

[54] FIREPLACE UNIT WITH CONTROLLABLE
HEAT CIRCULATION

2,362,526 11/1944 Austin..... 126/121
2,642,859 6/1953 Brown..... 126/121

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[51] Int. Cl. F24b 7/02
[58] Field of Search..... 126/121, 120;
137/625.44

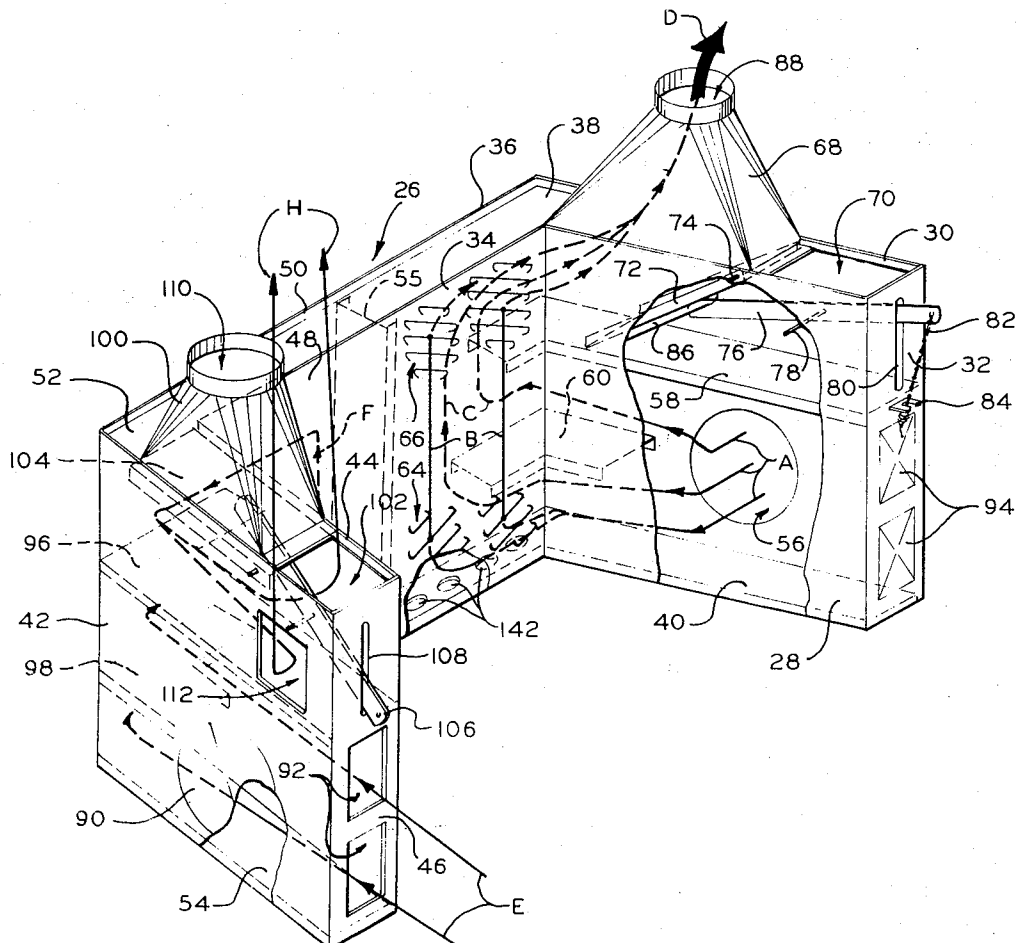
[56] References Cited
UNITED STATES PATENTS

1,813,273 7/1931 Bovey 137/625.44 X
737,382 8/1903 Frederick..... 126/121

[57] ABSTRACT

A fireplace unit of the heat-circulating type having means for selectively controlling the proportions of heated air circulated back into the room and vented to the outside through the chimney. The construction is such that protective cooling air continues to flow within the unit when the supply of room heating air is stopped, as well as when the normal inlet for the cooling air is inadvertently blocked. Also disclosed are means for optionally providing gravity or forced air flow, and for dividing the heating chamber into a plurality of compartments, each having separate control means for the recirculation or exhaust of heated air.

16 Claims, 5 Drawing Figures



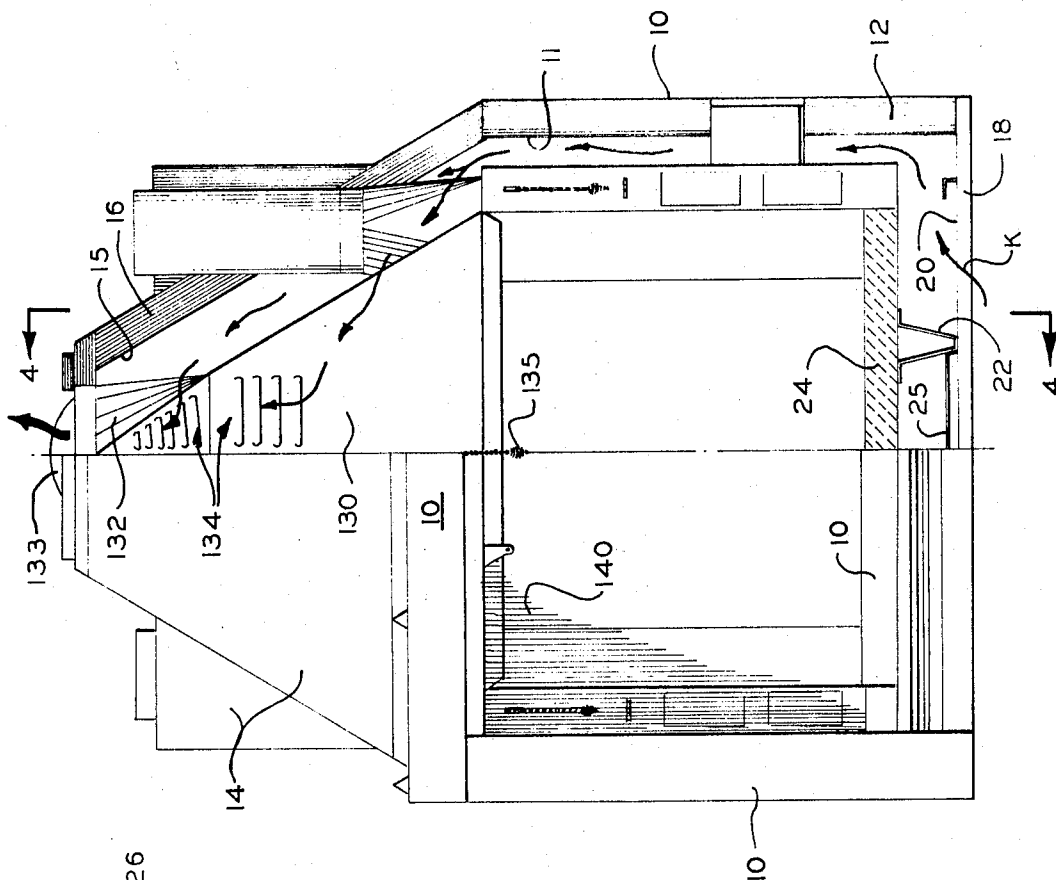


FIG. 1

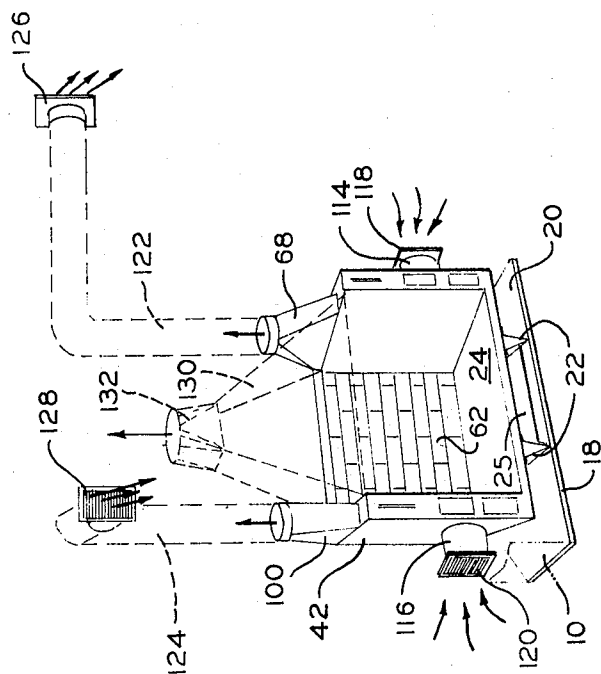


FIG. 2

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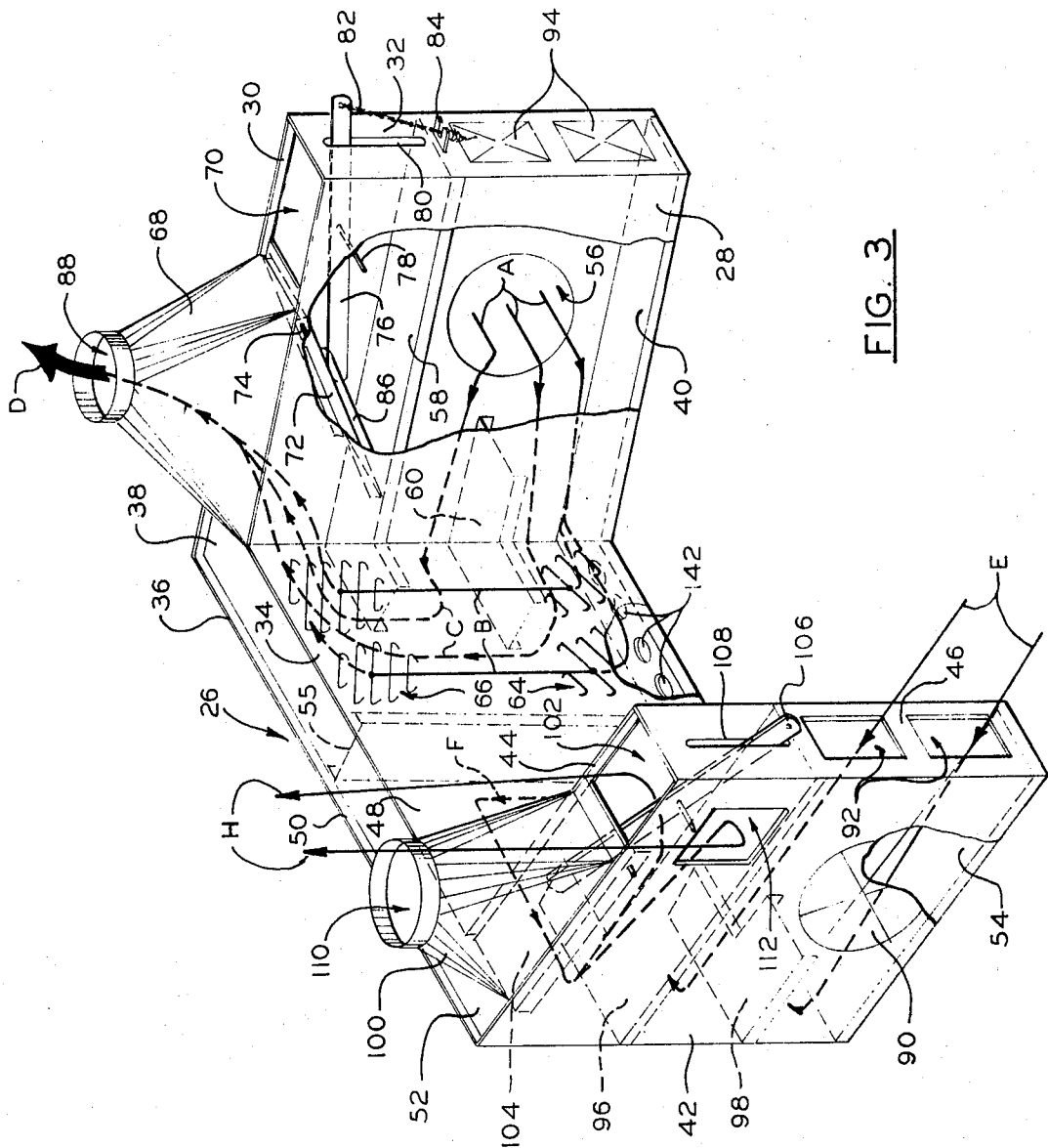


FIG. 3

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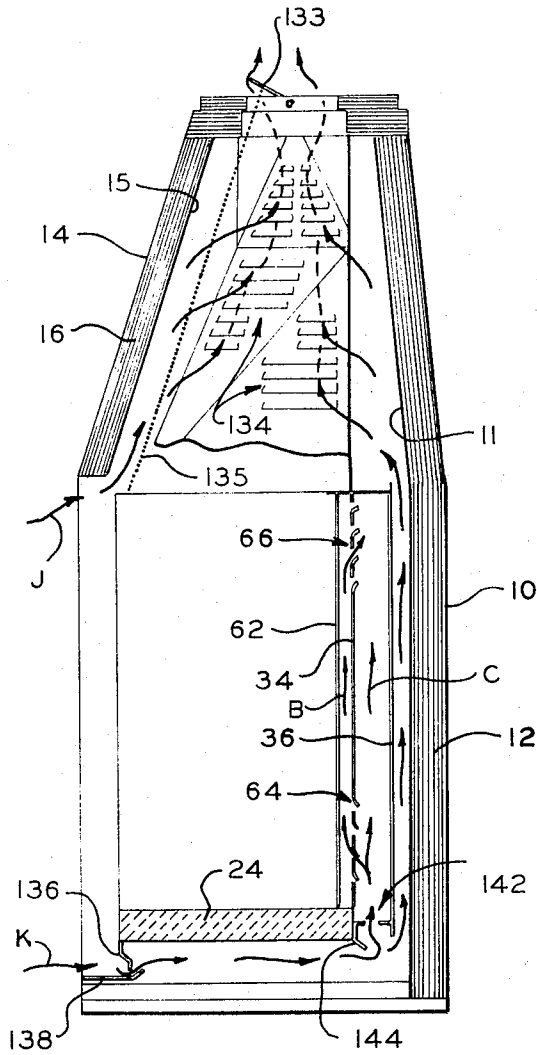


FIG. 4

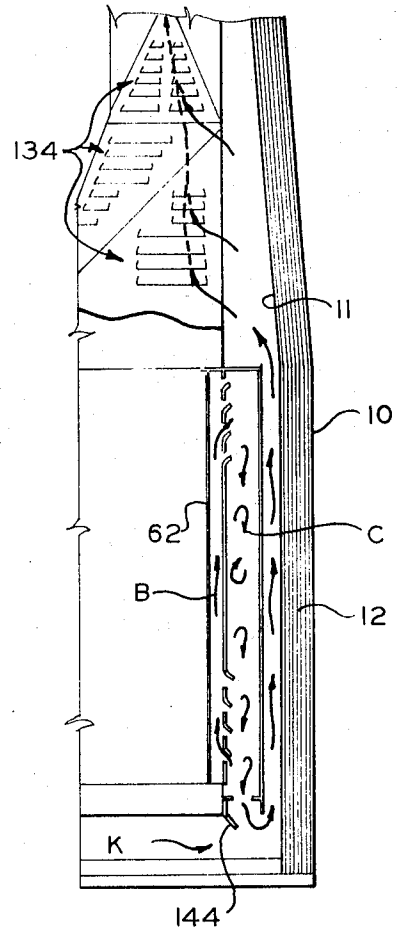


FIG. 5

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FIREPLACE UNIT WITH CONTROLLABLE HEAT CIRCULATION

The present invention relates to prefabricated fireplace units and, more particularly, to fireplace units having the capability of recirculating air for heating purposes.

For many years fireplace constructions of various types have been provided for the purpose of utilizing greater portions of the available heat for room heating purposes. That is, by providing suitable passageways around the combustion chamber, and ductwork to deliver the heated air to the desired location, convection heating is utilized to a greater extent. Obviously, a more efficient heating system may be provided by recirculating heated air than by relying solely on radiation from the combustion chamber with a large portion of the heat produced being vented directly to the outside through the flue.

Some of the recirculating type fireplace units have utilized gravity flow with the natural tendency of the lighter, heated air to rise, and others have used powered fans to provide a forced air supply. In general, however, it has been impractical to provide dampers to inhibit return of the heated air due to the likelihood of an overheated condition resulting. Thus, in fireplace units providing recirculation of heated air for more efficient utilization of available heat it has been necessary to allow such recirculation to be unrestricted and uncontrolled, or to provide a special installation to avoid overheating problems.

A principal object of the present invention is to provide a fireplace unit with the capability of controlling the recirculation of heated air, to the point of shutting off such recirculation altogether, without danger of overheating and without special installation over and above that normally provided for similar units with no heat control. This is achieved, as pointed out in detail hereinafter, by providing a construction which insures that protective cooling air continues to flow around the fireplace unit irrespective of the position of the dampers controlling recirculation of the heated air.

A further object of the invention is to provide a fireplace unit having a plurality of compartments which may be individually controlled, between fully open and fully closed positions, to provide recirculation of air heated within the unit.

Still another object is to provide a basic fireplace unit having means for optionally mounting fans in any of a plurality of compartments to provide forced recirculation of air heated therein, as well as providing, individually for each compartment, continuous, selective control of the proportions of such heated air recirculated for room heating purposes and vented to the outside.

A still further object is to provide a prefabricated fireplace unit having alternate means to prevent overheating in the event of inadvertent blocking of the principal inlet for cooling air.

In a more general sense, the object is to provide a novel and improved fireplace unit of prefabricated, sheet metal construction and having controllable heat recirculation capability.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts, which will be exemplified in the con-

struction hereinafter set forth, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention reference should be had to the following detailed description taken in connection with the accompanying drawings, in which:

FIG. 1 is a front elevational view of the fireplace unit of the invention, with the outer shell shown in vertical half-section;

FIG. 2 is a perspective view of the unit with the outer shell removed;

FIG. 3 is a perspective view of the heating compartment, showing alternate types of operation on the right and left sides;

FIG. 4 is a side elevational view in section on the line 4-4 of FIG. 1; and

FIG. 5 is a side sectional view, as in FIG. 4, showing an alternate air flow.

The preferred embodiment of the invention comprises a unitary fireplace structure which may be prefabricated at a factory and transported ready for installation in the structure wherein it is to be used. The walls, partitions and other major structural elements of the fireplace unit are preferably of a suitable gauge sheet metal, as in previous units of this type. The insulation may be of mineral fiber or other suitable materials commonly used for such purposes.

The lower portion of the unit, including the combustion chamber, is enclosed on the sides and rear by a lower housing comprising outer shell 10 and inner shell 11 of sheet metal with a layer of insulation 12 sandwiched therebetween. Outer shell 10 also encloses the front of the lower portion around the combustion chamber opening, as seen in the left half of FIG. 1. An upper housing is likewise formed of sheet metal outer shell 14 and inner shell 15, lined with insulation 16, enclosing the upper portions of the unit.

The unit rests on steel frame or skid 18 and is enclosed on the bottom by sheet metal skid cover 20. A pair of hearth supports 22 rest on the skid cover. Hearth 24 serves as the floor of the combustion chamber, resting on hearth supports 22, and is formed of the usual cast refractory material. Reflector plate 25 is positioned between the hearth supports to protect the skid cover and adjacent structure from heat radiated downwardly from hearth 24. A double walled chamber, denoted generally by reference numeral 26, is enclosed by the lower housing with a space provided between the inside of inner shell 11 and the outer walls of the chamber.

Chamber 26 is divided into a plurality of separate compartments, each having their own inlet and outlet means. Although the disclosed embodiment shows two compartments, which will be separately described and denoted as left and right compartments, it is to be understood that additional, similar compartments may be provided if desired. Each compartment has the capability of heating air for recirculation by either gravity or forced flow. For purposes of illustration, the right compartment of the chamber shown in FIG. 3 is equipped with an inlet fan for forced flow, while the left compartment has no fan and operates by gravity flow.

The right compartment includes inner and outer side walls 28 and 30, front wall 32, inner and outer rear walls 34 and 36, upper wall 38 and lower wall 40. The left compartment includes inner and outer side walls 42 and 44, front wall 46, inner and outer rear walls 48 and

50, upper wall 52 and lower wall 54. Vertical partition 55, shown in hidden lines in FIG. 3, separates the right and left compartments at the rear of chamber 26.

Outer side wall 30 of the right compartment has a circular opening 56 communicating with a fan installation, described later in connection with other Figures. The fan draws room air in through opening 56 below upper horizontal divider 58 which separates the right compartment into upper and lower portions between side walls 38 and 30, and partially between rear walls 34 and 36. Lower horizontal divider 60 partially further separates the lower portion between both the side and rear walls.

Forming the rear wall of the combustion chamber is liner 62, extending between inner side walls 28 and 44 of the right and left compartments of chamber 26, and in spaced relation to inner rear walls 34 and 48, as shown in FIGS. 4 and 5. Inner rear wall 34 includes a lower group of downwardly directed louvers, denoted collectively by reference numeral 64, and an upper group of upwardly directed louvers 66. Air entering the right compartment through opening 56 is indicated by the lines labeled A and will flow rearwardly, below upper divider 58 and both above and below lower divider 60. The air will be heated by the fire in the combustion chamber as it passes through chamber 26 and will seek to rise. A portion of the air reaching the lower rear of the right compartment will be directed by louvers 64 into the space between inner rear wall 34 and liner 62, such air being designated in FIGS. 3-5 by the lines labeled B. This air, as it rises between the inner rear wall and liner, is then caused to re-enter the upper rear of the right compartment by louvers 66. The heated air which remains between inner and outer rear walls 34 and 36 as it rises is labeled C. The B and C air are rejoined in the upper rear portion of the right compartment and flow forwardly, above upper divider 58 toward the outlet.

Right outlet hood 68 surrounds an opening in top wall 38 of the right compartment, also provided with a second opening 70. In the upper portion of the right compartment, baffle plate 72 is pivotally mounted on pin 64, between side walls 28 and 30. Control arm 76 is mounted for rotation on pin 78, also extending between the side walls, and has one end bearing against the lower side of baffle plate 72 and the other end extending out of chamber 26 through slot 80 in front wall 32. Chain 82 is attached to the end of arm 76 outside the chamber and may be engaged in the usual manner in fixed chain catch 84, on front wall 32.

Baffle 72 is shown in FIG. 3 in the lower position, resting on angle 86, affixed to the inside of inner side wall 28, and a similar, parallel angle, affixed to the inside of outer side wall 30. In this position the baffle, together with the angles, extends between side wall 28 and 30, and between upper divider 58 and upper wall 38, thereby deflecting the B and C air into hood 68 where it continues to rise and pass through outlet opening 88 as a flow of heated air labeled D. Pulling chain 82 down and securing it with the end of control arm 76 to which it is attached at the lower end of slot 80 serves to rotate baffle 72 upwardly into covering relation to the opening in top wall 38 surrounded by hood 68. The D air will then exit from the upper portion of the right compartment of chamber 26 through opening 70 in top wall 38 and another opening (not shown) in side wall 30. Thus, the position of control arm 76 determines

whether the heated air exits from the right compartment of chamber 26 through outlet 88 or opening 70, with consequences explained later.

The left compartment of chamber 26 is identical (as a mirror image) in all respects to the right compartment just described, except for the location of certain of the openings. Also, the left compartment is not equipped with a fan for assisting in air flow, as the right compartment is assumed to be, but instead is gravity fed. Of course, both or neither of the compartments may be provided with fans, as desired. Outer side wall 42 has a cover or knock-out panel 90 covering the opening where the air would enter if a fan were to be installed. Openings 92 are provided in front wall 46 for inlet of air, as indicated by lines E. Panels 94 provide a covering for similar openings in front wall 32 of the right compartment since the front wall openings are not used with the forced circulation system. As the air moves rearwardly in the left compartment, below upper divider 96 and on both sides of lower divider 98, it is heated and seeking to rise. Air within the rear of the left compartment is labeled F and a portion of such air is directed out of chamber 26 by louvers in the lower part of inner rear wall 48, in the same manner as B air is directed out of the right compartment by louvers 64. The portion of F air which is directed between inner rear wall 48 and liner 62 is not separately labeled to avoid further complicating the drawing, but it will be readily understood, from analogy with the previous description of the right compartment, that such air re-enters the upper rear of the left compartment to rejoin the F air which has risen between inner and outer rear walls 48 and 50.

Upper wall 52 of the left compartment includes a pair of rectangular openings between side walls 42 and 44, of the same proportions and location as the openings in upper wall 38 of the right compartment. The first of the openings is covered by left outlet hood 100 and the second opening is positioned forwardly thereof and denoted by the reference numeral 102. The left compartment also includes pivotally mounted baffle 104 and control arm 106, having one end extending through slot 108 in front wall 46. The chain and catch, although not shown, are provided as in the right compartment.

As shown in FIG. 3, the outer end of left control arm 106 is in the lower position, thereby maintaining baffle 104 in covering relation to the opening covered by hood 100. Thus, as the F air rises and flows into the upper front portion of the left compartment, it is unable to escape through hood 100 and outlet 110. With the baffle in the upper position, the heated air is vented from chamber 26 through opening 102 and an additional opening 112. The combined area of openings 102 and 112 should be substantially equal to the area of the opening in top wall 52 surrounded by hood 100. This air, indicated by the lines labeled H, is not returned to the room as recirculated air for heating purposes, but is vented to the outside through the flue, as explained later, with the combustion products.

Referring again to FIG. 2, both the left and right compartments are shown equipped with fans for forced circulation. The fans are of conventional construction, driven by electric motors, and are therefore not shown in detail. They are contained within cylinders 114 and 116, extending from outer side walls 30 and 42, respectively. The outer ends of cylinders 114 and 116 terminate flush with outer shell 10 of the lower housing, a

fragment of which is shown in phantom lines in FIG. 2. Instead of omitting cylinders 114 and 116 when fans are not to be installed and covering the resulting opening in the outer side wall of chamber 26 (e.g., with cover 90 of FIG. 3), the cylinders may be provided in any case and the covers provided on their outer ends (flush with the outer shell) when fans are not installed. The lower housing, as well as other appropriate portions of the fireplace, would normally be covered by a wall or some decorative covering provided with openings communicating with the fan inlets. These openings would be covered by protective grilles 118 and 120. In order to conduct the heated air to the desired location, right and left outlet hoods 68 and 100 are provided with suitable heat ducting 122 and 124, respectively, leading to outlet openings also covered by grilles 126 and 128. The heat ducting is conventionally made of double-walled pipe sections with a dead air space between the walls and a 1 inch clearance between the outer pipe and combustible adjacent structure. Rear liner 62 is shown in FIG. 2 with a decorative, embossed, brick pattern. Also shown in FIG. 2 in dotted lines are inner hood 130 and transition 132, providing an outlet to the chimney for smoke and other combustion products. Damper 133 (FIGS. 1 and 4) is provided in conventional fashion and controlled by chain 135.

As shown in FIGS. 1, 4 and 5, inner hood 130 and transition 132 are provided with upwardly directed louver openings 134 for admitting air flowing between inner shell 15 of the upper housing, and inner hood 130. Such air includes that heated within either compartment of chamber 26 when the baffles 72 and/or 104 are in the upper position, i.e., covering the openings communicating with outlet hoods 68 and 100. For example, the H air shown in FIG. 3 is vented from chamber 26 through openings 102 and 112, thereby flowing between the upper housing and inner hood 130. This air, or air similarly vented from the right compartment of chamber 26, will flow through louvers 134 and exhaust through the chimney, rather than being recirculated as interior heating air.

In addition to air vented from chamber 26, air enters the space around hood 130 and chamber 26 through openings across both the top and bottom at the front of the fire chamber, as best seen in FIG. 4. The air admitted at the top, labeled J in FIG. 4, flows between inner shell 15 and the front and sides of hood 130 and enters louvers 134 to be vented to the chimney. The air entering along the bottom, designated K in FIGS. 1 and 4, flows between upper and lower hearth covers 136 and 138, respectively, under hearth 24 and upwardly on each side (FIG. 1) and behind (FIGS. 4 and 5) chamber 26. This flow of cooling air around chamber 26 and hood 130 will be induced by the heating, rising and venting through louvers 134 of the air originally in the space when the fire is started, thereby drawing in room air along the openings as indicated at J and K. It should be noted that the legs forming hearth supports 22 are open from front to rear, thereby providing minimal resistance to air flow under hearth 24.

An additional, important feature of the invention is the provision of means for continuing the air flow through chamber 26 in the event of blockage of the normal inlets. Since openings 92 are positioned behind the protective screen, a fragment of which is indicated in FIG. 1 by the reference numeral 140, there is virtually no possibility of their being inadvertently blocked.

The openings covered by grilles 118 and 120, however, are more remote from the fireplace proper and may be positioned in a side wall near the floor. Thus, it is more likely that some object may be positioned so as to interfere with the flow of air therethrough. As seen in FIG. 3, a row of openings 142 is provided in bottom wall 40 along the rear of the right (fan equipped) compartment of chamber 26. Preferably, knock-out panels are provided in the rear part of the lower walls of chamber 26, and are removed to form the openings only when the compartment is to have a fan installed. As shown in FIG. 4, the K air flowing under the hearth will be drawn up through openings 142 into the rear of chamber 26 in the event the air drawn in by the fan is insufficient to replace the heated air vented from the chamber. This flow of cooling air insures against an overheated condition in the event of interference with the normal inlet of air. Under normal conditions the K air will flow under hearth 24 and upwardly between outer rear wall 36 and inner shell 11 to enter hood 130 through louvers 134 and be vented through the chimney.

FIG. 5 illustrates another condition of air flow which may exist within a fan-equipped compartment. When the fan is turned on, the air within the compartment will be at least slightly pressurized as the inlet volume of air normally remains slightly greater than the outlet volume until the fan is turned off. Therefore, if the fan is turned on before the air within chamber 26 is heated sufficiently to have much tendency to rise, a small amount of the air in the rear portion of the compartment may flow downwardly, out of chamber 26, through openings 142. Baffle 144 is provided across the bottom of the chamber to deflect this air rearwardly, thereby exerting minimal interference with the desired flow of the K air rearwardly and up the outside rear of chamber 26.

Although the foregoing description includes all necessary constructional details of a preferred embodiment, many refinements may be added in the actual production of such units. For example, chamber 26 could be provided with oversized, rough cut openings in front walls 32 and 46 of the right and left compartments with the finished openings, visible in the final product, being provided in a separate cover plate which fits over the chamber front wall. Furthermore, the front cover plates could extend around and rearwardly, in covering relation to the inner side walls of the chamber and preferably spaced slightly therefrom, in the same manner as rear liner 62 is spaced from the inner rear walls of the chamber. In this way the intense heat is not directly on the inner chamber walls, but rather on a separate, more easily replaceable element.

What is claimed is:

1. A prefabricated fireplace structure of the heat-circulating type comprising, in combination:
 - a. an open-front combustion chamber having a hearth floor, side and rear walls, and a flue for exhaust of combustion products;
 - b. a heating chamber having inner side and rear walls, adjacent said combustion chamber side and rear walls, outer side and rear walls spaced from said inner walls and connected thereto by upper and lower walls, and a pair of front walls adjacent the sides of the open front of said combustion chamber;
 - c. inlet means for admitting air into a lower portion of said heating chamber;

- d. outlet means for venting heated air from an upper portion of said heating chamber;
 - e. said combustion chamber rear wall being spaced from said heating chamber inner rear wall, the latter including lower openings, through which a portion of the air passing between said inner and outer rear walls is vented out of said heating chamber to an enclosed space between said combustion chamber rear wall and said heating chamber inner rear wall, and upper openings, through which said portion of air passes from said enclosed space back into said heating chamber; and
 - f. means for selectively directing said heated air either into said flue for exhaust with said combustion products or into an area to be heated.
2. The invention according to claim 1 wherein said heating chamber is divided by an interior, vertical partition between said inner and outer rear walls and said upper and lower walls into left and right compartments, each with its own independent inlet and outlet means.
3. The invention according to claim 1 wherein said heating chamber lower wall includes openings through which air may pass into or out of said heating chamber.
4. A prefabricated fireplace structure of the heat-circulating type comprising, in combination:
- a. an open-front combustion chamber having a hearth floor, side and rear walls, and a flue for exhaust of combustion products;
 - b. a heating chamber having inner side and rear walls, adjacent said combustion chamber side and rear walls, outer side and rear walls spaced from said inner walls and connected thereto by upper and lower walls, and a pair of front walls adjacent the sides of the open front of said combustion chamber;
 - c. inlet means for admitting air into a lower portion of said heating chamber;
 - d. outlet means for venting heated air from an upper portion of said heating chamber;
 - e. an inner hood above said combustion chamber for directing the combustion products to said flue;
 - f. an outer housing enclosing said heating chamber in spaced relation to said outer side and rear walls, and said inner hood, in spaced relation thereto; and
 - g. means for selectively directing said heated air either into said flue for exhaust with said combustion products or into an area to be heated.
5. The invention according to claim 4 wherein said outlet means comprise at least two openings in an upper portion of said heating chamber, one of which communicates with said area to be heated and the other of which vents air from said heating chamber to the space between said outer housing and said inner hood, the latter having openings to admit the air vented from said heating chamber.
6. The invention according to claim 5 wherein said means for directing said heated air comprise a baffle within said heating chamber movable between a first position, wherein said heated air is directed by said baffle to said one opening, and a second position, wherein said heated air is directed to said second opening.
7. The invention according to claim 6 and further including manually operable control means extending outside said heating chamber for moving said baffle between said first and second positions.
8. A fireplace unit of the heat-circulating type comprising, in combination:

- a. an open-front combustion chamber having a hearth floor, side and rear walls, and a flue for exhaust of combustion products;
 - b. an enclosed compartment adjacent at least a portion of said side and rear walls whereby air within said compartment is heated by heat from said combustion chamber;
 - c. an inlet through which air enters said compartment;
 - d. first and second outlets through either of which air heated within said compartment may be vented therefrom;
 - e. means directing air from said first outlet into a space to be heated;
 - f. means directing air from said second outlet out the flue with the combustion products from said combustion chamber; and
 - g. cover means selectively movable between a first position blocking said first outlet to direct substantially all air heated within said compartment through said second outlet, and a second position blocking said second outlet to direct substantially all air heated within said compartment through said first outlet.
9. The invention according to claim 8 and further including alternate inlet means through which air may enter said compartment in the event of blockage of said inlet.
10. The invention according to claim 9 wherein said alternate inlet means comprise one or more openings in a lower portion of said compartment and means for directing air under said hearth floor and through said openings.
11. The invention according to claim 8 wherein said cover means is moved between said first and second positions by manually engagable means on the exterior of the fireplace adjacent one of said side walls.
12. The invention according to claim 8 wherein said compartment is divided by a vertical partition into left and right sections, each having an independent inlet and first and second outlets.
13. The invention according to claim 8 wherein at least a portion of said compartment is divided by a horizontal partition into upper and lower sections, said inlet being in said lower section and both of said outlets being in said upper section.
14. A prefabricated fireplace structure of the heat-circulating type comprising, in combination:
- a. an open-front combustion chamber having a hearth floor, side and rear walls, and a flue for exhaust of combustion products;
 - b. an enclosed compartment adjacent at least a portion of said side and rear walls whereby air within said compartment is heated by heat from said combustion chamber;
 - c. inlet means for admitting external air into said heating compartment;
 - d. outlet means for venting heated air from an upper portion of said heating compartment;
 - e. means for selectively directing said heated air either into said flue for exhaust with said combustion products or into an area to be heated; and
 - f. means defining a space intermediate of said heating compartment and flue to prevent direct communication therebetween so that, whether heat from said compartment is directed into said flue or into an area to be heated, combustion products from

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said flue cannot fall or flow into said compartment.

15. The invention according to claim 14 wherein said flue is enclosed within an inner hood, and an outer hood is provided in spaced relation thereto, and air from said compartment to be vented out said flue is directed into the space between said inner and outer hoods and enters said flue through louvered openings in said inner hood.

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16. The invention according to claim 15 wherein said outlet means includes at least two outlet openings communicating, respectively, with the space to be heated and with said flue through said louvered openings, and said directing means comprises a movable baffle for directing air flow through said outlet openings.

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