Nov. 2, 1943. W. A. L. BEYER 2,333,146

HEATING AND VENTILATING FIREPLACE SYSTEM

Filed April 28, 1941 2 Sheets-Sheet 1

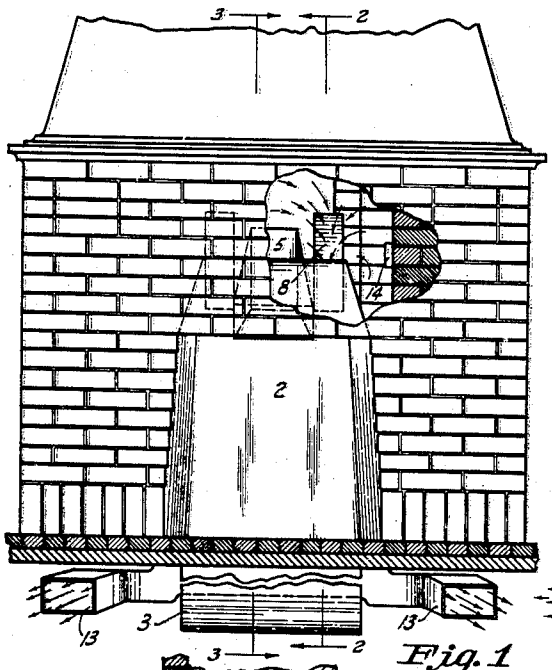


Fig. 1

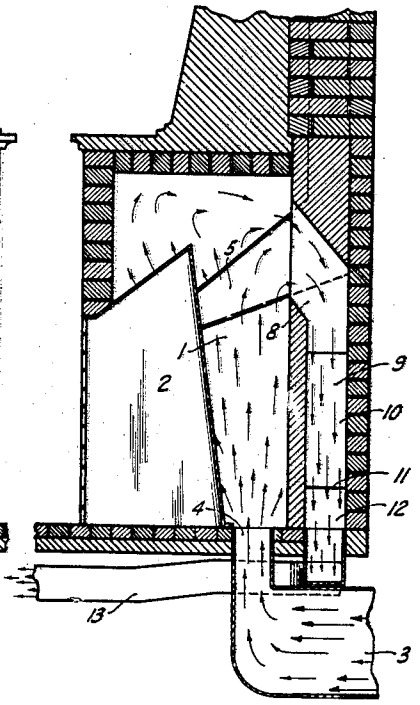


Fig. 2

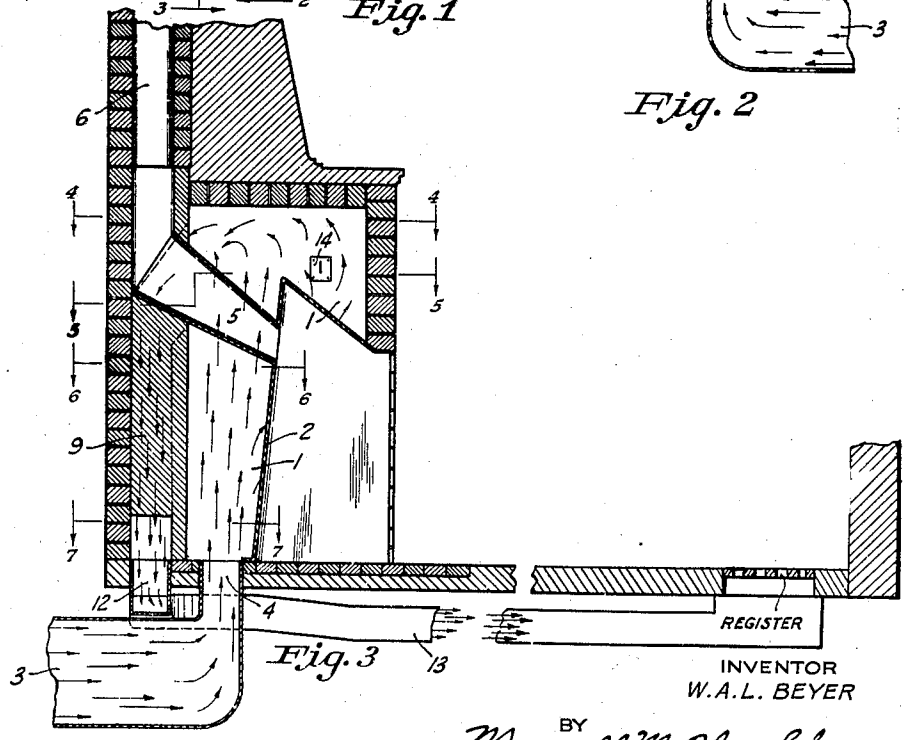


Fig. 3

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HEATING AND VENTILATING FIREPLACE SYSTEM

Filed April 28, 1941 2 Sheets-Sheet 2

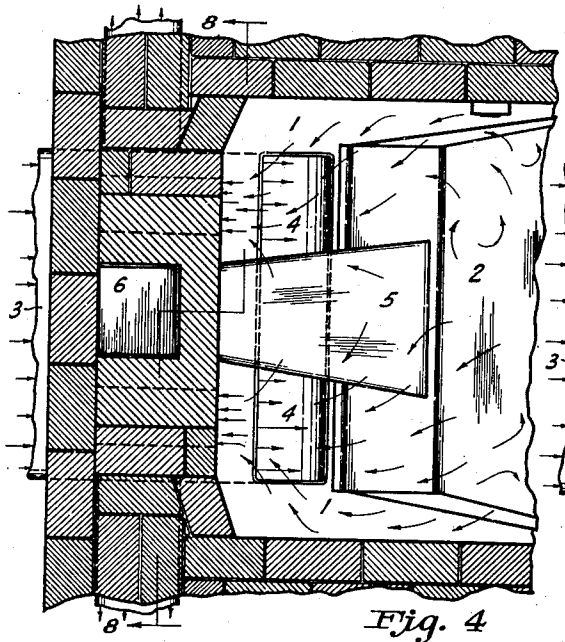


Fig. 4

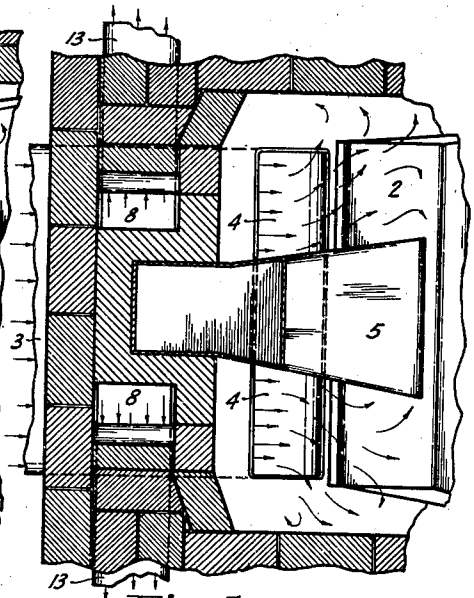


Fig. 5

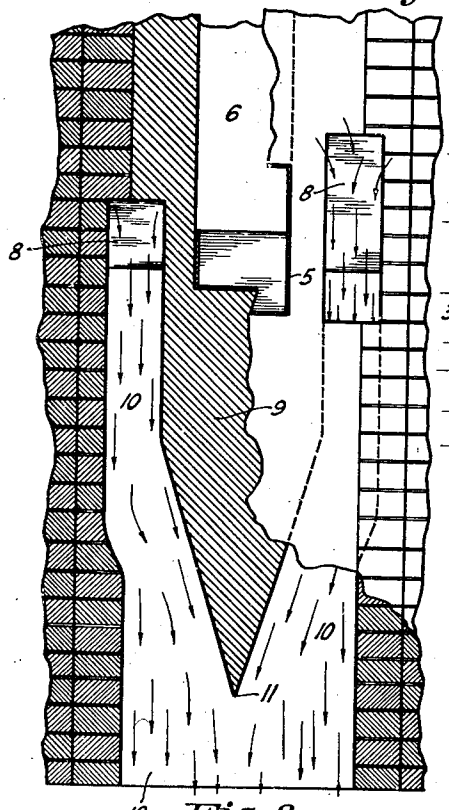


Fig. 8

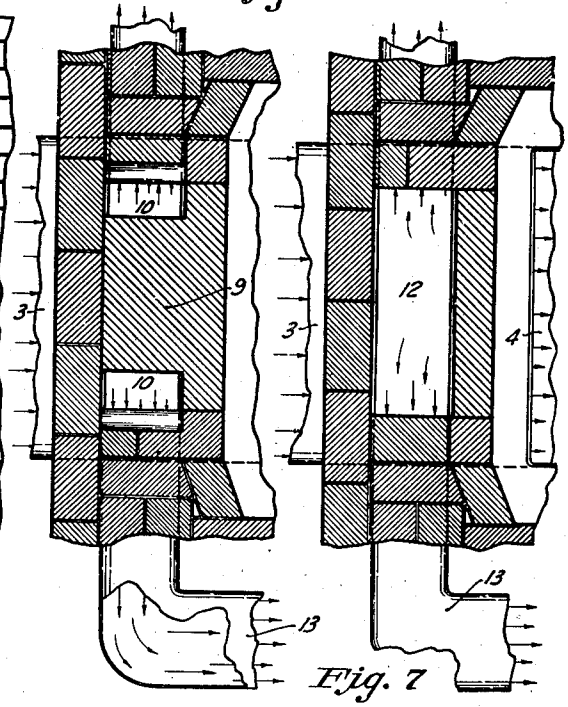


Fig. 6

Fig. 7

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HEATING AND VENTILATING FIREPLACE SYSTEM

William A. L. Beyer, Normal, Ill.

Application April 28, 1941, Serial No. 390,835

1 Claim. (Cl. 126—121)

My present invention is an improvement in a heating system whereby the fuel in a fireplace is more efficiently utilized, the stale air in the room being continually renewed by the introduction of fresh, outside, warmed air, the temperature equalized in all parts of the room, and the temperature equalized from times of brisk fire to the period when the fire dies down. It is a well known fact that, with a good fire burning in a fireplace, the heat radiated from the fireplace is so strong that it is not comfortable to stand or sit near the fireplace because that part of the body subjected to the directly radiated heat is uncomfortably warm while the opposite side of the body may still be chilly. However, the reason for this does not appear to have been well understood. Although there may be several factors contributing to this condition, the major factor and the one I desire to emphasize is the fact that, as the fire draws air out of the room to support combustion, the outside air pressure forces cold air into the room at any available opening, or, to state it another way, as a chimney draft tends to create a partial vacuum in the room, cold outside air is being drawn in around doors and windows. In all other fireplaces, as much cold air must come into a room which is provided with a fireplace as is used in the combustion chamber and discharged up the chimney. This cold air moving toward the fire and out through the chimney is the cause of the unfortunate chilly feeling at one's back in front of a fireplace.

If a sufficient amount of air to support combustion is given an easy, relatively frictionless access to the room, the air will use this channel and thus prevent the entrance of air through more restricted openings around doors and windows, and, if this air is heated on its way through the channel and is then introduced into the room at the proper place, the entrance of raw, cold air will be forestalled and thus the bane of fireplace heating, namely, alternate roasting and chilling near the fire, will be obviated.

My invention provides for an automatic, steady flow of fresh, outside, heat-conditioned air across the entire room, then into and out through the fireplace. This automatic action is brought about by the free flow of outside air through a duct provided therefor into the partial vacuum created by the draft in the chimney. My invention further provides means for equalizing the temperature and comfort conditions for all parts of the room from times of brisk fire to times of low fire conditions. In all other fireplaces, it is impossible to close the chimney flue damper until the fire is completely out. Earlier closing results in the room being filled with fumes or smoke. This results in rapid chilling of the room, for, as long as the chimney draft is open, it continues to draw cold air into the room. In my fireplace, this is obviated as all air which enters the room comes through the heated duct, and thus the room receives as much heated air as is dissipated by the air flowing out through the chimney. In my fireplace, with a big, brisk fire, the draft of the chimney is strong. The heating chamber warms the inflowing air quickly and it flows into the room rapidly to replace the air drawn out by the strong chimney draft. As the fire dies down, the draft of the chimney lessens, the warm air is drawn in more slowly, and even so, the continued entrance of such air forestalls entrance of outside, cold air.

Among the objects, therefore, of this invention are the following:

To supply a continuous flow of conditioned, fresh, outside air, sufficient to supply the entire demand of the fire in the fireplace;

To equalize, as nearly as possible, the temperature and comfort conditions in all parts of the room;

To conserve fuel;

To check the inflow of cold air through uncontrolled openings;

To provide a substantially frictionless opening for the admission of fresh air to supply the demands of a fire in the fireplace;

To eliminate smoking up of a room caused by low chimneys or adverse wind conditions;

To provide good draft conditions for a fireplace fire; and

Such further objects, advantages, and capabilities as will hereafter appear and as are inherent in the construction disclosed herein.

My invention further resides in the combination, construction, and arrangement of parts illustrated in the accompanying drawings and, while I have shown therein what is now regarded as the preferred embodiment of this invention, I desire the same to be understood as illustrative only and not to be interpreted in a limiting sense.

In the drawings annexed hereto and forming a part hereof,

Fig. 1 represents a front elevation of a fireplace, partly broken away to show internal construction;

Fig. 2 represents a vertical section substantially along the plane indicated by the line 2—2, Fig. 1;

Fig. 3 represents a vertical section substantially along the plane indicated by the line 3—3, Fig. 1;

Figs. 4, 5, 6, and 7 represent transverse sections substantially along the planes indicated by the lines 4—4, 5—5, 6—6, and 7—7, respectively, in Fig. 3; and

Fig. 8 represents a vertical section substantially along the broken plane indicated by the line 8—8, Fig. 4.

Reference will now be made in greater detail to the annexed drawings for a more complete dis-

closure of this invention. According to my invention, there is mounted within the fireplace opening 1 a heavy metal firebox 2 in which is customarily located a grate in which the fire is kept burning. This opening 1 constitutes an enlargement at the inner end of the duct 3. In the present drawings, the grate is not shown, since it is conventional. As is clear from the drawings, the walls of the firebox are sloping to insure the least possible resistance to the flow of air entering at 3 from an outside source, preferably from outside the house. I consider it desirable to have a box in the foundation wall of the house and to have a grating over the outside of this box to prevent, as far as possible, entrance of foreign objects. This is not regarded as involving invention and is therefore not disclosed. The air flowing through the admission pipe 3 flows upwardly through the floor and is admitted at 4 into the chamber 1 behind the firebox 2. The air flowing upwardly around the sides of the firebox, in contact with the walls thereof, and the walls of the flue 5, leading from the firebox 2 to the chimney, is heated in the course of its travel.

As is clear from Fig. 3, the flue gases pass into and upwardly through the chimney opening 6 to escape into the air. The air entering at 3 flows upwardly, then laterally and downwardly through the openings 8, shown most clearly in Figs. 5 and 8. This heated air passes downwardly from the openings 8 upon opposite sides of the heat-absorbing body 9, preferably made of cast metal. The two openings through which the heated air passes are indicated in Fig. 8 at 10. These two channels combine at the lower end of the body 9, as shown at 11, to form a single air channel 12 from which lead the two air-distributing conduits 13, as shown most clearly on Sheet I of the drawings. It is of course possible to use one or more of these air-ducts 13, and I therefore do not wish to be limited to any particular number or size. The one essential thing is that this duct or these ducts shall be as large and straight as convenient in order to reduce to a minimum the amount of friction which the air encounters. These air-ducts may lead to any part of the room but they preferably carry the air to a floor register in a remote part where the temperature is likely to be the lowest in the room. It is important that the air-carrying conduits shall be large to reduce to a minimum the skin friction. In reality, the fireplace opening 1 constitutes an enlargement of the duct comprising the parts 3, 1, 8, 13, and it is in this enlargement that the heating of the air takes place.

The walls of the firebox 2 are inclined in order to give better heat-exchange contact between the fire and the metal so as to produce a greater amount of heat transfer from the firebox to the air surrounding the same. Also, as is most apparent from Figs. 2 and 3, this results in an increase in the cross-section of the space surrounding the firebox, the farther from the floor a section is taken. This provides for the expansion of the air as it is heated and rises toward the top of the heating chamber. It also decreases the skin friction between the air and the surface of the firebox. Friction is also reduced by eliminating, as far as possible, sharp turns in the channels which the air must travel.

In Fig. 9 there is shown a structure in which a thimble 5*a* and a sleeve 5*b* replace the flue 5 of the structure described above. The thimble 5*a* may be either integral with the wall of the firebox 2 or may be made separately therefrom and secured thereto. Preferably the sleeve 5*b* is cast integral with the metal block 9, and the opening therein is made of a size and shape to closely receive the thimble 5*a* so as to reduce to a minimum the leakage of air or smoke between the parts 5*a* and 5*b*. Making the sleeve integral with the cast metal block and of greater thickness than the flue 5, described above, will tend to increase the latent heating capacity of the metal block after the fire goes out, thus prolonging the period of time when heated fresh air will be circulated through the fireplace and delivered to the room.

As will be readily recognized, the ordinary fireplace radiates heat only from the front, a large part of the heat generated by the fire being wasted in the gaseous products of combustion which go up the chimney without being utilized in any way. On the contrary, in this construction, a large percentage of the liberated heat, other than that which is radiated to the room, is absorbed by the metal and brick heat-storage material, and then this latent heat is transmitted to the air moving through the air channels to be delivered to the room. This air, coming into and moving through the heating chamber and conduits, keeps the cold air from coming in around doors and windows and, in this way, also, tends to increase the efficiency of the apparatus. This construction has several heat-radiating surfaces and this, too, tends to increase efficiency.

Since dampers for controlling the flow of heated air and products of combustion are conventional, I have omitted a showing of any such in the present drawings. Inasmuch as sizes and proportions, as well as the number and size of heat-distributing pipes may vary considerably, it will be understood that I do not expect to be limited to the specific details shown, and, also, it is of course understood that the specific description of structure set forth above may be departed from without departing from the spirit of my invention as set forth in this specification and the appended claim.

Having now described my invention, I claim:

In a space heating and ventilating system, a duct leading from an external source of fresh air to the space to be heated, said duct having an enlargement open at one side for the reception of a fire-box, a fire-box set into said enlargement and having its top, back, and lateral walls spaced from the walls of the duct sufficiently to permit free circulation of air through the duct, around the fire-box, the opening of the entrance part of the duct into the enlargement being located at the bottom of the enlargement and the exit from said enlargement being at the top part thereof, and the walls of the fire-box being sloped to increase from the bottom upwardly the cross-sectional area of the space between the fire-box and the duct walls, the part of the duct leading from said enlargement terminating in an exit into the space to be heated at a point in said space remote from said fire-box and at a level substantially that of the floor of the space being heated.

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