June 18, 1929. L. BOX 1,717,657

FURNACE

Filed Sept. 2, 1926

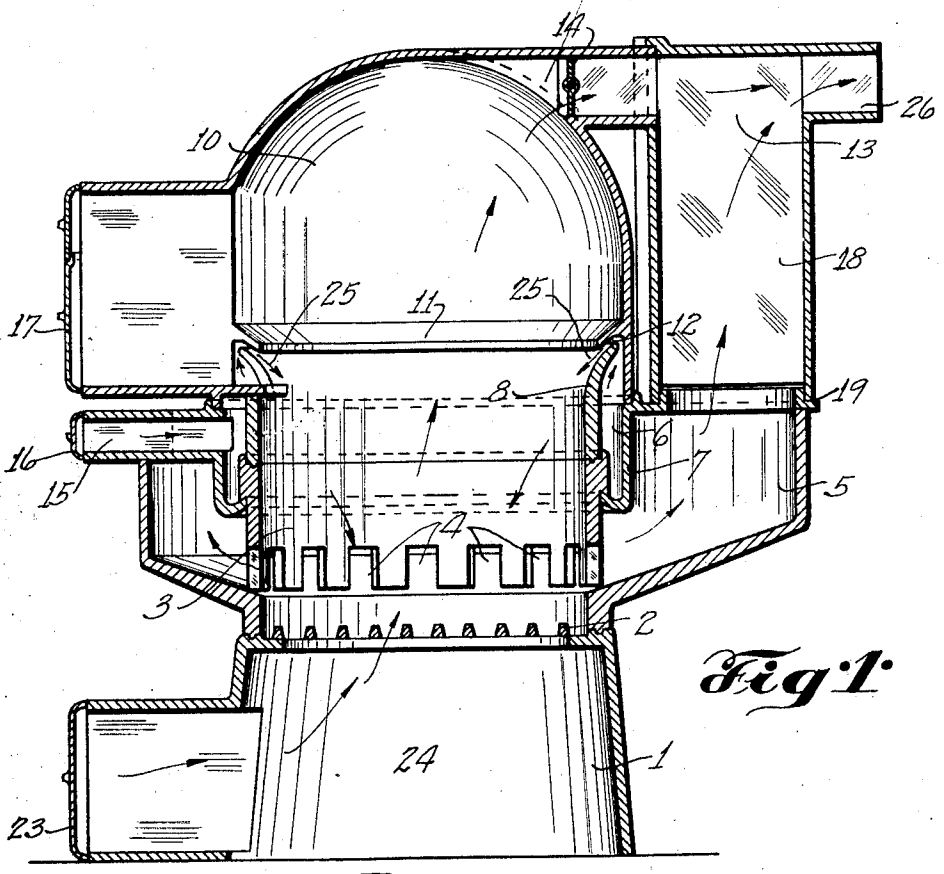

Fig. 1.

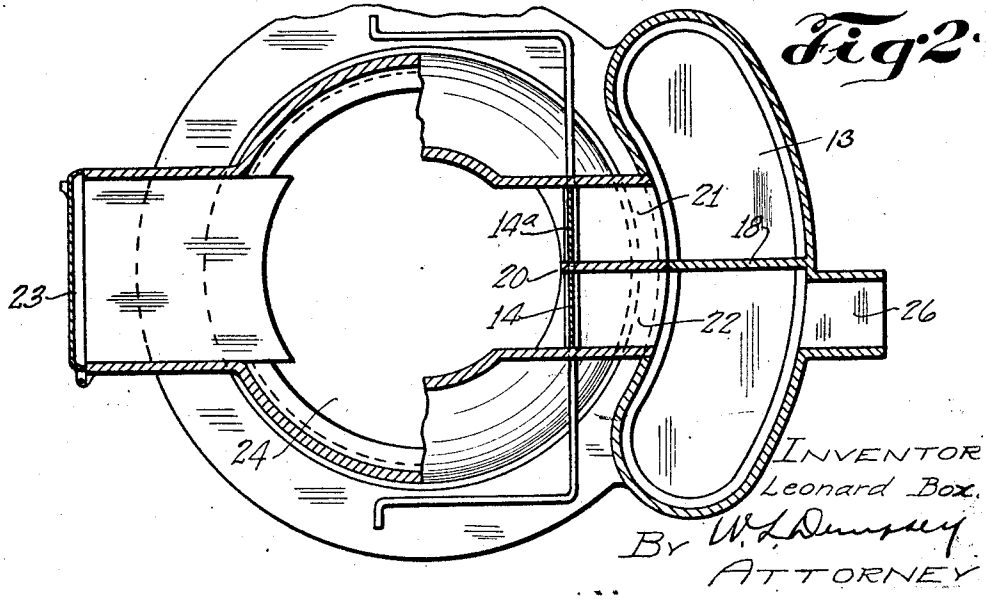

Fig. 2.

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UNITED STATES PATENT OFFICE.

LEONARD BOX, OF EAST ST. LOUIS, ILLINOIS.

FURNACE.

Application filed September 2, 1926. Serial No. 133,143.

My invention relates to furnaces and especially to that type of furnace known in the trade as "down-draft" furnaces.

The primary object of my invention is the production of a furnace which, under all conditions, will approach approximately complete combustion of the fuel, thereby resulting in greater economy and preventing the emission of smoke into the open air.

Another object of my invention is the production of a furnace of maximum simplicity and one that may be constructed at a minimum cost.

Other and further objects and advantages of my invention will be apparent from the specification, claim and drawings, in which:—

Fig. 1 is a vertical cross-section.

Fig. 2 is a horizontal section, partly broken away.

It is well known that but a very small percentage of the heat content of fuel is utilized, especially in domestic appliances. To reduce this waste and produce a more efficient furnace for domestic heating plants is the primary object of my invention.

The loss due to discharging smoke into the open air is well known. It is, also, well known that the ordinary furnace which admits air through the bottom of the grate and discharges it directly over the burning fuel results in the greatest waste. Therefore, many attempts have been made to confine the burning gases within the furnace and only emit the burnt products of combustion.

These attempts have resulted in what is known as "down-draft" furnaces, all of which, so far as the applicant is aware, are so designed that the air is admitted to the fire pot through a central tube of a fixed length, which discharges its air very close to the burning coal and which must necessarily be restricted in size so that the velocity of the air is relatively high and the time it takes it to reach the burning coal very short so that it is relatively cold.

I have found by experience that the solution of this problem requires a large volume of air flowing in at a relatively low velocity and heated to the highest possible temperature.

To bring about this ideal condition, my invention consists of a hollow base 1, of the conventional type, provided with a grate 2 of any suitable design. A detachable annular fire bowl 3 is provided circumferentially with a series of ports 4, disposed peripherally about the base of the fire bowl 3. The ports 4 are in open communication with a smoke chamber 5, circumferentially disposed about the fire bowl 3, and of relatively large capacity.

Integral with the smoke chamber 5 is a circumferentially disposed air chamber 6, separated from the smoke chamber 5 by a partition wall 7. Detachably superimposed upon the fire pot 3 is an annular wall 8, which serves the purpose of increasing the vertical height of the chamber 6. A gas dome 10 is provided adapted to rest on top of the partition wall 7 and encloses the upper portion of the fire bowl 3 and the annular wall 8.

The lower portion 11 of the gas dome 10 immediately above the wall 8 is sloped downwardly and inwardly to provide a passage 12 for the inflow of the heated air into the fire bowl.

The flue 13 is always in open communication with the smoke chamber 5, and may be intermittently put in open communication with the dome 10 by means of the damper 14. An air port 15, of ample capacity, puts the air chamber 6 in open communication with the air by means of the door 16, which is provided with a suitable register, not shown.

The fuel door 17 is adapted to be closed practically air-tight.

The flue 13 is provided with a vertically disposed partition wall 18, the lower end of said wall terminating at 19, and the upper end extending laterally into the dome at 20, thus dividing the flue into two compartments 21 and 22, the upper ends of the compartments being in intermittent communication with the space enclosed by the dome 10, and regulated by dampers 14 and 14^a. The lower ends of the compartments are always in open communication with the smoke chamber 5.

On starting the fire the air port 15 is closed airtight by the door 16, and the ash pit door 23 is opened, permitting the air to flow in through the ash pit 24 and through the grate bars into the fire bowl 3 and up through the dome 10 directly into the flue 13, the damper 14^a being open. When the fuel is well ignited, the door 23 is closed air-tight and the door 16 opened, and both dampers 14 and 14^a are closed, thereby causing the air to pass into the air chamber 6, where it is highly heated and flows into the fire bowl as indicated by the arrows at 25.

The air thus discharged into the bowl and dome is highly heated and of large volume and completely unites with the gases gener-

ated by the fuel, resulting in practically complete combustion of all the fuel. The hydrogen of the air and the carbon monoxide and water vapor pass downward through the ports 4 to the fire bowl, into the smoke chamber and up the flue and out through the smoke stack 26.

It is obvious that the prerequisites for complete combustion, viz a sufficient volume of highly heated air brought into immediate contact with the gases generated by the fuel, are present thereby producing a furnace of maximum efficiency at a minimum cost.

It will be noted that the air chamber is located so that the air absorbs heat from the walls of both the fire bowl and the smoke chamber, thereby recovering heat that would otherwise be lost, and the great efficiency of my furnace is largely due to the fact not only that a larger volume of air is heated, but that the air chamber is interposed between two highly heated chambers and the temperature of the air is thus uniformly maintained at a very much higher degree.

Having fully described my invention, what I claim as new and useful and desire to protect by Letters Patent is:—

A furnace of the class described, comprising a base, grate bars disposed upon said base, a fire bowl disposed above said grate bars, a plurality of ports peripherally disposed about the base of said fire bowl putting said fire bowl in open communication with an annular smoke and gas chamber, an annular smoke and gas chamber disposed about said fire bowl, an annular air chamber interposed between said fire bowl and said annular smoke and gas chamber, means for admitting atmospheric air into said annular air chamber, means for discharging air from said air chamber into said fire bowl about the periphery of the upper portion thereof, means for directing inwardly and downwardly the air so admitted into said fire bowl from said air chamber, and means for regulating and controlling the flow of air into said chambers and said furnace.

LEONARD BOX.