

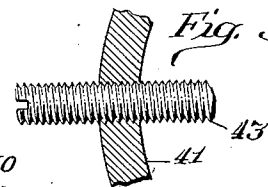
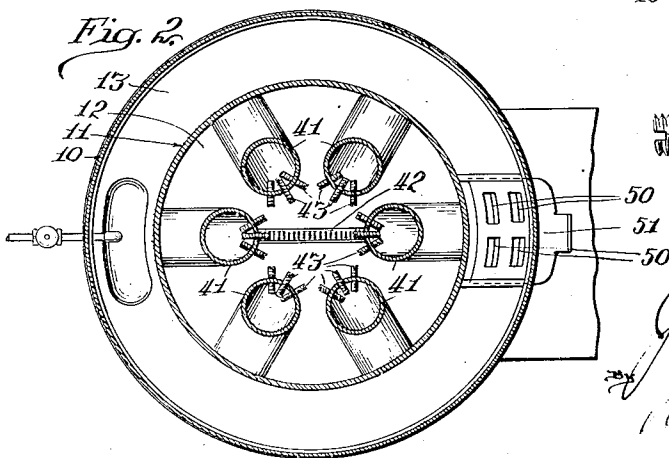
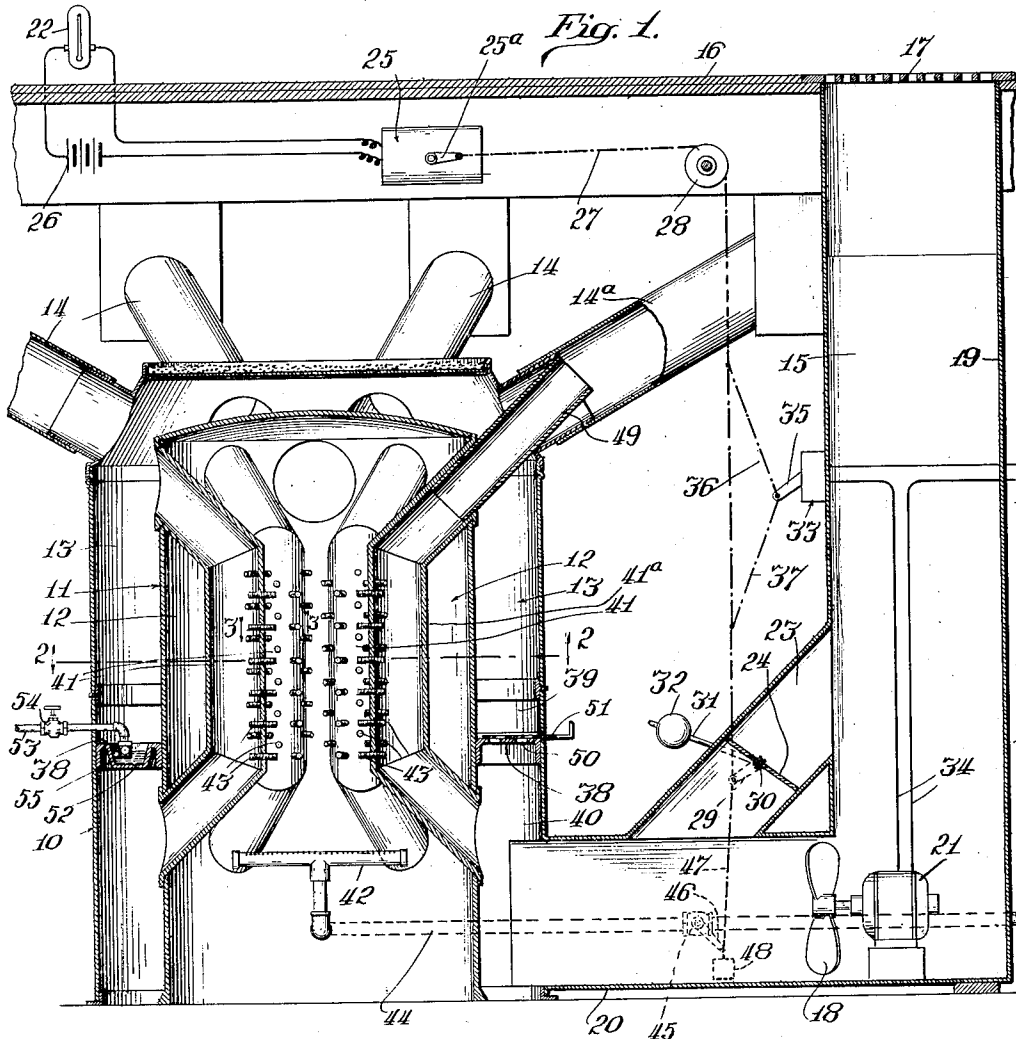
July 21, 1925.

1,546,450

J. W. MEAKER

FURNACE

Filed March 26, 1924



Inventor.

John W. Meaker
Baruch & Meaker
Attorneys

Patented July 21, 1925.

1,546,450

UNITED STATES PATENT OFFICE.

JOHN W. MEAKER, OF EVANSTON, ILLINOIS.

FURNACE.

Application filed March 26, 1924. Serial No. 701,962.

To all whom it may concern:

Be it known that I, JOHN W. MEAKER, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

My invention relates to certain improvements in hot air furnaces and is concerned more particularly with the construction of furnaces using a fluid, that is, oil or gas, as a fuel.

The principal object of the invention is to provide an oil or gas burning furnace, more particularly for a domestic heating plant, which will be so constructed as to utilize to the fullest extent the heat developed by the burner and which will distribute the heated air to the space or spaces to which it is destined as effectively as possible and in the quantity required. These purposes are carried out by a certain novel construction of the furnace calculated to effect a maximum heat exchange as between the combustion gases and the circulating air; and, preferably, through the employment of an automatically controlled blower or fan for producing a continuous circulation of air through the furnace to the space to be heated and from such space back to the furnace.

The invention comprises other incidental features of improvement to be hereinafter described and claimed. It is realized that some of these improved features might be employed in the coal burning furnace; and that, although it is preferable to use all of the described features in combination, it is not essential to do so. It is, therefore, my intention to cover the invention in its preferred embodiment as shown in the drawing appended hereto and also all modifications of such embodiment as may come within the scope of the appended claims.

In the drawing—

Fig. 1 is a fragmentary vertical sectional view of a furnace and appurtenances thereto constructed in accordance with my invention.

Fig. 2 is a sectional plan on line 2—2 of Fig. 1, and

Fig. 3 is a sectional plan view, on a larger scale, on line 3—3 of Fig. 1.

Referring to the drawing, the furnace is shown as consisting of an outer, upright, cylindrical casing 10 and an inner casing 11,

these casings providing an inner combustion space 12 and an outer air space 13. Leading from the air space 13 are one or more flues 14 for conveying heated air to the apartment or apartments to be heated. 15 is a return air flue, the inlet end of which extends to an opening in the flooring 16 above the furnace, this opening being provided with a grid or register 17. In the particular embodiment of the invention shown in the drawing, which embodiment, however, is subject to modification in this respect without departure from the invention, the air is continuously circulated from the furnace to the apartments to be heated through hot air flues 14 and back to the furnace through return flue 15. The installation has no fresh air pipe from outside the house although such pipe may be provided if desired.

Preferably a blower (by which I intend any means for creating air pressure) is provided for forcing air from the return flue through the furnace and hot air flues. In the drawing I have shown for this purpose a fan 18 located between the vertical leg 19 and the horizontal leg 20 of the return flue 15, which fan is driven by an electric motor 21. The blower may be operated continuously but preferably its action is intermittent and is controlled thermostatically in accordance with the temperature of the apartment or apartments to be heated. That is, the blower is set in operation when the room temperature falls to a certain point and is shut off when the temperature rises above a certain point. The thermostat for controlling the operation of the blower which, of course, will be adjustable to operate at any particular temperature for which it is set, is designated 22 and may be employed also for opening and closing the furnace damper, but as this arrangement is common it has not been shown on the drawing. As the fan, when idle, with its motor, tends to block or interfere with the flow of air through the return flue and into the furnace, a by-pass 23 around the blower outfit is provided having a damper 24 which is closed when the blower is in operation and opened when the blower is out of operation. Preferably this damper is automatically controlled by the thermostat 22 which controls the operation of the blower. The mechanism for energizing and de-energizing fan motor 21 and opening and

closing damper 24 may be as follows: 25 is a motor of any suitable type for giving oscillating movements to a lever arm 25^a. Motor 25 is in circuit with battery 26 and thermostat 22. 27 is a cord or chain attached to arm 25^a and extending over a sheave 28 and attached at its lower end to an arm 29 on the spindle 30 of damper 24. Fixed to the spindle 30 is another lever arm 31 provided with a weight 32. 33 is a circuit breaker of any suitable type for controlling current supply to the fan motor 21, the circuit of which is indicated at 34 and is connected with any suitable source of electric current (not indicated). Circuit breaker 33 is operated by a lever 35 attached by cords or chains 36, 37 with the cord or chain 27.

In an oil or gas burning furnace the zone of high temperature is more restricted, necessarily, because of the character of the fuel, than in a coal burning furnace. In order that an oil flame, for example, may be used economically the circulating air must be brought to the center of the combustion space by ducts constructed so as to bring about as complete heat exchange as is possible. This I accomplish by providing a horizontal partition 38 across the air space 13, dividing said space into upper and lower chambers 39, 40 and by providing a plurality of air heating ducts 41, the opposite ends of which open into the air space on opposite sides of partition 38, and which project radially toward the center of the combustion space 12. This division of the air passage through the furnace into a plurality of ducts necessarily increases the frictional resistance to the air flow as well as diminishing the effective cross sectional area of the air passage making very desirable the forced draft above described in order that the volume of air passed per unit of time should be sufficient for the maximum requirement. The burner 42, which may be of any preferred type, is located below ducts 41, the inner portions of the walls of which are preferably provided with radiating studs 43 which project into or, if desired, all the way across the ducts and into the central space between the ducts for the purpose of increasing the amount of heat transferred from the gases in the combustion space to the air currents passing through the air heating ducts 41. These studs may either be cast integral with the ducts or they may consist of threaded bolts, as shown in Fig. 3, which are screwed through threaded openings in the walls of the ducts. The capacity of the studs for absorbing and giving out heat is increased by their threading. This expedient for increasing heat transference is of importance inasmuch as the diminished cross sectional area of the air passageway (aggregate cross sectional areas

of ducts 41 in comparison with the cross sectional area of the air space 13) either increases the volume of air passed or, when the blower operates, involves a more rapid movement of the air. Preferably the oil or gas supply will be regulated also by the thermostat 22. With this in view the supply pipe 44 is provided with a valve 45 the operating lever 46 of which is connected by chain 47 with arm 29. Chain 47 has a weight 48 at its lower end. Valve 45 is open at all times but is moved to a throttling position when the blower is stopped.

There are certain other incidental features which are preferable and should be mentioned: It sometimes happens that one room of a house is more difficult to heat than another. When this is the case the hot air flue leading to such room, designated 14^a in the drawing, may be directly connected with one of the air heating ducts, designated 41^a, by a short pipe section 49.

Under some circumstances it may be advisable to allow a certain amount of air in chamber 40 of air space 13 to pass directly to the upper chamber 39. To make this possible partition 38 is perforated, as indicated at 50, and a damper 51 provided for controlling the air flow through these perforations.

For the purpose of humidifying the heated air, the partition 38 may be formed to provide a well or pocket 52 which may be supplied with water through pipe 53, the valve 54 of which may be set so as to provide a trickle of water just sufficient to take care of evaporation; or, as is preferable, the end of pipe 53 may be provided with a ball valve 55 suitably caged.

Operation: When the requirement for heat is considerable the fan 18 is in operation to draw air through register 17 and return air duct 15 and force the same into the lower chamber 40 of the air space 13 of the furnace. The damper 24 in by-pass 23 is closed, that is, in the position shown in Fig. 1. The air being unable to pass directly from chamber 40 to chamber 39 (except as a certain amount may pass through the openings 50 dependent upon the adjustment of damper 51) the air forced from the return duct by the fan is compelled to pass in divided streams through the air heating ducts 41 which are arranged so as to extend directly above the burner 42. For this reason the circulating air is very effectively heated and with the greatest possible economy of fuel. The heat exchange is facilitated by the radiating studs 43. When the temperature in the apartment to be heated rises to a certain point for which thermostat 22 is set, the thermostat closes the circuit through motor 25 and the lever 25^a is rocked to the left (Fig. 1). This causes circuit breaker 33 to break the circuit through the

fan motor 21 and rocks damper 24 to an open position so that air in the return duct 15 may by-pass the blower outfit. At the same time, in the case of an oil or gas burning furnace, the supply of fuel to the burner is diminished by partial closing of valve 45. In the case of a coal burning furnace the furnace damper will ordinarily be moved through operation of the thermostatic mechanism to slow down the fire. When the temperature falls below the minimum for which thermostat 22 is set to act, motor 25 is energized to move arm 26 to the right and weight 32 brings about the closing of damper 24 and a movement of the lever 35 of circuit breaker 33 which closes the fan motor circuit 34, whereupon the fan is set in motion and the supply of fuel to the burner is increased.

I claim:

1. In a hot air furnace having an inner combustion space and an outer air space, a fluid fuel burner in the combustion space, a plurality of air heating ducts opening at their opposite ends into the air space and extending through the combustion space into proximity with the burner, and means for producing a forced draft of air through said air heating ducts.

2. In a hot air furnace having an inner combustion space and an outer air space, a fluid fuel burner in the combustion space, a partition extending across said air space, a plurality of air heating ducts opening at their opposite ends into the air space on opposite sides of said partition and extending through the combustion space into proximity with the burner, and means for producing a forced draft of air through said air heating ducts.

3. In a hot air furnace having an inner combustion space and an outer air space, a partition extending across said air space, a plurality of air heating ducts opening at their opposite ends into the air space on opposite sides of said partition and extending through the combustion space toward the center thereof, and a blower for forcing air through said ducts.

4. In a hot air furnace having an inner combustion space and an outer air space, a fluid fuel burner in the combustion space, a plurality of air heating ducts opening at their opposite ends into the air space and extending through the combustion space into proximity with the burner, the walls of said ducts being provided with radiating studs extending into the ducts and into the space in the combustion chamber within said ducts and means for producing a forced draft through said air ducts.

5. In a hot air furnace having an inner combustion space and an outer air space, a partition extending across said air space, a plurality of air heating ducts opening at

their opposite ends into the air space on opposite sides of said partition and extending convergently into the combustion space, and means for producing a forced draft of air through said air heating ducts.

6. In a hot air furnace having an inner combustion space and an outer air space, a partition extending across said air space, air heating ducts opening at opposite ends into said air space at opposite sides of said partition and extending convergently into the combustion space, the walls of which ducts are formed with radiating studs extending into said ducts and into the central combustion space between the same and means for producing a forced draft through said ducts.

7. In a hot air furnace having a combustion space and an air space, hot air flues extending from the air space to the apartments to be heated, a return flue leading to the air space, a blower in said flue, a by-pass around said blower, and mechanism whereby the by-pass is closed when the blower is put in operation and is open when the operation of the blower ceases.

8. In a hot air furnace having a combustion space and an air space, hot air flues extending from the air space to the apartments to be heated, a return flue leading to the air space, a blower in said flue, a by-pass around said blower, and thermostatically actuated mechanism whereby the by-pass is closed when the blower is put in operation and is open when the operation of the blower ceases.

9. In a hot air furnace having an inner combustion space and an outer air space, hot air flues leading from the air space, a return flue leading to said air space, a partition extending across the air space, a plurality of air heating ducts opening at opposite ends into the air heating space on opposite sides of said partition and extending toward the center of the combustion space, and means for forcing air from the air return flue into said air space.

10. In a hot air furnace, the combination of outer and inner vertically arranged, cylindrical casings providing an inner combustion space and an outer air space, a horizontal partition across said air space, a plurality of air heating ducts which open into said air space at their opposite ends on opposite sides of said partition and extend radially into the combustion space, a plurality of hot air flues leading from the air space above said partition, a return air flue leading to the air space below said partition, and a blower in said return air flue.

11. In a hot air furnace, the combination of outer and inner vertically arranged, cylindrical casings providing an inner combustion space and an outer air space, a horizontal partition across said air space, a plurality of air heating ducts which open into

- said air space at their opposite ends on opposite sides of said partition and extend radially into the combustion space, a plurality of hot air flues leading from the air space above said partition, a return air flue leading to the air space below said partition, a blower in said flue, a by-pass around the blower, a damper in the by-pass, and a thermostatically actuated mechanism which operates alternately to set the blower in operation and close the damper and to stop the blower and open the damper.
12. In a hot air furnace, the combination of outer and inner vertically arranged, cylindrical casings providing an inner combustion space and an outer air space, a horizontal partition across said air space, a plurality of air heating ducts which open into said air space at their opposite ends on opposite sides of said partition and extend radially into the combustion space, a plurality of hot air flues leading from the air space above said partition, a return air flue leading to the air space below said partition, said ducts being provided with radiating studs which extend into the ducts and into the space between them, and means for producing forced drafts of air from the return air flue through the air heating ducts.
13. A hot air furnace comprising a fluid fuel burner and means through which air to be heated and products of combustion from the burner are adapted to be passed, said furnace being formed so as to provide a plurality of separate ducts for one of said gases which extend into the space through which the other gas is passed, and means for producing a forced draft of the air to be heated through said furnace.

JOHN W. MEAKER.