

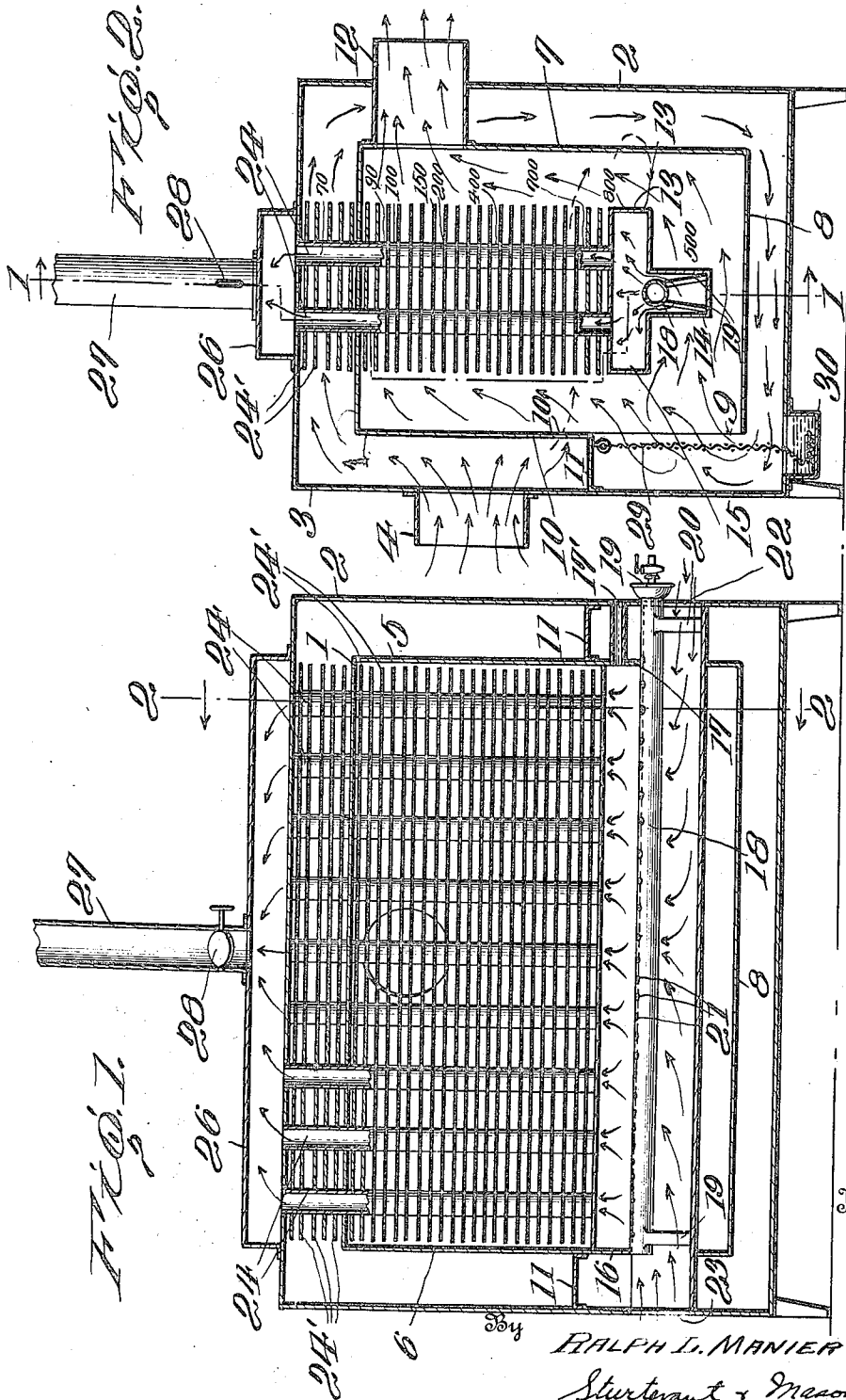
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R. L. MANIER

AIR HEATER

Filed Oct. 24, 1922



## UNITED STATES PATENT OFFICE.

RALPH L. MANIER, OF SYRACUSE, NEW YORK.

AIR HEATER.

Application filed October 24, 1922. Serial No. 596,544.

*To all whom it may concern:*

Be it known that I, RALPH L. MANIER, a citizen of the United States, residing at Syracuse, in the county of Onondaga, State of New York, have invented certain new and useful Improvements in Air Heaters, of which the following is a description, reference being had to the accompanying drawing and to the figures of reference marked thereon.

This invention relates to air heaters for both household and general use, and more particularly to air heaters of the liquid and gaseous fuel type.

One of the principal objects of this invention is to provide a simple, light and inexpensive heater providing a maximum heating effect.

Still another object of this invention resides in providing a construction wherein the air to be heated forms a blanket about the heating chamber, the air flow being arranged to first pass transversely over the top and transversely about the side of the heating chamber and thence downwardly into the lower portion thereof thereby imparting to the air the maximum preliminary heating units from the discharging gases before the air reaches the heating zone proper.

Still another phase of the invention resides in the construction of the heating flues and their arrangement relative to the inner and outer heating chambers whereby practically no flue heat is wasted and heat losses from radiation are reduced to a minimum without the usual encasing of insulating material.

Still another feature of the invention resides in the novel arrangement of the flue burner, especially with relation to its air supply whereby complete combustion of the fuel is insured.

A further phase of the invention resides in the disposition of the auxiliary air inlet to the burner; the relation of the flues to the heating chambers together with a control for the escaping flue gases whereby to regulate the temperature of the discharging gases, and hence the temperature of the air to be heated.

These and other objects will be apparent from a perusal of the following specification when taken in connection with the accompanying drawing, wherein—

Figure 1 is a side sectional view on the line 1—1 of Fig. 2, and

Fig. 2 is a sectional view on the line 2—2 of Fig. 1.

In general, the heater comprises an inner casing 1 preferably of rectangular shape forming the inner heating chamber. This casing is surrounded by an outer casing 2, the walls of which are spaced at all points from the walls of the inner casing, so as to form an enclosed air chamber completely surrounding the inner heating chamber. Of course, this inner heating chamber is supported and maintained in this suitable spaced relation by any desired type of spacing plates and struts which will be hereinafter alluded to. The lateral wall 3 of the outer casing is provided with a fresh air inlet 4, which air inlet is preferably located at a point substantially midway between the top and bottom of this wall so as to permit the incoming fresh air to travel somewhat in a horizontal plane around the lateral side walls 5 and 6 of the inner heating chamber as well as over the top of the inner chamber. The air after passing around and over the top of this inner chamber, then passes downwardly along the opposite side 7 of this inner heating chamber and thence under the lower wall 8 thereof, whence it enters an opening 9 in the wall 10 of the inner chamber, which latter, it will be noticed is directly in front of and adjacent the fresh air inlet 4 of the outer casing. A suitable partition 11 extends around the inner casing between it and the outer casing at the front and sides to prevent the direct flow of air from the inlet 4 to this opening 9. If desired, this partition member 11 may be used as a means for supporting and bracing the two chambers in spaced relation. In the upper portion of the wall 7 of the inner heating chamber there is arranged a hot air discharge 12 which passes outwardly at this point through the wall of the outer heating chamber so as to discharge the heated air outside of the heater where it is to be delivered at the desired points. This discharge is so arranged that the air flow in the space between the inner and outer chambers passes around it, thereby imparting heat to the incoming air.

From the foregoing construction, it will be manifest that the incoming fresh air is not compelled to travel in a continuously downwardly direction from the top of the heater to the bottom thereof as has heretofore been proposed. The direction of flow

of the fresh air is practically horizontally across the side heating walls in a horizontal plane and over the top of the inner walls in a horizontal plane, until it reaches the air space between the two chambers where the hot air discharge 12 is located, at which point the flow of air is downward. This arrangement of air flow has proven vastly superior in securing the heating effect than the before-mentioned construction of a purely downward flow.

The heating means for the air flowing through the inner chamber is arranged therein directly in the path of the flow there-through so as to provide a maximum heating effect. My improved type of heater is of the gaseous fuel type, although it is within the contemplation of my invention to provide a liquid fuel burner. In the present instance, the heater proper comprises a burner compartment 13 which is constructed as an enclosed casing of suitable design. In the preferred form of the design, there is a lower air receiving box 14 extending entirely across or lengthwise of the heater through the inner and outer walls thereof, and so out both ends to the atmosphere, so that fresh air can pass into this box from both ends as is shown in the drawing. This air box at its upper end merges into a wider combustion compartment 15, which as shown does not extend entirely to the outer wall but stops at the partitions 16 and 17. The burner 18 extends longitudinally of the air box 14 and is supported therein by suitable legs 19 and 20. This burner comprises a cylinder provided with suitable gas jets 21. Any desired means may be provided for lighting the burner, such as the port 17'. As will be noted, this burner is located at the junction of the air box 14 and combustion chamber 15 and is suitably spaced from the inner wall of the box 14, so that the air is compelled to travel very close to the burner cylinder as it enters the combustion compartment 15. The outer end of the burner 18 is provided with the necessary connection and valves to the gas main or liquid fuel main as is desired.

From this construction, it will be noted that the open ends 22 and 23 of this air box 14 constitute the fresh air supply for the burner, which supply is wholly independent of the air flow about and through the heating chambers.

The upper portion of the combustion chamber 15 communicates with a plurality of upstanding flues or pipes 24 preferably of soft brass and approximately one one-hundredth of an inch in thickness. These pipes are of any desired number and arrangement. Preferably they are arranged in pairs and are co-extensive with the length of the burner 18. These flues at their upper ends pass through the top walls of the heating cham-

bers and discharge into a common exhaust box 26 at the top of the casing. This common exhaust box in turn discharges into a suitable pipe 27. At the mouth of this pipe there is arranged an air control baffle in the form of a butterfly valve 28, which is adapted to be adjusted for each individual heater, to permit the escape of just the correct amount of fuel gases to produce a maximum heating effect in the flues 24. For every position of the gas valve there will be a definite fixed position of the butterfly valve 28, the same to be properly adjusted for given location of heater when installed. This valve in cooperation with the independent air inlets 22 and 23 and the restricted passageway for the air between the walls of the casing 14 and the cylindrical burner provides a most efficient means for preventing the passage of excess air through the combustion chamber and out of the stack without accomplishing the necessary combustion and heating.

For the purpose of securing a maximum amount of radiation from these flues, they are provided with increased radiation surfaces preferably in the nature of spaced horizontally arranged plates 24' of soft brass or other suitable material, preferably substantially seven thousandths of an inch in thickness. These plates extend in a vertical column from the top of the combustion chamber 15 to the uppermost top of the enclosing casing 2. By this arrangement, the majority of the plates are disposed within the inner heating chamber and a smaller number are arranged in the air passage immediately above the inner heating chamber and between the walls of the inner and outer chambers. The distance between these plates and between the combustion chamber walls 15 and the walls of the inner heating chamber are so designed as to give a maximum supply of air in contact with the hottest surfaces. The approximate temperatures of the various zones longitudinally of the baffles is illustrated by the numbers in Fig. 2.

If desired, the inlet 9 of the inner heating chamber may be provided with a vapor laden humidifying screen 29, which in the present instance, is hung from a partition 11 and trails into a water basin 30 carried at the base of the chamber 2. This screen provides a suitable means for not only clarifying the preliminarily heated air of impurities, but also adding the desired amount of moisture prior to the entrance of the air into the inner chamber.

In the operation of the above described construction, the air will pass transversely around and over the top of the inner combustion chamber where it will be preliminarily heated by means of the upper end of the flues 24, and particularly by means of the radiation plates 24' in the upper air passage. This air then passes downwardly and under

the bottom wall 8 of the inner heating chamber, thence through a humidifying and clarifying screen and then to the inner heating chamber, whence it passes not only up through the radiation plates 24' but also passes around and beneath the burner box 13 which is by far the hottest part of the burner, due to the fact that it is heated not only by the heat conducted through the metal of the burner compartment 15 but also by the downward radiation from the burner 18. The heated air then passes out through the hot air discharge 12 and is delivered as desired.

It will also be noted that the enclosed air passage between the inner and outer heating chambers provides a wall of insulating air about the inner heating chambers which prevents the waste of heat from the wall of the outer heating chamber by excessive radiation. This air blanket thus eliminates the necessity of the usual casing of heat insulating material. In addition, by isolating the burner flues and providing the same with an independent air inlet at the base and by discharging the same directly to the outside of the heater, the air to be heated is not contaminated by the fuel gases, so that should the gas be turned on without being lighted, there is no danger of escaping gas mixing with the air passing through the discharge 12. Another advantage of my present construction arises from the particular arrangement of the pre-heating passages and the disposition of the radiation plates in the flues, both within the inner heating chamber and in the upper pre-heating passage whereby for a given heating capacity, the heater will occupy less space than any other construction of heater, due mainly to the quick absorption of heat by the soft brass plates, the large area of heating surface and the forced intimate contact of the air with such surfaces.

The present type of heater may be used not only for heating the entire house in place of the usual hot air furnace, but may be used as an auxiliary heater or booster adapted to cooperate with the hot air furnace and to deliver heated air to the same risers or furnace headers. The heater may also be used for general purposes, such as tobacco seasoning, macaroni and paint drying, Japan baking, core baking, clothes drying, and in fact, anywhere that hot, clean air is required for the home or factory.

It will be noted that the weight of the heater is much less than any other heater of the same heating capacity due to the elimination of iron or steel tubes, and the mechanical insulating material. In the present instance, where the point of delivery 12 is above the heater, a natural draft will cause a circulation therethrough where the discharge 12 is on the same level as the heater

as when used for baking or drying purposes, a blower may be conveniently used to cause a circulation.

It is obvious that the temperature may be manually or thermostatically controlled as desired.

For higher temperature work, the present outside casing would be enclosed as an intermediate heat zone, and the incoming air forced to travel around this casing so as to secure an even lower external radiation loss.

It is obvious that minor changes in the details of construction and the arrangement of parts may be made without departing from the spirit of the invention as set forth in the appended claims.

Having thus described the invention, what I claim as new and desire to secure by Letters-Patent, is—

1. An air heater comprising an inner heating chamber, an enclosing heating chamber having its walls spaced therefrom and provided with an air inlet disposed substantially midway the base and top of one lateral wall, and communicating with said inner chamber at the base thereof contiguous to but partitioned from said air inlet so as to permit a flow of air substantially transversely about, over and beneath said inner chamber before entering the same, an air discharge disposed at the upper end of said chamber, and a heating flue arranged in said inner chamber in the path of said air passing therethrough.

2. An air heater comprising an inner heating chamber, an enclosing heating chamber having its walls spaced therefrom and provided with an inlet to the air and a connection with said inner chamber constructed and arranged to surround said inner chamber with a flow of air passing across its top and about its sides before entering the same, a heated air discharge for said inner chamber, and a burner flue arranged in said inner chamber and extending upwardly through said inner and enclosing casing at the top whereby to not only heat the air passing through but also across the top of said inner chamber.

3. An air heater comprising an inner heating chamber, an enclosing heating chamber having its walls spaced therefrom and provided with an inlet to the outside air and a connection with said inner chamber constructed and arranged to surround said inner chamber with a flow of air passing across its top and about its sides before entering the same, a heated air discharge for said inner chamber, and a burner flue disposed in said inner chamber, said flue comprising a plurality of pipes extending through the walls of said inner and enclosing chambers for discharging the flue gases outside of said heater, said pipes having spaced radia-

tion plates arranged in said inner and outer chambers in the path of flow of said air.

4. An air heater comprising an inner heating chamber, an enclosing heating chamber having its walls spaced therefrom and provided with a fresh air inlet and a connection with said inner chamber constructed and arranged to flow the air about the walls of said inner chamber and thence into the base thereof, an enclosed burner compartment extending across and spaced from the inner lower walls of said inner chamber and having its ends open and passing through said inner and outer chambers so as to communicate with the outside air at both ends, a burner in said compartment, and burner flues extending through the walls of said inner and enclosing chambers for discharging the fuel gases outside said heater.

5. An air heater comprising a heating chamber having a lower air inlet and an upper air discharge, an enclosed burner compartment having a relatively narrow air inlet portion merging into an upper wide burner portion, said narrow portion extending across and spaced from the inner lower walls of said chamber, said compartment having its ends open and passing through the outer walls thereof so as to communicate with the outside air at both ends, and a burner co-extensive with and disposed at the mouth junction of said wide portion whereby to provide for the efficient combustion of the burner fuel.

6. An air heater comprising an inner heat-

ing chamber, an enclosing heating chamber having its walls spaced therefrom and provided with a fresh air inlet and a connection with said inner chamber adapted to surround said inner chamber with a flow of air passing across its top and about its sides before entering the lower portion of the same, a hot air discharge for said inner chamber, a burner compartment disposed in said inner chamber, an independent fresh air supply for said compartment, and a plurality of flues connected to said compartment and extending through the walls of said inner and outer chambers for discharging the flue gases outside said heater, and means for regulating the discharge from said flues to control the temperature of said gases.

7. An air heater comprising an inner heating chamber having an air inlet in the basal portion of a lateral wall and a hot air discharge in the upper portion of an opposite lateral wall, a spaced enclosing heating chamber having a fresh air inlet contiguous to but partitioned from the air inlet of the inner chamber whereby to compel a flow of air over, about, under and thence into said inner chamber, a moisture laden screen extending across the air inlet to said inner chamber, and, a heating flue in said inner and enclosing chambers in the path of the air flow therethrough.

In testimony whereof, I affix my signature.

RALPH L. MANIER.