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1,676,054

R. W. SATTERHOLM

WARM AIR FURNACE

Filed June 4, 1927

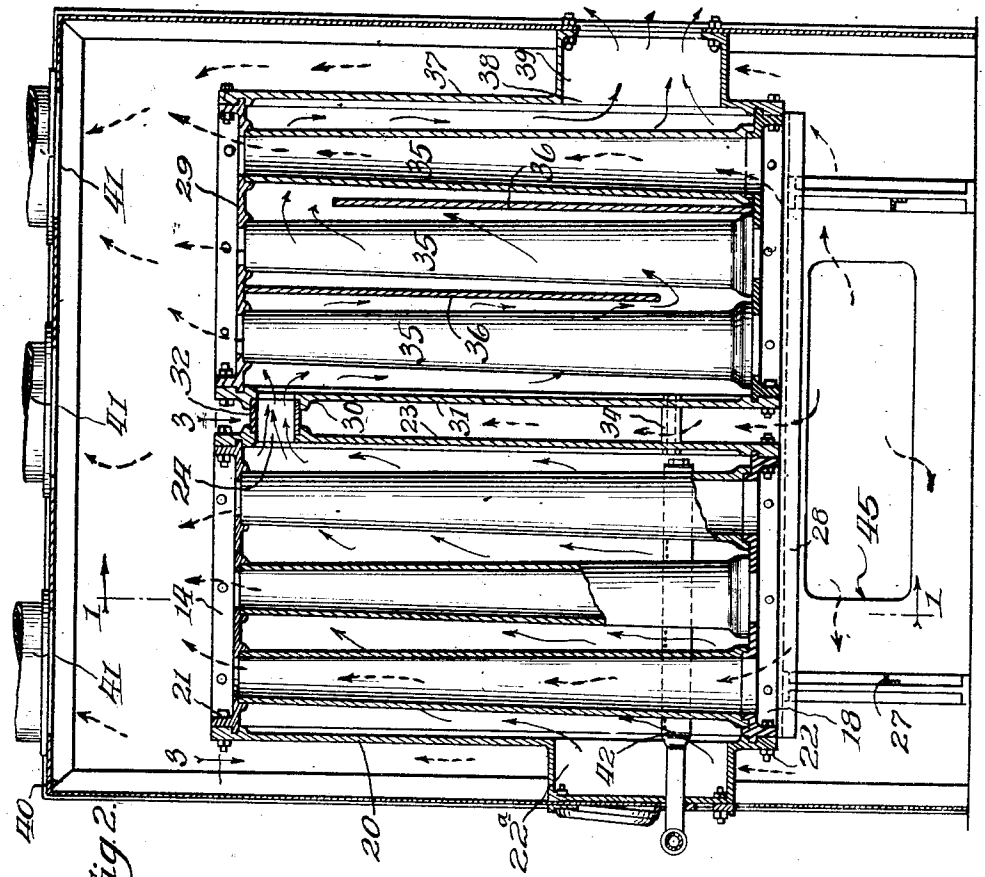


Fig. 2.

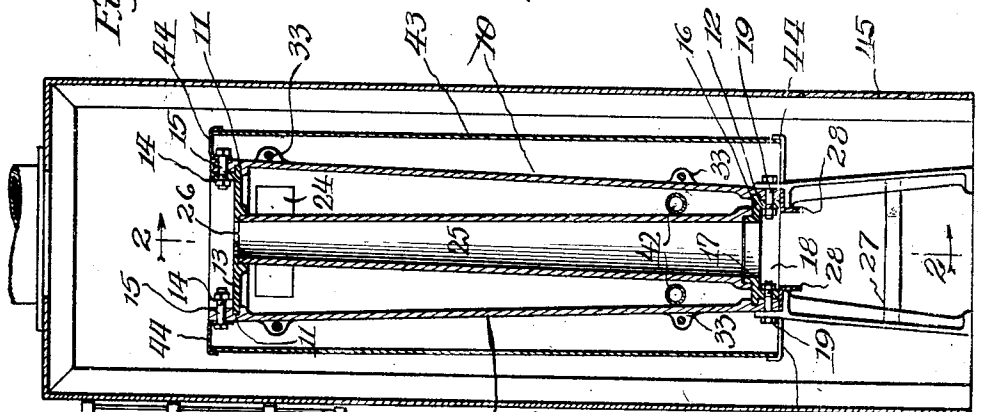


Fig. 1.

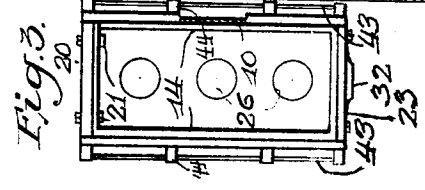


Fig. 3.

Inventor

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UNITED STATES PATENT OFFICE.

ROBERT W. SATTERHOLM, OF CHICAGO, ILLINOIS.

WARM-AIR FURNACE.

Application filed June 4, 1927. Serial No. 196,448.

This invention relates to improvements in warm air furnaces, and one of the objects of the invention is to provide an improved furnace of this character in which gas may be employed as a heating medium and which furnace will be so constructed and arranged that a maximum heat radiating surface will be provided to the air currents which are being circulated therethrough, with the result that the air will be quickly heated and a maximum amount of heat by the use of a minimum amount of fuel will be obtained.

A further object is to provide improved means which will retard the flow of air currents through the heating chamber, thereby insuring a thorough heating of the air before it is discharged from the heating chamber or furnace.

To the attainment of these ends and the accomplishment of other new and useful objects as will appear, the invention consists in the features of novelty in substantially the construction, combination and arrangement of the several parts hereinafter more fully described and claimed and shown in the accompanying drawings illustrating this invention, and in which

Figure 1 is a vertical sectional view taken on line 1—1, Figure 2, of a furnace constructed in accordance with the principles of this invention.

Figure 2 is a view partly in vertical section, partly in elevation and with parts omitted, as taken on line 2—2, Figure 1.

Figure 3 is a detail horizontal sectional view taken on line 3—3, Figure 2.

The furnace consists essentially of a casing having side walls 10 provided with inwardly opening grooves 11—12 respectively at the top and bottom thereof. A horizontal plate or member 13 is provided with an upright encompassing flange 14 spaced from the side edges of the member 13 so that the edges of the member 13 will enter the grooves 11. This member 13 is secured to the side members 10 by means of suitable fastening devices 15, preferably in the form of bolts which pass through the flange 14 and through the adjacent edges of the side members.

A bottom member 16 is provided with a series of openings having encompassing flanges 17 on the upper face thereof and depending from the lower face of the member 16 are flanges 18 which encompass the member and the flanges 18 are spaced from the lateral edges of the member 16 so that the edges of this member will enter the grooves 12. Fastening devices such as bolts 19 are provided for securing the member 16 to the side members 10 and these fastening devices pass through the flanges 18 and the adjacent portions of the members 10.

An end plate 20 engages the front edges of the members 10 to extend across the space therebetween and is secured in position by means of fastening devices 21—22 passing through the end member and the respective flanges 14 and 18.

The end plate 20 is provided with a door opening 22^a and a rear plate 23 secured in position in the same manner as the front plate 20, is provided with an outlet opening 24 arranged preferably adjacent the top of the members 10.

The structure thus formed constitutes a heating chamber and the members 10 are so arranged that they will diverge from the bottom plate 13 to the top plate 16 to form inclined walls. The end members 20 and 23 are similarly shaped.

Tubular members 25 are arranged within the chamber thus formed, and the lower ends of these members telescope respectively with the flanges 17 and the upper ends telescope into openings 26 in the plate or member 13. The tubular members 25 are of a tapered construction, the larger diameter being disposed adjacent the bottom of the heating chamber, while the smaller diameter is disposed adjacent the top of the chamber so that the walls of the tubular member 25 will converge in directions opposite to the direction which the walls 10 of the heating chamber converge.

With this construction it will be manifest that the heating area of the members 10 and of the peripheries of the tubular members 25 will be increased.

The structure thus formed is supported in any suitable manner preferably by means of suitable supports 27, any number of which may be provided and to which supports the heating chamber is secured. These supports 27 are connected by means of suitable angle irons 28 which serve as a means for supporting the structure intermediate the supports 27.

A second heating chamber designated generally by the reference numeral 29 and constructed in a manner similar to the heretofore described chamber may be provided and

coupled with the first chamber. The second chamber is provided with an opening 30 in the end plate 31 adjacent the opening 24, and a coupling 32 is disposed between the openings and these chambers may be fastened together in any suitable manner, such as by means of fastening bolts passing through suitable ears or projections 33 on the respective adjacent end plates.

Spacing nipples 34 may also be provided between the members.

The chamber 29 is provided with conical members 35, similar to the conical members 25 and intermediate the members 35 are baffles 36 which are arranged in staggered relation and alternately extending from the top and bottom walls of the chamber 29 to terminate respectively short of the opposite wall so that the heated gases will flow in a tortuous passage through the chamber 29 and around the tubular members 35.

The end member 37 of the chamber 29 is provided with an outlet opening 38 encompassed by a flange 39 and to which outlet opening the smoke stack or flue (not shown) may be connected.

The entire structure thus formed is arranged within an outer casing designated generally by the reference numeral 40, which may be constructed of any suitable material, preferably sheet material and secured together in any suitable manner. The casing 40 is in the nature of a hood and entirely encloses both of the chambers. The casing is of a size to be spaced from the walls of the chambers and is provided with flues 41 through which the heated air may be conveyed to the point of use.

Burners 42 of any desired construction may be employed as a heating medium and if desired members 43 may be supported by means of suitable brackets 44 adjacent but spaced from the walls of the chambers and also from the walls of the casing 40.

These members 43 are provided so as to hold the incoming air in contact with the side members of the heating chambers. It will be noted that the walls 10 of the heating chambers converge downwardly from the top and as the members 43 are arranged uprightly flues will be formed between the members 10 and the members 43. These flues decrease in size from the bottom to the top of the heating chamber, with the result that the passage of the air through the space between these two members will be retarded, thereby insuring a thorough heating of the air.

Air is supplied to the casing 40 in any suitable manner, such as through an air inlet opening 45 in one of the walls of the casing.

With this improved construction it will be manifest that the parts may be manufactured and shipped in a knock down condition and may be readily assembled by fastening the various plates together.

The walls of the heating chamber diverge from the bottom upwardly and these diverging walls co-operate with the walls of the casing 40 to form passages or flues which are gradually restricted or reduced from the bottom to the top of the heating chamber, thereby retarding a sudden rushing of the air over the heating surfaces so as to insure a thorough heating of the air before it is discharged through the flues 41.

While the preferred form of the invention has been herein shown and described, it is to be understood that various changes may be made in the details of construction and in the combination and arrangement of the several parts, within the scope of the claims, without departing from the spirit of this invention.

What is claimed as new is:—

1. A warm air furnace embodying a casing having an air inlet and an outlet, a heating chamber within the casing and out of communication therewith, means supporting the chamber above the bottom of the casing, said heating chamber being spaced from the wall of the casing and embodying upright walls and top and bottom plates, said plates having alined openings therethrough, the openings in the upper plate being of a smaller diameter than the openings in the bottom plate, the side walls of the heating chamber diverging from the said bottom to the said top plate, vertical tubes arranged within the heating chamber, said tubes tapering from the bottom to the top thereof and having communication at their ends respectively with the openings in the said bottom and top plates, whereby communication will be established with the said casing through the heating chamber, the said tubes co-operating with the side walls of the said casing to form passages for the products of combustion tapering in a direction opposite to the direction of taper of the air passages through the flues, an inlet and an outlet to the said heating chamber both being disposed adjacent the base of the chamber but out of direct communication with each other, and a burner in the heating chamber.

2. A warm air furnace embodying a casing having an air inlet and an outlet, a heating chamber within the casing and out of communication therewith, means supporting the chamber above the bottom of the casing, said heating chamber being spaced from the wall of the casing and embodying upright walls and top and bottom plates, said plates having alined openings therethrough, the openings in the upper plate being of a smaller diameter than the openings in the bottom plate, the side walls of the heating chamber diverging from the said bottom to the said top plate, vertical tubes arranged

within the heating chamber, said tubes tapering from the bottom to the top thereof and having communication at their ends respectively with the openings in the said bottom and top plates, whereby communication will be established with the said casing through the heating chamber, the said tubes co-operating with the side walls of the said casing to form passages for the products of combustion tapering in a direction opposite to the direction of taper of the air passages through the flues, an inlet and an outlet to the said heating chamber, both being disposed adjacent the base of the chamber but out of direct communication with each other, a burner in the heating chamber, and baffles within the heating chamber intermediate the said tubes, said baffles being arranged in staggered relation with respect to each other.

3. A warm air furnace embodying a casing having an air inlet and an outlet, a heating chamber within the casing and out of communication therewith and spaced from the walls thereof, means for supporting the chamber above the bottom of the casing, said chamber embodying two sections out of communication with each other except for a passage located at a predetermined point in the height of the chamber, each of said sections embodying upright walls and top and bottom plates, said plates having alined openings therethrough, the openings through the top plates being smaller than the openings through the respective bottom plates, the side walls of the chamber sections diverging from the bottom to the top plates, vertical tubes arranged in the respective chamber sections, said tubes tapering from the bottom to the top thereof and having communication at their ends respectively with the openings in the said bottom and top plates whereby communication will be established with the said casing through the respective chamber sections, the said tubes co-operating with the side walls of the respective chamber sections to form passages for the products of combustion tapering in a direction opposite to the direction of taper of the air passages through the flues, an inlet and an outlet to the said heating chamber, both being disposed adjacent the base of the chamber but out of direct communication with each other, and a burner in one of the heating chamber sections.

4. A warm air furnace embodying a casing having an air inlet and an outlet, a heating chamber within the casing and out of communication therewith and spaced from the walls thereof, means for supporting the chamber above the bottom of the casing, said chamber embodying two sections out of communication with each other except for a passage located at a predetermined point in the height of the chamber, each of said sections embodying upright walls and top and bottom plates, said plates having alined openings therethrough, the openings through the top plates being smaller than the openings through the respective bottom plates, the side walls of the chamber sections diverging from the bottom to the top plates, vertical tubes arranged in the respective chamber sections, said tubes tapering from the bottom to the top thereof and having communication at their ends respectively with the openings in the said bottom and top plates whereby communication will be established with the said casing through the respective chamber sections, the said tubes co-operating with the side walls of the respective chamber sections to form passages for the products of combustion tapering in a direction opposite to the direction of taper of the air passages through the flues, an inlet and an outlet to the said heating chamber, both being disposed adjacent the base of the chamber but out of direct communication with each other, a burner in one of the heating chamber sections, and baffles in the other chamber section, said baffles being arranged in staggered relation with respect to each other.

In testimony whereof I have signed my name to this specification, on this 27th day of May, A. D. 1927.

ROBERT W. SATTERHOLM.