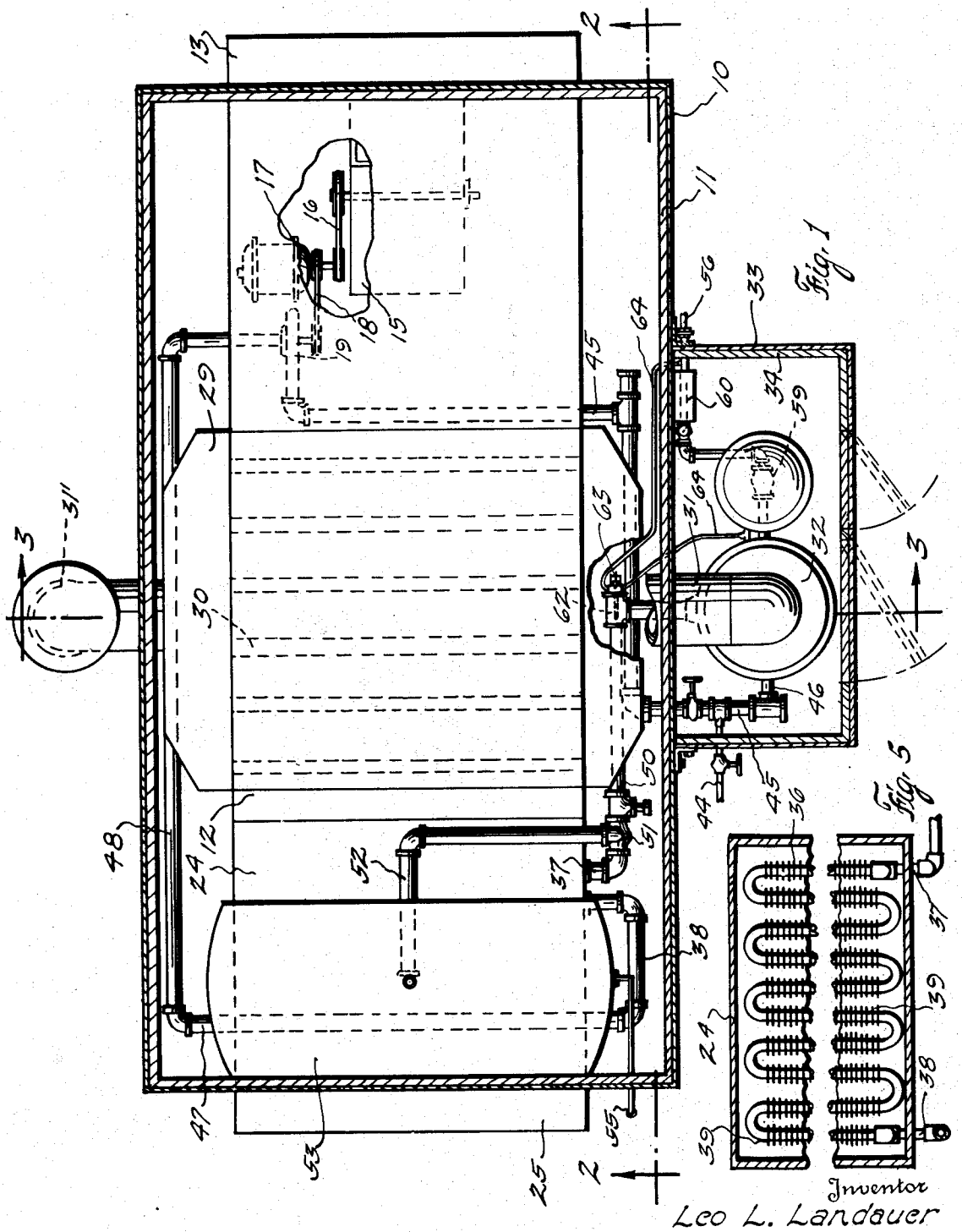
Aug. 29, 1933. L. L. LANDAUER 1,924,447

AIR CONDITIONING APPARATUS

Filed Nov. 7, 1932 3 Sheets-Sheet 1



Inventor
Leo L. Landauer

By Jack A. Ackley
Attorney

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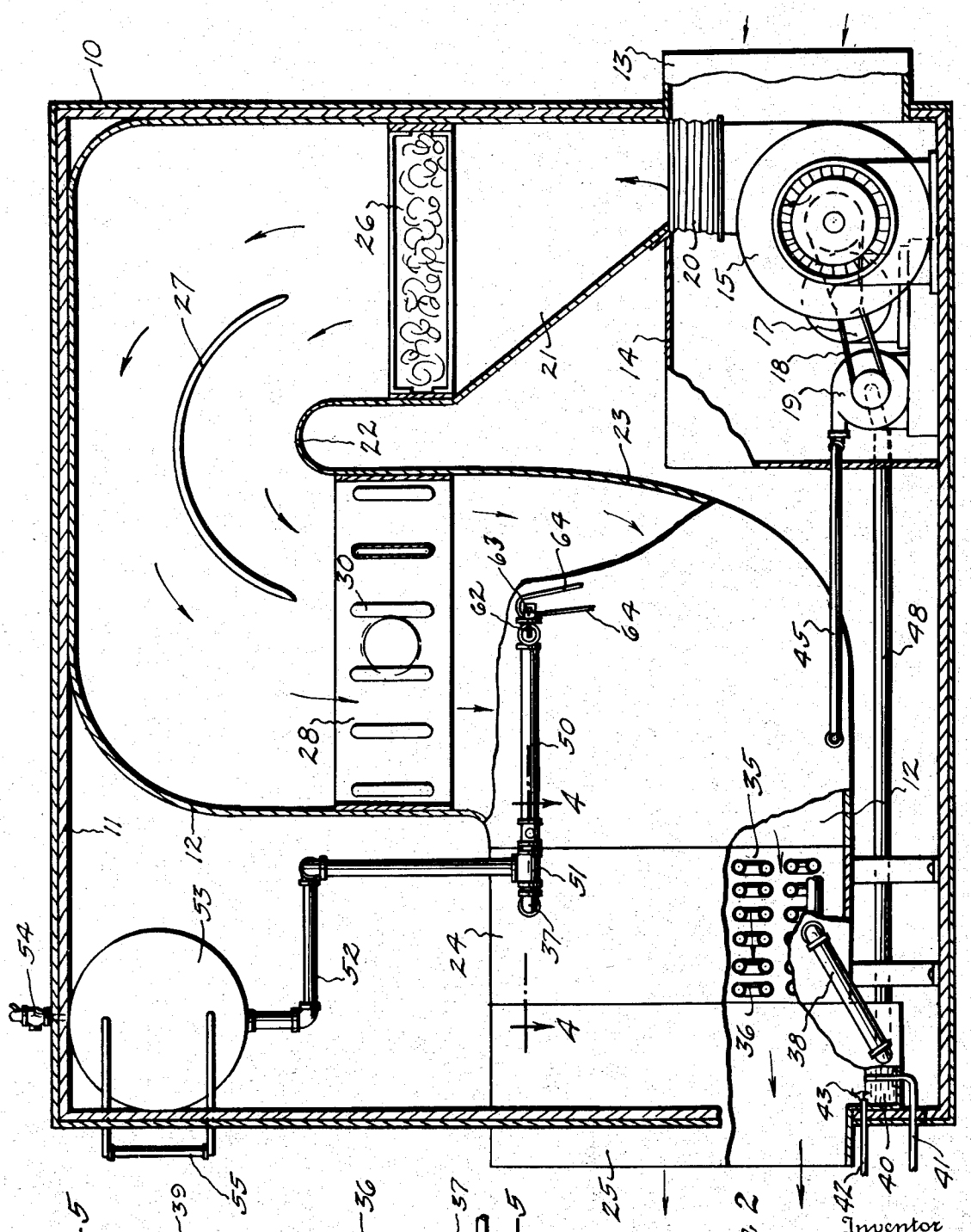


Fig. 2

Fig. 4

Inventor
Leo L. Landauer

Jack A. Ackley
Attorney

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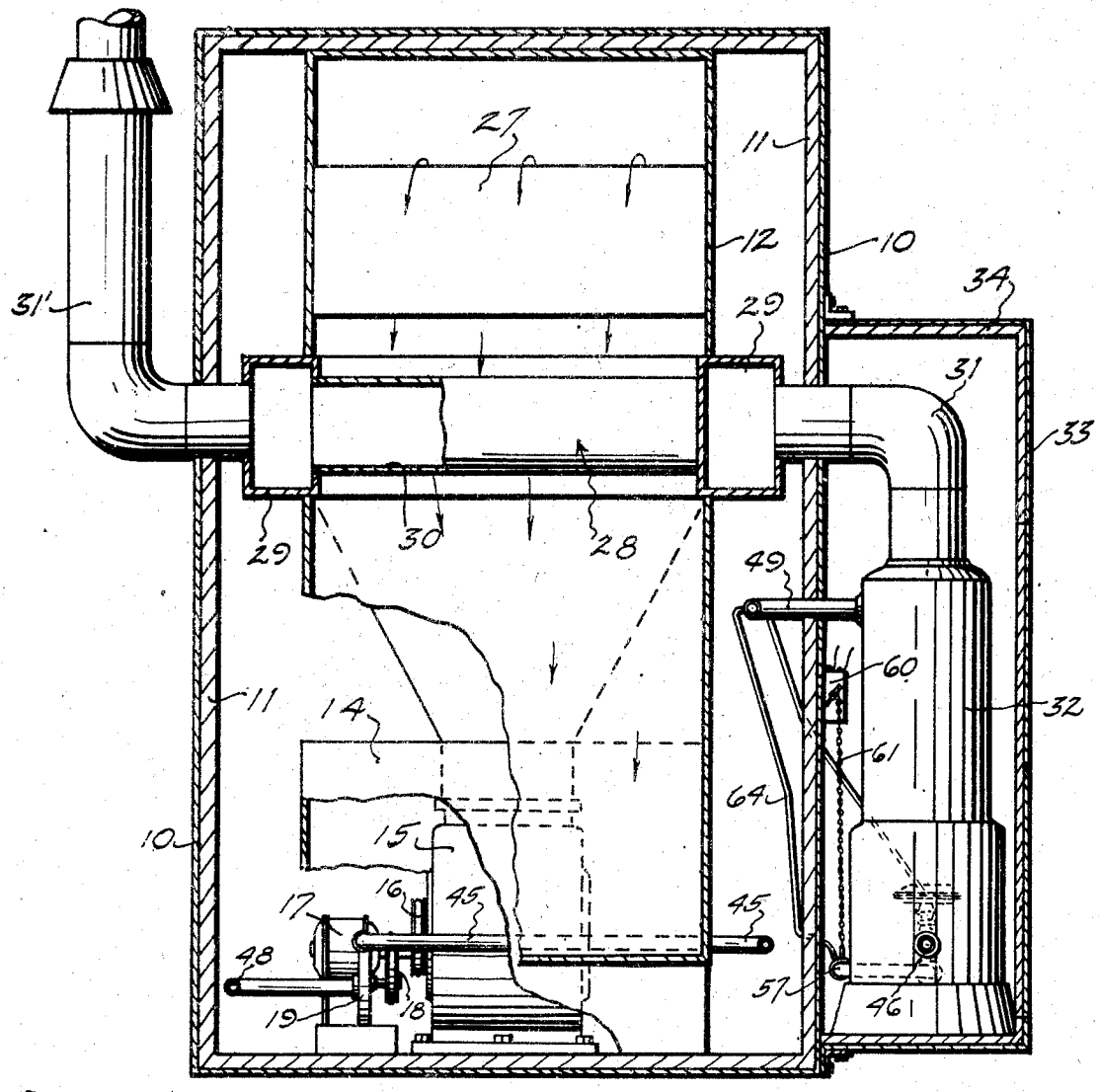


Fig. 3

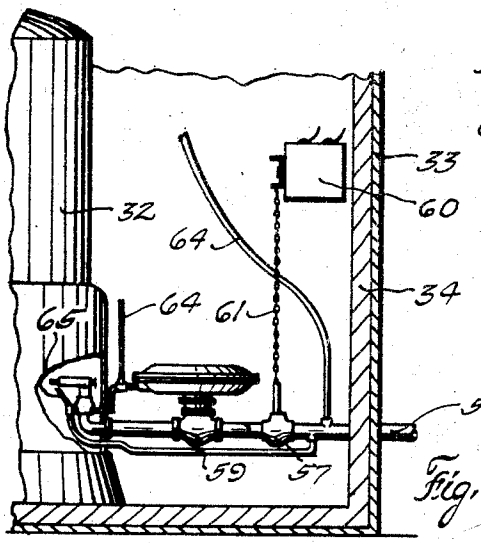


Fig. 6

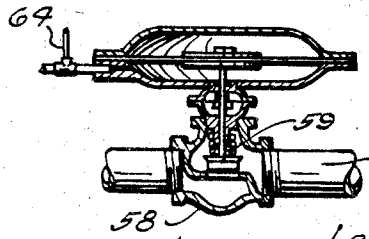


Fig. 7

Inventor
Leo L. Landauer

By Jack A. Ackley
Attorney

Patented Aug. 29, 1933

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UNITED STATES PATENT OFFICE

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AIR CONDITIONING APPARATUS

Leo L. Landauer, Dallas, Tex.

Application November 7, 1932. Serial No. 641,546

10 Claims. (Cl. 257—9)

This invention relates to new and useful improvements in air conditioning apparatuses.

One object of the invention is to provide an improved air conditioning apparatus or plant, which may be constructed as a self-contained unit and in an economical manner.

Another object of the invention is to provide an air conditioning apparatus which may be conveniently installed without providing a basement or furnace pit and also one which will utilize a minimum floor space.

A particular object of the invention is to provide an air conditioning apparatus wherein the air is forced through a conduit by means of a blower and pre-heated before being brought into contact with the primary heating elements, the waste gases from the heating means for the primary heating elements being utilized to heat the pre-heating means.

Another object of the invention is to provide an air conditioning unit through which the air is forced and the air currents kept constantly in motion, such currents first being filtered, then pre-heated, then heated, and finally humidified before being discharged from the unit.

Another object of the invention is to provide a self-contained air conditioning apparatus which may be economically operated at a maximum efficiency and which will be simple and compact.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings in which an example of the invention is shown, and wherein:

Figure 1 is a horizontal cross-sectional view of an air conditioning apparatus constructed in accordance with the invention,

Figure 2 is a longitudinal vertical sectional view taken on the line 2—2 of Figure 1, some of the portions being broken away to illustrate underlying parts,

Figure 3 is a transverse vertical sectional view taken on the line 3—3 of Figure 1, a portion of the air duct being broken away to illustrate other parts,

Figure 4 is a horizontal cross-sectional view taken on the line 4—4 of Figure 2,

Figure 5 is a vertical sectional view taken on the line 5—5 of Figure 4,

Figure 6 is a detail view showing the gas supply control, and

Figure 7 is a sectional view of the diaphragm gas valve.

In the drawings the numeral 10 designates an upright casing, preferably of sheet metal and rectangular in shape. The casing has a lining 11 of suitable heat insulating material. A sheet metal duct 12 is mounted in the casing and is given an undulating form to increase its length within the casing. At the lower portion of the rear of the casing is a rectangular collar 13 forming an air inlet, and air from any suitable source, either fresh air or circulated air or a mixture thereof, may be introduced through this collar.

An air box 14 mounted in the bottom of the casing at the rear thereof receives air from the collar. A suitable fan or blower 15 is mounted in the box. The fan is driven by a belt 16 from an electric motor 17 mounted in the box. The motor also drives a centrifugal water pump 19 by means of a belt 18. The discharge flue of the fan is connected to a flexible boot 20 in the upper end of the box which in turn is fastened to the collar of a transition 21 of the flue 12. The transition is attached to a return bend 22 and this is attached to the upper end of an elbow 23, while a sleeve 24 extends from the elbow along the bottom of the casing and through the front end of the casing and terminates in a collar 25, to which the distributing flue or conductor may be connected. The elements 21, 22, 23 and 24 constitute parts of the flue 12, which extends vertically as well as horizontally.

At the junction of the transition 21 and the bend 22, a suitable air filter 26 is mounted transversely, so that the air currents discharged from the fan must pass therethrough, whereby dust and extraneous matter is filtered out. A curved deflector 27 is mounted in the bend 22 and tends to cause a portion of the air currents to pass through the upper portion of said bend.

A pre-heater 28 comprising headers 29 connected by flat tubes 30 is mounted in the flue just above the elbow 23. The headers are located outside of the flue, while the tubes extend across the flue, and are arranged with their greatest dimensions vertically, so as to provide passages therebetween for the air currents. The vent pipe 31 of a water heater 32 is connected to one of the headers 29, while a vent pipe 31' leads from the other header through the side wall of the casing 10 to a suitable outlet. Waste gases and heat currents from the heater 32 pass through the tubes 30

and heat the same, whereby the air currents passing between the tubes are pre-heated.

The water heater 32 is enclosed in the housing 33 which is provided with a heat insulating lining 34. The heater may be located at any suitable place and the vent pipe extended to the pre-heater.

A heating unit 35 is mounted in the sleeve 24 of the flue 12 and includes a plurality of return tubes 36 connected at their upper ends with a hot water supply pipe 37 and at their lower ends with a discharge pipe 38. The tubes extend transversely of the flue in horizontal course and are provided with radiating fins 39 in the path of the air currents. This gives an increased heating surface and the pre-heated air currents passing between the heating tubes 36 are thoroughly heated.

Between the pre-heater 35 and the end wall of the casing, a water trough 40 is mounted in the bottom of the sleeve 34. An overflow pipe 41 maintains a water level in the trough and water is supplied by a pipe 42 and regulated by a cock 43. Moisture is thus supplied in the sleeve to humidify the heated air currents.

It is pointed out that cold or cool air currents entering the casing are forced through the flue 12 and kept in constant motion while in the casing. These air currents are first filtered, then pre-heated, then heated and finally humidified while passing through the casing. The entire conditioning of the air is accomplished in a continuous passage through a single casing and in a simple and efficient manner.

Water for the heater 32 is supplied by a service pipe 44 to a return pipe 45, which is connected by a pipe 46 with the bottom of the water heater. The pipe 45 extends from the housing 33 into the casing 10 and outside of the flue 12 to the discharge of the pump 19 in the box 14. The discharge pipe 38 from the heater 35 is connected with a pipe 47 which extends therefrom, through the trough 40 and is connected to a pipe 48 on the opposite sides of the casing extending rearwardly to the inlet of the pump 19. A hot water supply pipe 49 extends from the upper portion of the water heater 32 into the casing and connects with a pipe 50. The pipe 50 connects with a T 51, which is connected to the pipe 37.

It is obvious that a constant circulation of hot water is maintained from the heater 32 by way of pipes 49, 50 and 37 to the heater 35, thence by pipes 38, 47 and 48 to the pump 19 and from said pump back to the water heater 32 by pipes 45 and 46. In order that water of a higher temperature than 212 degrees F. may be used, the T 51 is connected by a pipe 52 with an expansion tank 53 mounted in the upper portion of the casing. A pressure relief valve 54 is connected through the top of the casing with the tank. A gage glass 55 on the outside of the casing is connected with the tank.

The heating may be automatically controlled if desired. A gas supply pipe 56 extends into the houisng 33 to the heater 32. A cut-off valve 57 is connected in this pipe and the valve case 58 of a diaphragm control valve 59 is also connected in the pipe 56 between the valve 57 and the heater. A valve operator 60 is mounted in the housing and is connected with the valve 57 by a chain 61. This operator is electrically connected with a temperature control thermostat, located at a point (not shown) at which it is desired to regulate the temperature and to which conditioned air is delivered from the device. This mechanism is common in the art and its operation is well understood.

The diaphragm valve is illustrated in Figure 7, and is so well-known as not to require detailed description. Its purpose is to cut off the gas supply when the water reaches an excessively high temperature. A thermostat 62 is inserted in the hot water pipe 50 and is provided with the usual trip valve 63 connected in a gas line 64 which leads from the gas supply pipe 56 in advance of the valve 57 and extends to the diaphragm valve to hold the same open. The thermostat 62 controls the closing of the valve 59, which latter is normally open. The operation of the thermostat 62 closes the valve 63 which cuts off the supply of gas to the valve 59, whereupon the latter is closed, thus shutting off the supply of gas to the heater 32. It is obvious that any suitable control means could be used and the details thereof are not a part of the invention. By circulating iced or cold water through the tubes 36 and cold air through the pre-heater, or cutting out the pre-heater, an air conditioning device for summer use may be provided.

The description which has been given recites more or less detail of a particular embodiment of the invention which is set forth as new and useful, however, I desire it understood that the invention is not limited to such exact details of construction, because it is manifest that changes and modifications may be made within the scope of the appended claims without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent, is:

1. In an air conditioning device, a housing, an undulating flue extending through said housing, means for forcing air currents through said flue, a heater arranged adjacent the discharge end of the flue in the path of the air currents, and a pre-heater disposed in the flue in advance of the heater and in the path of the air currents.

2. In an air conditioning device, a housing, an undulating flue extending through said housing, means for forcing air currents through said flue, a heater arranged adjacent the discharge end of the flue in the path of the air currents, a pre-heater disposed in the flue in advance of the heater and in the path of the air currents, and a humidifier arranged adjacent the heater.

3. In an air conditioning device, a housing, an undulating flue extending through said housing, means for forcing air currents through said flue, a heater arranged adjacent the discharge end of the flue in the path of the air currents, a pre-heater disposed in the flue in advance of the heater and in the path of the air currents, a water heater, a circulatory water conductor connected with the water heater and the air heater, and a pump connected in said conductor.

4. In an air conditioning device, a housing, an undulating flue extending through said housing, means for forcing air currents through said flue, a heater arranged adjacent the discharge end of the flue in the path of the air currents, a pre-heater disposed in the flue in advance of the heater and in the path of the air currents, a water heater, a circulatory water conductor connected with the water heater and the air heater, a pump connected in said conductor, and an expansion tank connected with the conductor, whereby water at a temperature

higher than 212 degrees F. may be circulated through the air heater.

5. In an air conditioning device, an upright casing, an air admitting box mounted at the rear of the casing, an undulating flue extending from said box through the casing and having its discharge end at the front end of the casing, an air blower mounted in the box and connected with the rear end of the flue, an air heater mounted in the flue and including water tubes, means for supplying hot water to the tubes of the heater, and a pre-heater for the air currents mounted in the flue in advance of the air heater.

6. In an air conditioning device, an upright casing, an air admitting box mounted at the rear of the casing, an undulating flue extending from said box through the casing and having its discharge end at the front end of the casing, an air blower mounted in the box and connected with the rear end of the flue, an air heater mounted in the flue and including water tubes, means for supplying hot water to the tubes of the heater, a pre-heater for the air currents mounted in the flue in advance of the air heater, means for circulating the water supplied to the tubes of the heater and returning the same to the heating means, and an expansion tank connected in said circulating means.

7. In an air conditioning device, a casing, a flue extending through the casing, means for continuously forcing air currents through said flue, a heater in said flue in the path of the air currents, and a pre-heater in said flue in the path of the air currents mounted in advance of the heater.

8. In an air conditioning device, a casing, a flue extending through the casing, means for continuously forcing air currents through said flue, a heater in said flue in the path of the air currents, a pre-heater in said flue in the path of the air currents mounted in advance of the heater, and heating means for supplying hot water to the heater and passing hot gases through the pre-heater for heating the same.

9. In an air conditioning device, a casing, a flue extending through the casing, means for continuously forcing air currents through said flue, a heater in said flue in the path of the air currents, a pre-heater in said flue in the path of the air currents mounted in advance of the heater, a water heater, a circulatory water conductor connected with the heater and the water heater and including a pump, means for supplying fuel to the water heater, and thermostatically controlled means for regulating the fuel supply.

10. In an air conditioning device; a casing; an air admitting box at the rear of the casing; a flue extending through the casing and including a transition, a return bend connected to the upper end of the transition, an elbow connected to the opposite end of the bend, and a sleeve connected to the lower end of the elbow; an air heater mounted in the sleeve of the flue; and a pre-heater for the air currents mounted in the flue adjacent the junction of the bend and the elbow.

LEO L. LANDAUER.