


Fig. 17.



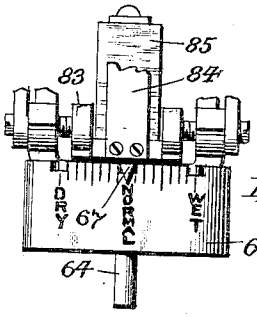


Fig. 18.

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UNITED STATES PATENT OFFICE.

CARL F. JOHNSON, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO JOHNSON SERVICE COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

THERMOSTAT AND LIKE DEVICE.

1,109,993. Specification of Letters Patent. Patented Sept. 8, 1914.

Application filed October 31, 1913. Serial No. 798,603.

To all whom it may concern:

Be it known that I, CARL F. JOHNSON, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Thermostats and like Devices, of which the following is a specification.

This invention relates to thermostats, hygrostats and the like, of the pressure motor type and more particularly to devices of this class operating by the control of a minute vent port by an element responsive to atmospheric changes. Briefly stated such systems involve the use of an element responsive to atmospheric changes, such as a thermostatic bar, or an element responsive to atmospheric humidity or the like, to operate a valve to open or close a leak port from a diaphragm chamber. Compressed air is constantly supplied to this chamber, at a less rate than the rate of outflow through the leak port so that the opening and closing of the leak port effects the automatic release and accumulation of pressure against the diaphragm and this by means of an interposed quick throw mechanism shifts a pilot valve between supply and exhaust positions to supply and exhaust pressure fluid to and from some controlled device such as a valve or damper motor.

The present invention resides in certain refinements of design and arrangement of the parts of the device as well as in certain novel mechanical features, and results in a reduction of the number of parts; a reduction in the size of the instrument; ready access to all working parts, and the ports and passages without destroying adjustments; easy adjustment of all working parts and ready convertibility to a thermostat, hygrostat or other automatic control device. Other advantages will be apparent on inspection.

Except as noted I illustrate the invention as applied to a thermostat in the accompanying drawings, in which—

Figure 1 is a vertical section of the thermostat on the line 1—1 of Fig. 2; Fig. 2 is a front elevation of the complete thermostat with the cover removed; Fig. 3 is a perspective view of the combined needle valve and leak port; Fig. 4 is an elevation, partly in section of one of the needle valves used in the wall pipe-head; Fig. 5 is a section on the line 5—5 of Fig. 1; Fig. 6 is a section on the line 6—6 of Fig. 1; Fig. 7 is a section on the line 7—7 of Fig. 2; Fig. 8 is a perspective view of the complete device with the cover removed; Fig. 9 is a detail view partly in section showing the mounting of the thermostatic bar and motor arm; Fig. 10 is a detail view partly in section showing the common fulcrum for the thermostatic bar saddle, and the motor arm; Fig. 11 is a perspective view of the thermostatic bar and its saddle; Fig. 12 is a detail view, partly in section, of the indicator dial; Fig. 13 is a fragmentary perspective view of the motor arm and its adjusting screw; Fig. 14 is a front elevation of the metal "plaster back" with pipe head attached; Fig. 15 is a perspective view showing the external appearance of the thermostat with its cover; Fig. 16 is a rear elevation of the complete device showing the plaster back and pipe head. Fig. 17 shows a control element sensitive to humidity substituted for the thermostatic bar to produce a device functioning under changes of atmospheric humidity, and Fig. 18 is a fragmentary elevation showing the dial used with the device of Fig. 17.

In the drawings 19 is the sheet metal "plaster back" or wall mount used to support the device in a plastered wall. It is fastened to the wall by means of nails or screws passed through the holes 20. At the upper end of the plaster back is a round flanged aperture in which is held the pipe head 21 which has a connection 22 for the air supply pipe and a connection 23 for the pipe leading to the diaphragm motor or other controlled device. Needle valves 24 shown in detail in Figs. 4 and 5 control the flow through the passages of the pipe head.

The flanged aperture in the plaster back 19 has an interrupted rear flange 25 and at its upper side a small inturned lug 26 spaced forwardly from the flange 25. After the pipe head 21 has been connected to its pipes and the plastering has reached the proper stage the plaster back is slipped upwardly over the pipe head and then swung to cause the lug 26 and flange 25 to straddle the upper edge of the head 21. A screw 27 is then inserted and fastens the pipe head and back securely together so that when the

back is fastened to the wall the pipe head is also rigidly supported and in proper position to receive the thermostat frame 28.

The thermostat frame 28 is a casting preferably of brass and is held against the pipe head 21 by two screws 29, a rubber gasket 30 being interposed. The frame 28 has an L shaped recess 31 and a round recess 32 which communicate through corresponding apertures in gasket 30 with the connections 22 and 23 respectively. The apertures in the gasket 30 are filled by felt inserts 33 which act as filters. The removal of the frame 28 by releasing screws 29 affects none of the thermostat adjustments and gives ready access to the filters 33 and to the needle valves 24.

The frame 28 has at its upper end a valve chamber 34 having a duct 35 leading from recess 31 and supply connection 22, and a duct 36 leading to connection 23. The outer end of chamber 34 is closed by a threaded head 37 through which slides the stem 38 of a double seated valve 39. When the valve seats to the right (in Fig. 1) it closes off the air supply to chamber 34 and permits pressure to exhaust from the chamber around stem 38 thus exhausting air from the damper motor or other controlled device connected to connection 23. When valve 39 seats to the left the exhaust is closed and pressure is admitted as will be obvious.

Leading from the lower end of the L-shaped recess 31 extends a port 40 to a chamber 41, which by a passage 42 is in free communication with a diaphragm chamber 43 in frame 28. The front of the chamber 43 is closed by a flexible diaphragm 44, usually of rubber, held in place by clamp ring 45 and screws 46. Screwed into the front of chamber 41 and making a tight joint by means of a thick soft rubber gasket 47 is the combined needle valve and leak tube 48, preferably of nickel. This is provided with a conical end 49 serving as a needle valve, a minute axial leak port 50 (necessarily exaggerated in size in the drawings) and a sealing flange 51. A screw driver slot 52 offers ready means of adjusting the needle valve and the elasticity of gasket 47 permits the required movement. The correct adjustment is such that the inflow to chambers 41 and 43 is less than the free outflow through the leak port so that when the leak port is open the diaphragm will collapse.

The lower end of the frame 28 is in the form of an open rectangular frame 53 at each side of which is a forwardly extending lug 54. Threaded one in each lug 54 are two alined pivots 55, the lugs 54 being slotted at 56 to exert a resilient clamping action on the pivots. The inner ends of the pivots 55 are conical and pivotally support a weighted saddle 57, on which is mounted a curved bi-metallic thermostatic bar 58. The upper end of the bar stands opposite the end of leak passage 50 and is there provided with an aperture 59 on the front side of which is clamped a transparent celluloid valve seat 60 by means of a riveted clip 61 having an aperture corresponding to the aperture 59 in the bar. The valve seat 60 is adapted to seal the port 50 under proper flexing of bar 58 due to changes in temperature. The celluloid valve seat does not cut out readily and will not bruise the end of the leak port while its transparency permits inspection of its seating action. By mounting it on the side of the bar away from the leak port all disturbing effect incident to irregular thickness of either bimetallic bar or celluloid is avoided. Threaded into the frame 53 is an adjusting screw 62 whose upper end limits the downward motion of the pivoted saddle 57. By adjusting the screw 62 the valve seat 60 may be set to close leak port 50 at any desired temperature. The screw 62 carries a cylindrical dial 63 bearing indicia which may be read through the cover or case hereinafter described. The frame of dial 63 carries a pin 64 which has a double function, the lower end serving as a crank or handle to move the dial and the upper end being a striker which engages a cam lug 65 on saddle 57 in one limiting position of dial 63 to lift the saddle and hold the valve seat 60 clear away from the leak port 50. This position is indicated by the word "Off" on dial 63 and is illustrated in Fig. 9.

A resilient wire frame 66 extends forward from frame 53 and carries a combined latch and pointer 67 adapted to catch in notches 68 in dial 63 and hold the dial in adjusted positions. The notches 68 may be omitted and in that event the pointer 67 merely exerts a frictional retaining action by bearing against the upper edge of the dial.

Mounted on the outer ends of the pivots 55 is the bifurcated motor arm 69. This has a plate 70 bearing against diaphragm 44 and through this, motion is imparted to the motor arm by the diaphragm. The arm 69 is normally held inward by a spring 71 connected thereto and to frame 28. One end of the spring is attached to frame 28 by inserting its looped end into an aperture 72 and fastening it with a pin 73. The other end is also looped and hooked over a lug 74 on arm 69.

The upper end of the motor arm 69 carries two spaced plates 75 having openings 76 through which works a ball 77 fast on valve stem 38. An annular coiled spring 78 confined between plates 75 surrounds and bears against the ball 77 and as arm 69 moves snaps to one or the other side of the median plane of the ball thus causing a quick throw movement of ball 77 and valve 39 opposite in direction to the movement of arm 69.

The movement of the arm 69 is limited by

a screw head 78ª which projects laterally into a slot 79 in arm 69. The side of head 78ª is cut away so that a partial turn of its screw will release the arm. Thus the arm will be released and again confined without losing the adjustment of head 78ª. Adjustment may readily be made by turning head 78ª.

The device is inclosed in a case 80 which is attached by screws 81 to the plaster back. The case is provided with apertured sides to permit free access of the surrounding air to the thermostatic strip. An aperture 82 is provided at the bottom of the front of the case and through this the dial 63 may be seen.

The device may be converted into a hygrostat by the substitution of a hygrostatic element for the thermostatic element, and is then well adapted for controlling humidifying devices of various kinds. In that case a saddle 83 is substituted for the saddle 57 previously described and carries an upright rigid sealing bar 84 (see Fig. 17). This bar is adapted to seal the leak port 50. The saddle 83 also carries a bar 85 of some substance which will vary in length with changes in atmospheric humidity. For example a small block of wood cut across grain will operate satisfactorily. This bar 85 carries a downwardly extending arm 86 attached to the upper end of the bar and bearing at its lower end on the end of the adjusting screw 62. The markings on the dial are changed to correspond to the changed function of the device as indicated in Fig. 18. Any other element responsive to changes in atmospheric conditions may be substituted for the thermostatic or hygrostatic element according to the nature of the device to be controlled.

The general principle of operation of the device will readily be understood by those skilled in the art, but certain advantages are secured by the arrangement of parts adopted, and these will now be pointed out.

By using the bifurcated motor arm and placing the valve strip between the legs thereof a great reduction in the length of the instrument is made possible and the motor arm serves to protect the sensitive element against injury. The use of a common pivot for the motor arm and the valve strip reduces the number of parts. The mounting of the valve strip on a weighted pivoted saddle prevents the sensitive element from ever being subjected to excessive stress, and allows the valve strip to be readily swung forward away from the leak port for inspection or repair. By unhooking the spring 71 from the lug 74 and giving the screw head 78ª a partial turn the motor arm as well as the valve strip may be swung forward out of the way. When this has been done the diaphragm may readily be removed and replaced and the valve 39 may be removed and replaced. After the parts have been swung back into place and connected the screw head 78ª may be readily swung back to its former position restoring the instrument to its original condition of adjustment. By removing the screws 29 the entire thermostat may be removed from the pipe head without affecting any adjustment thereof.

In the following claims I use the term "responsive element" to indicate any element responsive to atmospheric changes such as thermostats, hygrostats and the like.

Having thus described my invention, what I claim is—

1. A vent port for pressure motor control devices comprising a threaded vent tube and a needle valve member formed integrally therewith and adjustable by the rotation of said tube to control the supply of air to be vented through said tube.

2. A vent port for pressure motor control devices having a motor chamber, said port comprising a threaded vent tube adapted to vent air from said motor chamber, a valve member formed on the inner end of said tube and adjustable by the rotation thereof to control the supply of air to said chamber, and an elastic packing adapted to permit the necessary movement of said vent tube to adjust said valve.

3. The combination of a pipe head adapted to be mounted in an aperture in a wall; a wall plate adapted to be rigidly supported on said wall over said aperture, and itself provided with an aperture to receive said pipe head; releasable connections adapted to hold said pipe head rigidly to said wall plate; and an automatic control device responsive to changes in atmospheric conditions supported solely upon said pipe head.

4. The combination with a pressure motor control device including a motor and a control valve, of an arm adapted to be moved by said motor and operatively connected with said control valve; and a threaded member axially adjustable by a turning movement and having a lateral extension adapted to serve as a limit stop for the movement of said arm and movable into and out of operative relation therewith by said turning movement.

5. The combination with a control device including a motor and a control valve; of a pivoted arm adapted to be moved by said motor and operatively connected to said control valve; and a screw having a laterally extending flange adapted to limit the movements of said arm and cut away at one portion to release said arm by a partial turning of said screw.

6. The combination in a pressure motor thermostat of a motor; a bifurcated motor arm adapted to be actuated by said motor;

a thermostatic bar positioned between the branches of said motor arm; a common pivotal support for said bar and motor arm; and means for adjusting the position of said bar.

7. The combination in an automatic control device of a motor; a bifurcated motor arm adapted to be actuated by said motor; a responsive element adapted to control the action of said motor and positioned between the branches of said motor arm; a common pivotal support for said arm and responsive element; and means for adjusting the position of said responsive element.

8. The combination with a pressure motor thermostat having the usual diaphragm motor, of a pivotal support; a bifurcated motor arm mounted in said support and adapted to be actuated by said motor; a saddle also pivoted on said support; a thermostatic bar carried by said saddle extending between the legs of said motor arm and adapted to control the operation of said motor; an adjustable stop adapted to adjust the saddle; and a releasable stop adapted to limit the movement of said motor arm.

9. The combination with a thermostat having a frame and a motor chamber, of a removable diaphragm for said chamber; a pivoted motor arm adapted to be actuated by said diaphragm and extending over the same; a releasable stop normally retaining said arm in position over said diaphragm; a thermostatic element normally extending over said diaphragm; and an adjusting stop for said thermostatic element adapted to leave the same free to be swung manually away from said diaphragm to permit access to the latter.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CARL F. JOHNSON.

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A. A. JOHNSON.