

May 15, 1945.

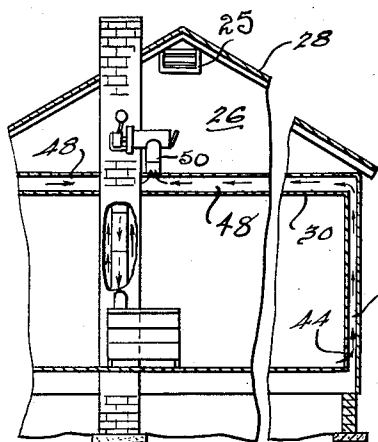
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2,376,173

HEATING APPARATUS

Filed Sept. 9, 1943

2 Sheets-Sheet 1



III. 1.

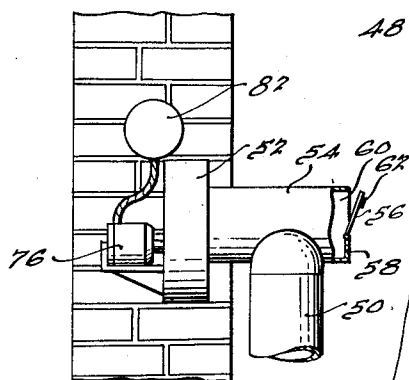


Fig. 3.

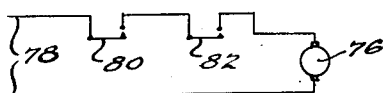
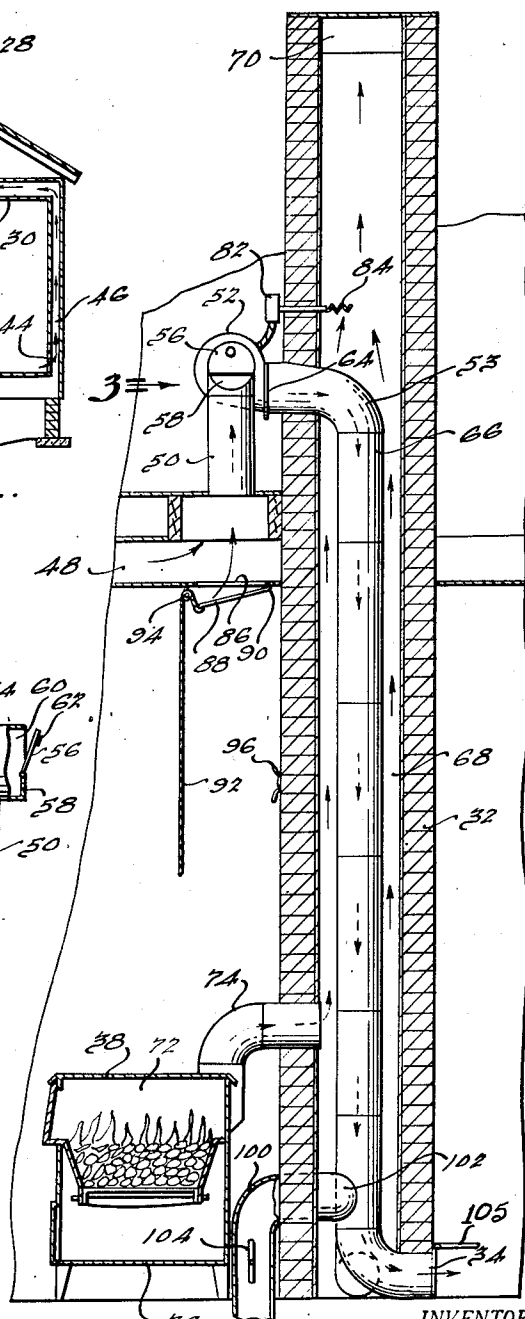


Fig. 2.



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2 Sheets-Sheet 2

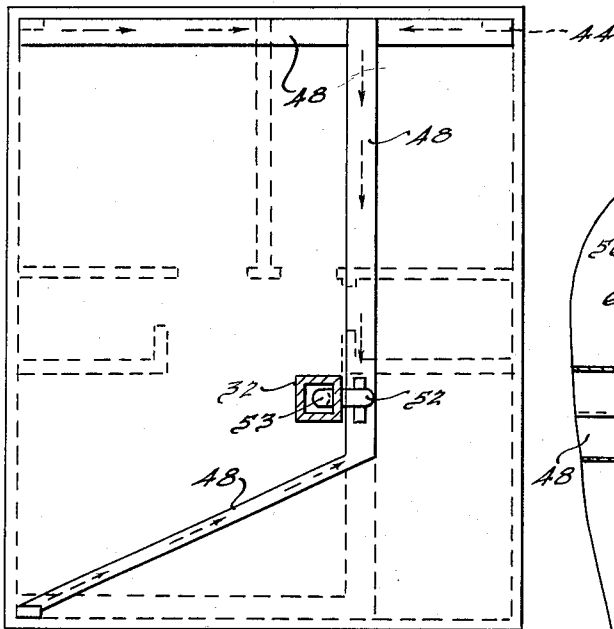


FIG. 5.

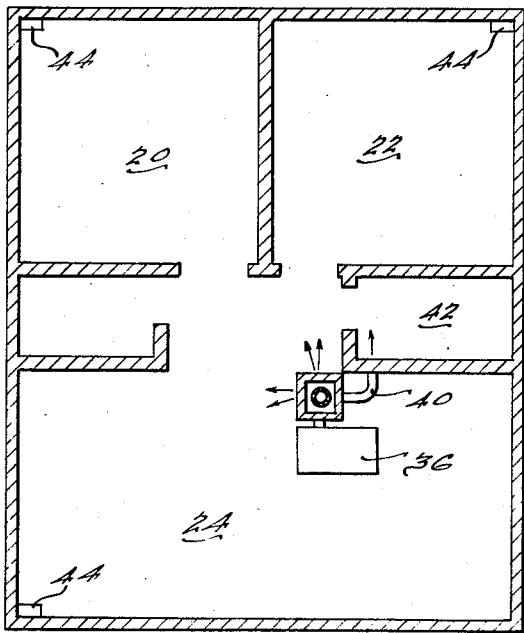


FIG. 4.

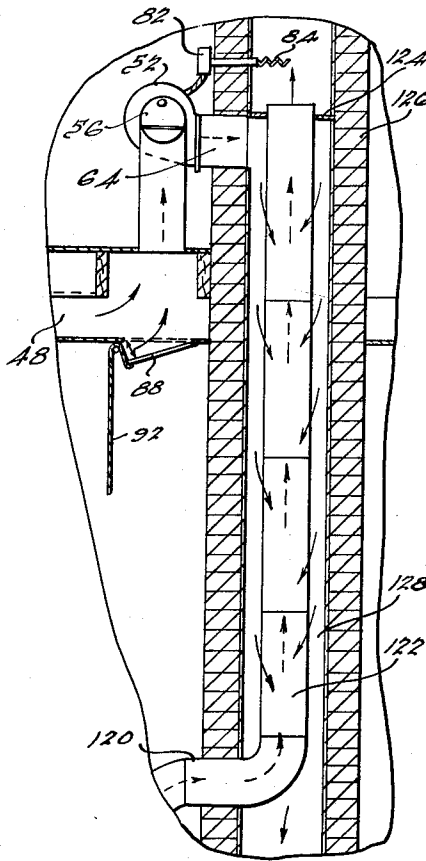


FIG. 6.

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HEATING APPARATUS

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mesne assignments, to Moritz L. Mueller and
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ants

Application September 9, 1943, Serial No. 501,613

6 Claims. (Cl. 237—2)

This invention relates to heating and air circulating systems and has particular reference to a low cost heating system for supplying heated air to a space in a building to be occupied by and for the comfort of human beings, and for circulating air therein.

Principal objects of the invention are:

To provide a novel and efficient low cost type of heating system which is particularly adapted, although not limited, for use in heating one-story homes where no basement is employed;

To provide a simple and inexpensive heating system which is adapted to promote the circulation of heated air throughout the house and which is also adapted for withdrawing heated air from the house during the time when it is not desired to supply heat to the space in the house;

To provide an inexpensive heating system for a small house in which the fuel burning apparatus thereof may also be utilized as a cook stove and in which system provision is made for preventing the overheating of the kitchen and for distributing heat from the kitchen in which the cook stove is arranged to other portions of the house.

Other objects and advantages of the invention will be apparent from a consideration of the following specification taken in conjunction with the accompanying drawings, of which there are two sheets and wherein:

Fig. 1 is a vertical cross section through a part of a house illustrating one form of heating system embodying the invention and the method of circulating the air to be heated through the heating system and the house;

Fig. 2 is an enlarged vertical sectional view of the heat exchange and air circulating part of the system;

Fig. 3 is an enlarged fragmentary view of the air circulating apparatus and the relief vent of the system;

Fig. 4 is a plan view of the interior arrangement of the house having the heating system arranged therein;

Fig. 5 is a plan view to the attic space of the house illustrating the air circulating system of the heating system;

Fig. 6 is a fragmentary view similar to Fig. 2 and illustrating a modified form of the invention; and

Fig. 7 is a view illustrating the wiring diagram for the blower motor.

In Figs. 1, 4, and 5, there is illustrated a house or dwelling having a plurality of rooms 20, 22, and 24 with an attic space 26 between the roof 28 of

the dwelling and the ceiling 30 over such rooms. The attic preferably is vented in any suitable manner, such for example as by a louvered opening 25 to atmosphere. A heating system embodying the invention is provided for heating the space in the rooms and comprises in general a chimney 32 forming part of a heat generating and recovering apparatus which is provided with a plurality of outlets 34 through which heated air is discharged to the space in the various rooms.

As illustrated in Fig. 4, the room 24 may consist of a combination living room, dining room and kitchen, such as now employed in many of the defense homes being erected, and have heat generating apparatus comprising a stove 36 arranged therein. As illustrated in Fig. 2, the stove 36 includes a combustion chamber 72 which may be adapted for burning hard fuel, such as coal, under natural draft conditions and be provided with a flat top 38 which forms a cooking top, as well as an oven. A water heating coil of a hot water system may be thermally associated with combustion chamber 72. In Fig. 4 the direction of flow of the heated air discharged through the outlets 34 is indicated by arrows, and from these it will be seen that one of the outlets 34 may be arranged to discharge air directly into the room 24 and another of the outlets may be arranged to discharge air toward the entrance to the rooms 22 and 20, which may be bedrooms, and another of the outlets may be connected by a short section of pipe 40 so as to discharge heated air into a small room 42; which might be used as a bathroom. The particular room arrangement disclosed is used merely as one example.

Return air outlets 44 may be arranged in the outside walls of the dwelling and communicate with the rooms 20, 22 and 24 in such a way as to induce a circulation of heated air across the rooms from the heated air outlets 34, and as indicated in Fig. 1, these return air outlets communicate with vertically extending ducts 46 formed in the walls of the dwelling, the ducts 46 at their upper ends communicating with lateral ducts 48 which deliver the return air to a pipe 50 which communicates with the intake side of the air blower 52. The upper end of pipe 50 opens into a laterally extending pipe 54, one end of which communicates with the intake side of the blower 52 while the other end of the pipe 54 is provided with a damper 56.

A plate 58 closes the lower part of the right hand end (Fig. 3) of pipe 54, while the damper 56 is pivoted to the plate 58 and is adapted to close the opening 60 formed in the end of the

pipe 54 above the plate 58. In Fig. 3 the damper 56 is shown in its open position, the position it is adapted normally to assume when the blower 52 is not operating. A weight 62 may be provided for insuring movement of the damper 56 to the position in which it is illustrated in Fig. 3. The damper 56 is adapted to move in a counterclockwise direction so as to close the opening 60, and this action is brought about by operation of the blower 52, the damper 56 being so arranged that flow of air into the opening 60 will move the damper 56 to position to close the opening 60 and to hold the damper in such position during the operation of the blower.

The discharge 64 of the blower is connected to the upper or inlet end of a heat exchanger member 66, the lower or outlet ends of the heat exchanger member 66 being connected with the outlets 34. The heat exchanger member 66 may be formed of a plurality of lengths of stove pipe arranged in end-to-end relationship, as illustrated, and which form a path for conducting air to be heated in intimate countercurrent heat exchange relationship with the flue gases which flow upwardly through the path 68 provided internally of the chimney 32.

The chimney 32 extends upwardly from its base to and above the roof 28 of the building, and is provided with an atmospheric vent 70 through which the products of combustion are discharged into the atmosphere. Heated products of combustion are generated in the combustion chamber 72 by the burning of fuel therein, and such heated products of combustion are supplied through a pipe 74 to the lower end of the flue path or duct 68, the height of the chimney 32 being sufficient to induce enough draft in the combustion chamber 72 so as to support combustion therein under natural draft, the combustion chamber 72 being supplied with air through suitable air intake openings (not shown).

The blower 52 is adapted to be driven by a motor 76, the circuit of which is illustrated in Fig. 7. The motor circuit 78 includes a hand-operated switch 80 and thermostatic switch 82. When both the hand switch 80 and thermostatic switch 82 are closed the motor 76 is adapted to drive the blower 52, which in turn will effect the circulation of air from the space in the rooms 20, 22 and 24 upwardly through the wall ducts 46, then laterally through the ceiling duct 48, thence through pipes 50 and 54, blower 52, elbow 53, heat exchanger member 66, and warm air outlets 34.

If at such time heated products of combustion are being generated in the combustion chamber 72, the passage of air through the heat exchanger member 66 will absorb heat from the flue gases in the flue gas passageway 68. The thermostatic switch 82 has the thermal element 84 arranged in the flue passageway 68 just above the upper end of the heat exchanger member 66, and preferably is set so that when the flue gas temperature at this point reaches a predetermined degree, say for example 225° F., the switch 82 will close and cause operation of the motor 76 and blower 52. When the temperature of the flue gases at this point falls below a predetermined degree, say for example a temperature of 125° F., the thermal element will open the switch 82, thereby discontinuing the operation of the blower.

As previously described, the damper 56 will open the relief vent 60 upon the stopping of the blower and will close the opening 60 upon starting of the blower. In this way the air path provided by

the heat exchanger member 66 is open at its top, as well as at its bottom, whenever the blower 52 is stopped. In this way, if the circuit of the motor should be open for any reason whenever heated products of combustion are being generated in the combustion chamber 72, heat will be dissipated from the heat exchanger member 66 by thermosiphonic flow of air therethrough. For example, in the summertime when it is desired to employ the stove 36 for cooking or other purposes without having heat supplied to the house, the switch 80 may be opened, thereby cutting out the thermostatic switch 82 and preventing the operation of the blower 52.

As the stove 36 is arranged in the kitchen 24 and exposed to the air therein, it will not only give off radiant heat, but will also dissipate heat to the air in the kitchen. Under some circumstances the kitchen may become too warm, and to relieve this situation a bleed or damper-controlled air intake 86 may be provided for admitting air from the upper part of the kitchen to the duct 48 which is on the intake side of the blower 52. A damper 88 pivoted at 90 is adapted to close the opening 86, the damper 88 normally being held open by gravity. A cord 92 passing over a pulley 94 may be connected to the free end of the damper for moving the same to its closed position, and the cord may be anchored to a bracket 96 for holding the damper in closed position. If the inlet 86 is open during the heating season, warm air from the kitchen will be drawn through the inlet 86 into the air circulating system, and after passing through the heat exchanger member 66 and the warm air outlets 34, may be distributed to the various parts of the house. In this way a better distribution of heat throughout the house may be obtained.

An air conduit 100 connected at one end 102 thereof to the lower end of the heat exchanger member 66 is adapted to conduct air from the heat exchanger member 66 to the outside of the dwelling. As illustrated in Fig. 2, the conduit 102 may extend through the floor of the dwelling and when the damper 104 thereof is open, as illustrated in Fig. 2, the air which has passed through the heat exchanger member 66 may be discharged externally of the house. During the time that heat is supplied to the house the damper 104 should be closed so that the air may be forced through the outlets 34. However, when the damper 104 is open, the outlets 34 may be closed by dampers 106 so that all of the air which passes through the heat exchanger member 66 will be discharged externally of the house. In this way, when the stove 36 is operated during the summertime, heated air may be withdrawn from the kitchen through the air inlet 86 to the duct 48, as well as from the various rooms through the outlets 44, and if desired a shunt may be provided around thermostatic switch 82 so that the blower 52 may be operated without regard to the temperature of the flue gases adjacent the thermostatic element 84.

In the modification illustrated in Fig. 6, the construction and operation of the system is the same except in the following particulars. The products of combustion are supplied through pipe 120 to the interior of heat exchanger member 122. The upper end of the heat exchanger member 122 is centered by a plate or baffle 124 which forms a seal between the outside of the heat exchanger member 122 and the inside wall of the chimney 126. Air from the blower 52 is supplied through the discharge 64 thereof to the air path which

is formed between the heat exchanger member 122 and the walls of the chimney 126. Above the plate 124 and heat exchanger member 122 the walls of the chimney 126 form the flue gas passageway which leads to an atmospheric vent. Below the heat exchanger member 122 the air path 128 may be provided with outlets, as shown in Fig. 2, for discharging heated air into the space in the rooms, as well as with a connection like the conduit 100 for optionally delivering the heated air externally of the space inside the house.

As the attic space 26 is vented to atmosphere and as the relief vent 60 opens into the attic, the air passageway of the heating apparatus will be vented externally of the space to which heat is normally supplied, when the damper 56 is open. In addition, as the warm air outlets 34 are open except when the damper 104 is open, the space which is normally supplied with heat is vented through the air path of the heating apparatus and the vent 60 through the attic to atmosphere when the blower 52 is not operating, although this, as well as the venting of the air path of the heating system, may be controlled by the dampers 105.

While the invention has been described with some detail, it is to be understood that the description is for the purpose of illustration only and is not definitive of the limits of the inventive idea. The right is reserved to make such changes in the details of construction and arrangement of parts as will fall within the purview of the attached claims.

I claim:

1. In a heating system for a building for human occupancy having space to be heated and an attic thereabove, said space providing a plurality of rooms, a chimney which forms part of the building and which extends upright to and above the roof of the building and has an atmospheric discharge, a stove in one of said rooms having a combustion chamber provided with means for burning fuel so as to generate heated products of combustion and a cooking surface, a heat exchanger member extending longitudinally of and for a substantial portion of the length of said chimney, said heat exchanger member and chimney providing a path for the upward flow of the products of combustion from said combustion chamber to said atmospheric discharge and a separate path for flow of air in intimate countercurrent heat exchange relationship with the combustion products, a flue connection between said combustion chamber and the lower end of said combustion products path, means including a return air duct and a blower operable to supply from said space to the upper end of said air path, air to be heated and under a pressure greater than the pressure of the products of combustion in said combustion products path, the inlet end of said return air duct communicating with one of said rooms other than that one in which said stove is arranged, the lower end of said air path having an outlet for discharging heated air into said space, an electric motor for operating said air blower, an electric circuit for said motor including a thermoplastic switch having a thermal element responsive to the temperature of the combustion products at the upper end of said heat exchanger member and adapted to close the circuit so that said air blower will be normally operated when heated products of combustion are being generated at a substantial rate, a manually operated switch in said circuit for preventing the operation of

said air blower as aforesaid without interfering with the generation of heated products of combustion in said combustion chamber when it is desired to use said stove for cooking purposes without operating said air blower, said air path having a relief vent at the upper end thereof communicating with the attic and adapted for venting said air path so as to dissipate from said heat exchanger member the heat absorbed thereby when said fuel burning means are operated for the purpose of cooking without supplying heated air to said space, and a by-pass between the upper end of said room in which said stove is located and said return air duct for withdrawing heated air from said room.

2. In a heating system for a building for human occupancy having space to be heated and an attic thereabove, said space providing a plurality of rooms, a chimney which forms part of the building and which extends upright to and above the roof of the building and has an atmospheric discharge, a stove in one of said rooms having a combustion chamber provided with means for burning fuel so as to generate heated products of combustion and a cooking surface, a heat exchanger member extending longitudinally of and for a substantial portion of the length of said chimney, said heat exchanger member and chimney providing a path for the upward flow of the products of combustion from said combustion chamber to said atmospheric discharge and a separate path for flow of air in intimate countercurrent heat exchange relationship with the combustion products, a flue connection between said combustion chamber and the lower end of said combustion products path, means including a return air duct and a blower operable to supply from said space to the upper end of said air path, air to be heated and under a pressure greater than the pressure of the products of combustion in said combustion products path, the inlet end of said return air duct communicating with one of said rooms other than that one in which said stove is arranged, the lower end of said air path having an outlet for discharging heated air into said space, an electric motor for operating said air blower, an electric circuit for said motor including a thermostatic switch having a thermal element responsive to the temperature of the combustion products at the upper end of said heat exchanger member and adapted to close the circuit so that said air blower will be normally operated when heated products of combustion are being generated at a substantial rate, a manually operated switch in said circuit for preventing the operation of said air blower as aforesaid without interfering with the generation of heated products of combustion in said combustion chamber when it is desired to use said stove for cooking purposes without operating said air blower, said air path having a relief vent at the upper end thereof communicating with the attic and adapted for venting said air path so as to dissipate from said heat exchanger member the heat absorbed thereby when said fuel burning means are operated for the purpose of cooking without supplying heated air to said space, a by-pass between the upper end of said room in which said stove is located and said return air duct for withdrawing heated air from said room, and means connected to the lower end of said air path for discharging the heated air therefrom externally of said space.

3. In a heating system for a building for human occupancy having space to be heated comprising

a plurality of rooms, a chimney which forms part of the building and which extends upright to and above the roof of the building and has an atmospheric discharge, a stove in one of said rooms having a combustion chamber provided with means for burning fuel so as to generate heated products of combustion and a cooking surface, a heat exchanger member extending longitudinally of and for a substantial portion of the length of said chimney, said heat exchanger member and chimney providing a path for the upward flow of the products of combustion from said combustion chamber to said atmospheric discharge and a separate path for flow of air in intimate countercurrent heat exchange relationship with the combustion products, a flue connection between said combustion chamber and the lower end of said combustion products path, means including a return air duct and a blower operable to supply from said space to the upper end of said air path, air to be heated and under a pressure greater than the pressure of the products of combustion in said combustion products path, the inlet end of said return air duct communicating with one of said rooms other than that one in which said stove is arranged, the lower end of said air path having an outlet for discharging heated air into said space and another outlet for discharging air externally of said space, damper means for selectively controlling the flow of air through said outlets, an electric motor for operating said air blower, an electric circuit for said motor including a thermostatic switch having a thermal element responsive to the temperature of the combustion products at the upper end of said heat exchanger member and adapted to close the circuit so that the air blower will be normally operated when heated products of combustion are being generated at a substantial rate, a manually operated switch in said circuit for preventing the operation of said air blower as aforesaid without interfering with the generation of heated products of combustion in said combustion chamber when it is desired to use said stove for cooking purposes without operating said air blower, said air path having a relief vent at the upper end thereof adapted to open externally of said space for venting said air path so as to dissipate from said heat exchanger member the heat absorbed thereby when said fuel burning means are operated for the purpose of cooking without supplying heated air to said space, a damper adapted to close said vent during operation of said blower, and a by-pass between the upper end of said room in which said stove is located and said return air duct for withdrawing heated air from said room, and a damper for controlling said by-pass.

4. In a heating system for a building for human occupancy having space to be heated, a chimney which forms part of the building and which extends upright to and above the roof of the building and has an atmospheric discharge, a stove in said space having a combustion chamber provided with means for burning fuel so as to generate heated products of combustion and a cooking surface, a heat exchanger member extending longitudinally of and for a substantial portion of the length of said chimney, said heat exchanger member and chimney providing a path for the upward flow of the products of combustion from said combustion chamber to said atmospheric discharge and a separate path for flow of air in intimate countercurrent heat ex-

change relationship with the combustion products, a flue connection between said combustion chamber and the lower end of said combustion products path, means including a return air duct and a blower operable to supply from said space to the upper end of said air path, air to be heated and under a pressure greater than the pressure of the products of combustion in said combustion products path, the inlet end of said return air duct communicating with said space near the floor thereof and remote from said stove, the lower end of said air path having an outlet for discharging heated air into said space near the floor thereof, an electric motor for operating said air blower, an electric circuit for said motor including a thermostatic switch having a thermal element responsive to the temperature of the combustion products and adapted to close the circuit so that the air blower will be normally operated when heated products of combustion are being generated at a substantial rate, a switch adapted to open said circuit for preventing the operation of said air blower as aforesaid without interfering with the generation of heated products of combustion in said combustion chamber when it is desired to use said stove for cooking purposes without operating said air blower, said air path having a relief vent at the upper end thereof adapted to open externally of said space for venting said air path so as to dissipate from said heat exchanger member the heat absorbed thereby when said fuel burning means are operated for the purpose of cooking without supplying heated air to said space, said return air duct having a damper controlled inlet above said stove for withdrawing air from said space during operation of said blower.

5. In a heating system for a building for human occupancy having space to be heated, a chimney which forms part of the building and which extends upright to and above the roof of the building and has an atmospheric discharge, a combustion chamber provided with means for burning fuel so as to generate heated products of combustion and a cooking surface, a heat exchanger member extending longitudinally of and for a substantial portion of the length of said chimney, said heat exchanger member and chimney providing a path for the upward flow of the products of combustion from said combustion chamber to said atmospheric discharge and a separate path for flow of air in intimate countercurrent heat exchange relationship with the combustion products, means including a return air duct and a blower operable to supply from said space to the upper end of said air path, air to be heated and under a pressure greater than the pressure of the products of combustion in said combustion products path, the inlet end of said return air duct communicating with said space remote from said combustion chamber, the lower end of said air path having an outlet for discharging heated air into said space, an electric motor for operating said air blower, an electric circuit for said motor including a thermostatic switch having a thermal element responsive to the temperature of the combustion products and adapted to close the circuit so that the air blower will be normally operated when heated products of combustion are being generated at a substantial rate, a switch adapted to open said circuit for preventing the operation of said air blower as aforesaid without interfering with the generation of heated products of combustion in said combustion chamber when it is desired to generate heated products of

combustion for cooking purposes without operating said air blower, said air path having a relief vent at the upper end thereof adapted to open externally of said space for venting said air path so as to dissipate from said heat exchanger member the heat absorbed thereby when said fuel burning means are operated for the purpose of cooking without supplying heated air to said space, and a by-pass between the upper end of said space adjacent said chimney and said return air duct for withdrawing heated air from said space during operation of said blower.

6. In a heating system for a building for human occupancy having space to be heated, a chimney which forms part of the building and which extends upright to and above the roof of the building and has an atmospheric discharge, a combustion chamber provided with means for burning fuel so as to generate heated products of combustion and a cooking surface, a heat exchanger member extending longitudinally of and for a substantial portion of the length of said chimney, said heat exchanger member and chimney providing a path for the upward flow of the products of combustion from said combustion chamber to said atmospheric discharge and a separate path for flow of air in intimate countercurrent heat exchange relationship with the combustion products, means including a return air duct and a blower operable to supply from said space to the upper end of said air path, air to be heated and under a pressure greater than the pressure of the products of combustion in said combustion pro-

ducts path, the inlet end of said return air duct communicating with said space remote from said combustion chamber, the lower end of said air path having an outlet for discharging heated air into said space, an electric motor for operating said air blower, an electric circuit for said motor including a thermostatic switch having a thermal element responsive to the temperature of the combustion products and adapted to close the circuit so that the air blower will be normally operated when heated products of combustion are being generated at a substantial rate, a switch adapted to open said circuit for preventing the operation of said air blower as aforesaid without interfering with the generation of heated products of combustion in said combustion chamber when it is desired to generate heated products of combustion for cooking purposes without operating said air blower, said air path having a relief vent at the upper end thereof adapted to open externally of said space for venting said air path so as to dissipate from said heat exchanger member the heat absorbed thereby when said fuel burning means are operated for the purpose of cooking without supplying heated air to said space, a by-pass between the upper end of said space adjacent said chimney and said return air duct for withdrawing heated air from said space during operation of said blower, and means connected to the lower end of said air path for discharging the heated air therefrom externally of said space.

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