Jan. 2, 1923. 1,440,497.

W. SHURTLEFF.

HEATING AND VENTILATING UNIT.

ORIGINAL FILED DEC. 16, 1918.

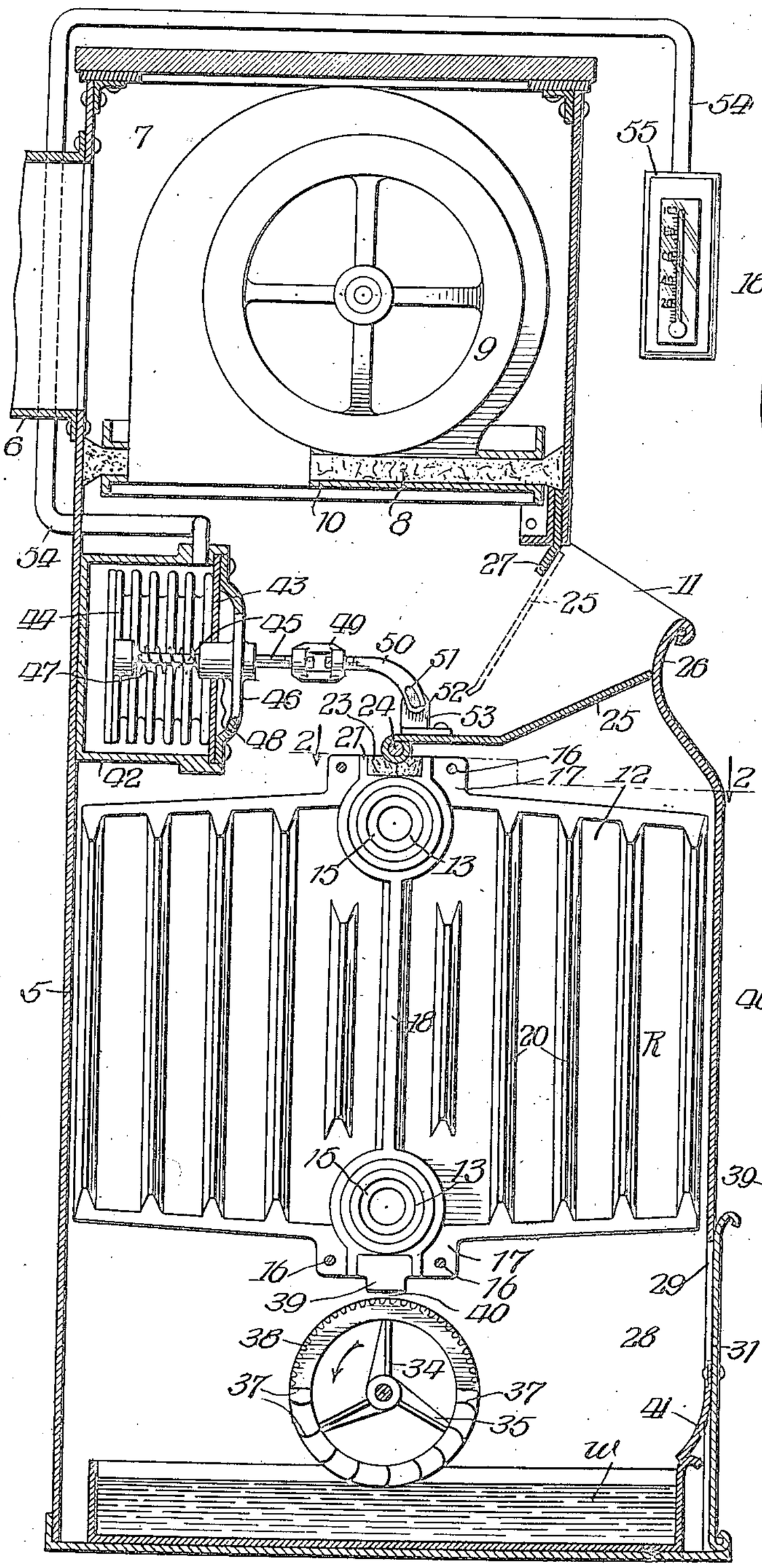

Fig. 1

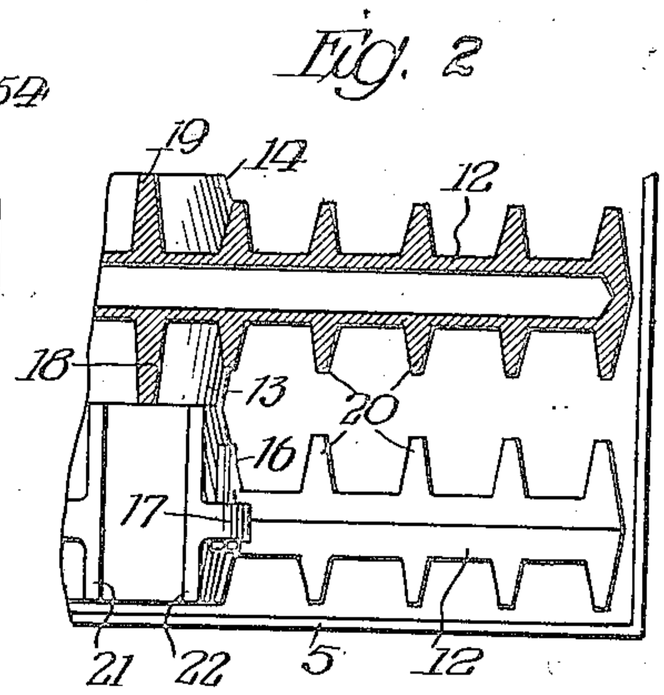

Fig. 2

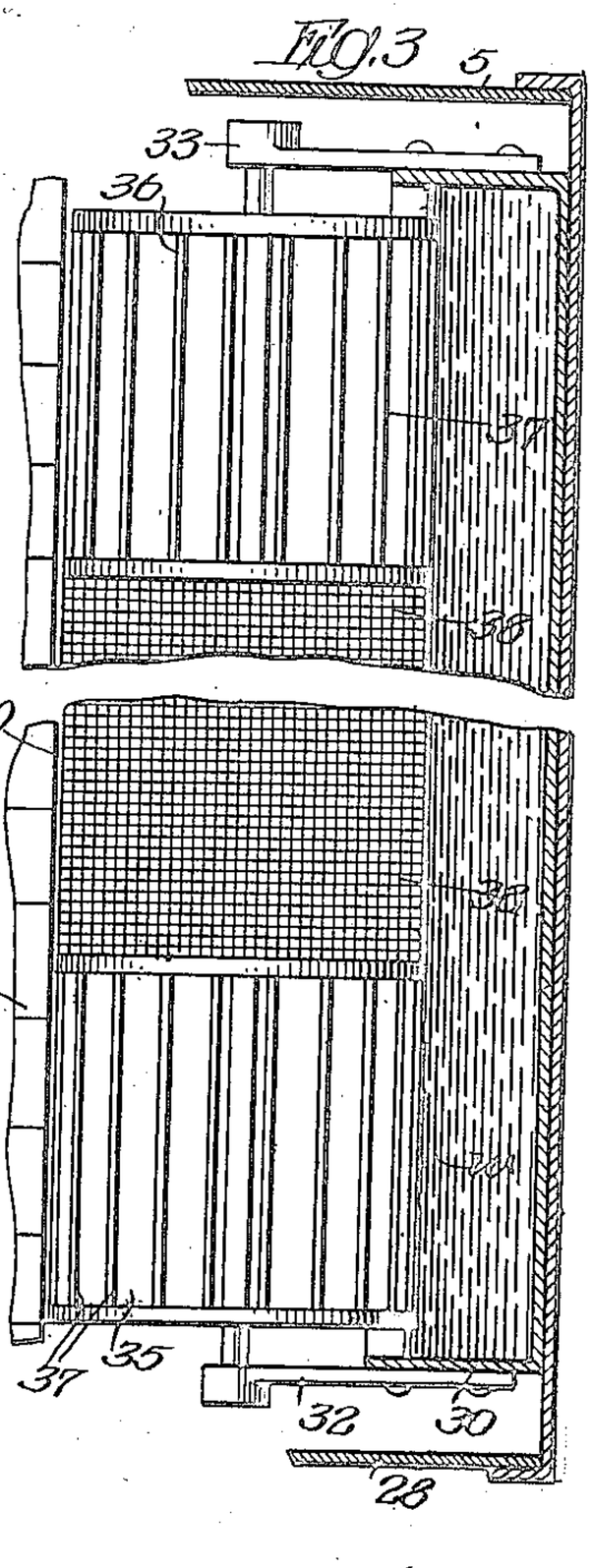

Fig. 3

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UNITED STATES PATENT OFFICE.

WILFRED SHURTLEFF, OF MOLINE, ILLINOIS, ASSIGNOR TO MOLINE HEAT, OF MOLINE, ILLINOIS, A CORPORATION OF ILLINOIS.

HEATING AND VENTILATING UNIT.

Original application filed December 16, 1918, Serial No. 266,850. Divided and this application filed June 25, 1920. Serial No. 391,752.

To all whom it may concern:

Be it known that I, WILFRED SHURTLEFF, a citizen of the United States, and a resident of Moline, in the county of Rock Island and State of Illinois, have invented certain new and useful Improvements in Heating and Ventilating Units, of which the following is a specification.

My invention relates to heating and ventilating units, particularly to that class in which external air is drawn into and through a housing in contact with a heating element before delivery into the room to be heated and ventilated. The subject matter of my invention is set forth in a prior application bearing the same title and Serial No. 266,850, filed December 16, 1918, and now Patent Number 1,358,181, of which this is a divisional application.

Among the objects of the invention is to provide improved means operating thermostatically to adjust a damper in the outlet of the unit so as to automatically and efficiently apportion the amount of heated air flowing from the unit into the room, and further, to arrange and operate the damper so as to divide the air issuing from the unit into an upper strata of unheated air and a lower strata of heated air, which eventually become mixed to effect the desired room temperature.

The various features of my invention are incorporated in a structure shown on the accompanying drawing, in which

Fig. 1 is a transverse vertical section of the unit.

Fig. 2 is a view from plane 2—2, Fig. 1, with one of the radiator sections in section, and

Fig. 3 is an enlarged vertical cross-section of the lower end of the unit showing the moistening structure in side elevation.

The unit shown comprises a rectangular housing 5 of sheet metal, which at its upper end and at the rear has the air inlet duct extension 6 which may be set into a window or other opening for the flow of air into the fan compartment 7 at the top of the unit. An insulated partition 8 forming the floor of the fan compartment supports the fan or blower 9 which discharged downwardly through the opening 10 in the partition 8. Within the housing intermediate the partition or shelf 8 and the housing floor is supported the radiator structure R with which the incoming air is blown into contact to be heated before it is delivered to the room through the outlet spout 11 at the front of the unit just below the partition 8. The radiator structure shown is built up of a number of sections 12 in the usual manner and each section comprises a hollow rectangular body from whose sides at the top and bottom extend the inlet and outlet lugs 13 and 14 which are connected together in the ordinary manner by means of nipples 15 to afford communication between the sections for the flow of water or steam, the sections being held securely together by means of bolts 16, extending through ears 17. At its opposite sides each radiator section has the fins 18 and 19 extending between the upper and lower lugs 13 and 14, respectively, these fins being of such lateral width that when the sections are secured together the opposed edges of the fins will engage so that these fins, together with the lugs, form a vertical wall dividing the radiator structure vertically. Between these center fins and the outer edges of the sections, the sections have intermediate fins 20 which may extend outwardly sufficiently to engage with each other when the radiator sections are clamped together, or which, as shown, may be shorter than the center fin so as not to meet. The length and breadth of the radiator structure is such that it will extend entirely between the front and rear and the side walls of the housing 6.

Extending across the top of each radiator section are the flanges 21 and 22, the flanges on adjacent sections registering to form a continuous groove along the top of the radiator structure for padding 23. A hinge rod 24 is pivoted at its ends in the sides of the housing 6 and extends along the padding 23, the damper plate 25 being secured at its inner edge to the rod. This damper plate is adapted to be swung across the outlet spout 11 between the front wall 26 and the rear abutment 27. The hinged end of the damper plate is in engagement with the padding 23 along its entire length so that the padding forms a seal against air flow

between the hinged end and the radiator structure. When the damper plate is in its upper position against the rear abutment 27 of the spout, as shown in dotted lines Fig. 1, directed air flow from the opening 10 into the room through the spout is prevented and all the air must travel downwardly through the rear half of the radiator structure, through the chamber 28 below the radiator structure, and then upwardly through the front half of the radiator structure to be heated before it is discharged into the room. If the damper plate is in its lower position with its end against the front wall 26 of the spout flow of air through the radiator structure is shut off and all the air coming in through the blower outlet 10 flows directly through the spout and into the room. For any intermediate position of the damper in the spout a corresponding proportion of cold and heated air flows through the spout and into the room.

Describing now the washing and moistening apparatus, the front wall of the housing 6 at its lower end has the opening 29 for the insertion into the bottom of the housing of a water pan 30, the door 31 being provided for the opening. Extending upwardly from the ends of the water pan are the bearing arms 32 and 33 for journalling the shaft 34. To this shaft at the ends thereof are secured the cylindrical fan or air wheel structures 35 and 36 having suitable propulsion blades 37. Extending between the wind wheel structures and concentric therewith is the cylindrical screen 38 which may be constructed of wire or perforated metal. The shaft 34 extends below the center line of the radiator structure and the registering extensions 39 on the radiator sections form a continuous flange between which and the surface of the water *w* in the pan 30 is the restricted passageway or gap 40 across which the wind wheel and screen structure extend so that all the air flowing through chamber 28 from the rear side to the front side of the radiator must pass through the wind wheel and screen structure, the air flowing through the wind wheel structure blades causing rotation of the entire structure on the shaft 34. The screen cylinder dips a distance into the water, the water coating the mesh in the screen and forming a film or water curtain in the path of the air flowing through the chamber 28. As the air forces its way through the curtain it picks up water particles which are thoroughly vaporized and mixed with the air during flow through the front side of the radiator structure, the air when delivered into the room being then uniformly and efficiently humidified.

Any dust held in suspension in the air flowing into the chamber 28 will strike the mesh cylinder and the water curtain formed thereby, the water holding the dust particles, and, as the cylinder rotates, these particles are carried downwardly and dropped into the water pan. It will be noted that the cylinder really forms two water curtains, that is, each half of the cylinder forms a curtain. Therefore, if any dust gets through the rear half of the screen it will be picked up by the front half. A very large cleaning, as well as humidifying surface is therefore afforded.

When the cylindrical structure is very rapidly rotated particles of moisture may be thrown therefrom upwardly toward the front half of the radiator structure. These particles, will, however, be picked up and carried by the air through the radiator structure to be vaporized. Any moisture deposited on the front wall or door of the housing will collect on and flow from the ledge 41 back into the pan.

Instead of two wind motor or fan structures, a greater number may be provided and mounted on the shaft 34 to rotate the screen cylinder. The more air that is delivered through the radiator structure, the more rapidly the moistening and washing structure will revolve, and vice versa, so that the air is always humidified in proportion to its volume.

The damper plate 25 may be set manually but preferably its adjustment is controlled automatically in accordance with the temperature of the room to be served. I show thermostatic control of the damper. Secured to the rear housing of the unit is the diaphragm housing 42 having the front wall 43 on which is supported the accordion-shaped diaphragm 44. The rear wall of the diaphragm is secured to the stem 45 which is slidable through the supporting bridge 46 secured to the housing 42. A compression spring 47 encircles the stem between the rear wall of the diaphragm and the hub 48 on the bridge and tends to keep the diaphragm unfolded. At its front end the stem 45 is connected by a turn buckle 49 with the end link 50 which has the slot 51 receiving the pin 52 of the fitting 53 secured to the damper plate 25. A tube 54 connects with the housing 42 and leads from the thermostat device 55, the tube and thermostat containing volatile liquid which changes in volume in accordance with the temperature. As shown on the drawing, the temperature has risen above normal, the volatile liquid having been expanded by the heat, this expansion within the housing 42 having caused the diaphragm rear wall to be shifted forwardly which resulted in swinging of the damper plate to shut off flow through the radiator structure and to permit only cold air to flow into the room. As soon as the room temperature drops, the liquid will

contract and the pressure in the housing 42 against the diaphragm correspondingly reduced to permit the spring 47 to shift the stem and to swing the damper plate upwardly. The proportion of cold air and heated air is thus automatically taken care of by the thermostatic control of the damper plate.

I do not, of course, desire to be limited to the exact construction and arrangement shown and described as changes and modifications are no doubt possible which would still come within the scope of the invention.

I claim as my invention:

1. In a heating and ventilating unit, the combination of a housing having a blower chamber provided with an air inlet, a heating chamber connected with said blower chamber and having an air outlet near the top thereof, a heating element in said heating chamber, a damper mounted in said heating chamber and adapted to regulate the flow of air directly from said blower chamber to said outlet and indirectly to said outlet through said heating element, fluid actuated means for controlling said damper, and temperature controlled means for regulating said fluid controlled means.

2. In a heating and ventilating unit, the combination of a housing having a blower chamber provided with an air inlet and a downward air outlet, a heating chamber connected with said blower chamber and provided with a lateral outlet adjacent the upper portion thereof, a heating element in said heating chamber, a damper mounted in said heating chamber intermediate said blower chamber and said heating element and adjustable to regulate the relative amount of air discharged through said outlet directly from said blower chamber and directly through said heating element, fluid actuated means in said heating chamber for automatically controlling said damper, and thermostatic means located in the room to be heated for controlling said fluid actuated means.

3. In a heating and ventilating unit, the combination of a housing comprising a blower chamber provided with an air inlet, a heating chamber connected with said blower chamber and provided with an air outlet in the upper portion thereof and adjacent said blower chamber, a heating element mounted in said heating chamber, means for directing the air from said blower chamber downwardly and then upwardly through said heating element to said outlet opening, a damper supported upon said heating element and adapted to control the volume of air delivered from said outlet directly from said blower chamber and the air passing upwardly through said heating element, and a thermostatic controlled fluid actuated unit mounted in said heating chamber and operatively connected with said damper.

4. In a heating and ventilating unit, the combination of a housing comprising a blower chamber having an air inlet opening, a heating chamber below and connected with said blower chamber, and provided with an outlet opening at its upper end, a heating element in said heating chamber and forming therewith a down passage and an up passage, a damper hinged between said down and up passages and extending toward said outlet opening and adapted to regulate the volumes of air delivered direct from said blower chamber to said outlet and through said heating element to said outlet, a fluid actuated unit mounted in said housing and operatively connected with said damper, and a thermostatic unit located in the room to be heated for controlling the action of said fluid actuated unit.

In witness whereof, I hereunto subscribe my name this 29th day of May, A. D., 1920.

WILFRED SHURTLEFF.