

April 5, 1955

H. T. WRIGHT

2,705,488

FIREPLACE HEAT EXCHANGER

Filed July 7, 1949

4 Sheets-Sheet 1

Fig. 1.

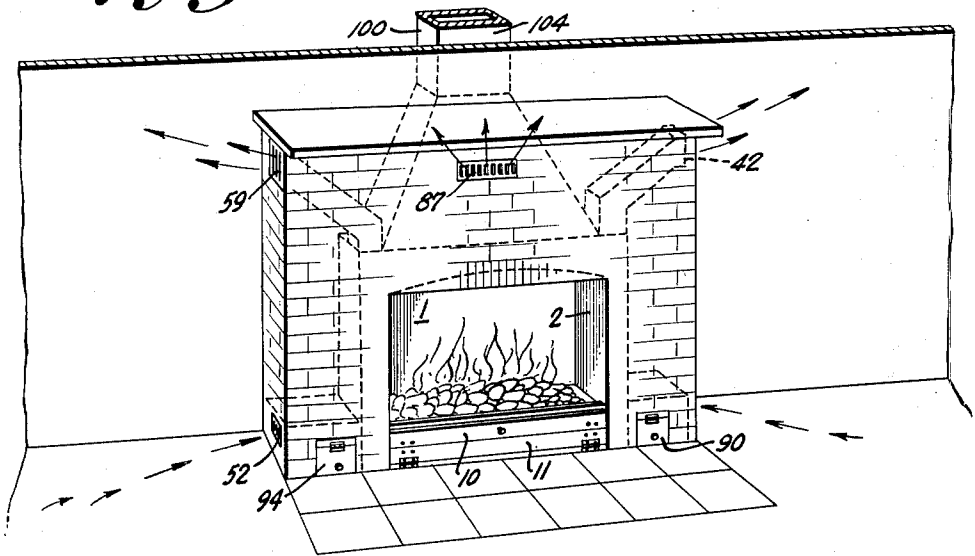


Fig. 5.

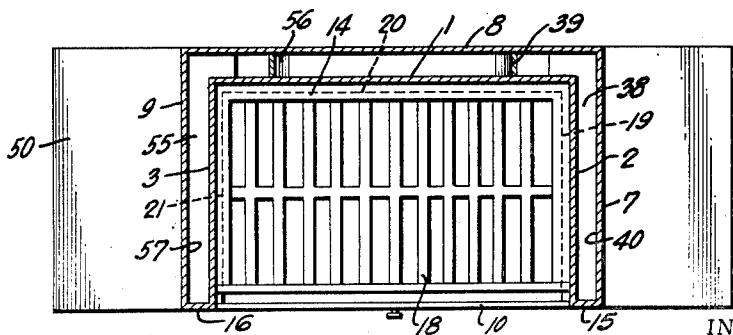
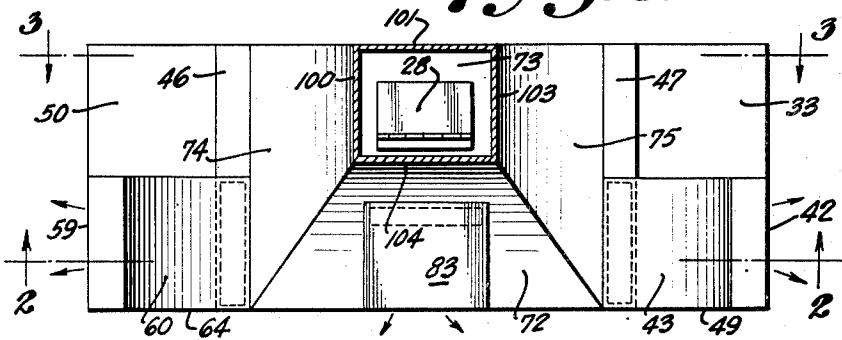


Fig. 6.

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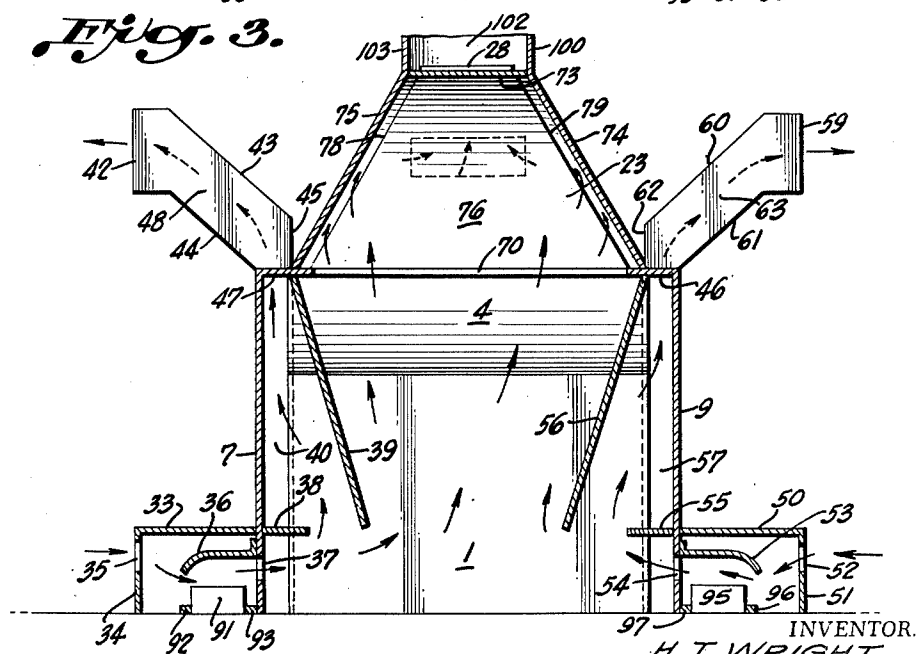
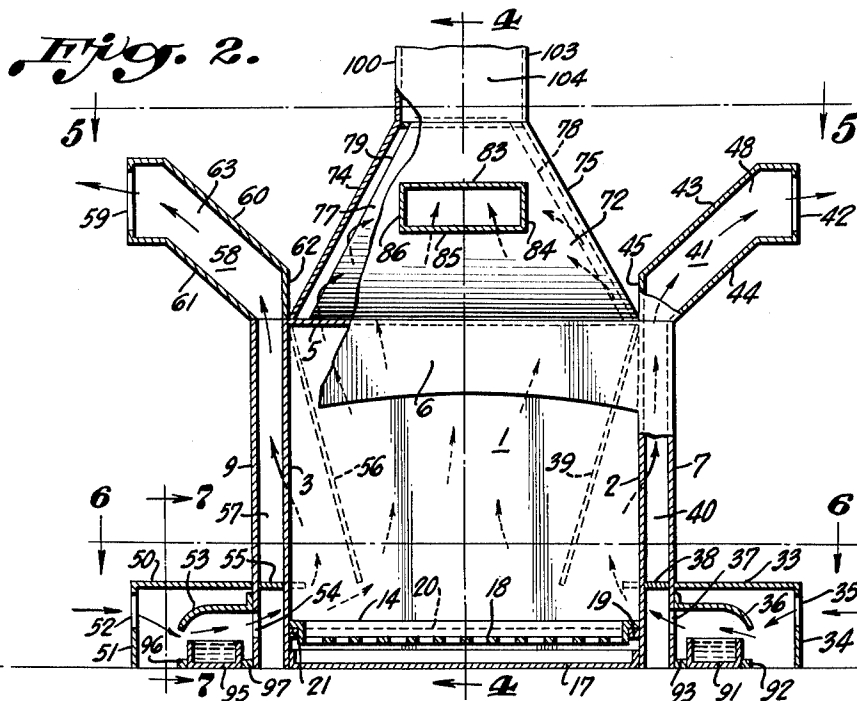
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Fig. 7.

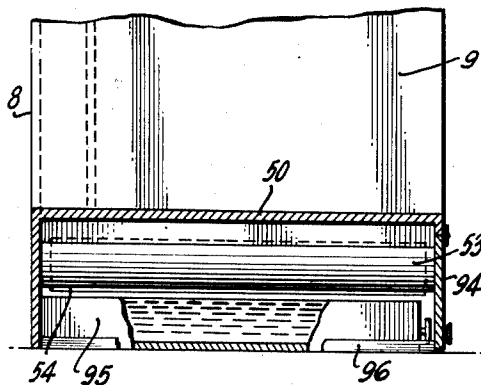


Fig. 8.

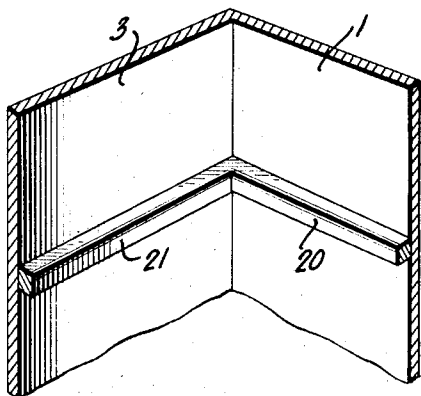


Fig. 9.

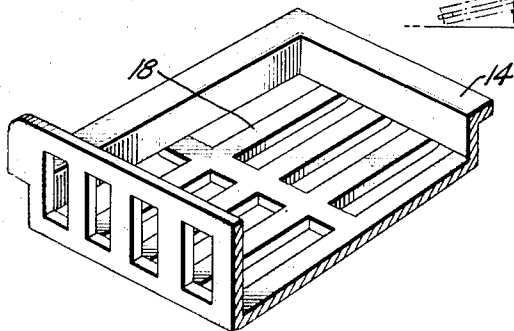
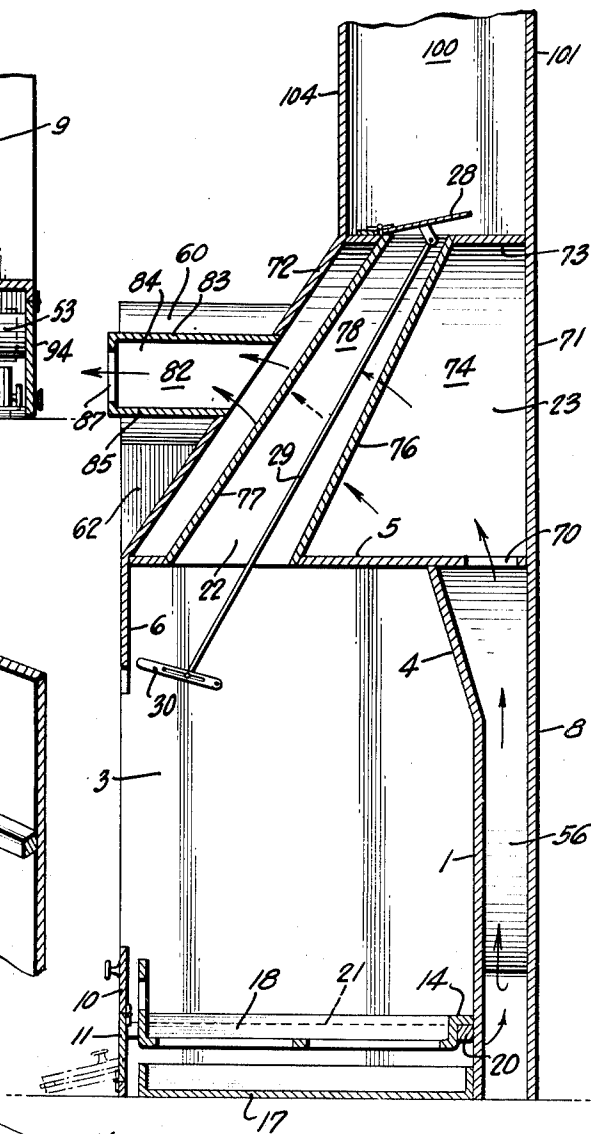


Fig. 4.



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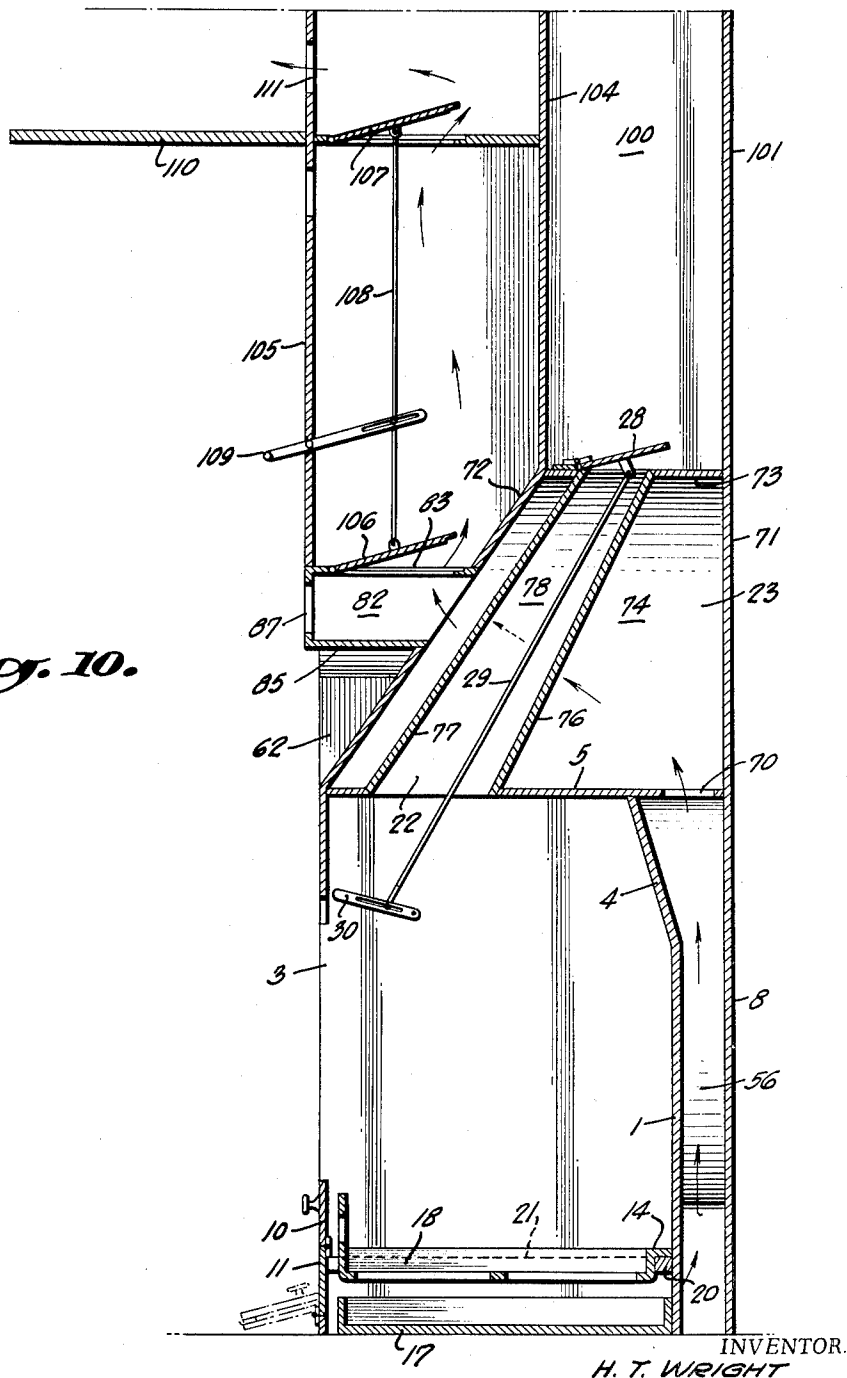
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Fig. 10.



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FIREPLACE HEAT EXCHANGER

Harry T. Wright, Richmond, Va.

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4 Claims. (Cl. 126—121)

This invention, relating as indicated to a fireplace heat exchanger, is more particularly directed to what may be termed a base, frame, or shell around which a conventional fireplace may be constructed and which will result in a fireplace having means associated therewith for drawing cool air adjacent the floor of the room in which the fireplace is situated into heating chambers. The air is heated and passed upwardly and thence outwardly into the room.

It is a more detailed object of the invention to provide air inlets adjacent the lower portion of the lateral walls of a fireplace and after such air has been heated the same is expelled through grills or the like located in the upper portion of the lateral walls and also through a grill or similar device located in the wall comprising the front of the fireplace.

Another detailed object of the invention is to provide means for humidifying the air and also for cleaning the air during its passage from the entrance grills to the exit openings.

A still further object of the invention is to provide primary heating chambers located adjacent the lateral and rear walls which define the combustion chamber and also to provide a secondary heating chamber in the normally unoccupied space which lies immediately above the combustion chamber and surrounds the smoke flue.

Another object of the invention is to provide humidifying and air cleaning means extremely simple in construction and permitting ready renewal of the water in the same.

Another object of the invention is to provide a means for obtaining greater radiation of heat from the fuel consumed in the grate, such means comprising a grate, either metallic or ceramic, in direct contact with the inner walls of the combustion chamber.

Other objects and advantages of the invention will become apparent as the description proceeds, reference being made to the accompanying drawings forming a part of the present description wherein:

Fig. 1 is a perspective view of the complete fireplace.
Fig. 2 is a vertical section taken on lines 2—2 of Fig. 5.
Fig. 3 is a vertical section taken on line 3—3 of Fig. 5.
Fig. 4 is a vertical section taken on line 4—4 of Fig. 2.
Fig. 5 is a horizontal section taken on line 5—5 of Fig. 2.

Fig. 6 is a horizontal section taken on line 6—6 of Fig. 2.

Fig. 7 is a vertical section taken on line 7—7 of Fig. 2.

Fig. 8 is a perspective view with parts in section of a corner of the combustion chamber.

Fig. 9 is a partial perspective view of the grate, and

Fig. 10 is a vertical section similar to Fig. 4 of a modification.

Referring now to the drawings, and more particularly Figs. 1, 2 and 3, it will be seen that I have provided a combustion chamber defined by the substantially vertical walls 1, 2 and 3, the rearwall 1 joining the lateral walls 2 and 3 in a conventional manner. These walls are preferably formed of sheet metal, but of course the construction could be formed entirely of ceramic material such as bricks or monolithic walls. The lateral walls as well as the rear wall are joined by a top wall 5 and the top wall 5 of the combustion chamber is connected to the rear wall 1 by a sloping wall 4. See Figs. 3 and 4. This sloping wall provides an expansion chamber for the heated air as it arises adjacent the highly heated wall 1. The lateral walls are joined at their forward portions by a

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depending lip or the like 6 which assists in maintaining the assembly rigidly and firmly.

A casing formed by lateral walls 7 and 9 connecting rear wall 8 closely surrounds the combustion chamber to provide three primary heating chambers.

The lower forward portion of the frame or shell is provided with folding doors 10 and 11 which are maintained in closed position as shown in Fig. 1 by means of buttons or latches (not shown). The spaced vertical walls; that is, the lateral combustion chamber wall 2, and the lateral wall 7 of the casing, are joined together at their forward portions by vertically extending wall 15 to form the primary chamber 40. In like manner the walls 3 and 9 are joined by the front wall 16 to form the primary chamber 57.

The inner walls or the combustion chamber are provided with supporting strips or flanges which may be integral or separate, as desired, to support the grate 18. Flange 19 is formed on wall 2 and flanges 20 and 21 are formed on walls 1 and 3 respectively. The grate 18 is provided with a flange 14 extending around three of its walls so as to be received in snug-fitting relationship with the walls of the combustion chamber. There is, however, a sufficient clearance for normal expansion and contraction of the grate. This construction permits the heat of the grate to be readily transmitted to the walls of the combustion chamber. Immediately beneath the grate an ash receptacle 17 is slidably received so that the same can be easily removed by opening the doors 10 and 11 to their full extent.

Immediately above the combustion chamber a flue or passageway 22 extends upwardly and angularly to the chimney. A secondary air heating chamber 23 surrounds the smoke flue so that as the highly heated air rises from the rear primary heating chamber the same is caused to pass around and in close relationship with the smoke flue. Draft through the smoke flue is controlled by means of a damper 28, rod 29 and link 30, means provided extending through the lateral masonry wall of the fireplace to actuate the link 30, such means not being shown since they are of conventional construction.

Referring now particularly to Figs. 2, 3 and 6, it will be noted that the horizontally extending wall 33 is connected to a vertically extending wall 34, the air inlet 35 being located in such last-named wall. A baffle 36 which extends horizontally and toward the air inlet 35 is bent downwardly so as to cause the air to pass immediately over water container 91. This insures humidification of the air and also causes the heavier particles of dirt and debris to fall into the water container. After this the air passes through port 37 and due to partition 38 the air travels rearwardly to the rear primary heating chamber where it is divided by baffle 39. This last-named baffle extends downwardly and inwardly between combustion wall 1 and casing wall 8 and a part of the air is caused by the same to pass into primary heating chamber 40. After this, such air passes upwardly through the angularly extending passageway 41 formed by walls 43, 44, 45 which are joined by vertical walls 48 and 49. After this the air is expelled through the exit 42 into the room where the fireplace is located.

On the opposite side of the fireplace or adjacent the opposite lateral wall thereof, the same construction is formed by the horizontally extending wall 50 connected to vertical wall 51 having therein the air port 52. Air passes beneath baffle 53, over water container 95, through port 54 and thence to the rear primary heating chamber where it is divided by the baffle 56 and passes upwardly through chamber 57 and passageway 58. Passageway 58 is formed by the vertical wall 62, angular walls 60 and 61 joined by the vertical walls 63 and 64. The heated air passes outwardly through the grill or exit 59.

Air rising through the rear primary heating chamber and under the baffles 39 and 56, rises upwardly and then passes through slot 70 in the upper wall 5 of the combustion chamber where it enters the secondary heating chamber 23. This heating chamber is formed by rear wall 71, this rear wall being an extension and preferably an integral part of lower rear wall 8 and lateral and front walls. Lateral walls 74 and 75 extend upwardly and inwardly and are connected by front wall 72,

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the lateral wall 74 being closely spaced from the lateral wall 79 of the smoke flue and the front wall 72 being closely spaced from the front wall 77 of the smoke flue while the other lateral wall 75 is closely spaced from the lateral wall 78 of the smoke flue. In this manner all of the heat which is normally lost once it passes from the combustion chamber performs a heating function in connection with the air in the secondary heating chamber 23. Obviously the cool air which rises and becomes heated must pass around the smoke flue and in contact therewith, which causes the same to be further heated. Then it passes outwardly through the horizontal passageway 82 which is formed by the horizontal walls 83 and 85 joined by vertical walls 84 and 86. The highly heated air finally passes outwardly through the grill 87 into the room in which the fireplace is located.

In the forward wall of the masonry or other material surrounding the fireplace frame of my invention I provide a door 90 giving access to the chamber formed by the walls 33 and 34 and permitting the water container 91 to be quite easily removed. The water container is slidably received between guide strips 92 and 93 and whenever desired the door 90 is lifted, the container 91 removed and refilled with fresh clean water.

At the opposite side of the fireplace the door 94 permits withdrawal of the water containers 95 which slides between guide strips 96 and 97.

I have shown a chimney which is formed by vertical side walls 100 and 103 which are joined by front and rear walls 101 and 104. It is, of course, possible to dispense with the chimney portion where regulations require an inner liner or hollow tile and in this case a fireplace frame or shell will terminate immediately above the uppermost horizontal wall 73 in which the damper 28 is mounted.

The various walls, partitions, baffles and other elements shown in the drawing are assembled in the manner illustrated either by bolting the sections together, welding, or in any other desirable manner. It is the object, as before said, to provide an assembled unit which briefly comprises a combustion chamber, primary air heating chambers and secondary air heating chambers with means to clean and humidify all air that passes through the heating chambers.

The assembly or frame as shown in Figs. 2 to 6 inclusive is placed on the floor of the room in which the fireplace is to be located and thereafter it is surrounded by brick or masonry or and other non-conducting material. The result is shown on Fig. 1.

Air immediately adjacent the floor of the room in which the fireplace is situated will be admitted through inlets 52 and 35 following the course of the arrows shown in Fig. 1. This air will then be caused to pass downwardly over baffle 53, for example, and then to rise upwardly over water pan 95. Here the cleaning and humidifying operation takes place. The air then passes through the port 54 and instead of rising upwardly it is forced to pass rearwardly due to the interposition of the horizontal partition 55. This partition extends from the forward wall 16 of chamber 56, rearwardly between lateral wall 3 of the combustion chamber and the wall 9 of the surrounding casing. It continues around the rear wall 1 of the combustion chamber thus causing air to pass around the lower rear wall 1 after which it flows up into the air heating chamber 57 due to baffle 56. It is then caused to pass upwardly and across the exterior of lateral wall 3 because the outlet of chamber 57 is located in the forward portion of the upper wall 46 of such chamber. After this the air passes upwardly through the angular passageway 58 and then outwardly through exit 59.

In like manner air passes through inlet 35 located adjacent the opposite lateral portion of the assembly.

The air flows upwardly between baffles 39 and 56 and the path of the same has been previously described and need not be repeated.

In the modification shown in Fig. 10 the horizontally extending passageway 82 is surmounted by a hot air conducting conduit formed by vertically disposed connecting walls in order to conduct heat away from the fireplace and either to the upper portion of the room in which the fireplace is located or to the room immediately above the fireplace. It is well known that the conventional fireplace warms the room in which it is situated to a great extent immediately adjacent the fire bed. It is also known that the room above the fireplace is usu-

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ally quite cool. It is only necessary to provide a hot air conduit in front of the chimney portion and this can be done by connecting three vertically disposed walls to the structure previously described and shown in Figs. 1 to 9.

The upper horizontal wall of the passageway 82 has damper 106 mounted therein, this damper being controlled by means of the link 108 and lever 109. A second damper 107 is disposed above the damper 106 so that when both dampers are open hot air rises and escapes into the room above the fireplace through the exit port 111. The floor dividing the fireplace room and the upper room is diagrammatically shown at 110.

It will, of course, be understood that after the desired temperature has been reached in the fireplace room the lever 109 can be moved downwardly thus permitting air to flow upwardly into the upper room. Furthermore, if desired, closures may be mounted on the exit ports 87, 59 and 42 thus insuring the passage of all the heated air to the upper room.

From the foregoing it will be seen that I have provided a unit or a single assembly preferably formed of sheet metal which can be used as the base or frame of a heat exchanging fireplace. This frame is provided with means to admit cool air adjacent the lower portion thereof and to humidify and clean such air before it is again returned to the room atmosphere. It will be specifically noted that the air is caused to pass the rear of the unit and then back across the lateral walls and then outwardly at a point above the combustion chamber.

In addition to the foregoing advantages it will be noted that the unit of my invention is provided with means to extract heat from the smoke flue so that the heated air is caused to flow outwardly into the room atmosphere from an exit port located in the front wall of the fireplace and spaced above the combustion chamber.

While the preferred form of the invention is herein shown and described, it is obvious that modifications may occur to those skilled in the art without departing from the spirit of the invention, and I do not, therefore, desire to be limited to the precise forms disclosed herein, but desire to cover all such modifications as come within the scope of the following claims.

I claim:

1. A fireplace heat exchanger comprising a combustion chamber defined by a rear wall and two lateral walls, a casing surrounding said walls, having lateral walls corresponding to the lateral walls of said combustion chamber, an entrance to admit air to the space between said combustion chamber walls and said casing in a lower portion of a lateral wall of said casing, an exit to permit escape of said air from said spaces and means to humidify and clean such air, said means being located outside of said casing and immediately adjacent said entrance and comprising a water pan and a baffle above said pan, said baffle extending over said pan horizontally from said casing and being turned downwardly at its outer edge.

2. A fireplace heat exchanger comprising a combustion chamber defined by a rear wall and two lateral walls, a casing surrounding said walls, having lateral walls corresponding to the lateral walls of said combustion chamber, an entrance to admit air to the space between said combustion chamber walls and said casing in a lower portion of a lateral wall of said casing, an exit to permit escape of said air from said spaces and means to humidify and clean such air, said means being located adjacent said entrance and outside of said casing, and comprising a water pan and a baffle above said pan, said baffle extending over said pan horizontally from said casing and being turned downwardly at its outer edge, terminating in an edge that lies below said entrance.

3. A fireplace heat exchanger comprising a combustion chamber defined by a rear wall and two lateral walls, a casing surrounding said walls, having lateral walls corresponding to the lateral walls of said combustion chamber, an entrance to admit air to the space between said combustion chamber walls and said casing in a lower portion of a lateral wall of said casing, an exit to permit escape of said air from said spaces and means to humidify and clean such air, said means being located adjacent said entrance, and adjacent a lower outer portion of said casing and comprising a water pan and a baffle immediately above said pan, said baffle extending over said pan and being turned downwardly, terminating in an edge that lies below said entrance, said water pan being slid-

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ably received beneath said baffle, whereby the water in said pan may be renewed as desired.

4. A fireplace heat exchanger comprising a combustion chamber defined by a rear wall, two lateral walls and a substantially flat top wall, a casing surrounding said rear walls and said lateral walls to form primary air heating chambers, a cold air inlet leading to said chambers, a flue extending through a portion of said top wall and communicating with a chimney, a secondary air heating chamber surrounding said flue, one of said primary air heating chambers communication with said secondary air heating chamber and means forming a passageway connecting said secondary chamber with the atmosphere, said one of said primary chambers being formed by said rear wall and the casing, and baffles connecting said rear wall and the casing, said baffles converging downwardly from said top wall and terminating above the lowermost portion of said rear wall.

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