June 6, 1939. A. W. LUNDSTRUM 2,160,883

CIRCULATING SPACE HEATER AND VENTING MEANS THEREFOR

Filed April 6, 1936 3 Sheets-Sheet 1

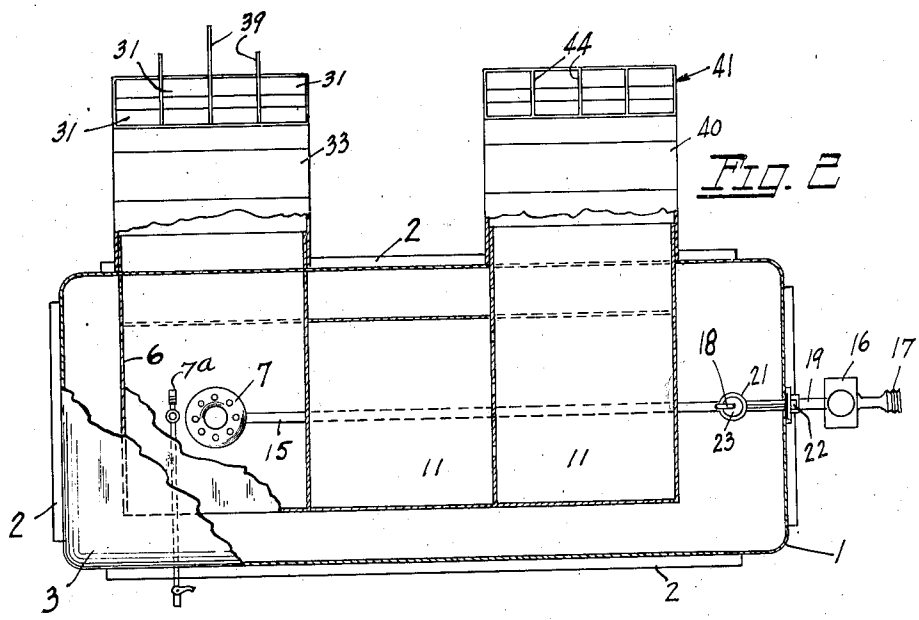

FIG. 2

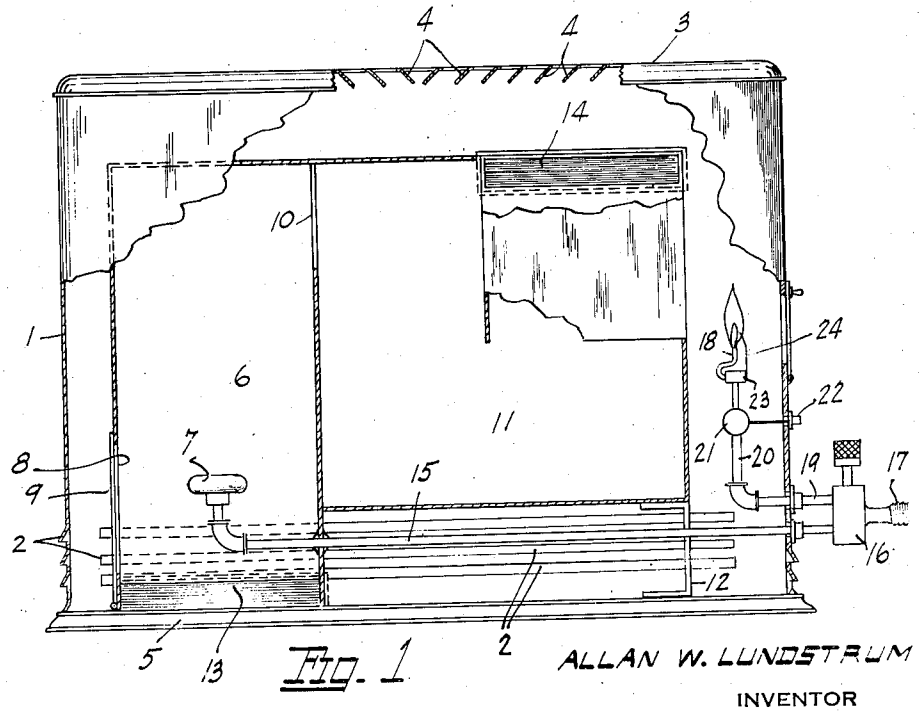

FIG. 1

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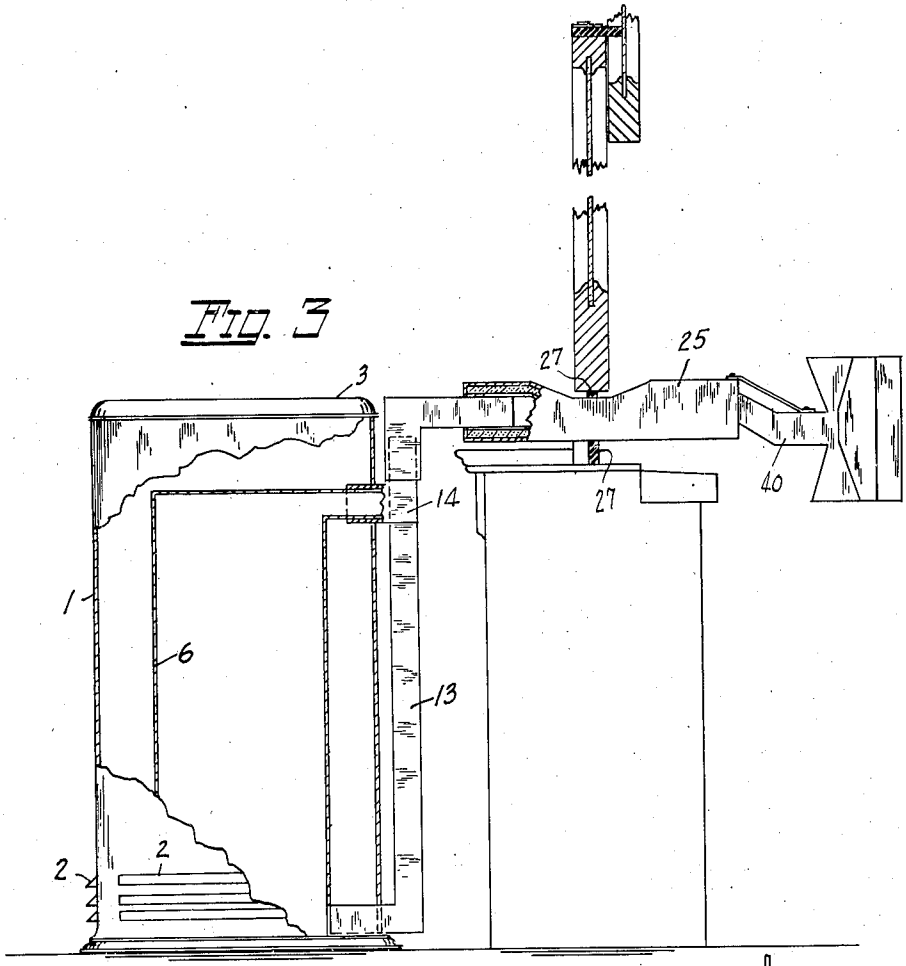

FIG. 3

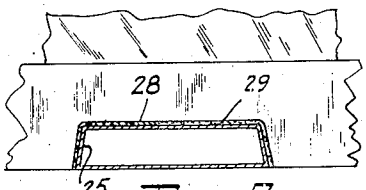

FIG. 5

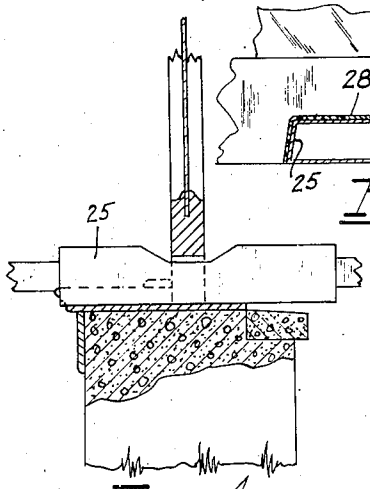

FIG. 4

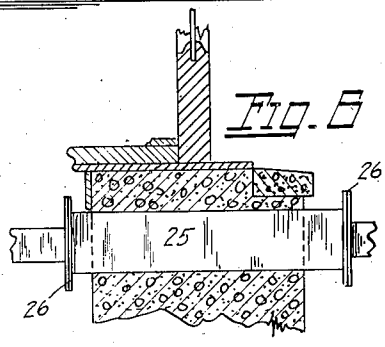

FIG. 6

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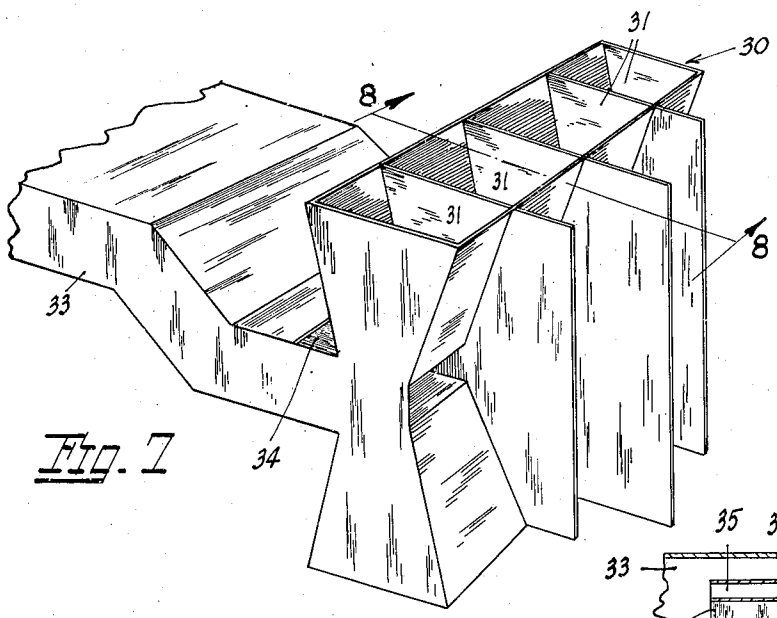

Fig. 7

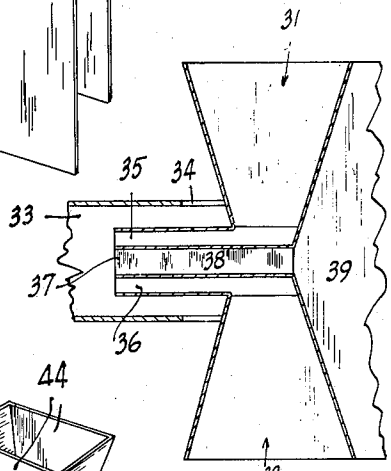

Fig. 8

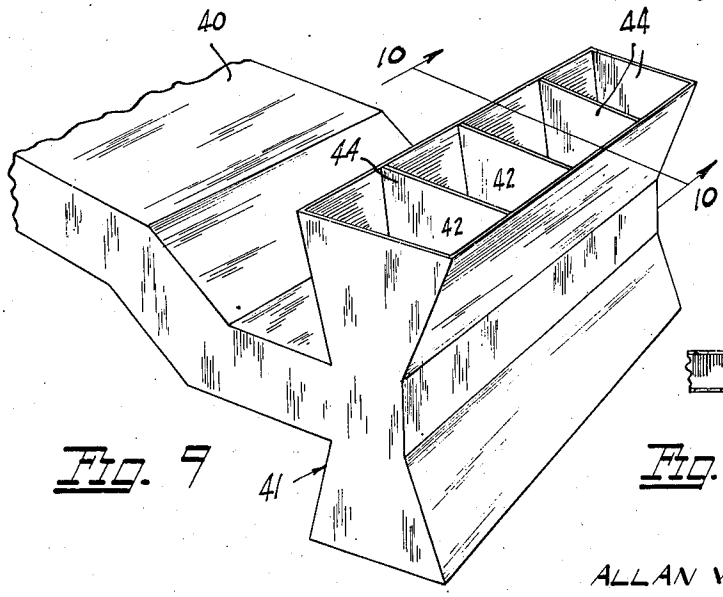

Fig. 9

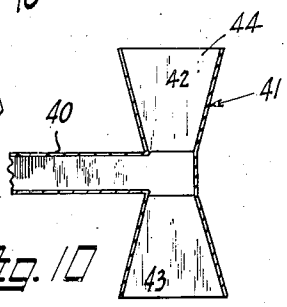

Fig. 10

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UNITED STATES PATENT OFFICE

2,160,883

CIRCULATING SPACE HEATER AND VENTING MEANS THEREFOR

Allan W. Lundstrum, Portland, Oreg.

Application April 6, 1936, Serial No. 72,900

5 Claims. (Cl. 126—85)

This invention is directed to circulating space heaters and more particularly to the gas fired type. One of the principal objects of the invention is the provision of air circulating means associated with the heater for producing a uni-directional draft through the air intake and flue passages thereof, under any and all wind conditions existing on the exterior of the space or building within which the heater is disposed. Another important object of the air circulating means is to prevent a reversal of air flow therethrough when a change occurs in the direction of air flow or wind conditions on the exterior of the building. An intake hood associated with the air intake passage is so designed that any air current impinging upon it from any direction, creates a pressure in the air intake passage. An exhaust hood associated with the flue passage is designed so that any air current impinging upon it creates a vacuum in the flue passage. Both of said hoods are so constructed that they may be mounted close together in a single unit without any danger of the flue gases entering the intake passage which, of course, would cause re-circulation of flue gases through the heater and ultimate smothering of the fire or flame in the combustion chamber.

Both of said intake and exhaust hoods form the terminal ends of passageways in open communication at one of their ends with the interior of the heater. Their opposite ends extend through a wall or window of a building to the exterior thereof. This particular method of extending the intake and exhaust passages through the wall of the building, eliminates the necessity of chimneys or smoke stacks which must necessarily extend above the highest point of a building to eliminate back drafts which interfere with proper combustion of fuels.

Another object of the invention is its particular construction to prevent gas or the products of combustion from escaping into the room. The combustion chamber of the heater, as well as its companion chambers, are entirely sealed with respect to the interior of the room and their only openings are through the intake and flue passages to the exterior of the room or building.

The heater proper is embraced within a cabinet or housing of any approved design, which is provided with suitable louvers through its side and end walls, and a series of heat deflecting or spreading louvers through the upper wall thereof.

Although I show and describe a gas fired heater, it is to be understood that the invention is applicable to any combustion chamber and particularly to those using liquid and gaseous fuels. Moreover, it is to be understood that the combustion chamber may be disposed anywhere and may be applied to a wide variety of uses where a heating chamber that is sealed with respect to the work being dealt with, is required, for example; the combustion chamber or heating chamber may be submerged in a vat, in dry rooms, in garages, and in numerous other places where an open flame would be hazardous. The invention is particularly adapted to the foregoing uses since the combustion chamber is entirely sealed, and its only openings are through the intake and flue passages which extend through the wall of the building to the exterior thereof and into open communication with the atmosphere.

These and other objects will appear as my invention is more fully hereinafter described in the following specification, illustrated in the accompanying drawings and finally pointed out in the appended claims.

In the drawings:

Figure 1 is a side elevation of my new and improved heater and cabinet with parts broken away for convenience of illustration.

Figure 2 is a top plan view of Figure 1, and also with parts broken away.

Figure 3 is an end elevation of the heater, with parts broken away, and showing the air intake and flue passages extending to the exterior of a building.

Figure 4 illustrates a semi-permanent installation of the air intake and venting system.

Figure 5 is a fragmentary detail view of a window frame showing a typical means of accommodating both the air intake and venting means.

Figure 6 is a fragmentary sectional view of a wall showing a permanent installation of the air intake and flue passages.

Figure 7 is a perspective view of the air intake hood.

Figure 8 is a sectional view taken on the line 8—8 of Figure 7.

Figure 9 is a perspective view of the venting hood for the flue passage.

Figure 10 is a sectional view taken on the line 10—10 of Figure 9.

Referring now more particularly to the drawings:

The main body of the heater consists of a cabinet or housing 1 of any suitable design and having fixed louvers 2 in its side and end walls at any desired location, but preferably near the bottom. The top wall or cover 3 is provided with suitable openings with which are associated a plurality of

deflecting vanes 4 arranged, as shown, to deflect the heat in diverging directions. The base 5 of the cabinet is preferably hollow so that any approved form of insulating material may be interposed between the floor and the bottom wall of the cabinet, or the base itself may be made of heat insulating material.

Within the cabinet 1 and in spaced relation with the side walls thereof, I provide a combustion chamber 6 provided with any approved type of burner 7. One wall of the combustion chamber is provided with an access opening 8 and a cover plate 9 therefor. The opposite wall of the combustion chamber is formed with an opening 10 to permit passage of heat into a companion chamber 11. The chamber 11 is preferably elevated from the floor of the cabinet by any suitable means such, for instance, as the leg or support 12.

The combustion chamber is provided with an air intake tube 13 in open communication at one of its ends with the interior of the combustion chamber at its lower end. The tube 13 extends upwardly along the back of the cabinet and is adjustably connected with the terminal end of the air intake means to be more fully hereinafter described. The chamber 11 is provided with a venting tube or flue passage 14 extending outwardly from the upper end of the cabinet, and adjustably connecting with an exhausting means hereinafter referred to. It is desirable to have both of these elements adjustably connected with the intake and exhaust ducts, so that window sills of various heights and walls of various thicknesses may be dealt with conveniently when installing the apparatus.

The burner 7 within the combustion chamber is supplied with gas through a pipe 15 which connects with a main and throttling valve 16 connected as at 17 with a main source of supply. The burner 7 is provided with any conventional type of flint lighter 7A, as shown, for lighting the same without the necessity of opening the cover plate 9.

Within the air space surrounding the cabinet 11, I provide a humidifier in the form of a continually burning jet 18 supplied with gas from the valve 16 through suitable pipes 19 and 20 which direct the supply of gas through a manually controlled valve 21, having an actuating knob 22 disposed on the exterior of the cabinet. The supply of gas to the jet 18 passes through a thermostatically actuated safety valve 23 adapted to automatically turn the gas off when the flame is extinguished. In other words, the cooling of the metal strip 24 will cause the valve 23 to close, and thereby prevent escapement of unburned gases.

Humidification is accomplished by the water vapor which results from the combustion of hydrogen in the fuel supplied to the jet 18. The amount of water vapor necessary for the comfortable humidification of any space is roughly proportional to the amount of heat necessary to be supplied to that same space for human comfort. Therefore, the valve 16 is provided with two separate orifices for the purpose of supplying proportional amounts of gas to the humidifying jet 18 and the burner 7.

The outer ends of the air intake and flue tubes are each connected with insulated tubes 25 adapted to pass beneath the lowermost edge of a window sash, when temporarily installed, or to be embraced by the sash, as shown in Figures 4 and 5, when installed in a semi-permanent manner. When permanently installed, the tubes extend entirely through the wall as shown in Figure 6, and are provided with coupling flanges 26 to accommodate the flanged ends of the air intake and flue tubes.

As shown in Figure 3, the tube 25 passes beneath the window sash which is elevated sufficiently to accommodate the tube and a suitable thickness of heat insulating material 27, which also serves to seal the opening beneath the window.

In the semi-permanent installation, the window sash is cut out or notched, as at 28, and provided with any suitable packing or insulating material 29 to snugly embrace the tube 25. In this particular installation, the side walls of the tube and the notch are tapered, as shown, to produce a tightly sealed engagement between the two.

Although I have shown a separate tube for the air intake and the flue, it is to be understood that a single tube, suitably partitioned into two channels or passage-ways, could accomplish the same result and, in some installations I may prefer to use this type of divided tube to conserve space or to fit certain structural conditions.

The air intake hood, shown in Figures 7 and 8, consists of a hollow body member, generally indicated at 30 and provided with a series of upper compartments 31 and a corresponding number of lower compartments 32. Both series of compartments are arranged vertically and converge toward the center section of the hood. The hood connects with and is supported by one end of a tube 33, whose opposite end connects with the tube 25 for communication with the interior of the heater, as aforesaid. An air opening 34 is provided on the upper and lower walls of the tube adjacent its point of connection with the hood. The inner ends of each of the upper and lower compartments are in open communication with horizontal air ducts 35 and 36 extending into the tube 33. An intermediate duct 37 is formed by the space between the ducts 35 and 36. Each intermediate duct is separated from the one adjoining by a wall 39, which is formed integral with a straightening vane 39. A plurality of straightening vanes are provided which extend outwardly from the hood, as shown, and are arranged in suitable spaced relation with respect to each other. Their object is to direct air currents, impinging upon them from any lateral direction, directly into the air duct 37, thence through the tube 33 and into the combustion chamber. The partition walls between the compartments 31 likewise straighten air currents impinging upon them and likewise direct the air currents through the air ducts 35 and 36 and through the tube 33. Air currents impinging upon the rear face or faces of the hood are also directed through the tube 33 by passing through the air spaces 34 provided for that purpose. The tube 33 is inclined downwardly for a portion of its length to prevent water, and other foreign matter from entering the tube and, subsequently, the combustion chamber. A suitable damper may be provided at any convenient point within the tube 13 to regulate the amount of air entering the combustion chamber for proper combustion.

The exhaust hood, shown in Figures 9 and 10, connects with and is supported by a tube 40 which is in open communication with the other of the tubes 25, as aforesaid. The tube 40 is also formed with an inclined portion to prevent foreign matter from entering the flue system. The hood consists of a venturi generally indicated at 41

and comprises a series of upper compartments 42, lower compartments 43 arranged vertically and in open communication with each other and with the tube 40. Each compartment is separated by straightening vanes 44 adapted to straighten and direct impinging air currents from any direction, vertically or horizontally, directly through the body member, and in so doing, create a suction or vacuum within the entire flue passage. From the foregoing, it will be seen that the air intake hood permits air passage into the combustion chamber at all times and under all conditions, and the exhaust hood, at the same time, permits a free exhaust of the flue gases, and that both will cooperate in causing a uni-directional flow of air through the combustion chamber. Regardless of the direction from which the exterior air currents strike the hoods, or the angle at which they impinge, the circulation of air through the air intake and flue can only be in one direction, and at no time can it be reversed due to a change in direction of the impinging air currents. This feature is of extreme importance since any back drafts created in the air circulating system would instantly stifle the burner in the combustion chamber.

It will be noted that the flue gases exhaust to the atmosphere either through the extreme upper or lower ends of the flue hood 41, and that the major quantities of air entering the air intake, as a result of a cross wind which might tend to carry the flue gases toward the air intake, do so at the center section of the hood. The important reason for this particular arrangement is so that, in the event of a cross wind flowing from the exhaust hood toward the intake hood, it will not direct the flue gases into the air intake. Obviously, the flue gases enter a stratum of air which is sufficiently removed from that entering the air intake, so that the two are prevented from co-mingling, and the same condition applies, regardless of the angle of approach of the air current. For instance, if the air current is approaching the top ends of both hoods, for example, in an angular and downward direction, the air strata will be divided; one part entering the compartments 31 of the air intake, and the other part entering the upper compartments 42 of the flue hood. The flue gases will then be driven downwardly and out through the bottom compartments of the flue hood, and away from the stratum, or path of air, entering the upper compartments of the air intake hood, and the same division of air strata will occur regardless of the direction of wind or the angle at which it impinges both hoods.

Thus, the two cooperating hoods perform three separate and highly important functions, namely, to produce a uni-directional flow of air through the air circulating system under all wind conditions of the atmosphere; to prevent any back drafts in the circulating system, and at the same time offer no interference whatever to the system producing its own draft under normal conditions.

Having thus described the invention, what I claim as new and desire to protect by Letters Patent is:

1. In a heater having a cabinet and a combustion chamber sealed with respect to the interior of the cabinet, the combination of an air intake duct and a flue duct both in communication with the combustion chamber and the atmosphere, baffle means formed on the outer ends of the ducts for directing air currents impinging thereon into the intake duct and out the flue duct in one direction.

2. An air intake duct and an exhaust duct in open communication at one of their ends with the interior of a cabinet and at their outer ends with the atmosphere, baffle means formed on the outer ends of the ducts for directing air currents impinging thereon into the air duct and out the exhaust duct in one direction, said means comprising air deflecting baffle means formed on the air intake duct and Venturi baffle means formed on the exhaust duct.

3. In combination with a heating device having a closed combustion chamber, air-intake and gas-exhaust ducts communicating with said chamber and arranged to extend exterior of a space to be heated, baffle means at the exterior ends of each of said ducts to cause flow into the air-intake duct and out of the exhaust duct when the wind is blowing from any direction, said baffle means being constructed to prevent admission of gases to the air-intake when the wind is blowing in a direction from the gas-exhaust duct to the air-intake duct.

4. In a heating device having a closed combustion chamber, the combination of air-intake and gas-exhaust ducts communicating with said chamber and terminating exterior of a space to be heated in horizontal alignment with each other, baffle means at the exterior ends of each of said ducts to cause flow into the air-intake duct and out of the exhaust duct when the wind is blowing from any direction, said baffle means being constructed to prevent admission of gases to the air-intake when the wind is blowing in a direction from the gas-exhaust duct to the air-intake duct.

5. In combination with a heating device having a closed combustion chamber, air-intake and gas-exhaust ducts communicating with said chamber and arranged to extend exterior of a space to be heated, baffle means at the exterior ends of each of said ducts to cause flow into the air-intake duct and out of the exhaust duct when the wind is blowing from any direction, said baffle means comprising a series of compartments of Venturi formation in communication with said ducts, and one of said baffle means including a plurality of straightening vanes.

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