B. C. WICKES.

DAMPER REGULATING MECHANISM.

APPLICATION FILED DEC. 9, 1909.

964,892. Patented July 19, 1910.

4 SHEETS—SHEET 1.

Fig. 1.

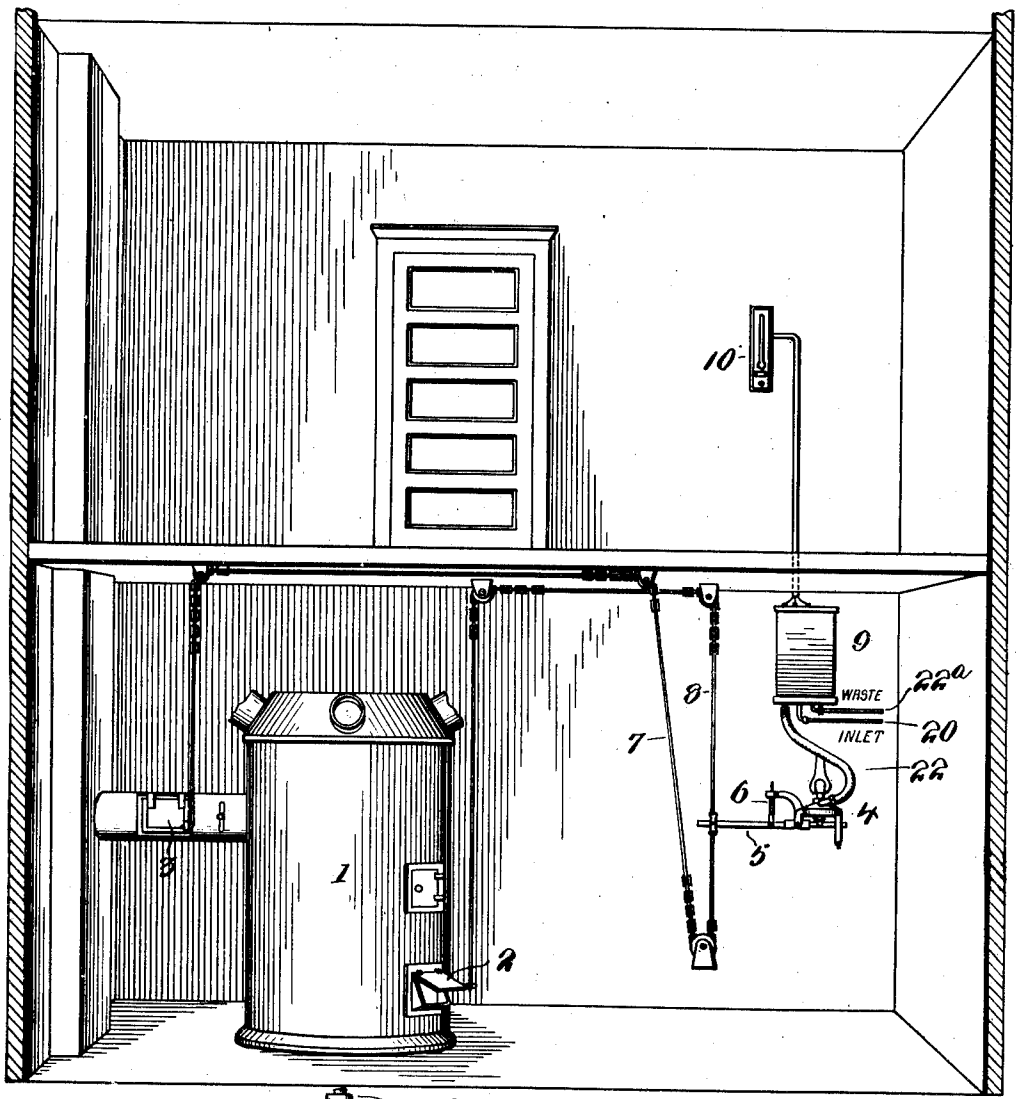
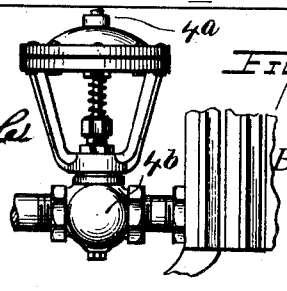


Fig. 7.



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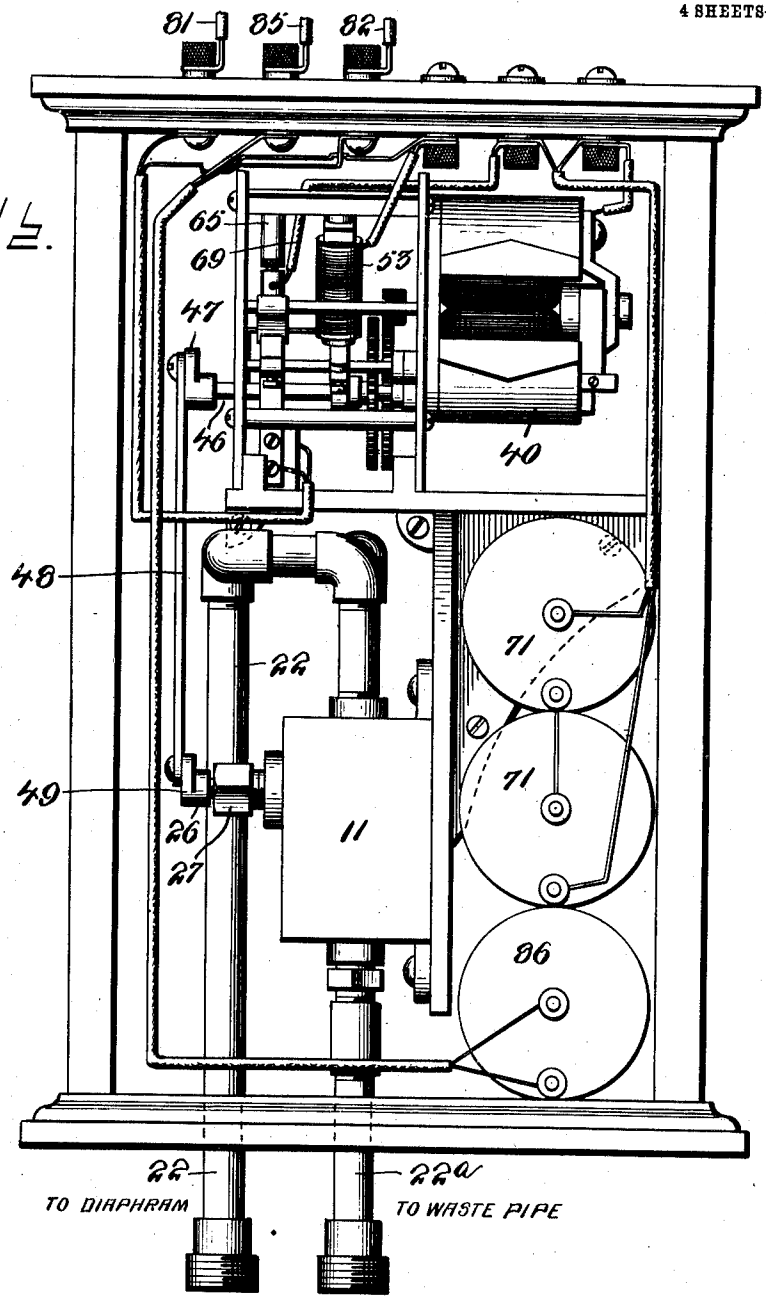
4 SHEETS—SHEET 2.

Fig. 2.



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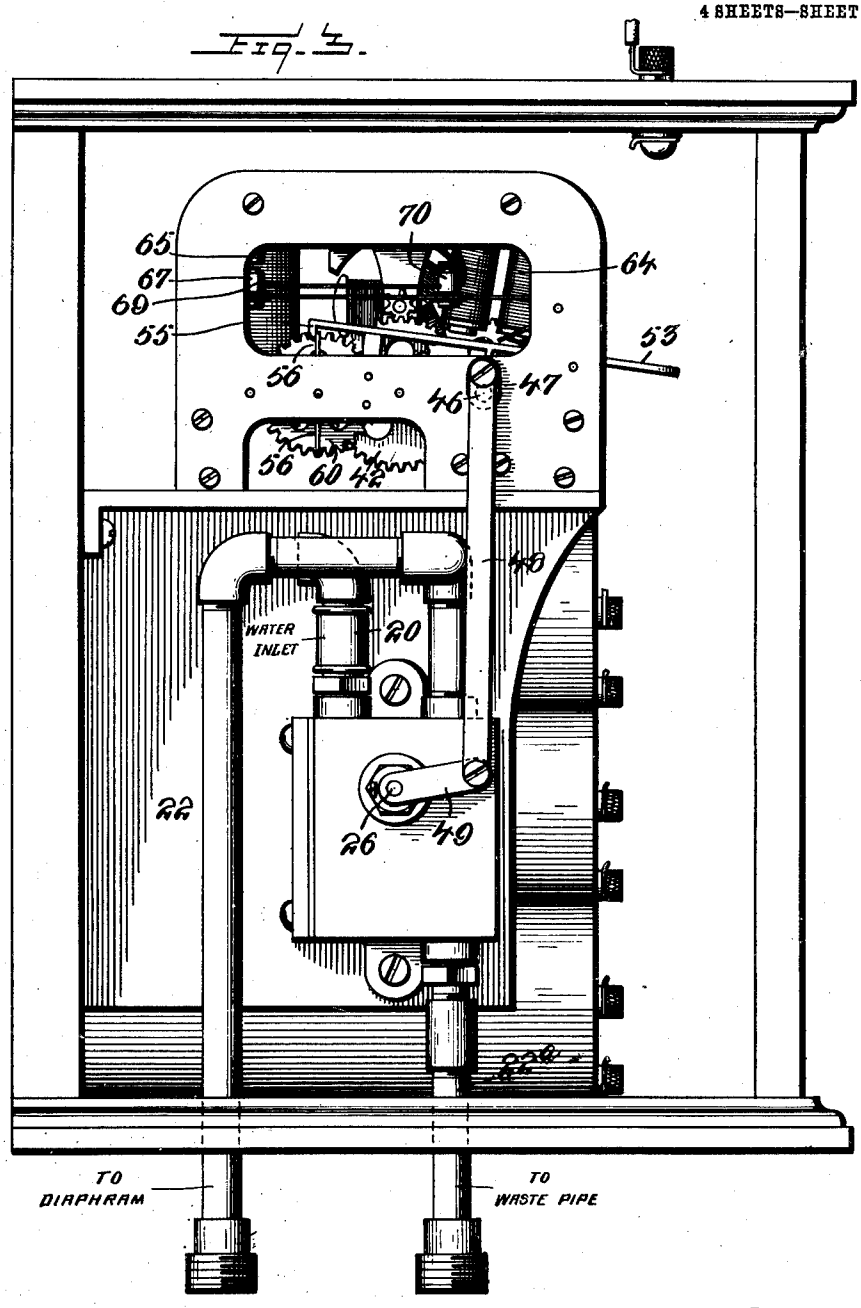
4 SHEETS—SHEET 3.

Fig. 4.



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4 SHEETS—SHEET 4.

Fig. 4.

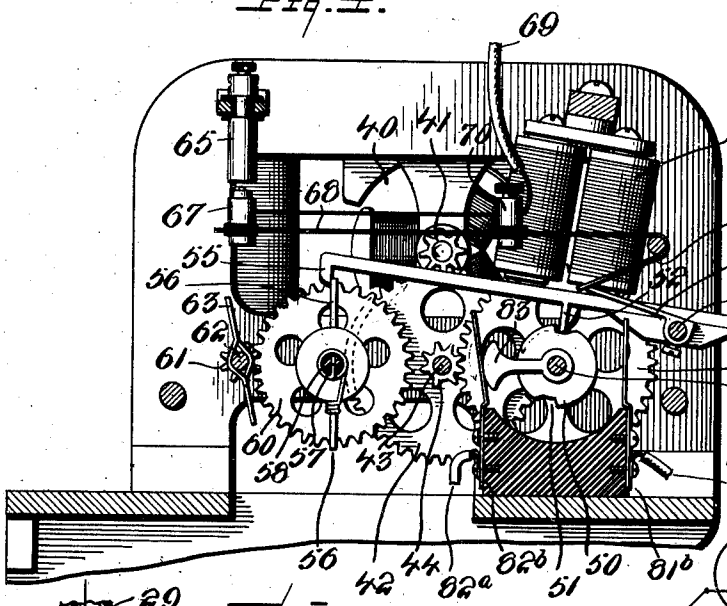


Fig. 5.

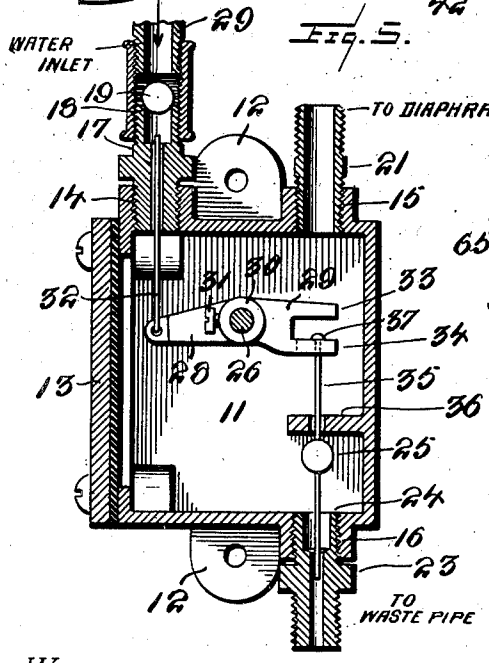
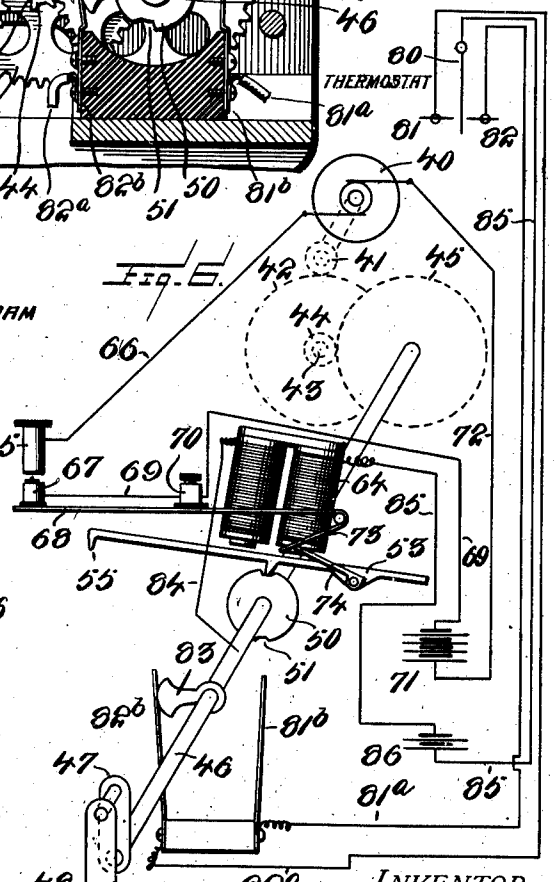


Fig. 6.



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UNITED STATES PATENT OFFICE.

BENJAMIN C. WICKES, OF AUBURN, NEW YORK.

DAMPER-REGULATING MECHANISM.

964,892. Specification of Letters Patent. Patented July 19, 1910.

Application filed December 9, 1909. Serial No. 532,272.

To all whom it may concern:

Be it known that I, BENJAMIN C. WICKES, a citizen of the United States, residing at Auburn, in the county of Cayuga and State of New York, have invented certain new and useful Improvements in Damper-Regulating Mechanism; and I do hereby 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.

The object of my invention is to provide damper regulating mechanism for the heating apparatus of houses and other buildings whereby an even desired temperature can be maintained automatically. In such devices it has been customary to employ as the motive power for actuating the dampers, a weight or spring driven motor, and to control the same by means of an electric device actuated by an electric thermostat. These motors have to be rewound at frequent intervals, generally once a day, and the neglect of winding results in a stoppage of the apparatus.

In carrying out my invention, I employ as the motive power for directly operating the dampers a fluid pressure device which can be connected to the water main in the building or other supply of fluid under pressure, and I provide a control apparatus for the fluid pressure device consisting of a valve mechanism to control the fluid, and an electric device for operating the valve mechanism, the latter being connected with the thermostat and actuated therefrom.

My invention consists in the novel features hereinafter described reference being had to the accompanying drawings which illustrate one form in which I have embodied my invention and the invention is fully disclosed in the following description and claims.

Referring to the said drawings, Figure 1 represents portions of a building, a heater therefor, and damper regulating mechanism embodying my present invention installed in connection therewith. Fig. 2 is an elevation of the box or casing containing the control apparatus, with the front side removed. Fig. 3 is a view of the same with one of the side walls of the casing removed. Fig. 4 is a detail view of the motor and electric controlling apparatus therefor. Fig. 5 is a vertical sectional view of the valve casing and valves for controlling the hydraulic damper operating mechanism. Fig. 6 is a diagrammatic view showing the electric circuits. Fig. 7 is a detail view of a modification.

In Fig. 1 I have shown a general view of the apparatus, in which figure 1 represents a heater provided with a main draft damper 2, and check draft damper 3; 4 represents a fluid pressure device consisting of a casing provided with a diaphragm, and a lever 5, actuated in one direction by the diaphragm and in the opposite direction by a spring 6, the said lever 5 being connected by chains or other flexible connections 7 and 8 with the dampers 2 and 3 in such manner that when the lever is moved in one direction the damper 2 will be opened and damper 3 closed, and vice versa.

9 represents a casing containing the control mechanism and 10 is a thermostat of ordinary or preferred construction electrically connected with the electric control device, as hereinafter described.

The valve mechanism for controlling the supply of fluid to the fluid pressure device 4, is preferably contained within the casing 9 and is illustrated in Figs. 2 and 3 and in section in Fig. 5. This valve mechanism comprises a box or valve casing 11, which is supported within the inclosing casing 9 in any desired manner, as by screws passing through ears 12, 12. The valve casing is preferably formed of a cored casting open at one side, which is closed by a plate 13, suitable packing being provided between the plate and the edges of the open portion of the casing. The casing 11 is provided with three openings, which are preferably threaded, two of these openings 14 and 15 are in the top of the casing and the third 16 is in the bottom, but a different arrangement could be made if desired. The aperture 14 receives a screw plug 17, provided with a longitudinal passage therethrough and having at its upper end a valve seat 18, upon which a ball valve 19 is adapted to be seated. This plug 17 is connected in any convenient manner with the water supply pipe or main in the building where the device is installed, as by a pipe 20 which may be a metal pipe or a flexible hose as preferred.

The aperture 15 is connected in any suitable manner with the fluid pressure device 4. In this instance it is fitted with a nipple

21, which is connected by a pipe 22, with the fluid pressure device. The aperture 16 is the discharge aperture, and is preferably connected with a waste pipe, or sewer connection by a pipe 22^a. In this instance the aperture 16 is fitted with a plug 23, provided with a valve seat 24 to receive a ball valve 25.

26 represents a rock shaft which is mounted transversely in the walls of the casing 11, and extends through one of said walls, where it is provided with a suitable stuffing box 27 to prevent leakage. Within the casing 11 the rock shaft 26 is provided with oppositely extending arms 28 and 29 secured to a collar 30, which is adjustably secured to the shaft 26 by a set screw 31. The arm 28 is provided at its outer end with a vertical stem or rod 32, pivotally connected to the arm and extending loosely through the aperture in plug 17, the upper end of said rod being in proximity to the ball valve 19. The arm 29 is provided with bifurcated portions 33, 34 one above the other, the lower part 34 being slotted to receive a stem or rod 35 passing through a guiding aperture in a lug 36 formed in the casing 11, and having its lower end loosely engaging the aperture in the plug 23, said rod carrying the ball valve 25 through which it preferably extends. The rod 35 is provided with an enlargement or head 37 which lies between the bifurcated portions 33 and 34 of its operating arm, for the purpose of permitting a certain amount of lost motion, thus permitting the valve 25 to seat itself without strain when lowered upon its seat. It will be seen that by rocking the shaft 26 in one direction the inlet valve 19 will be lifted from its seat and the waste valve 25 will be lowered upon its seat, thus opening the fluid inlet and placing the fluid pressure device 4 in communication with the water main, the pressure accumulating in the valve casing 11, and in the diaphragm chamber of the device 4, operating the lever 5, against the retracting spring and opening damper 2 while damper 3 is permitted to close. When the rock shaft 26 is moved in the opposite direction, the waste valve 25 will be lifted from its seat, and the valve 19 will be permitted to seat, thus cutting off communication with the fluid pressure supply, or main, and relieving the pressure in the valve casing and diaphragm chamber. The spring 6 will cause the return movement of the lever 5, returning the diaphragm and expelling a very small quantity only of fluid through the waste pipe, corresponding merely to the previous displacement of the diaphragm. The return movement of lever 5 will open check draft damper 3, and close the main damper 2. It will thus be seen that the dampers may be actuated by shifting the position of the rock shaft 26, and that the amount of fluid actually wasted in securing numerous operations of the dampers during the day, as may be required under the control of the thermostat, will be inconsiderable.

For operating the rock shaft 26, I prefer to employ a very small electric motor, capable of being operated in connection with one or two dry battery cells as such motors and batteries are very inexpensive, and the motor will have sufficient power to turn the shaft 26, while obviously not having power to directly operate the heavy damper doors, and such apparatus can be conveniently installed in small compass at any desired point in a house or building. The electric control mechanism for the rock shaft 26 is illustrated in Figs. 2 and 3 and in detail in Fig. 4, and comprises the following elements.

40 represents the motor, the armature shaft of which is connected by suitable intermediate gearing with the actuating shaft 46. In this instance the armature shaft is provided with a pinion 41 meshing with a gear 42 on an intermediate shaft 43, provided with a pinion 44 meshing with a gear 45 on the shaft 46. The shaft 46 is provided with a crank arm 47, which is connected by a link 48 with a longer crank arm 49 on the rock shaft 26, the relations of the parts being such that the throw of the crank 47 in making a half revolution will effect a movement of rock shaft 26 from one of its positions, previously described, to the other.

The shaft 46 is provided with a disk 50 having two notches 51 therein located a half circle apart, and these notches are adapted to be engaged by a pawl 52 on a trip lever 53 pivotally mounted in the framing of the electric control mechanism upon a rock shaft 54. The outer end of the lever 53 carries a stop lug 55, which when the pawl 52 is in one of the notches 51, is in position to be engaged by either of a pair of stop arms 56, secured to a hub which is loosely mounted on a shaft 57, and connected to the shaft by a torsional spring 58. The shaft 57 is provided with a pinion 59 meshing with the gear 42 for imparting motion thereto, and said shaft 57 is also provided with a gear 60, meshing with a pinion 61, on a fan shaft 62 carrying the ordinary retarding fan 63, or any other form of retarding device may be employed.

Above the trip lever 53 is secured an electromagnet 64 for raising the said lever to release the stop mechanism and start the motor as hereinafter described, said magnet being electrically connected with the thermostat as hereinafter explained.

65 represents a fixed contact stud insulated from the frame of the electric control mechanism, and connected with the motor circuit by a wire 66, (see diagram of circuits, Fig. 7).

67 represents a movable contact carried by but insulated from an arm 68 pivoted to the framing, and to said contact 67, a wire 69 forming part of the motor circuit is connected, said wire in this instance passing through a binding post 70, secured to but insulated from the pivoted arm 68. The wire 69 leads to the motor battery indicated at 71, and a wire 72 leads from said battery to the motor, thus completing the wiring of the motor circuit.

The contact arm 68 is provided with an actuating arm 73, which is in position to be engaged by an arm 74 on the rock shaft which carries the trip lever 53, so that when said lever 53 is lifted by the magnet 64 the contact arm 68 is also raised, thus closing the motor circuit, and starting the motor, at the same instant that the stop mechanism is released by the stop lug 55 disengaging one of the stop arms 56. When the motor is started it will continue to operate until actuating shaft 46 has been given a half revolution, whether the magnet 64 remained energized or not, as the pawl 52 will rise upon the portion of disk 50 between the notches, until the next notch 51 comes beneath it, when (the magnet being deënergized) the lever 53 will fall allowing contact lever 68 to fall and break the motor circuit, and lowering the stop lug 55 which is instantly struck by one of the stop arms and arrests the motor and train without shock owing to its yielding connection with the shaft 57.

In Fig. 7 I have shown the plan of wiring from the thermostat to the electric control mechanism, 80 representing the thermostatic element and 81 and 82 the contacts with which it coöperates. The said contacts 81 and 82 are connected by wires 81^a and 82^a respectively with spring contacts 81^b and 82^b lying in this instance on opposite sides of the shaft 46, and being alternately placed in circuit by a rotary switch arm 83, mounted on said shaft. The arm 83 is in circuit with the magnet 64 through the frame of the apparatus, as indicated in Fig. 7 by wire 84. The common return wire 85, connects the thermostatic element with magnet 64 through the battery 86. I prefer to provide two distinct circuits as herein shown, the one for the motor and the other for the thermostat and control magnet, and a separate battery for each circuit.

It will be seen that in whatever position the parts are left by the preceding operation of the device, only one thermostatic circuit is in condition to be closed by the movable element 80. As soon as the circuit is closed, and the magnet 64 has operated as before described to start the apparatus, the switch arm 83, will be carried away from the spring contact which it engages (as arm 82^b in Fig. 7) breaking the circuit through the magnet and permitting the mechanism to be stopped after a half revolution as before described, said arm 83 coming to rest in contact with the opposite spring contact arm and leaving the apparatus in condition to be operated when the thermostatic element is moved in an opposite direction and engages the other contact.

As the apparatus is stopped by the breaking of the motor circuit and the action of the stop lug 55, any back lash due to the compression of the torsion spring 58, will be checked by the pawl 52 on lever 53, engaging the end of the recess 51, which is made substantially radial as shown.

I also contemplate installing the apparatus previously described in connection with the pipe system of a steam or hot water system, in which case the fluid pressure device may be directly connected with a quick acting valve, in a pipe leading to the radiator or radiators in a room or suite of rooms, as an apartment or office, the same being one of a large number of rooms, or suites of rooms heated by the same heating system, whereby the temperature of the particular room or suite can be regulated independently of other portions of the building. In Fig. 8 I have shown such a device in which 4^a represents the fluid pressure device, and 4^b represents the quick acting valve connected directly therewith, the said fluid pressure device being connected to the other parts of the mechanism described, in the same manner as the device 4 is shown connected in Fig. 1. In installing the apparatus in hotels, apartments and office buildings the fluid pressure connections can be readily made with water pipes in the building, as in the contiguous bath, or toilet rooms, or at a stationary wash stand, and the box or casing containing the electric controlling mechanism, and valve mechanism can be placed adjacent to the water supply pipe out of the way, and the pipe 22^a can be extended as far as necessary to the fluid pressure device 4^a.

What I claim and desire to secure by Letters Patent is:—

1. In a damper regulating apparatus, the combination with a fluid pressure device, connections therefrom to the dampers, a valve mechanism for controlling the fluid pressure device and an electric control mechanism for said valve mechanism, comprising an electric motor, connections from said motor to the valve mechanism, an electric circuit for said motor, a switch for closing said circuit, an electromagnet for operating said switch, a yielding stopping mechanism for stopping the motor, and a pawl mechanism for preventing back lash when the stopping mechanism is thrown into operation.

2. In a damper regulating apparatus, the combination with a fluid pressure device, and connections therefrom to the dampers, of valve mechanism for controlling said fluid

pressure device, and an electric control mechanism for said valve mechanism comprising an electric motor, operative connections between the motor and the valve mechanism including a rotary part provided with locking notches, a trip lever having a pawl for engaging said notches, a yielding stop mechanism operated by said trip lever for arresting the motor, a magnet for operating said trip lever, and a switch for controlling said motor, operated by said magnet.

3. In a damper regulating apparatus, the combination with a fluid pressure device, and connections therefrom to the dampers, of valve mechanism for controlling said fluid pressure device, and an electric control mechanism for said valve mechanism comprising an electric motor, operative connections between the motor and the valve mechanism including a rotary part provided with locking notches, a trip lever having a pawl for engaging said notches, a yielding stop mechanism operated by said trip lever for arresting the motor, a magnet for operating said trip lever, a switch for controlling the motor, including a movable contact arm, operative connections between said contact arm and said trip arm, an electric circuit for said motor and its controlling switch, a thermostatic device, two separate circuits from said thermostatic device and a switch operated by said motor for connecting the magnet with one or the other of said thermostat circuits.

4. In a damper regulating apparatus, the combination with a fluid pressure device, and connections therefrom to the dampers, of valve mechanism for controlling said fluid pressure device, and an electric control mechanism for said valve mechanism comprising an electric motor, operative connections between the motor and the valve mechanism including a rotary part provided with locking notches, a trip lever having a pawl for engaging said notches, a yielding stop mechanism operated by said trip lever for arresting the motor, a magnet for operating said trip lever, a switch for controlling the motor comprising a stationary contact, a movable switch arm, and a movable switch contact carried by but insulated from said arm, an electric circuit through said stationary and movable contacts and the motor, operative connections between said trip arm and said switch arm for operating the latter from said magnet, and a separate circuit for said magnet.

5. In a damper regulating apparatus, the combination with a fluid pressure device, and connections therefrom to the dampers, of valve mechanism for controlling said fluid pressure device, and an electric control mechanism for said valve mechanism comprising an electric motor, operative connections between the motor and the valve mechanism including a rotary part provided with locking notches, a trip lever for stopping and releasing the motor, a rotary stop connected with the motor for engaging said trip arm, a magnet for operating said trip arm, a switch arm operated by said magnet, a movable contact carried by but insulated from said switch arm, a stationary contact in the path of the movable contact, an electric circuit for the motor, including said contacts, and a separate electric circuit for said magnet.

6. In a damper regulating apparatus, the combination with a fluid pressure device, connections extending therefrom to the parts to be controlled, a valve mechanism for said fluid pressure device, including a valve casing provided with a fluid inlet, a waste outlet and an outlet connection communicating with the pressure device, and horizontal valve seats in the fluid inlet and outlet, a ball valve engaging each of said valve seats, adapted to seat thereon by gravity, a rock shaft extending through said valve casing between the horizontal planes of the valve seats, a pair of arms within said casing secured to said rock shaft, a rod secured to one of said arms, and extending upwardly to engage one of said ball valves to lift it from its seat, a rod extending downwardly to the other of said valves and connected thereto, said rod being connected to the arm by a connection permitting lost motion, an electric motor operatively connected with the rock shaft, a stop mechanism for the motor, an electric device for releasing the motor from the stop mechanism, a thermostat and operative connections between the said electric device and said thermostat.

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

BENJAMIN C. WICKES.

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E. THORN.