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 a heat radiator and a blower are inclosed in a housing having connection with the outside air and having a discharge opening into the room to be heated and ventilated, the incoming cool air being driven by the blower in contact with the radiator and then delivered to the room.

One difficulty heretofore has been to provide a radiator of sufficient height to give sufficient area for heating the cold outside air to the temperature desired for the room to be heated, distance of travel of the air being the prime factor in obtaining the final temperature. The units are usually placed with their inlet openings in front of a window to receive the cold air when the window is raised, the top of the unit being a short distance above the window sill. Window sills, of course, differ in height and where the vertical distance is limited the radiators used in prior devices could not give the required heating area. In some of these prior art devices the air passage space above and below the radiator has been encroached upon but this causes cramping and retardation of the air flow and prevents the device from operating efficiently.

One important object of my invention is to provide an improved radiator which will make the heating and ventilating devices equally efficient independently of their height. My improved radiator has the same general construction as other radiators except that it is divided by a vertical wall from the blower housing and this division causes the air from the blower to flow downwardly through one half of the radiator and upwardly through the opposite half, and the one side of the radiator tempering the air and the other side warming it to the required temperature before delivery into the room. The air not only circulates around the radiator structure as in prior devices but flows through the radiator halves in intimate contact with the opposed sides of the radiator sections, the radiator surface being further increased by fins on the sections.

Another important feature of my invention resides in improved valve and damper means for permitting flow of cold air directly into the room, or for mixing cold and warm air to any degree desired, and for controlling the volume of air to be delivered to the room at any desired temperature, either cold, hot or medium.

Another important feature of my invention resides in improved moistening mechanism automatically controlled by the amount of air passing through the radiator, the greater the volume of heated air the greater the amount of moisture delivered thereto.

A structure embodying the various features of my invention is shown on the accompanying drawings, in which—

Figure 1 is a vertical sectional view through a unit showing the unit applied to a window opening,

Fig. 2 is a sectional view on plane 2—2, Fig. 1,

Fig. 3 is a side elevational view of the outlet portion of the unit, and

Fig. 4 is an enlarged sectional view on plane 4—4, Fig. 3, showing the damper controlling mechanism.

The rectangular housing 5 of sheet metal has an inlet duct 6 extending rearwardly at its upper end from the blower chamber 7, the outer end of the duct supporting a frame 8 which in practice rests on the window sill to bring the duct into alignment with the open space 10 of the raised window 11. An abutment strip 12 is shown secured to the window against which the upper part of the frame 8 abuts to shut out flow of air directly into the room from the window opening. Within the frame 8 is fitted the screen 13 for cleaning the air before it enters the unit. The housing 5 is closed at its upper end by the top 14 and the wall section 15 in front of the fan chamber is set inwardly from the body wall 16 of the housing to form the outlet spout or nozzle 17. Below the inlet duct 6 the partition or shelf 18 extends horizontally through the housing and supports the blower 19 whose outlet end 20 extends downwardly through the opening 21 in the partition. The shelf 18 is preferably
double-walled to receive material 22 such as felt which presses against the walls of the housing to seal the fan chamber 7 from the body of the unit.

5. Within the housing intermediate the shelf and the bottom is the radiator structure R with which the incoming air is blown into contact before it is delivered to the room through the outlet spout 17. This radiator structure is built up of a number of sections 23 in the usual manner. Each section comprises a hollow rectangular body 24 from whose opposite sides extend the fins 25. Each section has at its upper end opposed inlet and outlet lugs 26 and 27 and at its lower end similar inlet and outlet lugs 28 and 29, nipples (not shown) engaging in the lugs of adjacent sections of the radiator structure affording communication for flow of water or steam between the sections, the sections being held securely together by means of bolts 30 extending through ears 31, in the well known manner. When the sections are clamped together by the bolts the lugs of adjacent sections engage with each other (Fig. 32) and the vertical center fins 32 on the sides of the sections engage with each other to form walls which cooperate with the abutting lugs to divide the radiator structure vertically. As shown, the other fins 25 are shorter than the center fins and do not meet, but it is evident that they could be of the same length as the center fins and engage with each other so as to form individual vertical passageways.

Extending across the top of each radiator section are the flanges 33 and 34, the flanges on adjacent sections registering to form a continuous groove along the top of the radiator structure for felt padding 35. A sheet metal damper or deflecting plate 36 extends across the interior of the housing 5 from one side to the other thereof and is hinged on a rod 37. The hinged end of the damper extends along the felt packing 38 which forms a seal against direct air flow from the blower to the outlet when the damper is closed. This packing and the packing 22 of the shelf 18 also acts to absorb vibrations and prevent noise when the blower is running. The damper 36 extends into the outlet spout 17 to be adjusted therein in any position between the front and rear walls of the spout.

The radiator structure extends close up to the four walls of the housing 5 so that when the damper is swung against the walls of the unit, all 15 all the air from the blower must travel downwardly through the rear half of the radiator structure and upwardly through the front half of the radiator structure and out of the spout 17, the air during its passage through the rear half being tempered and during flow through the front half of the radiator structure being heated to the desired temperature. If the damper 36 is swung forwardly against the front wall 16 then all the air from the blower will travel directly through the spout into the room. If the damper is placed at an intermediate position in the spout, some of the air will be blown directly into the room and the balance will circulate through the radiator structure to be warmed before delivery from the spout, and by adjusting the damper any mixture of cold and warm air can be obtained.

To lock the damper in adjusted position the threaded ends of the stiffening bar 36 may extend through slots 39 and 39' in the side walls of the housing to receive winged clamping nuts 40 and 40'.

In Figs. 3 and 4 a double damper arrangement is shown by means of which adjustment can be made for controlling the volume of air to be delivered to a room at any desired temperature or for controlling the temperature of the air without interfering with the volume delivered. The additional damper 41 is hinged on the rod 42 in front of the rod 37 of the damper 36 and the ends of the stiffening rod 43 at the outer edge of the additional damper extend through the slots 39 and 39' in the sides of the spout. Links 44 and 44' are pivoted at their inner ends on the respective ends of the stiffening rod 38 of the damper 36 inside of the thumb nuts. These links have the longitudinal slots 45 and 45', respectively, through which the ends of the stiffening rod of the damper 41 extend, these ends being threaded for receiving the wing nuts 46 and 46', respectively. Between the links and the adjacent sides of the spout abutment collars 47 and 47', respectively, are secured to the ends of the stiffening rod 43 so that the links can be clamped against these collars by the wing nuts to lock the damper 41 to the links in any position. Washers 48 and 48' are interposed between the inner ends of the links and the spout sides to offset the thickness of the collars 47 and to keep the links parallel with the spout sides.

With the double damper construction shown various adjustments for volume, mixture and temperature can be made. For example, in Fig. 3, the damper 41 is locked to the links 45 and 45' intermediate the link ends to space the dampers a certain distance apart, the dampers in this position closing a fixed area of the spout passageway. By loosening the wing nuts 40 the locked together damper structure can be swung to any desired position in the outlet spout. The full lines in Fig. 3 show the damper structure resting against the rear wall of the spout so that the air from the blower must all travel through the radiator structure. However, the spout passageway
is restricted by the damper structure with a correspondingly limited delivery of heated air therethrough. The dotted lines in Fig. 3 show the double damper structure swung downwardly to be intermediate the front and rear walls of the spout so that part of the air from the blower can flow directly through the spout into the room and the balance through the radiator structure, the volume of air delivered from the spout remaining the same, so long as the adjustment between the dampers remains the same. Thus the dampers can be relatively adjusted to give the desired volume of air and then the adjusted damper structure swung in the spout and locked in position depending upon the ratio of cold to warm air desired.

Provision is also made to supply moisture to the warm air in proper quantity. In the lower part of the front wall of the housing is the opening 49 through which a water pan 50 can be inserted below the radiator structure, the door 51 being provided to close the opening. A ball float 52 may be provided for controlling a valve (not shown) through which water is delivered to the pan so as to keep the water level in the pan constant. An inclined shaft 53 is journaled in brackets 54 and 55 supported on the pan and at its inner end has the windmill 56 secured thereto, this windmill being in position to be in the path of the air flowing through the space between the pan and the radiator structure on its way from one side of the radiator to the other side. The shaft also supports a centrifugal water thrower in the form of a disk 57 having vanes 58 thereon, this water thrower dipping into the water in the pan. The thrower is in such a position that when it is rotated during the passage of air through the windmill water particles will be thrown upwardly against the outgoing side of the radiator structure so that the air flowing through this side will pick up the water particles and vapor to be properly moistened before it is delivered into the room. An apron 59 is secured to the door 51 whose lower end engages with the top of the pan when the door is closed in order to return to the pan any water thrown against the front wall of the housing or the door or any water dripping down from the radiator structure.

Efficient moistening of the air is accomplished automatically. When the air from the outside flows directly into the room no moistening is usually required. However, when the air flows first through the radiator where heating thereof reduces the relative humidity, then its lost moisture must be replenished and as the windmill is driven in accordance with the amount of air flowing through the radiator the proper amount of moisture will be automatically delivered to the air under all conditions. The air also strikes the water in the pan which catches dust and dirt so that the air is cleaned.

I thus produce a very efficient heating and ventilating unit which on account of my improved form of radiator has much greater capacity than devices of the prior art. By means of the improved damper arrangement nice adjustment can be made for the volume of air delivered and for any desired ratio of cold air and heated air. Moistening of the air is accomplished automatically as required.

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

1. In a device of the class described, the combination of a housing having an air inlet and an air outlet, a blower within the housing, a radiator within the housing below said blower, a vertical wall dividing said radiator into two sides, means for causing the air from said blower to flow downwardly through one side of the radiator and upwardly through the other side thereof before it reaches said outlet.

2. In a device of the class described, the combination of a housing having an air inlet and an air outlet, a radiator within the housing having vertical passageways therethrough, and a damper positioned between said inlet and outlet and extending to said radiator for deflecting the air downwardly through one part of the radiator and upwardly through another part thereof before it reaches the outlet.

3. In a device of the class described, the combination of a housing having an air inlet and an air outlet, a blower in the upper part of said housing, a radiator in the housing below the blower, said radiator having vertical passageways, an adjustable damper extending upwardly from said radiator into said air outlet, said damper in one position causing all the air from the blower to flow downwardly through one part of the radiator and upwardly through another part thereof before it reaches the outlet.

4. In a device of the class described, the combination of a housing having an air inlet and an air outlet at its upper end, a blower chamber between said inlet and outlet and a blower therein for directing air downwardly, a radiator within the housing a distance below said blower, said radiator having vertical passageways therethrough, a damper hinged along the top of said radiator and extending into said outlet, said...
5 damper in one position causing all the air from the blower to travel downwardly through part of the radiator and upwardly through another part thereof before it reaches said outlet, and said damper in other positions causing all the air to flow directly from said blower through said outlet or permitting part of the air to flow from said blower through the outlet.

5 In a device of the class described, the combination of a housing having an air inlet and an air outlet, a blower in the upper part of said housing, a radiator structure within said housing below the blower, said radiator structure comprising a plurality of vertical sections separated to form passageways, a vertical wall dividing said radiator structure into two parts, and a deflecting wall extending from the radiator structure above said dividing wall and between the blower outlet and said air outlet for causing the air from the other part to flow downwardly through the passageways of one radiator structure and upwardly through the passageways of the other radiator structure before it reaches the air outlet.

6 In a device of the class described, the combination of a housing having an air inlet and an air outlet, a blower in the upper part of said housing, a radiator structure within said housing below the blower, said damper hinged along the top of the radiator structure at the dividing wall thereof and extending into said air outlet, said damper in one position causing all the air from said blower to travel downwardly through one part of the radiator structure and upwardly through the other part thereof before delivery through the air outlet, and said damper in other positions permitting part or all of the air from the blower to flow directly through said air outlet.

7 In a device of the class described, the combination of a housing having an air inlet and an air outlet at the upper end thereof, a blower in the upper end of said housing for receiving the incoming air and directing it downwardly, a radiator within the housing below said blower outlet, said radiator comprising a plurality of radiator sections, fins extending from adjacent sections into contact with each other to form a vertical wall for dividing the radiator vertically into two parts, and a damper hinged along the top of said radiator in line with said wall and extending into said air outlet, said damper in one position causing all the air from the blower to flow downwardly through one part of the radiator and upwardly through the other part of the radiator before it reaches the outlet, and said damper in other positions permitting part or all of the air from the blower to flow directly through the outlet.

8 In a device of the class described, the combination of a housing having an air inlet and an air outlet near its upper end, a blower chamber at the upper end of said housing and a blower therein, a radiator within the housing between the blower outlet and the air outlet, a damper adjustable to cause all the air from the blower to be heated by said radiator before delivery thereof through said outlet and adjustable to cause part or all of the air from the blower to flow directly through said air outlet.

9 In a device of the class described, the combination of a housing having an air inlet and an air outlet, a blower for blowing air from the inlet downwardly into the housing, a heat radiator within the housing, an intermediate blower to flow downwardly through the heater and upwardly through the blower outlet for heating the air before it reaches the air outlet, a water pan within the housing below said radiator, and means propelled by the air flow within said housing for throwing water from the pan against said radiator and into the path of the air flowing therethrough.

10 In a device of the class described, the combination of a housing having an air inlet and an air outlet, a blower for blowing air from the inlet downwardly into the housing, a heat radiator within the housing intermediate the lower end thereof and the blower outlet for heating the air before it reaches the air outlet, a water pan within the housing below said radiator, a windmill located in the path of the air flow through said housing to be rotated thereby, and means driven by said windmill to pick up water from said pan and throw it against said radiator to be vaporized for moistening the air before it is delivered from said air outlet.

11 In a device of the class described, the combination of a housing having an air inlet and an air outlet, a blower for blowing air downwardly into the housing, a radiator within the housing having vertical passages ways therethrough, means for causing the air from the blower to flow downwardly through one part of the radiator and upwardly through another part thereof before it reaches the outlet, a water pan within the housing below said radiator, a windmill below the radiator in the path of the air flowing from one part to the other thereof, and a disk rotated by said windmill, said disk being below the outlet for blowing the air from the outlet for the purpose of discharging water particles against the radiator where the water is vaporized and the air moistened before delivery from said air outlet.
12. In a device of the class described, the combination of a housing having an air inlet and an air outlet, a radiator within the housing below said inlet and outlet, a damper structure extending upwardly from the radiator into said outlet, said damper structure being adjustable to control the volume of flow through said outlet and being shiftable in said outlet to control the ratio of direct air flow and heated air flow through said outlet.

13. In a device of the class described, the combination of a housing having an air inlet and an air outlet, a radiator within said housing in the path of air flowing from said inlet to the outlet, two dampers extending from the radiator into said outlet, said dampers being relatively adjustable to control the area of said outlet and thereby the volume of flow therethrough, and said dampers being shiftable together in said outlet for controlling the ratio of direct air flow from the inlet to the outlet and heated air flow.

In witness whereof, I hereunto subscribe my name this 24th day of September, A. D., 1918.

WILFRED SHURTLEFF.