March 10, 1959 J. D. PIERCE 2,876,690

HEATING, COOLING AND VENTILATING SYSTEM

Filed Jan. 11, 1955 2 Sheets-Sheet 1

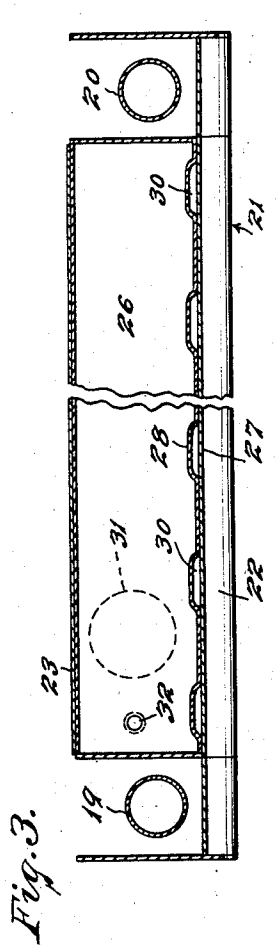


Fig. 3.

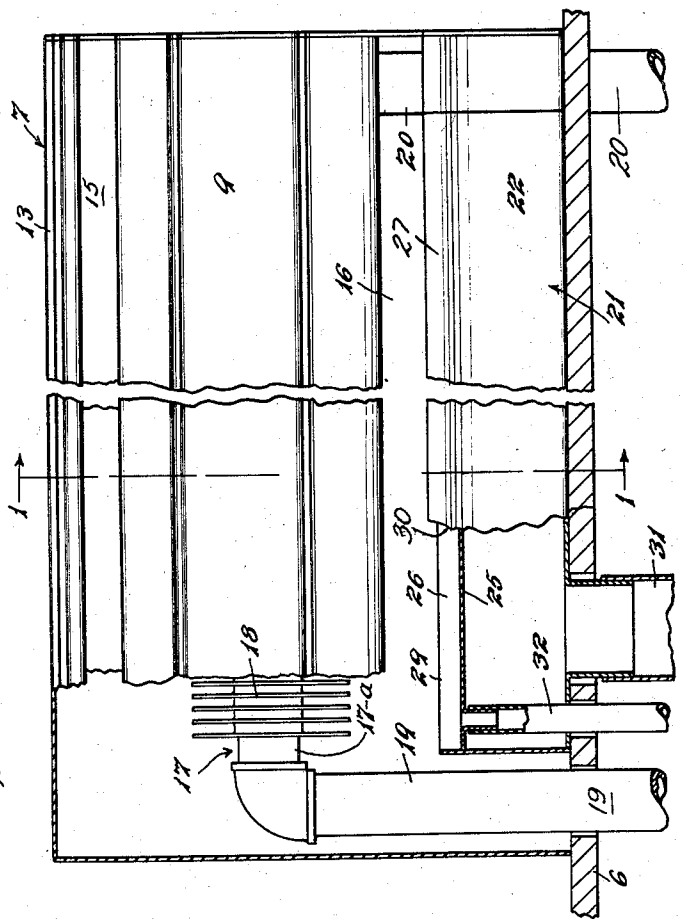


Fig. 2.

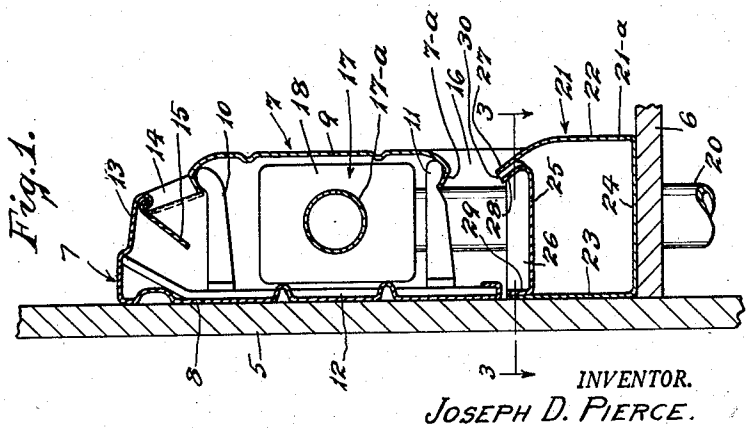


Fig. 1.

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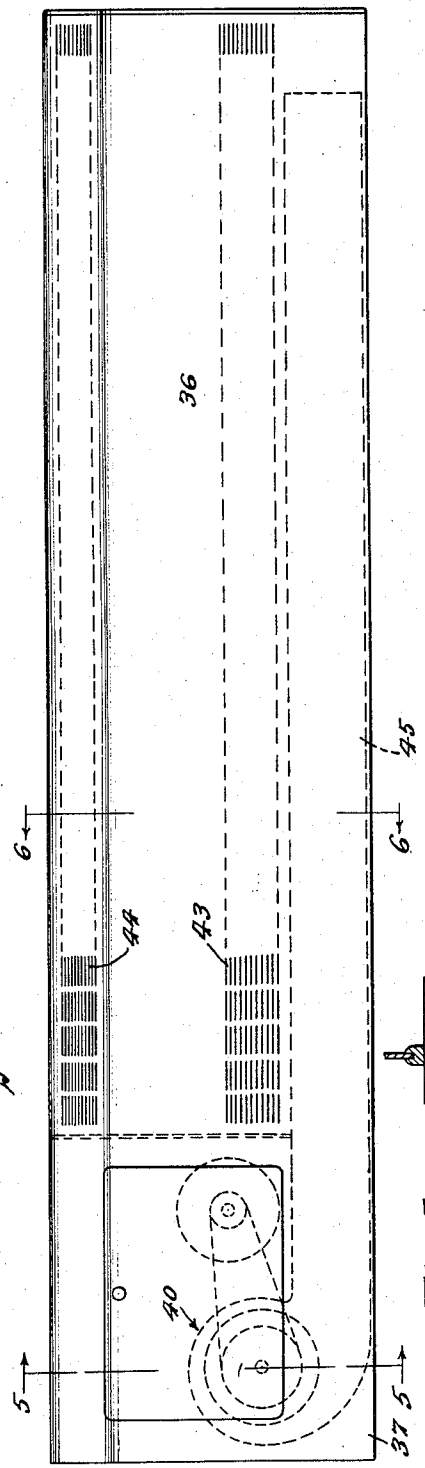


Fig. 4.

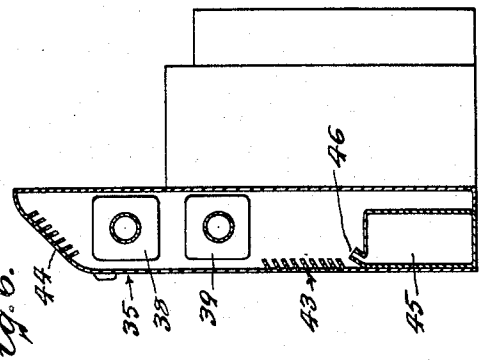


Fig. 6.

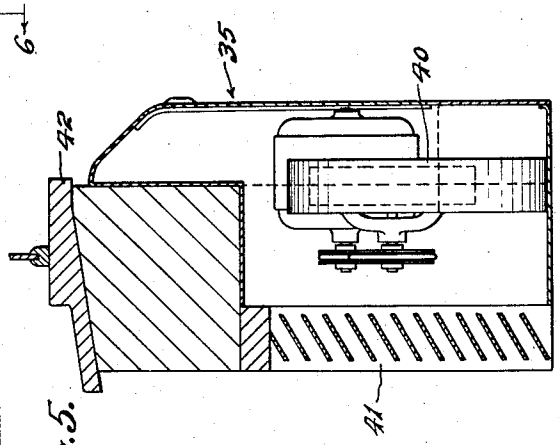


Fig. 5.

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HEATING, COOLING AND VENTILATING SYSTEM

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Application January 11, 1955, Serial No. 481,059

7 Claims. (Cl. 98—38)

This invention relates to a heating, cooling and ventilating system and more particularly to an air-conditioning system that is adapted for heating, cooling and ventalating space within a building or room; the said system being particularly designed to heat or cool, while at the same time ventilate, or to just ventilate.

It is an object of this invention to provide such a system which includes one or more air-conditioning units having a heating or cooling element in combination with means for blowing a controlled amount of fresh air over or through said element and thereby aspiring circulation of the interior room air through the said unit along with the fresh air.

A further object of this invention is the provision of such a system wherein there is included an element for draining off condensate when the system is used for cooling.

A still further object of this invention is to provide an air-conditioning unit for said system which is compact and attractive in design as well as economical to manufacture and highly efficient in its operation.

Further objects and advantages of this invention will be more clearly understood from the following description and from the accompanying drawings in which:

Fig. 1 is a sectional side view, on line 1—1 of Fig. 2, of an air-conditioning unit used in combination with my improved system.

Fig. 2 is a front view of said unit with parts thereof broken away and in section.

Fig. 3 is a sectional plan view of said unit on line 3—3 of Fig. 1.

Fig. 4 is an enlarged front view of a modified form of unit.

Fig. 5 is an enlarged sectional side view, on line 5—5 of Fig. 4, with parts being shown in elevation.

Fig. 6 is a sectional side view on line 6—6 of Fig. 4.

As shown in the drawings, the numeral 5 denotes a side wall of a room or building and 6 denotes the floor thereof.

As shown in Figs. 1, 2 and 3, this invention includes what may be termed an air-conditioning unit which is composed generally of an enclosure 7 having a back plate 8 that preferably fits against the wall 5, and a front plate or cover 9 which forms the upper portion of the front of said enclosure and is supported on suitable brackets 10 and 11 that are mounted upon a supporting bracket 12. The back plate 8 has a top portion 13 which extends laterally therefrom and is spaced from the top of the front plate 9 to provide an air outlet opening 14 that is controlled by means of a suitable damper or shutter 15 for regulating the flow of air through the said unit.

An inlet opening 16 is provided below the front plate 9 and a suitable heating or cooling element 17 is contained in said unit between the front plate 9 and the back plate 8 and supported therein by suitable brackets, not shown. The said element may be generally in the form of a heat-exchanger and includes a conductor pipe 17–*a* for a heat-transfer circulant, and a series of heat-transferring fins 18 for transferring heat to or from the pipe.

The said pipe 17 may be connected to a suitable source for a heating or cooling circulant by means of conductor pipes 19 and 20.

It is well known that in such forms of air-conditioning units air from the room is permitted to enter the unit through the inlet space 16, pass through the fins of the element 17, and then leave the unit through the discharge opening 14; thus the air of the room or space being conditioned is circulated through the said unit and repeatedly brought into contact with the heat-transfer fins 18.

In order to permit the use of such air-conditioning units in combination with heating, cooling and ventilating systems, I provide an air duct 21 that is preferably constructed of an elongated trough-shaped member 21–*a* having front, rear and bottom walls 22, 23 and 24, respectively, and a top wall 25 which is disposed below the upper edges of the said front and rear walls to provide, in the top of the duct, a drain trough 26 which is located below the element 17.

The upper edge portion 27 of the front wall 22 is bent inwardly at an angle, as clearly shown in Fig. 1, and the upper wall 25 of the said air duct has upstanding portions forming front and rear side walls 28 and 29, respectively, of the drain trough 26. The front side wall 28 runs parallel to and adjacent the upper edge portion 27 and is disposed at substantially the same angle and secured against the inner side of said portion 27 at spaced intervals, as shown in Fig. 3; the intermediate portions of said wall 29 being spaced from the portion 27, to provide, along the lower edge of the opening 16 a series of spaced air jets 30 which are adapted to discharge fresh air upwardly and inwardly into the said unit so as to aspirate the room air through the said unit and thereby induce circulation of the room air over the element 17.

In the form of the unit shown in Figs. 1 to 3, the said air duct 21 may be located upon the floor 6 and adjacent the wall 5 where it is disposed below and spaced from the upper front portion 9 so that the inlet opening 16 is provided and the front wall 22 of said duct is utilized to form the lower front portion of the enclosure.

In the form of air-conditioning unit just above described, the air is forced into the duct 21 by a suitable fan or blower drawing fresh air from the exterior of the building. The said fresh air is then discharged through the jets 30 and directed thereby inwardly and upwardly through the unit and over the element 17. The said jets of air will aspirate air from the room through the inlet opening 16, mixing it with the fresh air, and directing the mixed air over the said element and discharging it into the room through the outlet opening 14.

When the said unit is used for cooling, a cooling medium is circulated through the pipe 17–*a*; thus cooling the element 17. The fresh air supplied through the jets 30 will then aspirate room air and circulate it over the said cooled element and cool the mixed air in the same manner as it is heated when the said unit is used for heating purposes.

Any condensate formed upon the cooled element 17, by the cooling of the air brought into contact therewith, will drop from said element into the drain trough 26 from which the condensate will drain into the pipe 32 and be carried away thereby.

In the modified form of air-conditioning unit illustrated in Figs. 4 to 6, I provide a suitable enclosure 35 having a heating element section 36 and a blower section 37. Suitable heating elements 38 and 39 are mounted in the section 36 and a blower 40 is contained within the section 37 and adapted to draw fresh air, preferably through a grill 41, from the exterior of the building. The said unit is preferably installed under a window sill 42 of a building but may also be used in any other suitable location.

The front cover or wall of the section 35 is provided

with inlet louvers **43**, which are located below the heating elements **38** and **30**, and with outlet louvers **44** that are located above said heating elements.

A fresh air duct **45** is provided along the bottom of the enclosure and below the louvers **43** in the front wall. This fresh air duct has a series of spaced air jets **46** running along the upper front edge thereof and angled to direct air streams upwardly and inwardly past the inlet louvers **43**, so as to aspirate room air therethrough and re-circulate the mixed air over the heating elements **38** and **39** and through the discharge louvers **44**.

The operation of the said modified form of unit is the same as that above described for the form illustrated in Figs. 1 to 3 with the exception that the said modified unit is intended for heating and ventilating, or for ventilating only, and not for cooling and the drain trough **26** is therefore omitted.

It will be noted that the front plate **9** has a bottom flange **7–*a*** which extends inwardly and upwardly into the enclosure and thereby provides an air guide above the jet **27** which causes the opening **16** to operate as a venturi for drawing air into the inlet opening **16**.

It has been found by actual experience that very satisfactory results may be obtained by mixing fresh air with the room air in proportions of one cubic foot of fresh air to each cubic foot of room air that is moved through the conditioning unit. In the type illustrated in Figs. 4 to 6, which is particularly intended for use in school rooms, it is preferred to mix one cubic foot of fresh air to one and a half cubic feet of room air. In extremely cold weather, lesser amounts of fresh air may be supplied through the air jets in proportion to the amount of room air.

I claim:

1. In a heating and ventilating system for a building, a unit including an enclosure having inlet and outlet openings, a heat-exchanger between said openings, a fresh air duct communicating with the exterior of the building and having a front wall with an upper edge running along the bottom of the inlet opening, means for forcing air through said duct, and a series of jets disposed along said upper edge of the front wall and angled upwardly and inwardly for directing air from said duct past the inlet opening into said enclosure and over the heat-exchanger and through the outlet opening.

2. In a heating, ventilating and cooling system, an air-conditioning unit including an enclosure having a lower inlet opening, an upper outlet opening, a heat-exchanger between said openings, a duct running along the bottom of said unit below the said lower opening, means forming a drain trough in the top of said duct, and means forming an air jet located at the front upper edge of said duct and having side walls angled upwardly and inwardly for directing air from said duct inwardly past the inlet opening into said enclosure, over the said heat-exchanger and through the outlet opening.

3. An air-conditioning unit including an enclosure having a lower inlet opening and an upper outlet opening, a heat-exchanger element between said openings, an air duct running along the bottom of said unit below and at said inlet opening, means providing an air jet located adjacent the bottom of said lower opening and having side walls angled inwardly to direct air from said duct inwardly and upwardly past the said lower inlet opening into the enclosure and thereby aspirate air from the exterior of said unit and cause circulation thereof through said unit.

4. An air-conditioning unit including an enclosure having a front wall with a lower inlet opening and an upper outlet opening, a heat-exchange element between said openings, an air duct running along the bottom of said unit below said inlet opening and having air-discharge openings along the upper front edge thereof disposed at the bottom of the inlet opening; the walls of said air discharge opening being angled to direct air from said duct inwardly past the said inlet opening and thereby induce a flow of air through said inlet opening and cause circulation of the mixed air over the heat-exchanger and outwardly through the outlet opening.

5. An air-conditioning unit including an enclosure having a front wall with a lower inlet opening and an upper outlet opening, an air duct running along the bottom of the unit below said inlet opening and having a top wall and a front wall, the said top wall having upstanding side walls forming a drain trough running along the top of said duct, the front upstanding wall of the trough and the upper portion of the said front wall of the duct being spaced to form an air jet therebetween and angled inwardly for directing air from said duct inwardly and upwardly through the said enclosure.

6. An air-conditioning unit including an enclosure having a front wall with a lower inlet opening and an upper outlet opening, a heat-exchanger located between said openings, an air duct running along the bottom of said enclosure and having a front wall forming a front portion of the enclosure and a top wall with upstanding portions forming side walls for a drain trough running along the top of said duct; the front upstanding side wall of the drain trough and the upper edge portion of the front wall of the duct being adjacent the lower edge of the inlet opening and spaced for forming jets therebetween, the said jets being angled for directing air from said duct upwardly and inwardly into said enclosure and thereby causing aspiration of room air through the said inlet opening and re-circulation of the mixed air through said unit.

7. An air-conditioning unit including an enclosure having a top portion and an upper portion spaced from the said top portion and providing an air outlet opening therebetween, an air duct disposed below the said upper portion and spaced from the bottom thereof to provide an inlet opening therebetween, a drain trough in the top of said air duct having upstanding side wall portions, the side wall portion of said trough and the upper edge portion of the front wall of the duct adjacent the inlet opening being angled inwardly and spaced to provide an air jet therebetween for directing air from said duct upwardly and inwardly past the said inlet opening and into the enclosure.

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