

March 17, 1942.

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2,276,400

AIR HEATING DEVICE

Filed Jan. 15, 1940

2 Sheets-Sheet 1

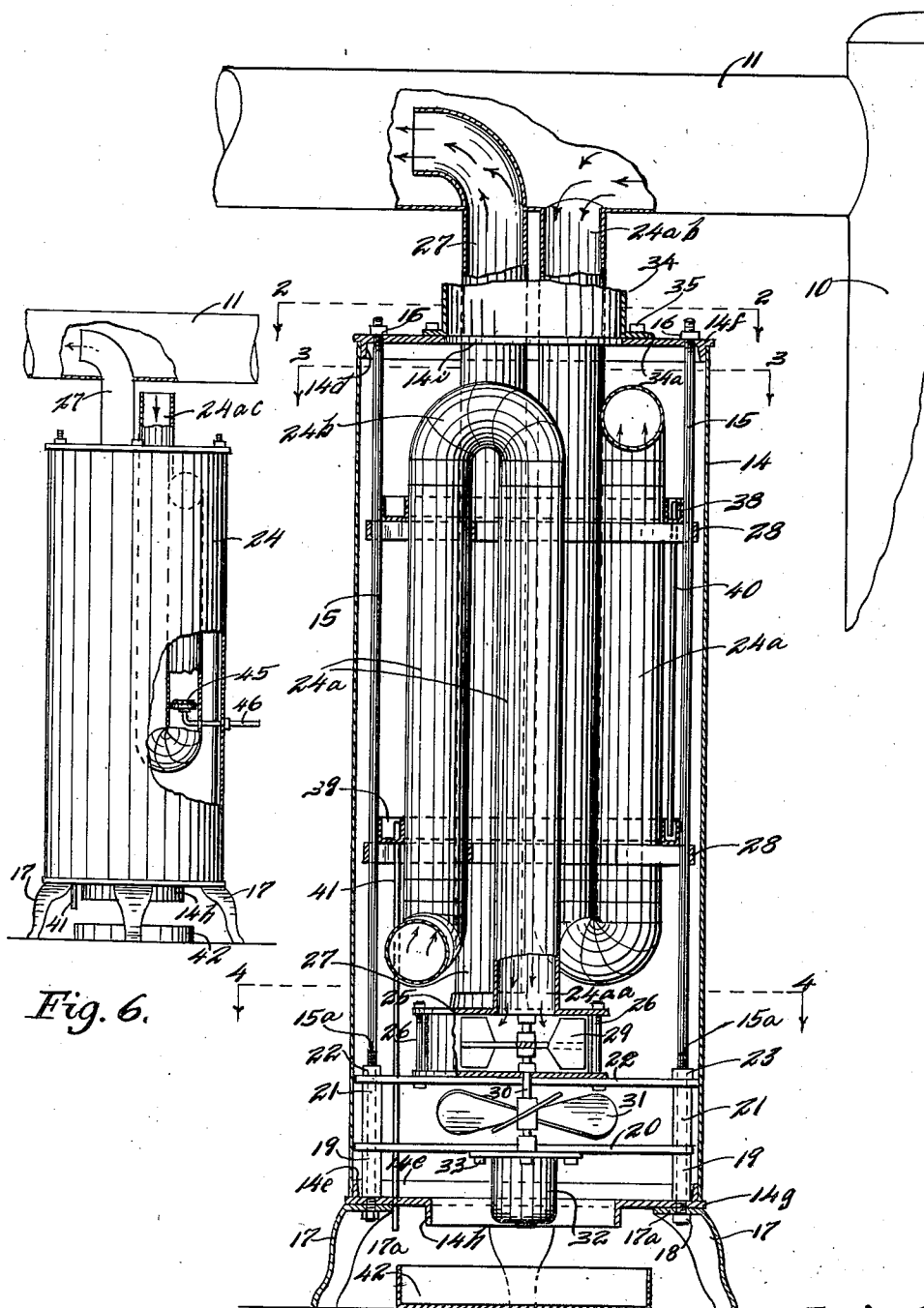


Fig. 6.

Fig. 1.

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2 Sheets-Sheet 2

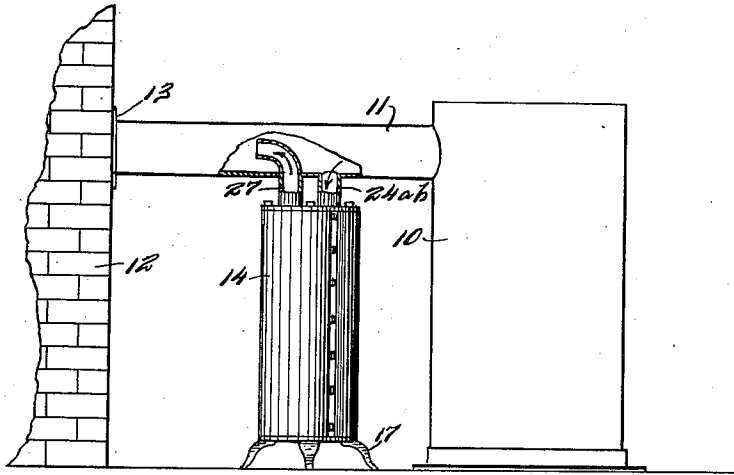


Fig. 5.

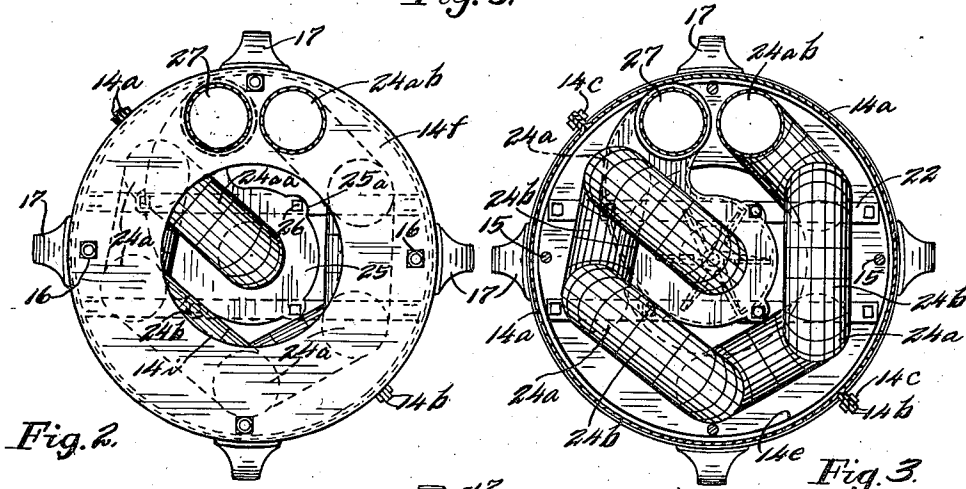


Fig. 2.

Fig. 3.

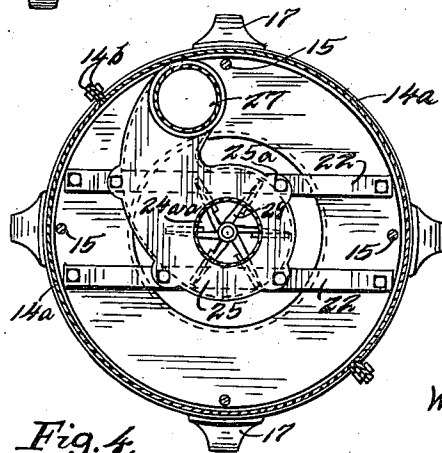


Fig. 4.

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UNITED STATES PATENT OFFICE

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AIR HEATING DEVICE

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5 Claims. (Cl. 257-137)

This invention relates to an air heater or a heat saving device and while said device may have various applications, it is particularly designed to be used with a furnace such as a furnace heated by an oil burner. Most domestic oil burners have been installed in furnaces originally designed for the use of coal or other solid fuel. In many of these installations there is insufficient flue travel to utilize the heat from the burning oil. With such an installation it is desirable to have an air heater so that the heat generated may be more efficiently used.

It is an object of this invention to provide an air heater of simple and efficient design adapted to be connected to the smoke pipe of a furnace and which may be used to heat the room in which the furnace is disposed or to heat any other desired room or rooms.

It is a further object of the invention to provide a device comprising an elongated casing, a member in said casing comprising a series of conduits extending parallel to the axis of said casing and connected at their ends to form a circuitous passage through said member with reversely extending portions, one end of said member being connected to the smoke pipe of a furnace and the other end being connected to a fan casing in said first mentioned casing containing a fan adapted to draw the hot gases from the smoke pipe through said member, the discharge side of said fan casing being connected to said smoke pipe nearer the chimney than said first mentioned conduit is connected, a second fan in said first mentioned casing and a motor for driving said fans whereby air is passed through said first mentioned casing over said member and is heated.

These and other objects and advantages of the invention will be fully set forth in the following description made in connection with the accompanying drawings in which like reference characters refer to similar parts throughout the several views and in which:

Fig. 1 is a view partly in vertical section and partly in side elevation of the device;

Fig. 2 is a horizontal section taken on line 2-2 of Fig. 1 as indicated by the arrows;

Fig. 3 is a horizontal section taken on line 3-3 of Fig. 1 as indicated by the arrows;

Fig. 4 is a horizontal section taken on line 4-4 of Fig. 1 as indicated by the arrows;

Fig. 5 is a view in side elevation, some parts being broken away and others shown in vertical section illustrating the use of said device; and

Fig. 6 is a view in front elevation, some parts

being broken away and others shown in vertical section, said figure showing a modification.

Referring to the drawings, particularly Figs. 1 and 5, a furnace 10 is shown which may be of any ordinary fuel burning type, such as one containing an oil burner, said furnace having leading therefrom a smoke pipe 11 through which the hot gases of combustion pass to the chimney 12. A portion of a thimble connection 13 is shown, fitted into the opening in chimney 12 and into which pipe 11 passes. The device of the invention comprises an elongated casing 14 and while this casing might be of various forms, in the embodiment of the invention illustrated it is shown as cylindrical. Said casing comprises a shell 14a shown in Figs. 3 and 4 as made of two semi-cylindrical portions having outturned flanges 14b connected by a plurality of headed and nutted bolts 14c. Shell 14a fits at its ends about flanges 14d and 14e respectively formed on end plates 14f and 14g respectively. Plates 14f and 14g are connected by a plurality of circumferentially spaced rods 15, the same being shown as four in number, which rods are threaded at their ends and provided with nuts 16 above plate 14f. At their lower ends rods 15 pass through plate 14g and through horizontal portions 17a of leg members 17. Nuts 18 are secured on the lower ends of rods 15, thus holding legs 17 firmly in place against plate 14g. Above plate 14g sleeves 19 surround bolts 15a which also extend through plate 14g. A pair of bars 20 extend across casing 14 and are bored to have bolts 15a pass therethrough, said bars resting on sleeves 19. Above bars 20 sleeves 21 surround rods 15 and a pair of bars 22 receive bolts 15a and rest upon sleeves 21. Nuts 23 are threaded on bolts 15a and act to clamp bars 20 and 22 in place against sleeves 19 and 21 respectively.

A member designated generally as 24 is disposed in casing 14 and comprises a plurality of conduits 24a extending parallel to the axis of casing 14 and throughout a greater portion of the length thereof. Certain of the conduits 24a are connected at their tops and bottoms by elbows or U-shaped pipes 24b, so that member 24 has a continuous circuitous passage passing there-through through the various conduits 24a, which passage has reversely extending portions or in other words portions extending upwardly and downwardly. One conduit 24aa forms one end of member 24 and the same is connected to the inlet opening of a fan casing 25 supported upon the bars 22 and secured thereto by headed and

nutted bolts 26 passing through lugs 25a at the top and bottom of casing 25 and through bars 22. A conduit 24ab forms the other end of member 24 and this conduit is connected to the smoke pipe 11 as shown in Figs. 1 and 5. The outlet of fan casing 25 is connected by a conduit 27 to the smoke pipe 11 at a point on the chimney side of conduit 24ab or at a point farther from the furnace 10 than is the conduit 24ab. Conduit 27 may be projected into the smoke pipe 11 and have its end directed toward the chimney as shown in Figs. 1 and 5. The member 24 is supported in casing 14 by frame members 28 formed of iron bars or strips extending about the conduits 24a and also secured to the rods 15. The casing 25 encloses a fan 29 mounted on a shaft 30 which extends through fan casing 26 and between the bars 22. A second fan 31 is secured to shaft 30 below bars 22 and between the same and bars 20. A motor 32 illustrated as of the electrical type is secured to bars 20 by bolts 33. It will be noted that casing 14 has an opening at its lower end surrounded by a flange 14h depending from plate 14g. Said casing also has an opening 14i at its upper end disposed centrally of plate 14f and a conduit 34 surrounds opening 14i and has a flange 34a connected to the top of plate 14f by bolts 35. It will be understood that conduits 24ab and conduits 27 extend through plate 14f at one side of opening 14i as shown in Fig. 2.

A pan 38 is supported in casing 14 preferably resting on the upper frame 28 and a similar pan 39 rests on the lower frame 28. Pans 38 and 39 will be of a shape to fit between the vertically extending conduits 24a. A pipe 40 connects with pan 38 some distance above the bottom thereof and is arranged to discharge into pan 39. A pipe 41 connects with pan 39 some distance above the bottom thereof and passes through the lower plate 14g so that it can be connected to some suitable drain. A pan 42 is preferably disposed below the opening in flange 14h.

With the furnace 10 operating, hot gases will pass from the furnace through the smoke pipe 11 to the chimney 12. Motor 32 will be supplied with current in the usual manner and will drive shaft 30, thus operating fans 29 and 31. Fan 31 will preferably be arranged to force air upwardly. Fan 29 will exert suction through the member 24 and the hot gases of combustion will be drawn from smoke pipe 11 through conduit 24ab and then successively through the conduits 24a until the gases pass through conduit 24aa into the fan casing 25. The gases will pass through this fan casing and be discharged therefrom through conduit 27 into the smoke pipe 11. It will be noted that the gases passing through member 24 will be at somewhat reduced pressure or pressure below the pressure of the air in casing 14 so that there will be no leakage of these gases into the casing 14. There will thus be no odor from the furnace gases passing through member 24. It will also be noted that the withdrawal of the hot gases from the smoke pipe and their subsequent discharge thereinto will not in any way decrease or adversely affect the draft in smoke pipe 11. In fact by having the conduit 27 arranged with its discharge directed toward the chimney, the draft may be increased. The fan 31 will cause movement of air through the opening within flange 14h and this air will pass upwardly around fan casing 25 and around the various conduits of member 24 and will pass out through conduit 34 at the top of casing 14. This air will be well heated in its passage through

casing 14. The various conduits 24a give a very large surface for contact with the air so that the device has a high degree of efficiency as a heat exchanger. If the device is used to heat the room in which it is placed, the heated air may be delivered into said room from the top of casing 14. If it is desired to heat other rooms conduit 34 will be extended to such rooms. The cooler air is, of course, nearer the floor and will usually be taken in through plate 14g. It will be understood, however, that fan 31 could move the air downwardly so that heated air would be discharged through the opening plate 14g. The device can also be used as a humidifier. Water will be placed in the pan 38 and this may be maintained at a desired level by a control device (not shown). The water will run through conduit or pipe 40 into pan 39 and when it reaches a certain level in pan 39 will drain off through drain pipe 41. The pan 42 is provided in case there should be any condensation within casing 14. It will be noted that the structure is quite simple and can be easily assembled. The conduits 24a and the elbows 24b will all be of standard size and these can be easily assembled and economically replaced if necessary.

In Fig. 6 a slightly modified form of the invention is shown in which the structure is the same as in Figs. 1 to 5 except that conduit 24ac, corresponding to conduit 24ab in Fig. 1, is not connected to smoke pipe 11. Instead a fuel burner 45, such as a gas or oil burner, is disposed in the conduit adjacent the bottom of conduit 24ac and will be supplied with fuel through the pipe 46. Burner 45 will be supplied with air drawn from the atmosphere as shown through the top of conduit 24ac and the hot gases of combustion from burner 45 will then be drawn through member 24 just as the hot gases from smoke pipe 11 are drawn there-through in the form shown in the other figures. The pipe 27 will be connected to some suitable gas discharge means such as the smoke pipe 11 shown in Fig. 6.

From the above description it will be seen that I have produced a very novel and efficient air heater or heat saving device. The device is very compact and it is apparent that the same will have a high degree of utility for the purpose intended.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the parts, without departing from the scope of applicant's invention, which generally stated, consists in a device capable of carrying out the objects above set forth, in the parts and combinations of parts disclosed and defined in the appended claims.

What is claimed is:

1. An air heating device having in combination, a casing comprising upper and lower end plates with cylindrical flanges extending towards each other, said end plates having openings there-through forming inlet and outlet openings, a shell comprising semi-cylindrical members fitting about and extending between said flanges and having outwardly and vertically extending mating flanges, means connecting said latter flanges for holding said shell in place, a plurality of rods extending between said end plates for clamping the same and said shell together, a frame at the lower end of said casing, a member disposed in said casing comprising a plurality of conduit convolutions and having an inlet pipe extending through the upper of said end plates adapted to

be connected to a container of hot gases, a fan casing supported on said frame to which one end of said member is connected, a conduit extending from the discharge side of said casing through the upper of said end plates adapted to be connected to said container, a motor carried on said frame, a shaft connected to said motor, a fan in said fan casing driven by said shaft for drawing air through said member and a second fan on said shaft within said first mentioned casing for moving air through said casing.

2. An air heater constructed and arranged to be attached to the smoke pipe of a furnace having in combination, an elongated vertically extending casing having an inlet at its bottom and an outlet opening at its top, a device in said casing comprising a plurality of pipes extending in spaced relation therein for the greater part of the length of said casing, U-shaped members connecting the ends of said pipes to form a continuous conduit, a fan casing adjacent the bottom of said casing to which one end of said conduit is connected, a fan in said fan casing, the other end of said conduit extending through and beyond the top of said first mentioned casing and connected to said smoke pipe, a pipe connected to the discharge outlet of said fan casing and extending vertically through the top of said first mentioned casing and connected to said smoke pipe, a second fan in said first mentioned casing

below said fan casing for drawing air into said first mentioned casing to the inlet opening thereof and forcing it out through said outlet opening of said first mentioned casing, said air passing around said device and a motor below said last mentioned fan for driving both of said fans.

3. The structure set forth in claim 2, vertically spaced bands extending about said pipes for supporting the same and means at the sides of said first mentioned casing for supporting said bands.

4. The structure set forth in claim 2, vertically spaced bands extending about said pipes for supporting the same, means at the sides of said first mentioned casing for supporting said bands, a shallow annular pan supported upon each of said bands and extending about said pipes, a conduit extending from adjacent the top of the upper pan to adjacent the bottom of the lower pan and a conduit extending from adjacent the top of the lower pan through the bottom of said first mentioned casing.

5. The structure set forth in claim 2, said last mentioned pipe being connected to said smoke pipe at the chimney side of said other end of said conduit and having its terminal directed longitudinally of said smoke pipe in the direction of travel of the gases to the chimney.

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