March 24, 1953 M. A. HELLER ET AL 2,632,502

GAS BURNER WITH FORCED COMBUSTION AIR

Filed April 28, 1950 2 SHEETS—SHEET 1

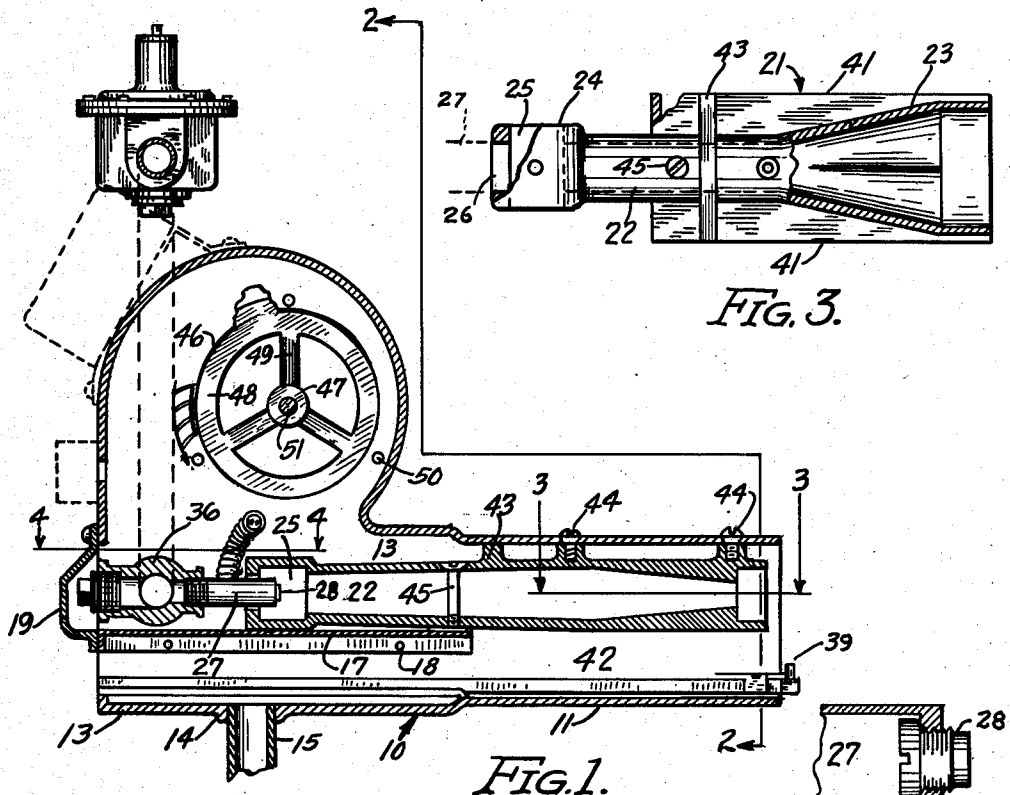


FIG. 1.

FIG. 3.

FIG. 4a.

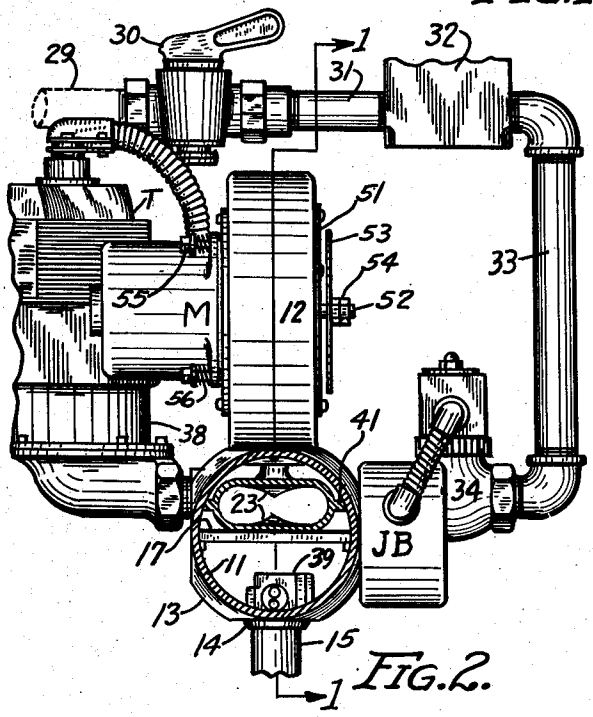


FIG. 2.

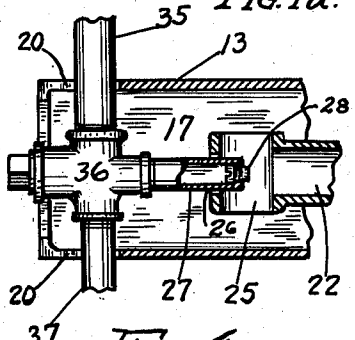


FIG. 4.

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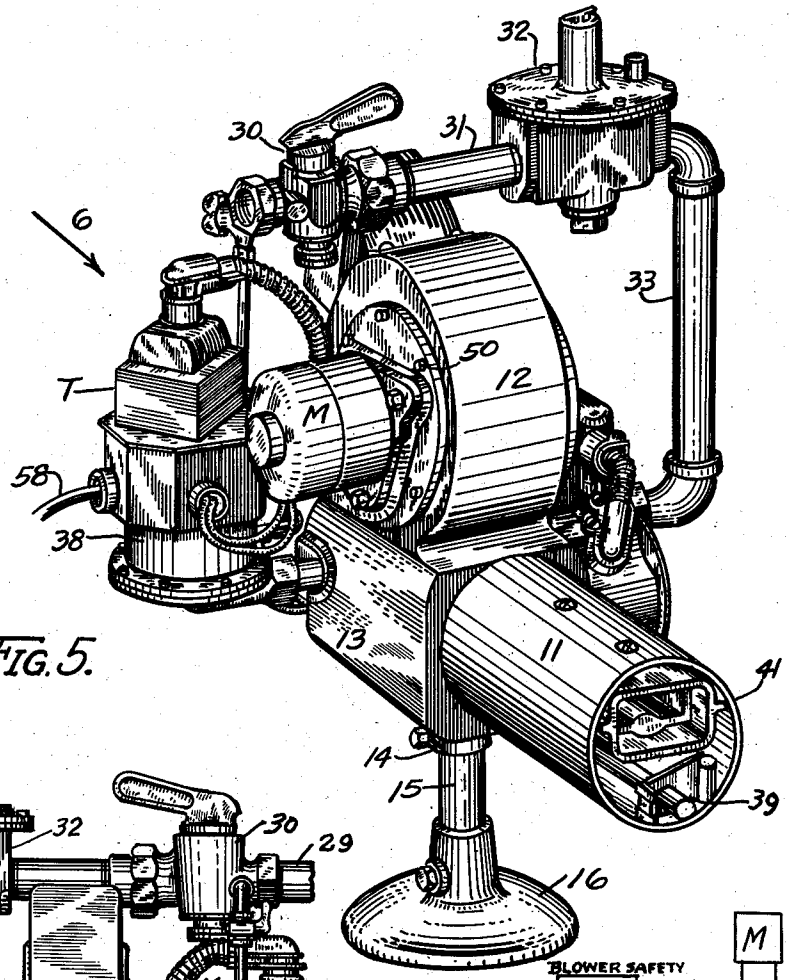


FIG. 5.

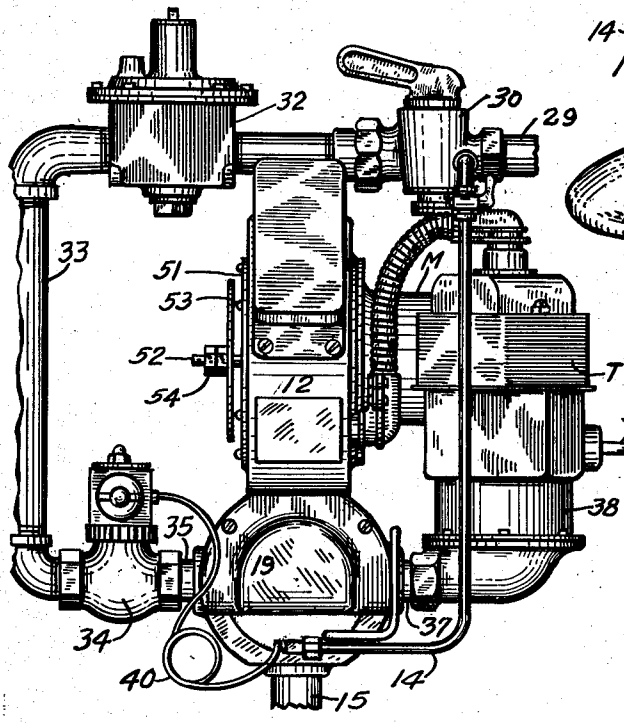


FIG. 6.

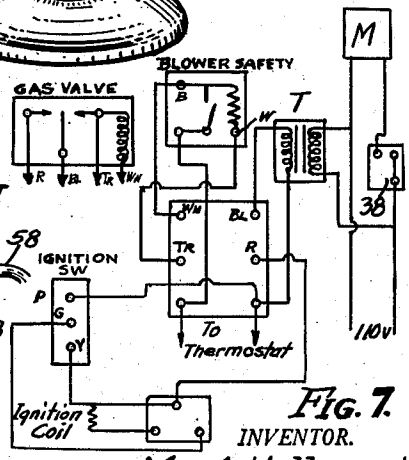


FIG. 7.

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GAS BURNER WITH FORCED COMBUSTION AIR

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Application April 28, 1950, Serial No. 158,738

6 Claims. (Cl. 158—109)

1

This invention relates to improvements in gas burners of the type employed for heating buildings.

Where natural gas has become available for heating, it has been quite generally adopted because it is cleaner and more economical than other fuels.

Before natural gas became available many heating plants were converted from coal burning to oil burning. Oil, although it is cleaner and more convenient than coal, has some objectionable features that are absent in gas fuel, and besides, it has been found that natural gas is more economical than oil.

Many installations now burning oil are being converted to natural gas.

It is, of course, highly desirable that the conversion from oil to gas shall be made as simple as possible so that the conversion can be effected quickly and at a minimum cost.

It is the object of this invention to produce a gas burner, of the forced draft type, so designed and constructed that it will fit almost any furnace that has been adapted for the burning of oil, and which can therefore be substituted for an ordinary oil burner with practically no alterations in the furnace.

It is a further object to produce a gas conversion burner so designed that it will be entirely self-contained and pre-wired so that it will require only to be connected with the gas supply, the electric supply and with the thermostat.

A further object is to produce a burner of such construction that the primary air is supplied under pressure, entirely independent of the auxiliary air, and in which the quantity of primary air can be conveniently regulated separate from the auxiliary air.

Another object is to produce a burner of such construction that the principal part thereof is comprised of a single casting.

Another object is to produce a burner in which the main gas control valve and the pressure reducing and control valve are both positioned above the burner in such positions that they may be conveniently controlled and regulated.

A further object is to produce a burner of the class described in which the burner head or nozzle is of such a construction that it discharges the gas in a broad jet which produces a wide flat flame, and which has a mixing chamber terminating in a head having an axial opening for the gas supply pipe and orifice and openings for primary air.

A still further object is to produce a burner of such construction that the pilot burner and thermo-couple or equivalent safety devices are positioned below the main flame and so constructed that this assembly may be readily removed for inspection and/or repair, the pilot burner being in a position where the flame can be viewed from the outside.

2

The above and other objects that may become apparent as this description proceeds are attained by means of a construction and an arrangement of parts that will now be described in detail, for which purpose reference will be had to the accompanying drawing in which the invention has been illustrated, and in which:

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

Figure 2 is a view partly in elevation and partly in section taken looking in the direction of arrows 2—2, Figure 1;

Figure 3 is a top plan view of the gas nozzle, parts being broken away and shown in section to better disclose the construction;

Figure 4 is a view taken on plane 4—4, Figure 1;

Figure 4a is a section showing the orifice to an enlarged scale;

Figure 5 is a perspective view of the burner;

Figure 6 is a rear end elevation looking in the direction of arrow 6 in Figure 5; and

Figure 7 is a wiring diagram.

In the drawing, reference numeral 10 designates the burner casing as a whole. Reference numeral 11 designates the tubular burner housing, 12 the fan housing, and 13 the primary air chamber whose under surface has a thickened portion or hub 14 provided with a threaded opening for the reception of the upper threaded end of support pipe 15, to the lower end of which a base 16 is attached. It will be observed that the primary air chamber has the cross sectional shape of a square with rounded corners, instead of being cylindrical like the burner housing. Plate 17 is secured to the side walls of the primary air chamber, and held in place by screws 18. Plate 17 forms the bottom wall of the primary air chamber and divides the space into an upper and a lower compartment. A removable cover 19 closes an opening in the rear wall or the primary upper compartment of the air chamber. Opposite side walls of the primary air chamber are provided with notches or openings 20 as shown in Figure 4, for a purpose that will later appear. Burner head or nozzle 21 comprises a single casting having a tubular mixing section 22 that terminates in a laterally flaring nozzle portion 23, the opening in which, when viewed as in Figure 2, is hourglass-shaped. The other end of the

nozzle terminates in a square portion 24 having a transverse opening 25 for the admission of primary air. The end wall of part 24 has an opening 26 for the reception of the end of gas pipe 27, which is provided with a removable orifice member 28. The gas supply line has been designated by numeral 29 and connects with the gas shut-off cock 30. A short pipe 31 extends from cock 30 to the pressure regulator 32. From the pressure regulator, pipe 33 extends downwardly to gas valve 34 that closes automatically whenever the pilot flame goes out. From 34, pipe 35 extends to a pipe fitting cross 36 from which it extends to and is connected with the pressure control switch 38 that controls the operation of motor M and transformer T. The pilot burner and the safety thermostat element have been designated by reference numeral 39, but no attempt has been made to show the details of the construction because they, together with valve 34, are available on the market and have been incorporated in this burner to perform their usual function. Instead of the usual thermal couple, this device employs a mercury filled element that generates a pressure which is communicated to valve 34 by pipe 40.

Referring now to Figures 1 and 3, it will be observed that nozzle 21 is provided with flanges 41 that contact the inner surface of burner housing 11 and which with the body of the nozzle and plate 17, delimits an auxiliary air passage 42. The nozzle is in addition provided with an upwardly extending flange 43 that engages the inner wall of the burner housing and prevents air escaping from the primary air chamber. Nozzle 21 is secured in position by means of two screws 44 as shown in Figure 1.

A pin or screw 45 extends through the mixing tube 22 and serves to split the gas stream to facilitate the spreading thereof as it enters the flaring nozzle. The side walls of the fan housing are provided with openings 46. Attached to the outer surface of the fan housing in concentric relation with openings 46 is bearing 47 which is attached to ring 48 by radiating spokes 49. Screws 50 secure this bearing to the fan housing. A fan rotor or impeller (not shown) of the "Sirocco" type is mounted on the motor shaft 51. The opening in the opposite side wall of the fan housing is partially closed by a similar wheel-like plate to the hub of which a bolt 52 is connected and projects outwardly. An air regulating disk 53 is threadedly connected with the bolt and is held in adjusted position by nuts 54.

Motor M is attached to the wheel-like member whose rim has been designated by numeral 48 and is attached thereto by bolts 55 and springs 56. As above stated, the fan impeller is carried by the motor shaft. The quantity of air that enters the fan and is delivered by it to the burner as primary air is controlled by the position of disk 53.

Referring now to Figure 4*a*, which is an enlargement of that part of the gas pipe 27 shown in section in Figure 4, it will be seen that the orifice member 28 is so connected with pipe 27 that it may be inserted and removed through the pipe fitting cross 36.

The burner is provided with all of the standard automatic controls and safety devices, which are connected with the burner in such a way that the electric wiring may be done at the factory, thereby simplifying and expediting the installation.

Let us now assume that the tubular burner housing 11 is positioned so as to open into the combustion chamber of a furnace, that valve 30 is connected to the gas supply pipe 29, and that conductor 58 is connected with the electric supply. The pilot burner is ignited, and if the thermostat is adjusted the motor will start and gas will flow into the nozzle, primary air will enter through opening 25, and auxiliary air will enter through passage 42. The amount of primary air is controlled by the position of plate 53. The auxiliary air flows through passage 42 below plate 17 and the nozzle.

If the orifice becomes clogged or must be replaced by one of different capacity, the plug at the rear end of the cross pipe filling 36 is removed and the orifice is unscrewed by using a screwdriver.

Attention is directed to the fact that the housing, including the fan housing and the burner housing, is a unitary casting.

Attention is called to the fact that the pilot burner and thermo responsive element or thermo-couple are positioned underneath the main flame where they are both protected from the intense heat to which they would be subjected if positioned above the main burner. Another feature is that opening 42 through which the auxiliary air enters is unobstructed and this permits the pilot flame to be viewed from the outside by looking through the open air passage.

The pipe that conducts gas to the pilot burner and the connections to the thermo responsive device are readily removable without disturbing other parts of the burner, and therefore repairs and/or replacements can readily be made.

Another important feature is that the air supply for the pilot flame is independent of the primary air supply and this assures that any danger that the pilot flame might be extinguished accidentally is reduced to a minimum.

Having described the invention, what we claim as new is:

1. In a gas burner, in combination, a hollow burner body comprising an elongated tubular portion of substantially cylindrical shape having a horizontal axis, a fan housing at one end, a rotary impeller in the housing, the outlet opening of the fan housing communicating with the tubular portion near one end thereof, means comprising a plate attached to the wall of the burner body dividing it into two compartments, the compartment above the plate forming a primary air chamber and a lower compartment, a tubular burner nozzle having its rear end positioned on the plate, said nozzle having means engaging the sides and the top of the inner surface of the tubular member, which in combination with the plate delimits the primary air chamber, means for introducing a jet of gas into the rear end of the burner nozzle, the latter having lateral openings adjacent the point where the gas is introduced, for the admission of primary air, a pilot burner and a heat responsive control element adjacent to the discharge end of the burner nozzle, a passage for auxiliary air being formed in the cylindrical body below the plate and nozzle, and means for adjusting the quantity of primary air delivered by the fan to the primary air chamber, said nozzle extending from the front portion of the plate towards the outlet end of the cylindrical body.

2. A gas burner in accordance with claim 1 in which both ends of the elongated tubular portion are open and in which that portion of the rear end wall that is above the plate is formed in

part by a removable closure plate leaving that portion below said plate open.

3. A gas burner in accordance with claim 1 in which that portion of the tubular burner nozzle forwardly of the lateral openings has a cylindrical mixing passage that terminates in an outwardly flaring opening of transversely oblong cross section adapted to deliver an outwardly flaring transversely oblong flame.

4. A fuel gas burner comprising in combination, a unitary hollow burner body terminating in an elongated tubular portion having a horizontal axis, a fan housing whose air delivery port communicates with the interior of the tubular portion adjacent one end thereof, a plate extending across the interior of the hollow body adjacent the fan discharge opening, dividing it into an upper primary air chamber and a lower compartment forming an auxiliary air passage, a removable plate forming the rear end wall of the primary air chamber, the rear ends of the side walls of the hollow burner body having inwardly extending notches directly above the plate for the reception of a gas pipe, an elongated burner nozzle having its fuel receiving end resting on the plate and extending from the front portion of the plate to the outlet end of the tubular portion, means supporting the nozzle, the upper surface of the nozzle having a transverse flange fitting the interior of the tubular portion, the sides having longitudinal lateral flanges contacting the inner surface of the tubular portion, whereby a primary air chamber is delimited, the end in the burner nozzle in the primary air chamber having a transverse opening for the admission of primary air, the nozzle having an opening extending its entire length, means for discharging a jet of gas into the nozzle at the transverse opening, the nozzle opening terminating in an outwardly flaring portion of transversely oblong cross section for delivering a flattened stream of combustible fuel.

5. A gas burner in accordance with claim 4 wherein the auxiliary air passage is substantially straight and extends between the ends of the body, whereby a flame issuing from the burner nozzle may be viewed from the rear open end of the auxiliary air passage while the means for varying the primary air is adjusted.

6. A gas burner in accordance with claim 4 wherein a pilot burner is positioned at the discharge end of the burner nozzle underneath the same, in position to be cooled by air flowing through the auxiliary air passage and in which the pilot burner may be removed through said passage.

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