April 20, 1954 W. R. RAY 2,675,868

ROTARY GAS BURNER

Filed Dec. 11, 1950

Fig. 1

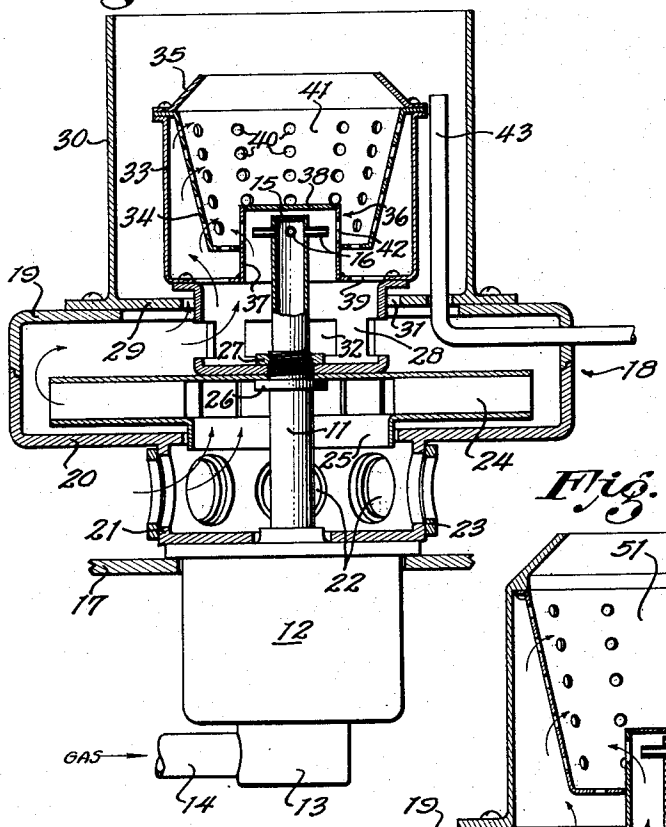


Fig. 2

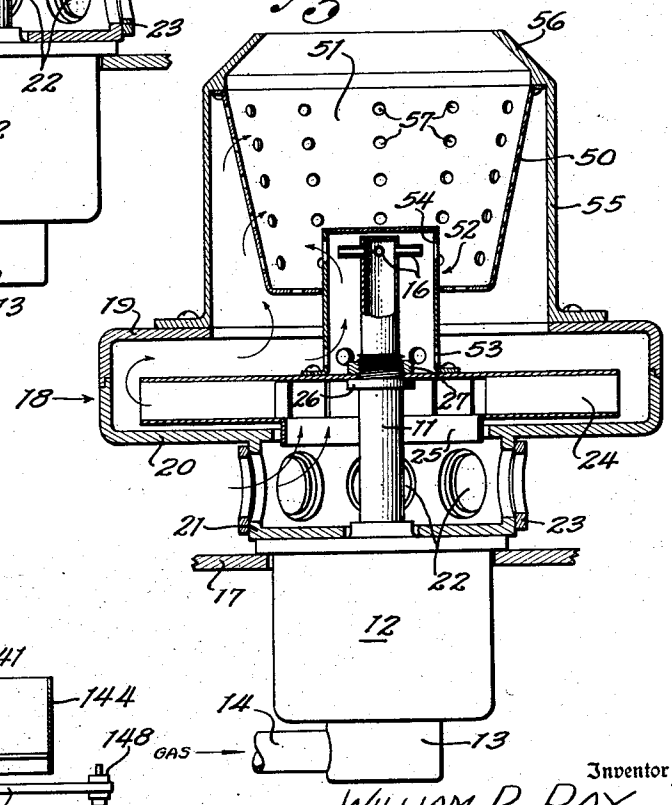
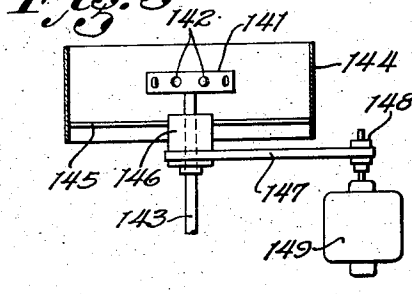


Fig. 3



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2,675,868

ROTARY GAS BURNER

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Application December 11, 1950, Serial No. 200,265

4 Claims. (Cl. 158—109)

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This invention relates to burners for ordinary fuel gas and has for a main object the provision of a gas burner which, while more compact than conventional burners, is highly efficient. I accomplish this object, in general, by rotating a gas flame at relatively high velocity in a circular path.

By rotating the flame in this manner there is rapid relative movement between the entire outer surface of the flame and the atmosphere surrounding it, so that complete combustion of the gas results.

The present application is a continuation-in-part of my copending application Serial No. 679,285 for Rotary Oil-Burner, filed June 25, 1946, wherein means (reproduced as Fig. 3 of the present drawing) were shown for rotating the air around a stationary gas burner; these means having been deleted prior to issue of the application on December 9, 1952, as Patent No. 2,620,864.

For full understanding of the invention, and further appreciation of its objects and advantages, reference is to be had to the following detailed description and accompanying drawing, and to the appended claims.

In the drawing:

Figure 1 is a sectional view of a rotary gas burner embodying this invention;

Figure 2 is a similar view of a modified form of gas burner according to the invention; and

Figure 3 is a sectional view of a gas burner as shown in Fig. 5 of said copending application.

Referring first more particularly to Fig. 1 of the drawing, the numeral 11 indicates the shaft of an ordinary electric motor 12. This shaft is hollow, and its open lower end is connected by suitable means in cap 13 (such as the rotary seal shown in my copending application Serial No. 787,648, November 24, 1947, now Patent No. 2,568,763) to a gas-supply conduit 14. Shaft 11 is closed at its top by a disk 15 and is provided adjacent thereto with a plurality (four, as shown) of radially-projecting nozzles 16 for passage of the gas from the interior of the shaft.

Numeral 17 indicates a plate attached to the flange of motor 12 and forming a support for the burner structure. Attached to the top of the motor is a blower casing generally indicated at 18 and comprising an upper and a lower dished member 19, 20. Joined to the underside of the lower member 20 is a hollow cylindrical member 21 having circumferential openings 22 for inlet of air which can be regulated by rotary

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adjustment of an apertured annular shutter 23 fitting the periphery of member 21.

Within the blower casing 18 and attached to shaft 11 is a rotary blower 24 whose inlet or mouth 25 is arranged to receive air from the openings 22. The blower 24 rests on a shoulder or collar 26 formed on shaft 11 and is clamped thereto by a nut 27 with the bottom wall of a cupped member 28 therebetween. The upper part of member 28 extends through a large opening in the top wall of the blower casing, and through a smaller opening in a plate 29 mounted on top of that casing. Extending upward from plate 29 and surrounding the opening therein is an annular wall 30. The opening in plate 29 is considerably larger than member 28 so that there is an annular opening 31 therebetween through which air can pass from the blower casing to the space bounded by wall 30.

The major part of the air forced from the blower casing passes through rectangular openings 32 in the side wall of member 28 to supply a burner structure mounted on top of this member. The burner structure comprises a cupped member 33 secured at its bottom to the flange of member 28 and having within it a bowl-shaped structure 34; member 33 and structure 34 being secured together at their flanges and with a short funnel-like section 35 on top. Secured, as by welding, to the edge of a central opening through the bottom wall of the cupped member 33 is an inverted cup-shaped member 36, consisting of a cylinder 37 and a disk 38 welded thereto, which extends freely through an opening in the bottom wall of structure 34.

Relatively large openings 39 are provided in the bottom of member 33, and the entire area of the bowl-like structure 34 is perforated as indicated at 40, so that the air from the blower casing passes through openings 32 and 39 into the space between member 33 and structure 34, and thence through the perforations 40 into the combustion chamber 41 constituted by the interior of structure 34. In practice, the perforations 40 are more numerous and of relatively smaller size than those shown. To avoid crowding of the drawing, the various curved arrows indicating air flow in the system are shown only at the left of the figure.

In the side walls of the cup-shaped member 36 are openings 42, in register with the nozzles 16, through which openings the gas flames burning at the nozzles project into the combustion chamber 41. Air for initial or partial combus-

tion of the gas as it issues from the nozzles is supplied from the blower casing by way of the open bottom of member 36. It is to be observed that no air is mixed with the gas (as in a Bunsen burner) before it issues from the nozzles. By confining the nozzles within the cup-shaped member they are shielded from direct exposure to combustion in chamber 41.

In operation, the burner structure and blower are rotated at relatively high speed (say, 1000–1700 R. P. M.) by the motor; the gas being turned on and ignited by any convenient means, such as the pilot burner indicated at 43. The flames issuing from the nozzles 16, and projecting through the openings 42 in the cup-shaped member 36, produce a swirling fire in the combustion chamber 41; and the air forced by the blower through the perforations in bowl 34, mainly crosswise of the fire, intimately intermixes with the burning gases to complete the combustion. The main body of the fire in the combustion chamber rotates at a speed slower than that of the rotating structure so that the movement of the bowl 34, and of the air entering through its side walls, relative to the body of fire contributes to the intimate intermixture of the gas and air necessary for complete combustion.

Since there is a rich mixture of gas and air in the flames issuing from the nozzles and in the lower region of the bowl, there is little danger of extinguishment of these flames; as, however, may occur in a flame of the Bunsen type if too much air is introduced to the interior of that flame. In the rotary gas burners of this invention the combustion becomes complete only toward the upper region of the combustion chamber.

The funnel-like top section 35 of the burner structure serves to impede outward passage of the flames from the combustion chamber and therefore contributes to the completion of the combustion; the section 35 also serving to concentrate the fire as it issues therethrough. Secondary air for the burner is supplied through the annular opening 31 to the space between the burner and the annular wall 30.

While the burner is vertical as shown in the drawing, its performance and effectiveness are substantially the same when it is arranged horizontally. The annular wall 30 may serve as a partial support for the burner structure when the same is arranged horizontally and its wall 30 projects through an opening into a furnace.

Referring now to Fig. 2 of the drawing: the burner structure shown in this figure differs from that of Fig. 1 mainly in that the perforated bowl-shaped structure 50 which defines the combustion chamber 51 in Fig. 2 is stationary. The hollow shaft 11, motor 12, blower casing 18 and blower 24, as well as their associated elements, may be the same as shown in Fig. 1 and therefore have been assigned the same numerals.

In Fig. 2 the inverted cup-shaped member 52, surrounding the nozzles 16 and extending into the combustion chamber 51 through an opening in the bottom of bowl 50, is elongated and attached to blower 24; air-inlet openings 53 being provided in the lower side walls of this member, as well as the openings 54 in register with the nozzles. The stationary bowl 50 is attached at its top to a shoulder formed in the upper part of a surrounding annular wall 55 mounted on the open top of the blower casing and having a funnel-like top section 56.

The operation of the burner shown in Fig. 2 is generally the same as that of Fig. 1 described above; the rotating flames issuing from the nozzles and projecting into the combustion chamber 51 being intimately mixed with the air forced by the blower into the chamber through the perforations 57 in bowl 50. While good combustion of the fuel is accomplished in this burner, somewhat better results are obtained with the burner of Fig. 1 for the reasons given above in connection therewith.

The showing of Fig. 3 is the same as original Fig. 5 of my aforementioned copending application Serial No. 679,285, except that each of the reference numerals has been increased by one-hundred to avoid confusion with the numerals in Figs. 1 and 2 of the present application.

The following description of Fig. 3 is as it appears in the prior application: The numeral 141 indicates a burner-head, having a plurality of peripheral orifices 142, connected to a stationary gas-supply pipe 143. Mounted for rotation about the burner-head is a drum 144 which is joined at its lower end by a spider 145 to a pulley 146 journaled on the pipe, this pulley being connected by a belt 147 to the driving pulley 148 of a motor 149. Rapid rotation of the drum causes rotation of the air around the burner-head and thereby imparts turbulence to the gas flames, issuing laterally from the orifices 142, to effect improved combustion. If no primary air is introduced into the gas so that the flame is luminous when the drum is stationary, upon rotation of the drum the flame becomes non-luminous or blue.

The broad feature of this invention is therefore the provision of means for producing relative rotation between the gas flame and the air surrounding it, and this can be done either by the arrangement of Fig. 3, or, preferably, by so rotating a gas flame that it moves in a circular path, as in the arrangements of Figs. 1 and 2. The means for forcing air into the fire produced by the swirling flames, while highly beneficial, is not essential to the practice of this invention in its broadest aspects.

The specific embodiments of my invention herein shown and described are obviously susceptible of modification without departing from the spirit of the invention, and I intend therefore to be limited only by the scope of the appended claims.

I claim as my invention:

1. A rotary gas burner comprising: a hollow shaft; a plurality of nozzles projecting laterally from said shaft adjacent one end thereof, said nozzles communicating with the interior of the shaft; means for supplying fuel gas through the shaft to said nozzles; an electric motor for rotating the shaft at high speed; a cup-shaped member carried by said shaft and rotatable therewith, the side walls of said member being concentric with the shaft and surrounding said nozzles, there being openings through said side walls in register with the nozzles, the mouth of the member facing in a direction toward the end of the shaft opposite said one end thereof; and blower means driven by said motor for forcing air into said cup-shaped member generally by way of its mouth.

2. A rotary gas burner as defined in claim 1, and including a bowl-shaped structure forming a combustion chamber around said cup-shaped member, the side walls of said structure being generally concentric with the cup-shaped mem-

ber and provided with openings; and means whereby air forced by said blower passes into said chamber through said last-named openings.

3. A rotary gas burner comprising: a hollow shaft; a nozzle projecting laterally from said shaft and communicating with the interior thereof; means for supplying fuel gas through the shaft to said nozzle; an electric motor for rotating the shaft at high speed; a bowl-shaped structure carried by the shaft and rotatable therewith, the side walls of said structure being concentric with the shaft and forming a combustion chamber for receiving gas directly from said nozzle, said side walls having openings therethrough; and blower means driven by said motor for forcing air through said openings into said combustion chamber.

4. A rotary gas burner comprising: a hollow shaft; a plurality of nozzles projecting laterally from said shaft adjacent one end thereof, said nozzles communicating with the interior of the shaft; means for supplying fuel gas through the shaft to said nozzles; an electric motor for rotating the shaft at high speed; a cup-shaped member carried by said shaft and rotatable therewith, the side walls of said member being concentric with the shaft and surrounding said nozzles,

there being openings through said side walls in register with the nozzles, the mouth of the member facing in a direction toward the end of the shaft opposite said one end thereof; a bowl-shaped structure also carried by the shaft and rotatable therewith, the side walls of said structure spacedly surrounding said cup-shaped member to form a combustion chamber and having openings therethrough; and blower means driven by said motor for forcing air through said last-named openings into said combustion chamber, as well as into said cup-shaped member generally by way of its mouth.

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