

[54] FIREPLACE FOR HEAT CONSERVATION  
AND DISTRIBUTION

3,724,443 4/1973 Carson..... 126/121

[76] Inventors: Daniel T. Galluzzo, 3659 Fallston Rd., Jarrettsville, Md. 21084,  
Christopher G. Galluzzo; Vincent Galluzzo, both of 1 Lakecliff Rd., Cockeysville, Md. 21030

Primary Examiner—William F. O'Dea  
Assistant Examiner—Peter D. Ferguson  
Attorney, Agent, or Firm—Walter G. Finch

[22] Filed: Mar. 4, 1974

[21] Appl. No.: 447,505

[52] U.S. Cl. .... 126/120; 110/116; 126/7;  
126/10; 126/68; 126/73; 126/107; 126/121

[51] Int. Cl. .... F24b 7/00

[58] Field of Search ..... 126/120, 121, 7, 10, 68,  
126/73, 107, 124; 110/116, 117

## [56] References Cited

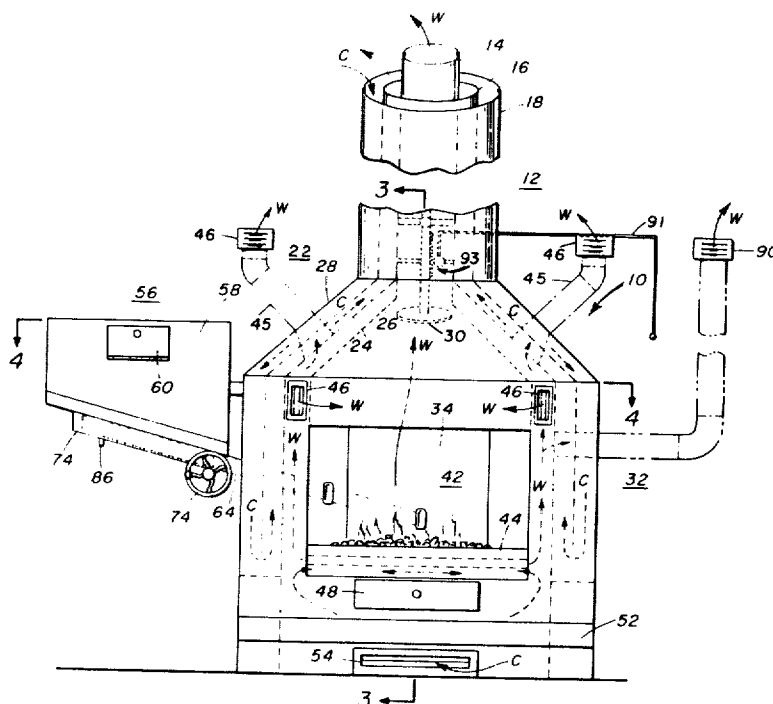
## UNITED STATES PATENTS

|           |        |                |           |
|-----------|--------|----------------|-----------|
| 1,411,132 | 3/1922 | Taylor.....    | 126/121   |
| 1,638,286 | 8/1927 | Burley.....    | 126/121   |
| 1,896,252 | 2/1933 | Sloan.....     | 110/116   |
| 2,080,323 | 5/1937 | Limoni.....    | 126/121   |
| 2,375,318 | 5/1945 | Mudgett.....   | 126/121   |
| 2,821,975 | 2/1958 | Thulman.....   | 126/120   |
| 3,096,754 | 7/1963 | Howrey.....    | 126/121 X |
| 3,190,281 | 6/1965 | Northwood..... | 126/120   |

## [57] ABSTRACT

The present invention relates to a fireplace structure for a dwelling or the like wherein relatively cool air from the lowest levels of the space in which the fireplace structure is located is drawn into heat exchanging contact with the exterior surfaces of the firebox walls, the air heated thereby being ducted to a desired outlet location in the dwelling for heating purposes. The cool air thus heated by heat exchange through the firebox walls serves to insulate the firebox from surrounding combustible materials. Insulation of the smoke flue which bears heated air and smoke particles away from the interior of the firebox is accomplished by the thermally-induced movement of relatively cold air from the exterior of the dwelling into an insulating relation about the smoke flue. The present fireplace structure is further provided with an adjustable telescoping fuel hopper for the selective introduction of fuel into the interior of the firebox.

9 Claims, 7 Drawing Figures



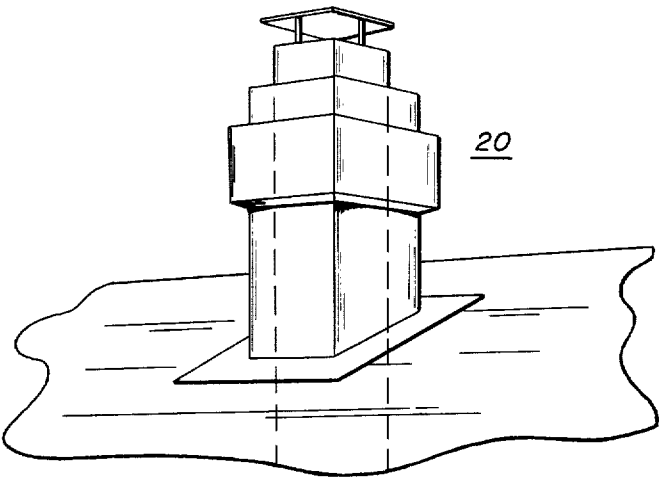
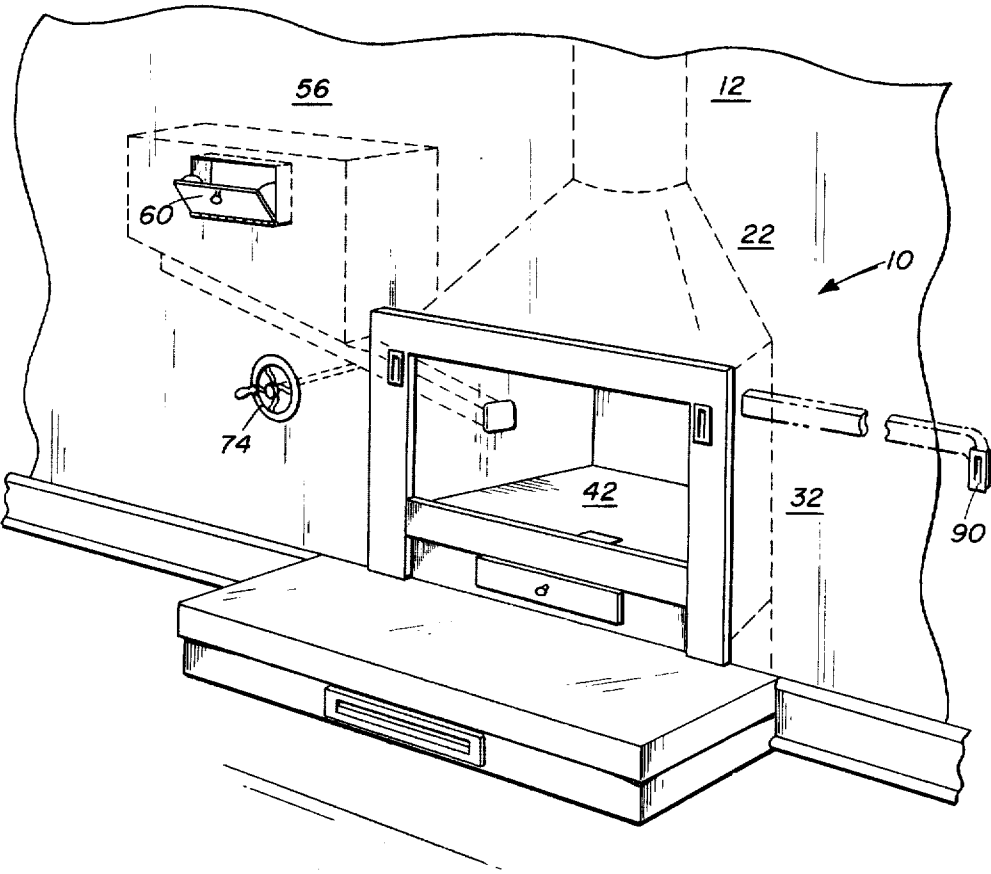


FIG. 1

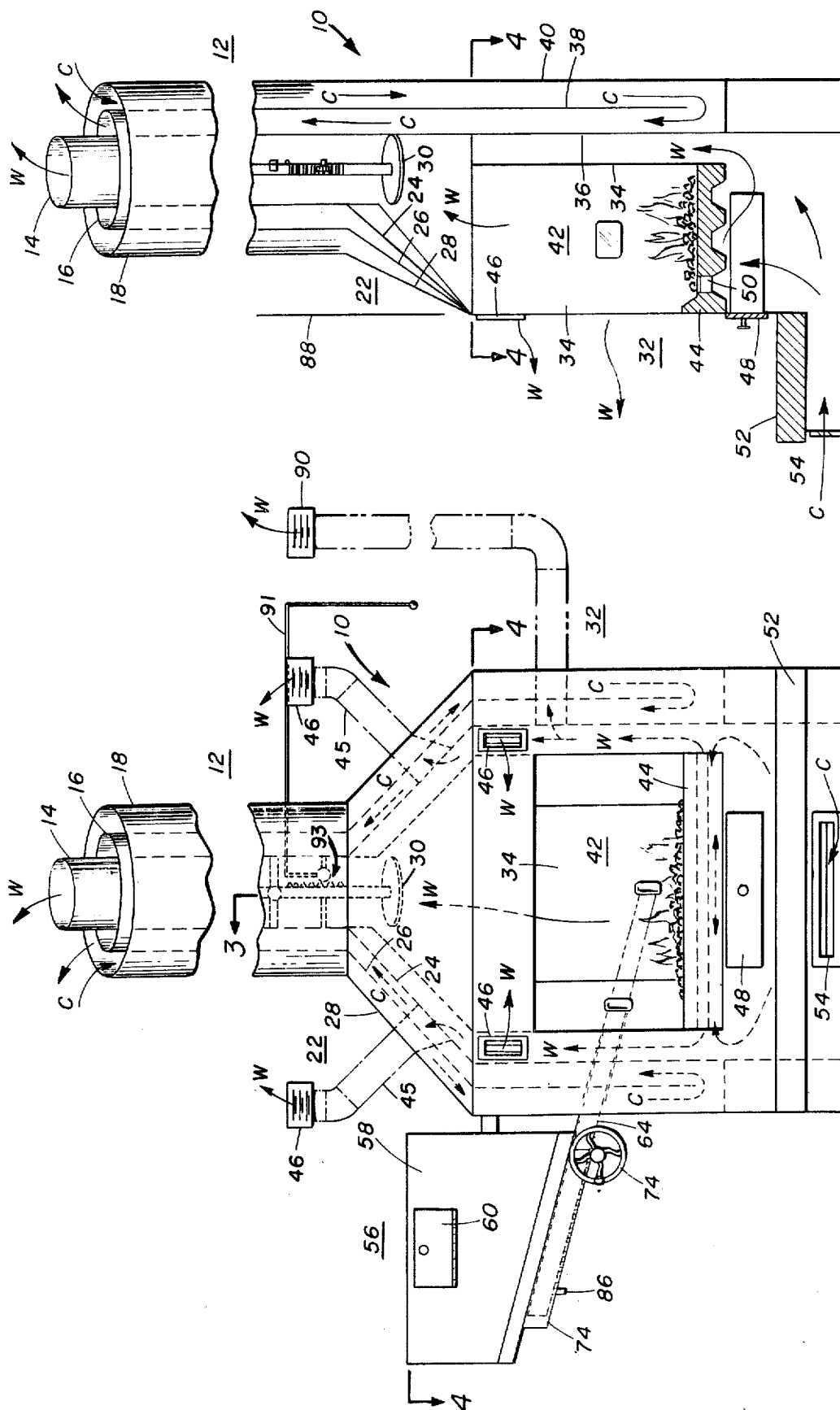
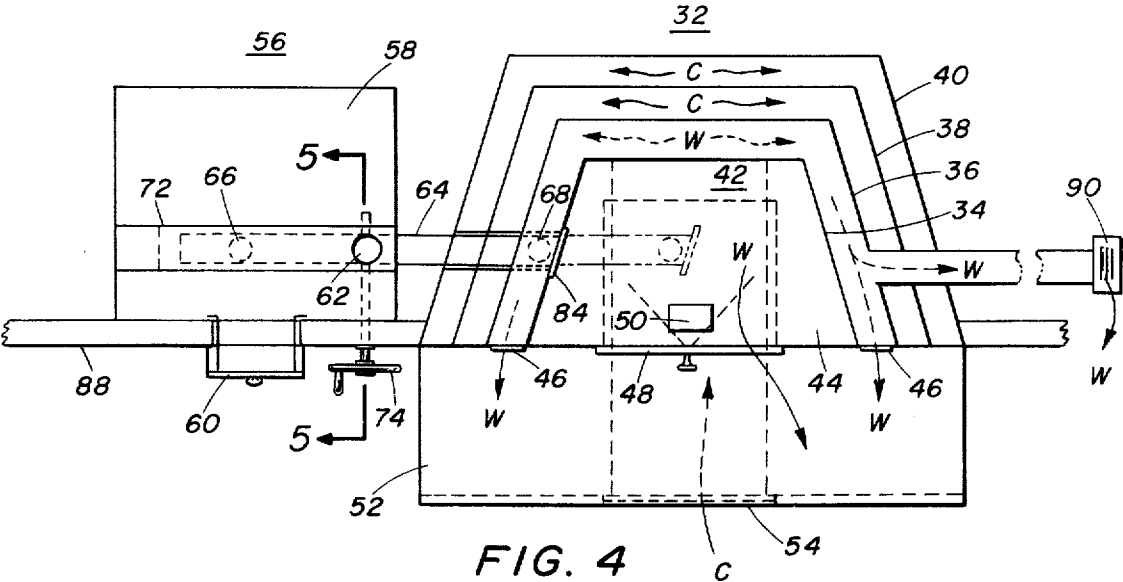
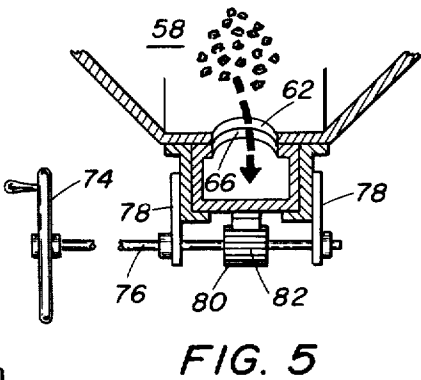
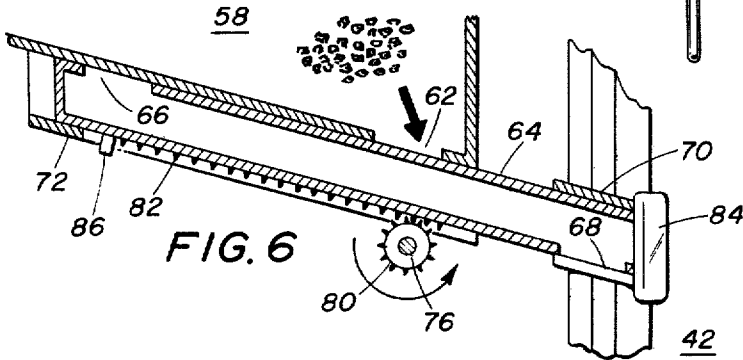
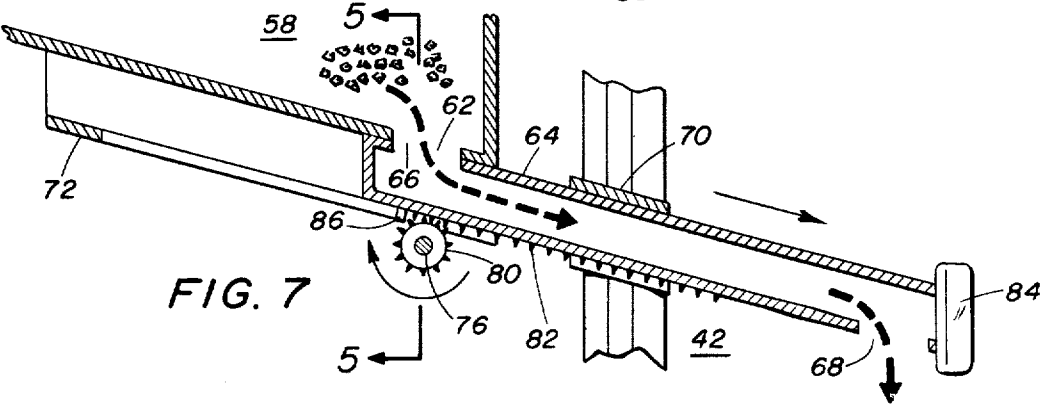


FIG. 3

FIG. 2



## FIREPLACE FOR HEAT CONSERVATION AND DISTRIBUTION

### BACKGROUND OF THE INVENTION

#### A. Field of the Invention

The invention relates to fireplace structures, particularly of the open hearth type wherein fuel is subjected to combustion with oxidizing air generally drawn from the space into which the structure opens. In particular, the invention relates to a heat conserving fireplace structure wherein heat generated by the combustion of fuel is distributed to a desired point of use.

#### B. Description of the Prior Art

Traditional open hearth fireplace structures discharge a great proportion of the heat generated by combustion of fuel therein to the exterior of the housing structure in which the fireplace is located. This heat is thus displaced from the housing structure without providing a thermally valuable environmental effect. The present fireplace structure provides for more effective utilization of the heat generated within a fireplace, thereby conserving said heat. The heat thus conserved may then be distributed to a desired point of use.

### SUMMARY OF THE INVENTION

The invention provides a heat exchange system for fireplace structures, particularly structures of the open hearth type typically used ornamentally and for heating purposes in a dwelling or the like. The invention improves the ability of a fireplace structure to contribute to the provision and maintenance of a thermally acceptable environment in a dwelling by more efficiently conserving and utilizing the heat generated by combustion of fuel in the fireplace structure. In operation, the present invention draws the relatively cooler air from near floor level of the room or space in which the fireplace structure is located into an interior chamber which surrounds the firebox of the fireplace structure, the firebox being that portion of the structure in which fuel is undergoing combustion. The relatively cool air is heated by heat exchange through the walls of the firebox, the now heated air being circulated to a desired point of use. The heating of the relatively cool air being continuously drawn into heat exchanging contact with the exterior walls of the firebox acts also to insulate the firebox at least partially from potentially combustible material in the dwelling which may be adjacent to the fireplace structure. Heated air and smoke particles being directed externally of the dwelling through a smoke flue communicating with the firebox heats relatively cold air surrounding the smoke flue, which relatively cold air is drawn from the exterior of the dwelling to insulate the smoke flue. Heat exchange through the walls of the smoke flue heats the relatively cold air and causes it to move upwardly, thereby creating a suction effect which continuously draws relatively cold exterior air into insulating contact with the smoke flue. The present fireplace structure may further be provided with an adjustable telescoping fuel hopper which is used to introduce fuel into the interior of the firebox as frequently as desired and at appropriate positions in the firebox to obtain efficient combustion of the fuel therein.

Accordingly, it is a primary object of the invention to provide a fireplace structure having a heat exchange

system for conserving heat generated by the combustion of fuel in the fireplace structure.

Another object of the invention is to provide a circulatory system whereby heat generated by combustion of fuel in the fireplace structure is distributed to a desired point or points of use.

A further object of the invention is to provide insulatory capability to a heat conserving fireplace structure whereby the fireplace structure may be located at zero clearance with combustibles such as walls, studs, sheathing, or paneling forming a portion of a dwelling or the like.

Still another object of the invention is to provide a mechanism for introducing fuel into the firebox of the fireplace structure for combustion therein.

Further objects and attendant advantages of the invention will become more readily apparent by reference to the following description of the preferred embodiments of the invention.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a fireplace assembly located in a dwelling or the like, the upper portion of the assembly which is external of the dwelling being spaced from the lower interior portion of the assembly for convenience of presentation;

FIG. 2 is a schematic view of the fireplace assembly of FIG. 1 from a front elevational orientation illustrating inter alia the flow of both heating and insulating air through the assembly;

FIG. 3 is a schematic view of the present fireplace assembly from a side elevational orientation;

FIG. 4 is a plan view schematically rendered of the present fireplace assembly taken along the line 4—4 of FIG. 2;

FIG. 5 is a front elevational view in section of a hopper mechanism and taken along the line 5—5 of FIG. 4;

FIG. 6 is a side elevational view in section of the hopper mechanism in the retracted position; and,

FIG. 7 is a side elevational view in section of the hopper mechanism in its extended position.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention is best understood by referring to the drawings wherein a fireplace assembly is generally shown at 10 in FIGS. 1, 2, and 3. The fireplace assembly 10 is seen to be generally comprised of a triple flue assembly 12, a hood assembly 22, a firebox 32, and an external chimney 20. The external chimney 20 is seen in FIG. 1 to be disposed externally of a dwelling or the like for ornamentally housing the upper portions of the flue assembly 12 in a well-known manner. The flue assembly 12 extends from its upper portion, which extends externally of the dwelling, downwardly into the interior of the dwelling and into enclosed communication with the hood assembly 22. The flue assembly 12 more particularly comprises a centrally disposed smoke flue 14 which may be formed from a circular pipe member. An air outlet flue 16 and an air inlet flue 18 are concentrically disposed about the smoke flue 14 and function to insulate the smoke flue 14 in a manner to be described hereinafter.

At their lower end portions, the smoke flue 14, air outlet flue 16, and air inlet flue 18 communicate with and may be integrally formed respectively with a smoke

flue hood 24, air outlet hood 26, and air inlet hood 28, which hoods 24, 26, and 28 form the hood assembly 22. The hood assembly 22 surmounts the firebox 32, which firebox 32 has a firebox wall 34 defining a fire chamber 42 in cooperation with a fire brick hearth 44. Fuel, such as natural cellulose material or coal and the like, is subjected to combustion on the surface provided by the hearth 44, thereby generating substantial heat energy and causing the hearth 44 and the firebox wall 34 to become heated to an elevated temperature. Further, heated air and heated gaseous products of combustion as well as fine particulate material is directed upwardly from the burning fuel through the smoke flue 14.

An air circulation chamber is partially defined by the firebox wall 34 and an air circulation chamber wall 36, the wall 36 being spaced from the firebox wall 34 and extending thereabout and terminating at the level of the supporting surface or floor on which the fireplace assembly rests. The air circulation chamber thus partially defined further extends beneath the hearth 44. An air intake vent is 54 disposed at floor level beneath a hearth platform 52 which extends into the space or room of the dwelling in which the fireplace assembly 10 is located. The chamber is closed at its upper end and does not communicate with the smoke flue hood 24. Relatively cool air which is typically disposed at or near the floor in a dwelling is drawn into the intake vent 54 and thereby into the air circulation chamber defined by the firebox wall 34 and chamber wall 36. In this air circulation chamber, the relatively cool air comes into contact with the rear surfaces of the firebox wall 34 and the lower surface of the fire brick hearth 44, which hearth 44 may be of a convoluted configuration as shown best in FIG. 3 to provide a greater heat exchange surface to the air in the air circulation chamber. Thus, the cool air drawn in the air circulation chamber is heated by heat exchange through the firebox wall 34 and the hearth 44. This heated air rises and acts to draw additional relatively cool air from the room through the intake vent 54, thereby creating an air circulation which continuously supplies cool air to the heat exchanging surfaces of the firebox wall 34 and the hearth 44. This heating of the cool air thus flowing into the air circulation chamber acts inter alia to insulate the firebox 32 from surrounding potentially combustible material in and around wall 88 of the dwelling, thereby contributing to the ability of the present structure to be disposed with zero clearance to such combustible materials. Further, and more importantly, the air thus heated rises to and passes through circulation vents 46 which communicate the air circulation chamber with the interior of the room or space in which the fireplace assembly 10 is located. The heated air may be distributed through ducts as shown best in FIGS. 1, 2, and 4 to remote circulation vents such as vent 90 to heat a room, a space or a floor structure remote from the fireplace assembly 10. The heated air moves through the vents 46 or vent 90 without the need for blowers or the like due to the circulatory flow caused by a thermal drawing effect as the relatively cool air is heated and rapidly rises within the air circulation chamber.

The heated gases and particulate material emitted from the burning fuel in the fire chamber 42 moves upwardly through the smoke flue 14 as previously described. The flue 14 must be insulated in order to allow positioning of the fireplace assembly 10 with minimum clearance to surrounding combustible materials. In

order to accomplish this insulative function, the air outlet flue 16 and air inlet flue 18 communicate respectively with the air outlet hood 26 and air inlet hood 28 as described previously. The air outlet hood 26 has a lower wall 38 which is spaced from and extends about the air circulation chamber wall 36 to define an air outlet chamber. Similarly, the air inlet hood 28 has a lower wall 40 which is spaced from and extends about the air outlet hood 26 to define an air inlet chamber. The air inlet chamber and air outlet chamber communicate at their lower portions. Relatively cool air in the air outlet chamber is heated due to contact with heat exchange surfaces on the exterior surfaces of the smoke flue 14 and on the air circulation chamber wall 36, heat being exchanged through the flue 14 and wall 36 from the heated air in the smoke flue 14 and in the air circulation chamber. The air thus heated rises and exits the flue assembly 12 through the air outlet flue 16, relatively cold air then filling the void thereby created in the air outlet chamber by moving into the air inlet flue 18, down through the air inlet hood 28, into the air inlet chamber, and into the air outlet chamber in a circulating fashion to be heated therein and also during its passage through the air outlet hood 26 and the smoke flue 14. Thus, the fireplace assembly 10 and the smoke flue 14 in particular is insulated by the thermally induced flow of relatively cold air from the exterior of the dwelling through the air inlet flue 18 to be eventually heated and to pass out of the dwelling through the air outlet flue 16, thereby cooling the outer surfaces of the smoke flue 14, the smoke flue hood 24, and the air circulation chamber wall 36 to provide insulation therefor. Since the air insulative arrangement thus described in primarily intended to insulate the upper portions of the fireplace assembly 10, i.e., the smoke flue 14 and the smoke flue hood 24, the walls 38 and 40 may be terminated at higher locations than are shown in FIG. 3 such that heated air in the air circulation chamber is not cooled by the relatively cold air flow in the air inlet chamber and the air outlet chamber which are partially defined respectively by the walls 38 and 40. Thermal insulation (not shown) would be disposed on or behind the air circulation chamber wall 36 to insulate the air circulation chamber partially defined thereby and to further insulate the firebox 32, which firebox 32 is partially insulated by the air flow within the air circulation chamber. The heated air in the air circulation chamber thus remains maximally heated for distribution to desired points of use.

Several ancillary devices which render the fireplace assembly 10 more easily used include a damper 30 disposed at the junction of the smoke flue 14 and the smoke flue hood 24, the damper 30 being operated in a known fashion. Further, an ash dump 50 is disposed in the hearth 44 and provides an opening therein through which ashes may be swept into an ash drawer 48 which is disposed beneath the hearth 44, the ash drawer 48 being removable from the front of the fireplace assembly 10 to more conveniently remove ash material from the fire chamber 42.

A fuel hopper assembly 56, which is particularly useful for storing and dispensing coal, is shown generally in FIGS. 1, 2, and 4 and particularly in FIGS. 5, 6, and 7. The hopper assembly 56 comprises a storage container 58 which is filled with the fuel to be dispensed through loading door 60 which opens into the room of the dwelling in which the fireplace assembly 10 is lo-

cated. The container 58 opens at its lower end through an opening 62 which communicates the interior of the container 58 with a movable chute 64 disposed beneath the container 58. The container 58 and chute 64 are preferably disposed within the interior of the wall 88, the loading door 60 being disposed on the face of the wall 88. The chute 64 is shaped substantially in the form of a rectangular box which opens at 66 or its upper surface and at 68 on its lower surface at the opposite end of the chute. The container 58 is open to the interior of the chute 64 only when the opening 62 is aligned with the opening 66 in the chute. The openings 62 and 66 are aligned only when the chute 64 is positioned with its inner end extended into the fire chamber 42 at its full extension. The chute 64 is extended into the fire chamber 42 by a rack 82 on the lower surface of the chute 64 and pinion 80 which is operated by a hand wheel 74 on the end of a shaft 76, the shaft 76 having the pinion 80 also mounted thereon. The shaft 76 is supported by supports 78 which are in turn mounted on structure in which the chute 64 slides. The extensions of the rack 82 extend through a longitudinal opening in a slotted sleeve 72, the chute 64 sliding in part on the sleeve 72. The chute 64 is further supported on its entry into the fire chamber 42 by a sleeve 70 located in an opening in the firebox wall 34. The chute 64 is fitted with a fireproof cap 84 on its inner end, i.e., the end thereof which is extendible into the fire chamber 42. In its inoperative position, i.e., the position in which the chute 64 is fully retracted from the fire chamber 42 and rests beneath the container 58, the fireproof cap 84 closes the opening in the firebox wall 34 through which the chute 64 may be extended. At the fully desired extension of the chute 64 into the fire chamber 42, a stop 86 on the outer end of the rack 82 abuts the pinion 80 to prevent further movement of the chute 64 into the fire chamber 42. The openings 66 and 62 may be so formed as to admit fuel into the chute 64 at a desired point in the extension of the chute into the fire chamber 42. At full extension thereof, the openings 66 and 62 are fully aligned and fuel moves from the container 58 into the chute 64 and out of the chute 64 through the opening 68 into the fire chamber 42. Fuel may thus be dispensed into the fire chamber 42 for combustion as desired and without the untidiness usually associated with adding a fuel, such as coal, to a fire chamber.

Referring again to FIGS. 2 and 3, the damper 30 may be seen to include structure which renders the damper adjustable to a desired position without the necessity for reaching up into the interior of the fire chamber 42. A draw chain 91 may be pulled from a point in the living space in which the fireplace assembly 10 is located. Operation of the draw chain 91 actuates a ratchet and pawl mechanism shown generally at 93, the mechanism 93 being disposed in the throat of the smoke flue 14.

It can be seen in FIG. 2 that the vents 46 may be disposed at points immediately above the fire chamber 42 or at points a short distance above said fire chamber. Heat ducts 45 communicating the uppermost vents 46 with the air circulation chamber allow passage of warm air from said chamber to the vents 46.

The invention is thus seen to include a fireplace assembly 10 which may be prefabricated for installation in a dwelling or the like and which withdraws relatively cool air from a space which may be the living space or room in which the assembly 10 is located, and heats the

cool air by contact with the firebox wall 34 and hearth 44, the heated air then being circulated to a desired point of use. This circulation of relatively cool air about the firebox wall 34 and hearth 44 also serves to insulate the firebox 32. This heated air is thus utilized to provide controlled environmental warmth within a dwelling rather than being discharged into the atmosphere. Relatively cold air, usually from outside of the dwelling is further drawn into a multi-chambered flue assembly 12 for insulation of the heated air and gaseous products being discharged through the smoke flue 14 from the interior of the firebox 32. The invention further provides a convenient ash dump 50 useful for cleaning of the firebox 32. As can be appreciated from the description given hereinabove, it is possible to practice the invention in fashions other than that specifically described without departing from the teachings of the invention. Accordingly, it is to be understood that the invention is to be limited only by the claims appended hereto.

We claim:

1. A fire place assembly for installation in a communicating relation with an environmental space in a structure such as a dwelling or the like, comprising:

firebox means having heat exchange surfaces thereon and in which a fuel is oxidized to generate heat;

means enclosing the firebox means in spaced relation thereto and cooperating therewith to define an air circulation chamber substantially therebetween;

air intake means communicating the interior of the air circulation chamber with the aforesaid environmental space at a relatively low elevational level therein such that relatively cool air in said space is drawn into the air circulation chamber, the relatively cool air being heated therein on contact with the heat exchange surfaces on the firebox means, the air thus heated then being upwardly mobile to draw by way of a thermal suction effect additional relatively cool air into the air circulation chamber through the relatively low elevationally disposed air intake means;

air outlet means for distributing the heated air in the air circulation chamber to a desired point of use;

fuel hopper means disposed adjacent to said firebox means for introducing fuel contained in said hopper means into the firebox means, the fuel hopper means comprising

container means for holding the fuel, said container means having an opening in a lower portion thereof, and

chute means disposed to receive fuel thereinto from the opening in the container means, the chute means being extendible into the interior of the firebox means through an opening therein to dispense fuel thereinto; and,

means for extending the chute means into the firebox means, said last-mentioned means comprising

rack means on the chute means, and pinion means engageable with the rack means and moveable to advance the chute means into the interior of the firebox means.

2. The fireplace assembly of claim 1 and further comprising hearth means having heat exchange surfaces thereon, the hearth means acting to further define the air circulation chamber and to contact the air therein to heat said air.

7

3. The fireplace assembly of claim 2 wherein the hearth means is formed with a convoluted surface bounding the air circulation chamber, the convoluted surface substantially forming the heat exchange surface on said hearth means thereby to increase heat transfer to the air in the air circulation chamber. 5

4. The fireplace assembly of claim 1 and further comprising flue means for discharging heated air, gaseous products of combustion, and suspended particulate matter in the heated air from the firebox means, the flue means including air circulatory means for insulatably surrounding the heated air and combustion products. 10

5. The fireplace assembly of claim 4 wherein the flue means comprise: 15

a smoke flue centrally disposed in said flue means and extending from communication with the firebox means to a point external of the aforesaid structure, heated air and gaseous products of combustion being discharged from the firebox means through the smoke flue; 20

an air outlet flue spaced from and concentrically disposed about the smoke flue and defining a first chamber therebetween, the air outlet flue extending externally of the structure; and, 25

an air inlet flue spaced from and concentrically disposed about the air outlet flue and defining a second chamber therebetween, the second chamber communicating with the first chamber at a location spaced from the firebox means, the air inlet flue extending externally of the structure for receiving relatively cold air thereinto, said cold air circulating through the second chamber and into the first 30

8

chamber, the first chamber bounding the smoke flue, relatively cold air in said first chamber acting to insulate said smoke flue, the relatively cold air being heated by heat transfer from said smoke flue and rising in said first chamber to exit the air outlet flue externally of the structure, the air thus heated being upwardly mobile to draw by way of a thermal suction effect additional relatively cold air through said air inlet flue and into heat exchanging relation to said smoke flue and subsequently out of the air outlet flue in a circulating fashion.

6. The fireplace assembly of claim 1 and further comprising duct means for distributing the heated air in the air circulation chamber to a point of use at a location remote from said fireplace assembly. 15

7. The fireplace assembly of claim 1 and further comprising ash dump means disposed in a lower portion of said firebox means for receiving ash residue in the firebox. 20

8. The fireplace assembly of claim 7 and further comprising ash drawer means disposed beneath the firebox means and receiving ash residue thereinto from the ash dump means in the firebox means, the ash drawer means being removable from the fireplace assembly for convenient disposal of the ash residue. 25

9. The fireplace assembly of claim 1 and further comprising fireproof cap means on the end of the chute means which extends into the interior of the firebox means, the cap means acting to close the opening in said firebox means through which the chute means extend. 30

\* \* \* \* \*

35

40

45

50

55

60

65