July 24, 1928. 1,678,086

H. D. SCHRADER

GAS BURNER

Filed Oct. 25, 1926 2 Sheets-Sheet 1

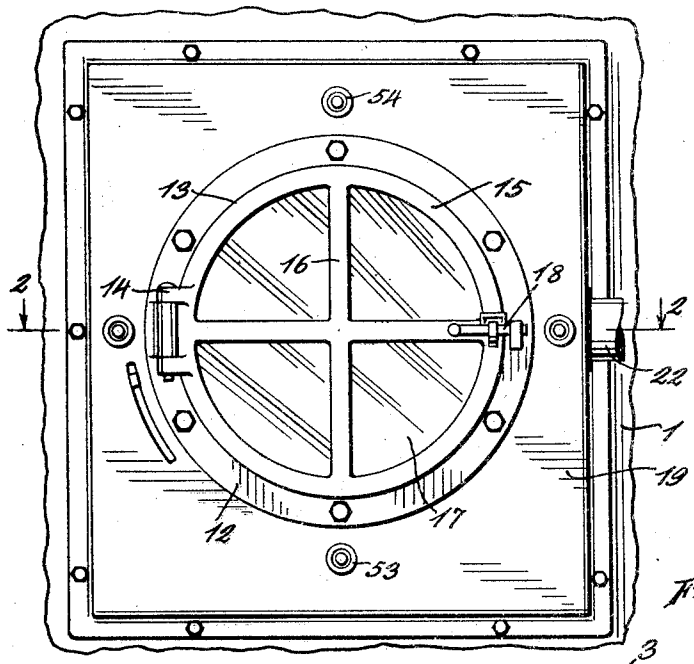


Fig. 1.

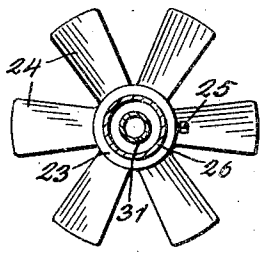


Fig. 3.

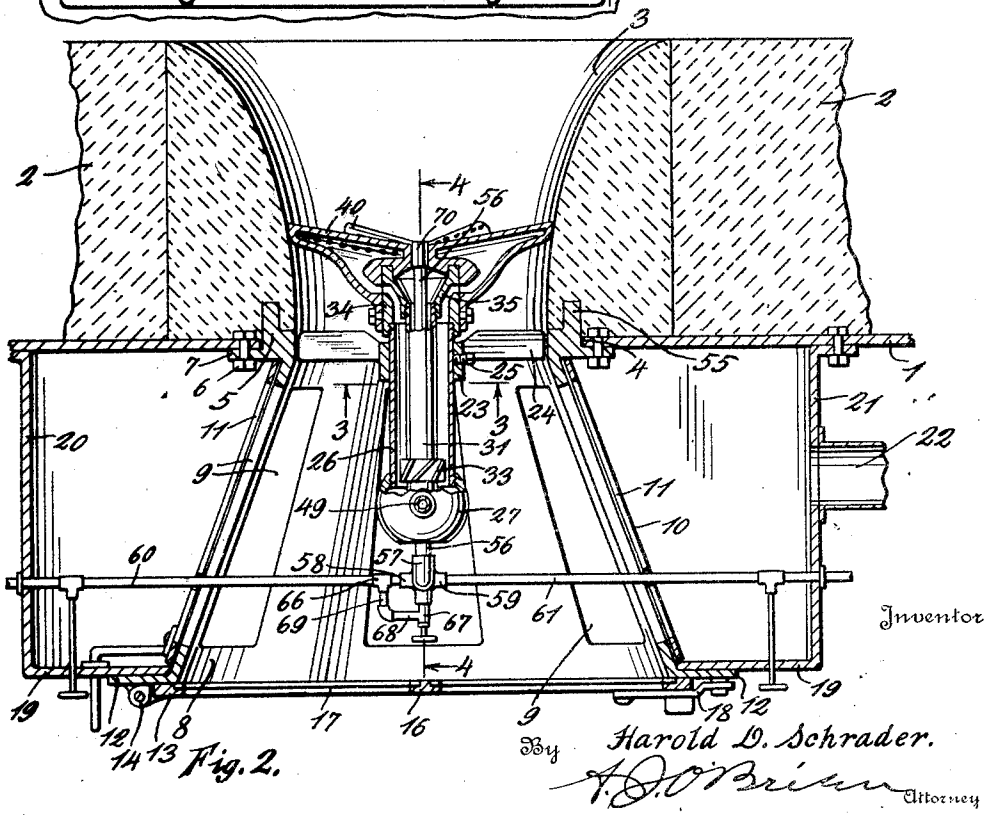


Fig. 2.

Inventor

By Harold D. Schrader.

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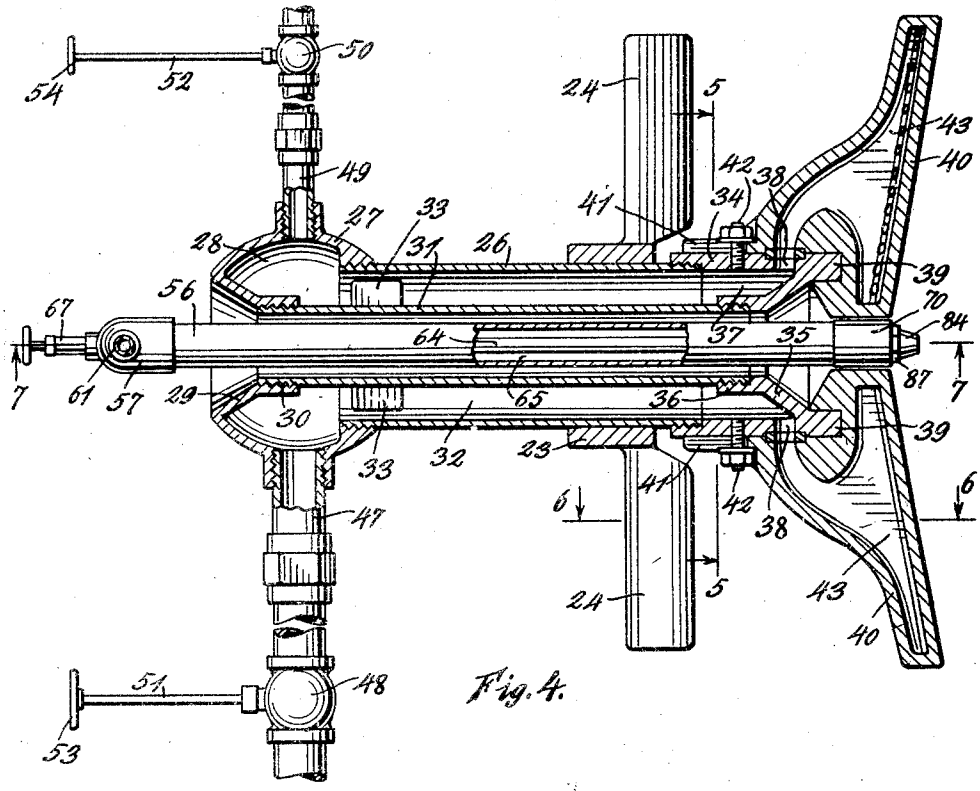


Fig. 4.

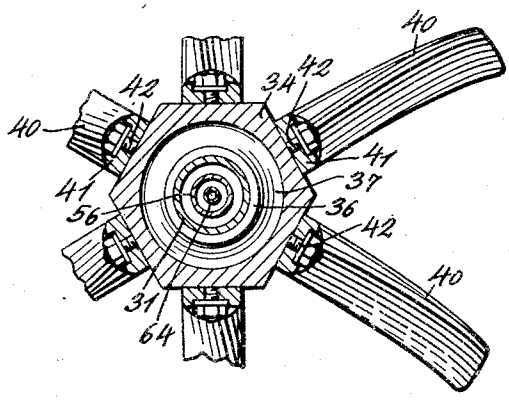


Fig. 5.

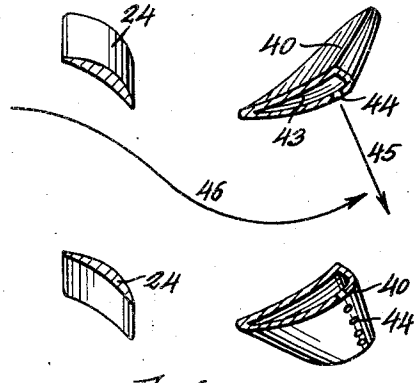


Fig. 6.

Inventor

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Patented July 24, 1928. 1,678,086

UNITED STATES PATENT OFFICE.

HAROLD D. SCHRADER, OF DENVER, COLORADO.

GAS BURNER.

Application filed October 25, 1926. Serial No. 143,945.

This invention relates to improvements in gas and oil burners and has reference more particularly to a combined burner in which either gas or oil can be burned separately or simultaneously with equal satisfactory results.

It is becoming increasingly popular to heat houses and to produce heat for power and other purposes by means of oil or gas fuel and it is the object of this invention to produce a burner of simple construction that shall be so designed that it will burn either gas or oil efficiently and which shall be safe in its operation and so constructed that it can be conveniently installed and controlled.

It is a further object of this invention to produce a burner in which either natural or artificial gas can be used with natural or forced draft and which shall be provided with means for mixing the gas with a dilutent whenever this may be found necessary. Another object of this invention is to provide a burner with steam or air connections by means of which it can be readily cleaned without making it necessary to take it apart. It is a further object of this invention to produce a burner in which the parts exposed to heat can be readily removed and replaced whenever this becomes necessary.

A still further object of this invention is to produce a burner adapted for either oil or gas in which the oil burner can be removed without affecting in the least the operation of the gas burner.

The above and other objects which may become apparent as the description proceeds are obtained by means of a construction and arrangement of parts which I will now describe in detail, reference for this purpose being had to the accompanying drawings, in which the preferred embodiment has been illustrated and in which:

Figure 1 is a front elevation of a portion of the furnace which has been equipped with my improved burner;

Figure 2 is a section taken on line 2—2, Figure 1;

Figure 3 is a section taken on line 3—3, Figure 2; and shows the air deflector plate which serves to direct the course of the incoming air;

Figure 4 is a section taken on line 4—4, Figure 2;

Figure 5 is a section taken on line 5—5, Figure 4; and

Figure 6 is a section taken on line 6—6, Figure 4 and shows the relationship of the air deflectors and the burners.

In the drawing reference numeral 1 designates the metal wall of the furnace and numeral 2 designates the lining of refractory material which may be ordinary fire brick, while reference numeral 3 designates the throat or the opening in which the burner is located. The wall member 1 is provided with an opening 4 to which a casting 5, forming part of my burner construction, is secured by means of bolts 6 which pass through the flange 7 and the part 1 of the furnace. This casting has an outwardly extending conical portion 8, which forms an air chamber and which is provided with a plurality of cut-out portions or openings 9 for the admission of air to the interior thereof. A rotatable cover 10 is secured in place about the conical portion 8 and this is provided with openings 11 that correspond to the openings 9 in such a way that when the portion 10 is rotated the openings 11 can be moved into register with the openings 9 so as to permit the maximum amount of air to enter. By changing the relative position of the parts 8 and 10, the effective area of the openings may be regulated to any extent desired. The conical part 8 is provided at its outer end with an outwardly extending flange 12 to which the door 13 is connected by means of a hinge 14. This door has a circular rim 15, which is connected by means of four or more radial arms 16 to which transparent members 17 of pyrex or other transparent heat resisting material is secured. The door is held in closed position by means of a latch 18.

Secured to the inner surface of the flange 12 is the front plate 19 of an air box which is formed by the plate 19 and the end members 20 and 21. This air box is provided with a tube 22 that extends to a blower which may be used whenever it is desirable to employ forced draft. When forced draft is not used, air is permitted to enter the box through a suitable opening which has not been shown.

An air deflector comprising a central hub portion 23 which is provided with a plurality of outwardly extending blades or arms 24 has an outside diameter which is substantially the same as the smallest interior diameter of the casting 5 so that when this deflector is put into place in the manner shown

in Figure 2, it will serve as a centering device to hold the burner parts in proper position. A set screw 25 which passes through the hub portion 23 serves to clamp the deflector member in place on the burner.

Referring now more particularly to Figure 4, it will be noticed that the burner comprises a tubular member 26 of considerable diameter whose ends are threaded. To one of these threaded ends I have secured a substantially spherical housing 27 having a chamber 28 which is in communication with the interior of the pipe 26. This housing has a reentrant conical portion 29 which terminates in an internally threaded cylindrical portion 30 to which the pipe 31 is threadedly connected. The pipe 31 is in axial alignment with the pipe 26 so as to provide an annular cylindrical space 32 between the interior of the pipe 26 and the exterior of the pipe 31. Secured to the pipe 31 at the end nearest to the chamber 28 are deflector plates 33 which are arranged spirally in the manner shown most clearly in Figure 2. Secured to the other threaded end of the pipe 26, is a hollow casting 34 which forms part of the burner construction proper. This part has a hexagonal outer surface like that indicated in Figure 5 and has a reentrant conical portion 35 that projects inwardly from the outer end thereof and terminates in a cylindrical internally threaded portion 36 which is threadedly connected to the corresponding end of the pipe 31. An annular chamber 37 is formed between the inner walls of the part 34 and the outer wall of the cylindrical portion 36. Openings 38 are drilled through the outer wall and into the annular chamber 37 at the center of each of the hexagonal surfaces.

It will be noted that the outer end of the casting 34 is provided with a flange 39 which serves as a means for anchoring the burner arms 40 in place thereon, one burner arm 40 for each of the hexagonal outer surfaces, and each of these arms is provided with a notch which is adapted to receive a portion of the flange 39. These arms are provided with a downwardly extending flange 41 which is perforated for the reception of a bolt 42 by means of which they are clamped to the member 34 (Figure 4). These arms are hollow and provided with chambers 43 that have an opening which communicates with the opening 38 when the arms are in position on the member 34. In this manner it will be noticed that the interior of each of the burner arms is in direct communication with the cylindrical annular chamber 32. The arms 40 are each provided with a row of openings 44, through which the gas escapes. The axes of these openings are in the direction of the arrow 45 in Figure 6, so that the gas, when it leaves the arms will move in the direction of these arrows. From Figure 6, it will also be noted that the air which enters between the deflector arms 24 is forced to take the path indicated by arrow 46 and will therefore intersect the path of the gas jets at an angle of substantially ninety degrees. This produces a very good mixture of air and gas which results in a thorough combustion of the latter and which therefore gives high efficiency from a thermal point of view.

In Figure 4 the gas supply pipe has been indicated by numeral 47 and the control valve by numeral 48. This pipe is connected to the hollow cylindrical member 27 and is in direct communication with the chamber 28. Another pipe 49 is also connected to the member 27 and communicates with the chamber 28. This pipe is controlled by a valve 50 and is adapted to supply steam, air or inert gas to the gas which enters by means of pipe 47. Whenever the gas is of a higher calorific value than that required for the most efficient operation, it is customary to mix the same with a certain amount of gases of combustion which merely serve as a dilutent and assist in obtaining a more thorough and efficient combustion. The valves 48 and 50 are provided with long stems 51 and 52, respectively, which terminate in hand wheels 53 and 54, respectively. These hand wheels may be located at some convenient place outside of the air chambers. Where it is desired to burn gas merely, the burner which I have described above is sufficient. In the operation of this burner the gas enters the chamber 28 from pipe 47 and here it is mixed either with an inert gas or with steam and passes from thence into the cylindrical annular chamber 32 between the deflector blades 33. These deflector blades serve to mix the gas with the inert gas or with the steam and this mixture then passes inwardly along the chamber 32 through the opening 38 to the interior chamber 43 of each of the burners. From the burner arms the gas emerges through the holes 44 in the direction indicated by the arrow in Figure 6 and is here mixed with the incoming stream of air which travels in the direction of arrow 46. The air is either forced inwardly by means of a fan or in some installations the draft produced by the gas as it emerges from the holes 43 is sufficient to cause the necessary amount of air to enter.

I desire to call attention at this point to the flange 55 of the casting 5 (Figure 2), This flange projects into the interior of the furnace and serves to hold the lining blocks 3 properly centered about the burner. From this figure it will be noticed that the lining blocks 3 are of a peculiar shape and are provided with an annular recess for the reception of the flange 55.

I also want to call attention to the fact

that by means of the pipe 49 and the control valve 50, it is possible to admit steam or air under pressure into the burner for the purpose of cleaning the same. This is accomplished by closing valve 48 and opening valve 50, thereby forcing air or steam under pressure through the annular chamber 32, the interior of the burner arms and through the openings 44. This is a very convenient way of cleaning the burner whenever this is found to be desirable. In addition to this, I desire to call special attention to the manner in which the burner arms 40 are secured to the hub 34, which permits them to be readily removed and replaced whenever it is necessary. Since these burner arms are always subjected to a high temperature they deteriorate very fast and must be replaced whenever the deterioration reaches a certain stage.

I have shown the interior of the pipe 31 of the gas burner as being occupied by means of the tubular portion 56 of the oil burner, and I will now proceed to describe the construction of this oil burner.

In the description above, I have intimated that the interior of pipe 31 is open so as to form an air passage and this is true whenever the burner is intended for use in connection with gas only. In gas burners, the admission of air through the central opening produces a better combustion than when the air is mixed in any other way and I therefore consider that this central air opening is of particular importance in the construction of the gas burner. In addition to the advantage of admitting air to the center of the burner, this center opening can also be used for the reception of the oil burner which I will now describe in detail.

Where the oil burner alone is used the arms 40 of the gas burner act as a diffuser of the air and serve to produce better mixture. When the gas burner alone is used steam or air may be passed inwardly through the oil burner and this will keep the parts cool and also serve to mix oxygen with the gas at the center of the flame whereby better combustion is secured.

From the above description it will be observed that the door is provided of transparent portion 17. This is of great importance as it permits the operator to view the operation of the burner and the position of the parts without having to open the door. As the door is in communication with the throat in which the burner is located, the opening of the door would interfere with the proper operation and I therefore consider the presence of this transparent portion of great importance in this combination.

Having thus described my invention, what I claim as new is:

1. A gas burner comprising a hollow body member having a mixing chamber and two axially aligned openings, one of which is of greater diameter than the other, a pipe secured to the side of the opening having the larger diameter, said pipe extending outwardly from said body member, a second pipe, whose exterior diameter is smaller than the interior diameter of the first mentioned pipe located within the latter, one end of said smaller pipe extending through the mixing chamber and threadedly connected with the wall of the smaller opening, a hub member having a central opening and an annular chamber concentric therewith, the outer wall of the annular chamber being connected with the larger pipe and the inner wall of said annular chamber being connected with the smaller pipe, whereby the annular chamber is put into communication with the mixing chamber through the annular cylindrical space between the pipes and a plurality of hollow burner arms secured to the hub member and having their interiors in communication with the annular space in the hub.

2. A gas burner comprising a hollow body member having a mixing chamber and two axially aligned openings, one of which is of greater diameter than the other, a pipe secured to the side of the opening having the larger diameter, said pipe extending outwardly from said body member, a second pipe, whose exterior diameter is smaller than the interior diameter of the first mentioned pipe located within the latter, one end of said smaller pipe extending through the mixing chamber and threadedly connected with the wall of the smaller opening, a hub member having a central opening and an annular chamber concentric therewith, the outer wall of the annular chamber being connected with the larger pipe and the inner wall of said annular chamber being connected with the smaller pipe, whereby the annular chamber is put into communication with the mixing chamber through the annular cylindrical space between the pipes, a plurality of hollow burner arms secured to the hub member and having their interiors in communication with the annular space in the hub and a plurality of spiral deflecting vanes on the exterior surface of the smaller pipe between the mixing chamber and the burner.

3. A gas burner comprising a hollow body member having a mixing chamber and two axially aligned openings, one of which is of greater diameter than the other, a pipe secured to the side of the opening having the larger diameter, said pipe extending outwardly from said body, a second pipe, whose exterior diameter is smaller than the interior diameter of the first mentioned pipe located within the latter, one end of said smaller pipe extending through the mixing chamber and threadedly connected with the wall of the smaller opening, a hub member having a

central opening and an annular chamber concentric therewith, the outer wall of the annular chamber being connected with the larger pipe and the inner wall of said annular chamber being connected with the smaller pipe, whereby the annular chamber is put into communication with the mixing chamber through the annular cylindrical space between the pipes and an air deflecting centering spider secured to the larger pipe between the mixing chamber and the burner.

4. A gas burner comprising a hollow body member having a mixing chamber and two axially aligned openings, one of which is of greater diameter than the other, a pipe secured to the side of the opening having the larger diameter, said pipe extending outwardly from said body, a second pipe, whose exterior diameter is smaller than the interior diameter of the first mentioned pipe located within the latter, one end of said smaller pipe extending through the mixing chamber and threadedly connected with the wall of the smaller opening, a hub member having a central opening and an annular chamber concentric therewith, the outer wall of the annular chamber being connected with the larger pipe and the inner wall of said annular chamber being connected with the smaller pipe, whereby the annular chamber is put into communication with the mixing chamber through the annular cylindrical space between the pipes, an air deflecting centering spider secured to the larger pipe between the mixing chamber and the burner and a plurality of spirally arranged vanes on the outer surface of the smaller pipe between the mixing chamber and the burner.

5. A gas burner having, in combination, a hub portion having a cylindrical annular chamber extending inwardly from one end thereof and a central opening concentric with said annular chamber and extending entirely through said hub, a flange extending forwardly from one end of the hub, a plurality of hollow burner arms, each arm having a projection provided with a notch for receiving the flange and means for securing the arms to the sides of the hub, said hub and burner having registering openings whereby the interior of the hub is in communication with the interior of the burners.

6. A gas burner having a central hub provided with hollow burner arms extending outwardly, said arms having surfaces that are inclined in the direction of the axis of the hub, a deflector plate spaced a short distance from the burner arms, said deflector having a plurality of radial arms whose sides are inclined in the opposite direction from that of the burner arms.

In testimony whereof I affix my signature.

HAROLD D. SCHRADER.