Aug. 31, 1937. J. PEOPLES 2,091,487

OIL BURNER

Original Filed May 6, 1935 4 Sheets-Sheet 1

Fig. 1.

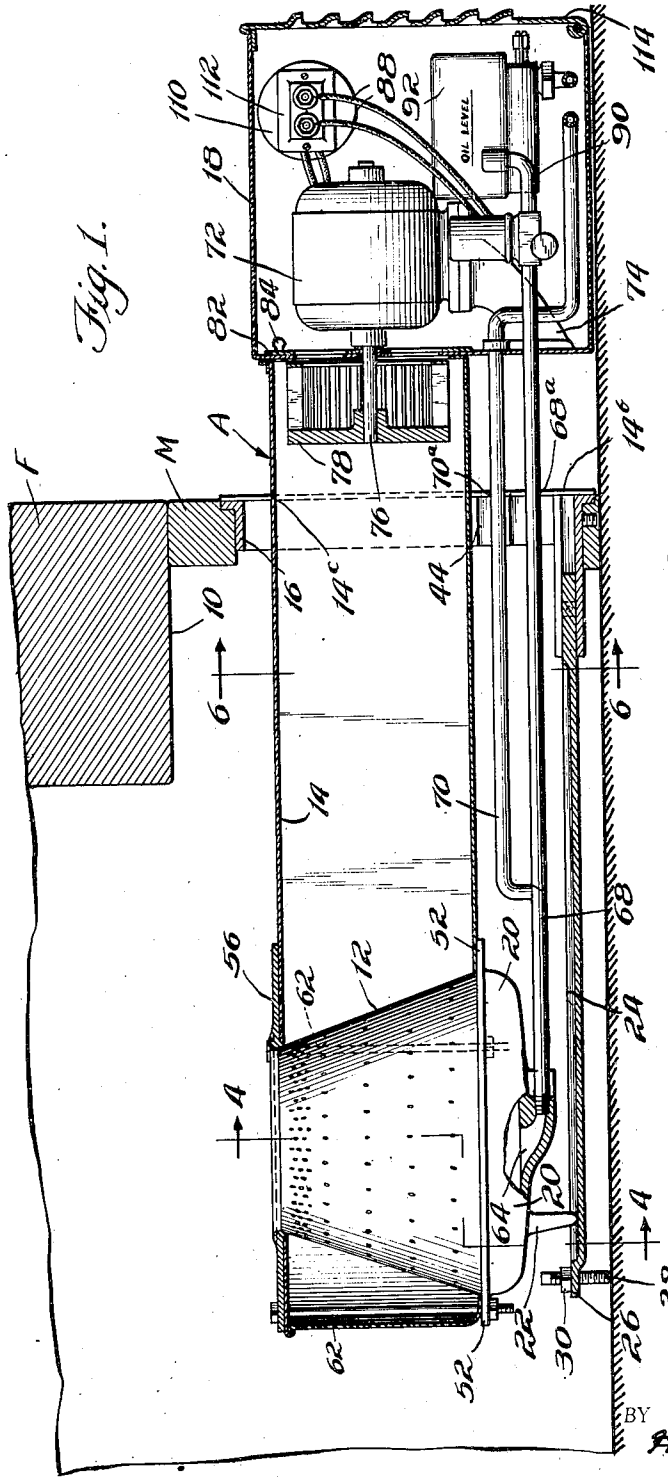


Fig. 3.

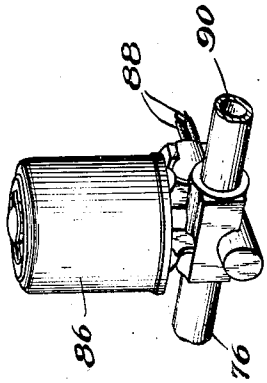
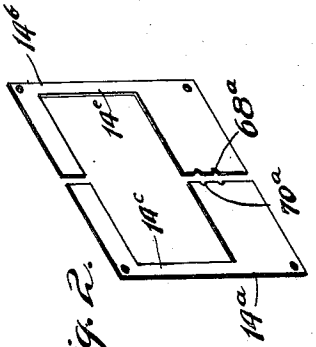


Fig. 2.



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Aug. 31, 1937. J. PEOPLES 2,091,487

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Original Filed May 6, 1935 4 Sheets-Sheet 2

Fig. 8.

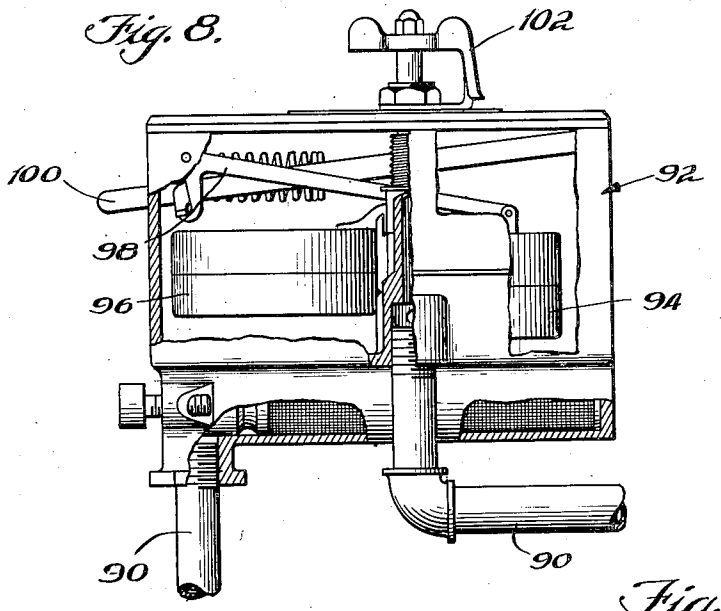


Fig. 10.

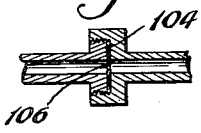


Fig. 9.

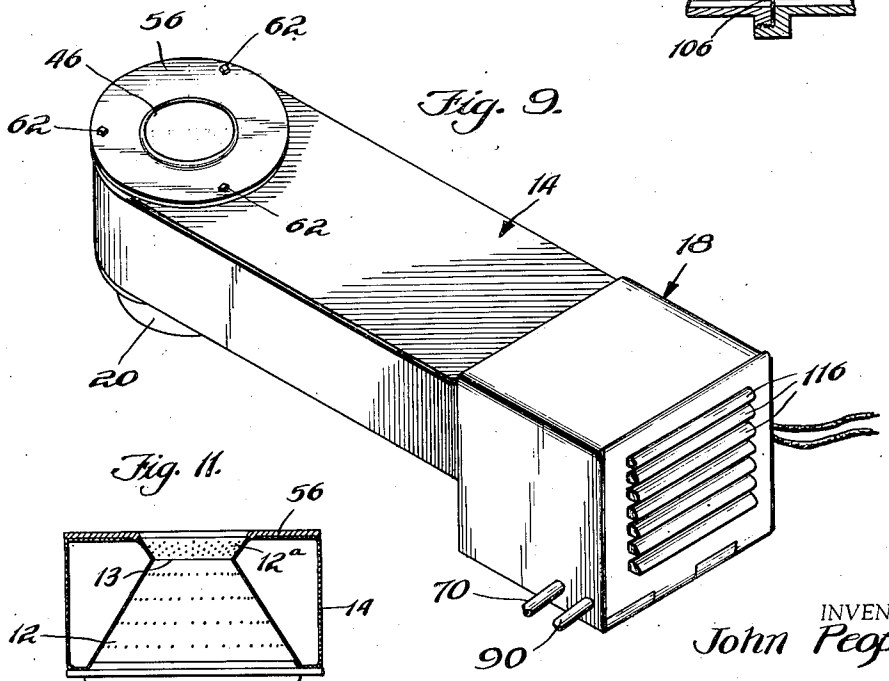


Fig. 11.

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Aug. 31, 1937. J. PEOPLES 2,091,487

OIL BURNER

Original Filed May 6, 1935 4 Sheets-Sheet 3

Fig. 4.

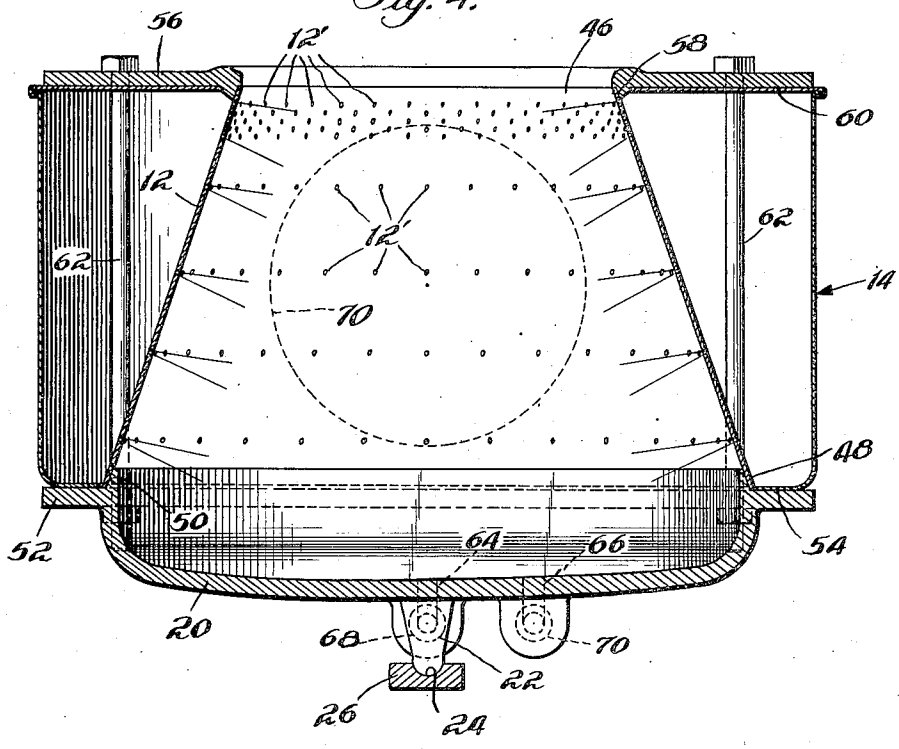
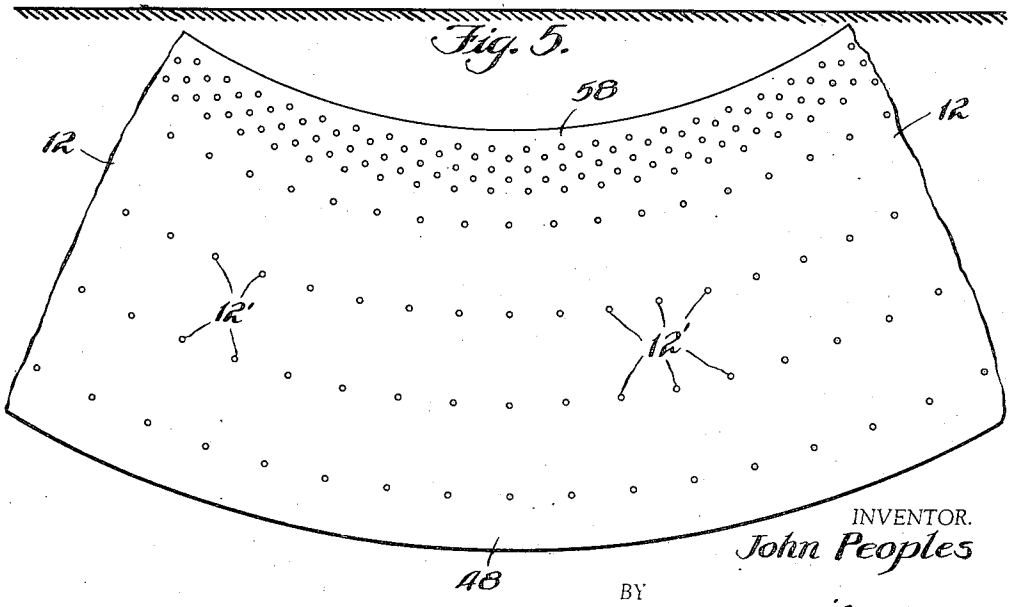


Fig. 5.



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Aug. 31, 1937. J. PEOPLES 2,091,487

OIL BURNER

Original Filed May 6, 1935 4 Sheets-Sheet 4

Fig. 6.

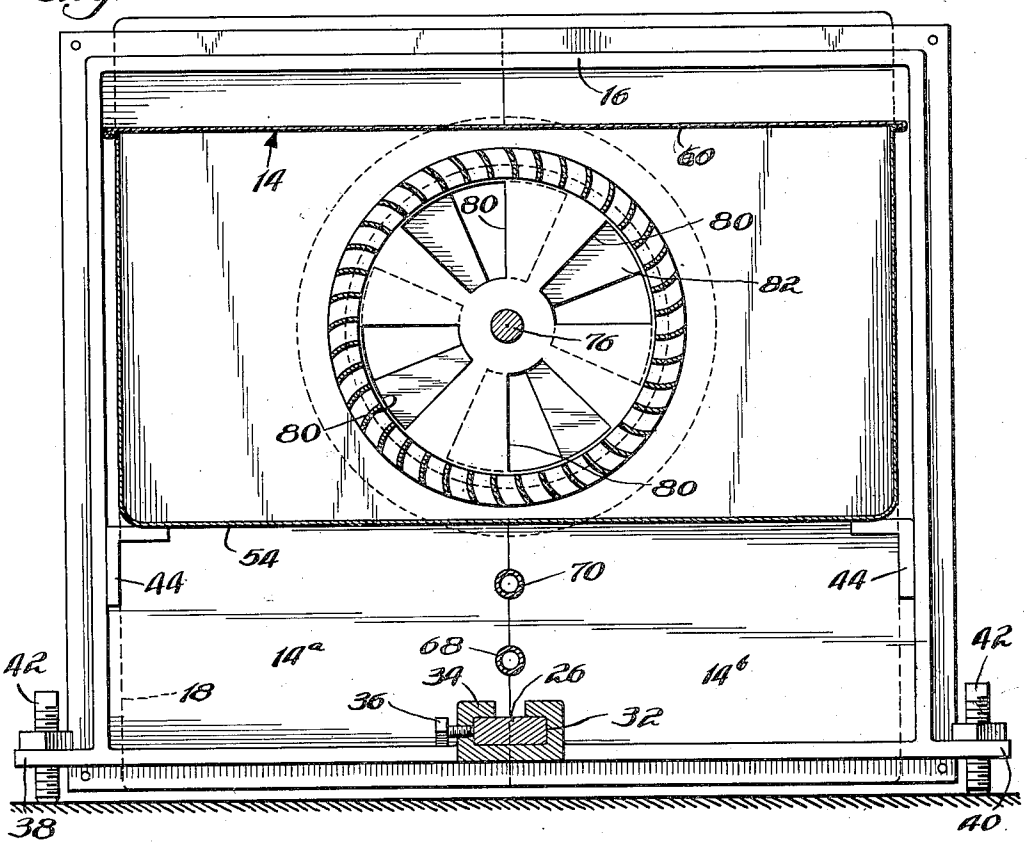
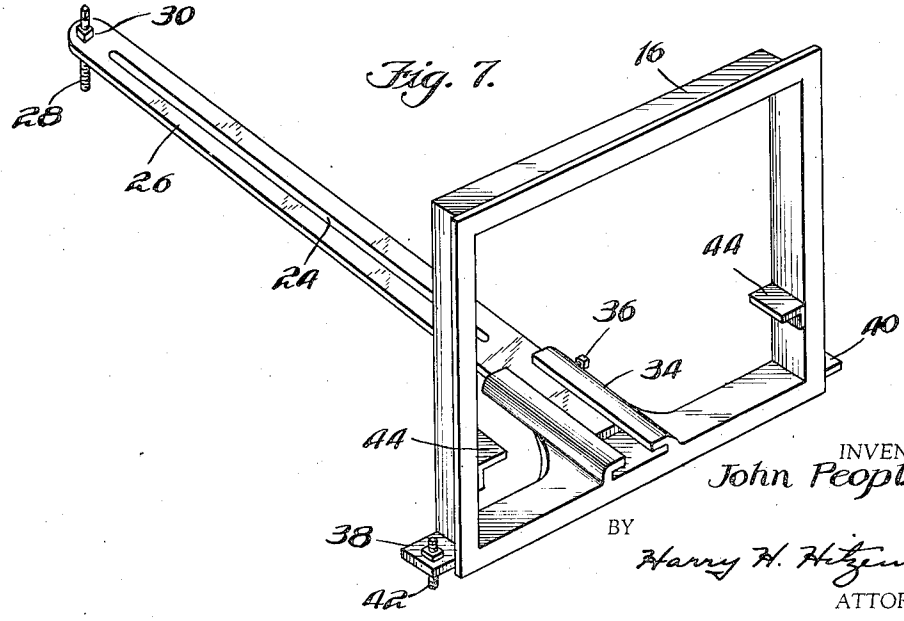


Fig. 7.



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UNITED STATES PATENT OFFICE

2,091,487

OIL BURNER

John Peoples, Oak Park, Ill.

Application May 6, 1935, Serial No. 19,988
Renewed June 21, 1937

3 Claims. (Cl. 158—92)

My invention relates to improvements in oil burners and similar devices.

My invention relates more particularly to a simplified oil burner structure capable of producing an efficient oil burning operation.

In order to secure a clear understanding of my invention, I desire to offer a short explanation of the theory of combustion which is carried out by my improved construction.

Three theories of combustion have been announced and followed in the oil burning industry since the burning of oil for heating purposes came into use.

The first two, the preferential combustion of carbon theory and the preferential combustion of oxygen theory, have been followed for years by combustion engineers in the design of oil burner equipment. The third, the hydroxylation theory which appears to be the only correct theory, is now the generally accepted theory and is being generally followed by combustion engineers in designing oil burners.

Under the hydroxylation theory, a certain mixing of gases by a chemical process must take place before combustion. This mixing involves the addition of oxygen to vaporized oil molecules to produce alcohols and aldehydes from original hydrocarbons and the oxygen in the air.

The addition of oxygen to hydrocarbons before heating in the flame is very desirable. If this is not done, soot is produced; if it is, carbon monoxide is produced. In other words, if oil vapors are heated that have not had oxygen combined with them, it will produce soot. If, however, oxygen has been properly added to the hydrocarbons, it causes a chemical combination to take place, and heating this product will not produce soot, but rather will produce carbon monoxide—a clean burning gas in place of soot. Therefore, every combustion problem involves a race between hydroxylation and cracking. If hydroxylation occurs before cracking, there will be no soot. If cracking occurs before hydroxylation, it will produce soot.

Cracking takes place after making alcohols and aldehydes. It is desirable to keep the fuel mixture that is being formed at a low point or below the cracking temperature of hydrocarbons, which is approximately 650° Fahrenheit, because the cracking of hydrocarbons will produce soot; whereas if alcohols and aldehydes are formed before any cracking is done, then alcohols and aldehydes break down chemically in such a way as to produce carbon monoxide—a clean gas—rather than soot.

Many of the burners of the prior art ran liquid oil out on red hot vapor plates, which was the ideal condition for producing soot. Hence it was necessary to produce very active mixing of air and to take great precautions to get the soot burned up instead of having it get away and deposit in the upper parts of the boiler as an insulator.

An object of my invention is to provide a burner which will produce a maximum amount of hydroxylation.

A further object is to provide a burner having more simple and more effective means of hydroxylating.

A further object of my invention is to provide a burner of the type described capable of installation or removal as a unit, comparatively light and capable of easy manipulation by a single person.

A further object is to provide an oil burner construction so arranged that a very small fan or blower unit will provide sufficient forced draft for heating at its maximum efficiency.

A further object is to provide an improved supporting frame member for installing or removing the burner as a unit.

A further object is to provide improved means for sealing the opening into which the burner has been placed easily and quickly so that an ordinary workman can install the apparatus.

Other objects and advantages will be more apparent from the following description, wherein reference is had to the accompanying four sheets of drawings, upon which

Fig. 1 is a vertical sectional view of my improved oil burner showing the same operatively mounted in an ordinary type of furnace;

Fig. 2 is a perspective view of the split plates which form an air seal over the supporting frame;

Fig. 3 is a perspective view of the solenoid valve in the fuel supply line;

Fig. 4 is a cross sectional view through the mixing chamber taken on the line 4—4 of Fig. 1;

Fig. 5 is a fragmentary developed view of the conical wall of the mixing chamber showing the spacing of the air holes;

Fig. 6 is a cross-sectional view through the air tube and associated parts, taken generally on the lines 6—6 of Fig. 1;

Fig. 7 is a perspective view of the supporting frame for the burner unit;

Fig. 8 is a side view partially in section, of a float valve used in connection with the fuel supply line;

Fig. 9 is a perspective view of the burner showing the manner in which the same is capable of handling as a single unit;

Fig. 10 is an enlarged detailed view of the gas supply control, and

Fig. 11 is a view similar to Fig. 4 of a modified type of mixing chamber.

Referring generally to Fig. 1, I have shown the burner unit A mounted in the ash door opening 10 of the usual type of furnace F with the burner proper extending to the center of the furnace.

With this arrangement the mixing chamber 12 is shown positioned vertically in the center of the furnace and the air tube 14 may extend outwardly therefrom through a supporting frame 16 and be connected on the outside of the furnace with a housing 18 within which the fan motor and the various controls may be located.

The mixing chamber 12 is attached to a base or bowl portion 20 provided with a foot member 22 which is normally supported in an operating position in a groove 24 that is provided in an extended bar 26 which is secured in the frame 16. A suitable levelling stud 28 and locking nut 30 are provided at the extended end of bar 26 to adjust the height of the bar to a desired position. The bar 26, which is rectangular in shape, is adapted to extend at its forward end into a groove 32 in a bearing portion 34 extending rearwardly from the frame 16.

A locking stud 36 is provided to securely hold the bar 26 in a desired extended position. The frame 16 is provided with a pair of ear portions 38 and 40 through which adjusting studs 42 extend to regulate the desired height thereof for placing the frame in a level position.

After the frame has been placed in a desired level position in the ash door opening of the furnace, brick and mortar M may be placed around the border of frame 16 to make an air-tight seal in the door opening. With the frame in position, the burner unit A may now be moved into operative position on the frame with the foot 22 resting in the groove 24 and the air tube 14 resting upon the L-shaped support members 44, provided upon the sides of frame 16.

Referring now to Fig. 4, the mixing chamber 12 may be formed as a conically shaped tube of comparatively thin sheet metal which has been provided with a plurality of rows of minute openings 12'.

In the construction which I have shown, I provide four rows of openings spaced a considerable distance apart and five rows of openings spaced comparatively close together, the five rows being adjacent the throat or apex 46 of the mixing chamber 12.

The lower end 48 of the cone-shaped chamber 12 is adapted to seat upon the outside of a flange 50 which extends upwardly from the bowl member 20. This member is also provided with a horizontal flange 52 which extends outwardly therefrom and provides a shoulder for the lower wall 54 of the air tube 14. A circular retaining ring 56 is provided with a tapered bore 58 into which the upper end 46 of the mixing chamber 12 is seated. The upper wall 60 of the air tube 14 may lie beneath the ring 56, and as thus assembled, the bowl, the mixing chamber, and the air tube are securely held together by a plurality of bolt members 62 which extend through the ring 56 and the flange 52 of the bowl 20, and which are provided with suitable fastening nuts to hold the same together.

The bowl 20 is provided in its floor with inlet openings 64 for fuel oil and 66 for gas for ignition purposes. Conduits 68 and 70 may extend from these openings to suitable sources of oil and gas supply.

The housing 18 as previously described is adapted to be fastened to the front end of the tube 14. A comparatively small and light duty motor 72 is provided mounted upon a supporting member 74 attached to a side wall of the housing 18. A motor shaft 76 may extend through a damper arrangement into the air tube 14 and a fan member 78 may be secured to the shaft within the tube as shown. The fan 78 may be of the "Sirocco" type capable of drawing air through the draft openings 80 which may be controlled by a damper 82 which may be manually regulated by a knob member 84.

The oil conduit 68 may extend forward into the housing 18 and pass through a magnetic valve 86 of the type shown in Fig. 3. This valve is of the solenoid type which is adapted to close off the fuel supply upon the failure of current to hold the core of the solenoid in raised position so that when current to the motor fails, current through the lines 88 to the windings of the solenoid is also shut off and the plunger drops, whereby the flow of fuel to the burner is closed off.

A conduit 90 may extend from the valve 86 to a second valve 92 which is in the nature of a float valve adapted to shut off the supply of oil to the burner whenever the pressure becomes too great. The float valve 92 is of the general type employing a float 94 and an auxiliary float 96 so that when the oil rises in the primary float chamber it will overflow into an auxiliary chamber which forces an auxiliary float to rise and through the leverage 98 releases a safety trip lever 100 to cut off the supply of fuel to the burner. In order to manually reset the trip mechanism, it is only necessary to raise lever 100, which extends from the side of the float body. A manual adjusting valve 102 is provided to allow the setting of the valve during installation to any desired volume.

The gas supply conduit 70 may extend into the housing 18 as shown, and be provided with the control 104 shown in Fig. 10. This control may consist of a metal disc in which a very small opening 106 is provided, allowing for the flow of a very small amount of gas which is just sufficient to provide a flame when ignited. In this manner the amount of gas which flows to the burner is restricted to such an extent that there is no danger of explosion or other trouble due to an excess amount of gas.

Access to the compartment 18 and to the motor, valves, control box 110 and transformer 112, may be had by providing a door 114 for the front opening of the compartment. The door may be suitably hinged at its lower end in any desirable manner and be further provided with a plurality of louvres 116 so that air may be drawn to the fan 78. This arrangement has the additional advantage of providing cooling means for the motor 72.

A pair of split plates 14*a* and 14*b* which are provided with the complementary openings 14*c* for the air tube 14 and similar openings 70*a* and 68*a* for the conduits, are adapted to be placed upon the outside of frame 16 to form an air-tight seal over the opening therein. These plates may be held in position by suitable screw members which may be fastened in the vertical flange of the frame 16.

From the foregoing description it will be apparent that a very compact and easily assembled oil burner has been provided. The installation, as is readily apparent, is extremely simple and can easily be done by one inexperienced in the art.

By the use of the conically shaped vaporizing or mixing chamber, a highly advantageous construction has been provided. This shape eliminates dead cold corners; it produces better controlled movement of the gases through the cham-

ber; it produces a larger volume of properly prepared mixture in a given space than other designs; it is much more simple to assemble and build; it gives the maximum amount of time for carrying out the initial mixing of air and oil vapors at the lowest possible temperatures. I have found by experiment that there are certain heights relative to diameters which are most effective, and the object of this design is to get a practical height that can be used and still give enough time and room to hydroxylate and complete the chemical reactions therein at the rate at which the mixture is produced. The more mixture produced, the less time a given quantity of mixture can remain in the chamber. In order to get an adequate mixture in the burner, one must have the most advantageous arrangement of air ports and vaporizing pool on the bottom of the chamber. In order to get the quickest complete mixing, one must have the maximum number of holes practical to use without getting them so small that they would be impractical in operation. In the areas around any given large hole, there is a large percentage of air in the center of the jet around the hole. If the hole is too large, it can produce a cracking temperature of flame inside the hole.

Due to the design of this mixing chamber, the air is distributed into this mixing chamber so that a mixing of air and oil vapors is obtained before combustion. The same result has been accomplished in the past by means of mixing in a fan arrangement, while with my improved construction it is done without any moving parts. The design of the mixing chamber is such that the quantity and the rate of mixing is directly controlled thereby and increased capacity is secured with a given outside dimension of the burner, and the heat output of this type of mixing chamber is larger than other mixing chambers now in use.

The amount of oil burned per hour depends on the dimensions. For a given diameter, more mixture will be produced than is produced by other designs on the market. This may partially be attributed to the manner in which the air is directed into the mixing chamber.

The air is blown downwardly and across the surface of the oil pool on the floor of the burner, thereby creating a movement which takes the molecules of accumulated gas from the surface and moves them upwardly and out of the mixing chamber.

In Fig. 11, I have illustrated a modified mixing chamber 12 which differs somewhat from the preferred form. In this form I provide a throat portion 12*a* flared outwardly from the opening 13 at the upper end of the mixing chamber proper. An advantage of this structure is that due to the fact that the air jets in the throat portion are directed upwardly, the mixture which passes through the neck or opening 13 is even more violently agitated and mixed, and is also more rapidly drawn out of the mixing chamber. I have found by experiment that either structure herein described operates very efficiently and satisfactorily.

From the foregoing description, it will be apparent that applicant has provided an extremely simple, cheap, and economical construction. Due to the manner in which the burner and its supporting frame are associated, it will be apparent that installation is a comparatively easy matter.

While I have illustrated and described a specific embodiment of the invention, it will be apparent to those skilled in the art that various detailed changes and modifications may be made in the exact structure shown, and I do not wish to limit myself in any particular; rather what I desire to secure and protect by Letters Patent of the United States is:

1. An oil burner structure comprising an apertured, frusto-conical, metal tubular member forming a mixing chamber, an elongated air conduit associated therewith and having one end portion surrounding said tubular member with its side wall spaced therefrom, a ring member engaging the upper side of said air conduit and having an axial opening with a tapered shoulder therearound forming a seat which engages the upper edge of said tubular member, a burner bowl having an upwardly extending shoulder forming a seat engaging the lower edge of said tubular member and a peripheral flange engaging the lower side of said air conduit, and means connecting said ring member and peripheral flange which clamps said burner bowl, tubular member and air conduit together as a unitary air-tight structure.

2. An oil burner structure comprising an apertured, frusto-conical, metal tubular member forming a mixing chamber, an elongated air conduit associated therewith and having one end portion surrounding said tubular member with its side wall spaced therefrom, a ring member engaging the upper side of said air conduit and having an axial opening with a tapered shoulder therearound forming a seat which engages the upper edge of said tubular member, a burner bowl having an upwardly extending shoulder forming a seat engaging the lower edge of said tubular member and a peripheral flange engaging the lower side of said air conduit, means connecting said ring member and peripheral flange which clamps said burner bowl, tubular member and air conduit together as a unitary air-tight structure, said means comprising bolt members fastened between said ring member and the peripheral flange of said burner bowl.

3. An oil burner structure comprising an apertured, frusto-conical, metal tubular member forming a mixing chamber, an elongated air conduit associated therewith and having one end portion surrounding said tubular member with its side wall spaced therefrom, a ring member engaging the upper side of said air conduit and having an axial opening with a tapered shoulder thereabout forming a seat which engages the upper edge of said tubular member, a burner bowl having an upwardly extending shoulder forming a seat engaging the lower edge of said tubular member, and a peripheral flange engaging the lower side of said air conduit, fuel and gas conduits communicating with the floor of said burner bowl, said conduits extending parallel to and below said air conduit, means connecting said ring member and peripheral flange to clamp said burner bowl, tubular member and air conduit together as a unitary air-tight structure and a combined supporting frame and closure member extended below said burner and across the face of the furnace opening.

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