

Dec. 9, 1952

W. R. RAY

2,620,864

ROTARY OIL BURNER

Filed June 25, 1946

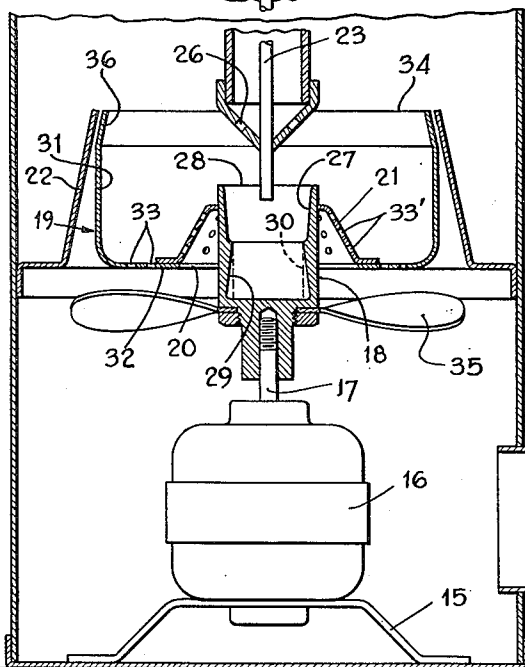
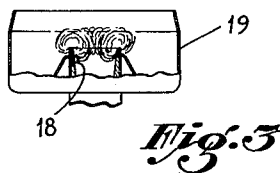
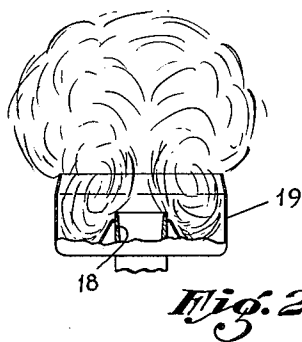
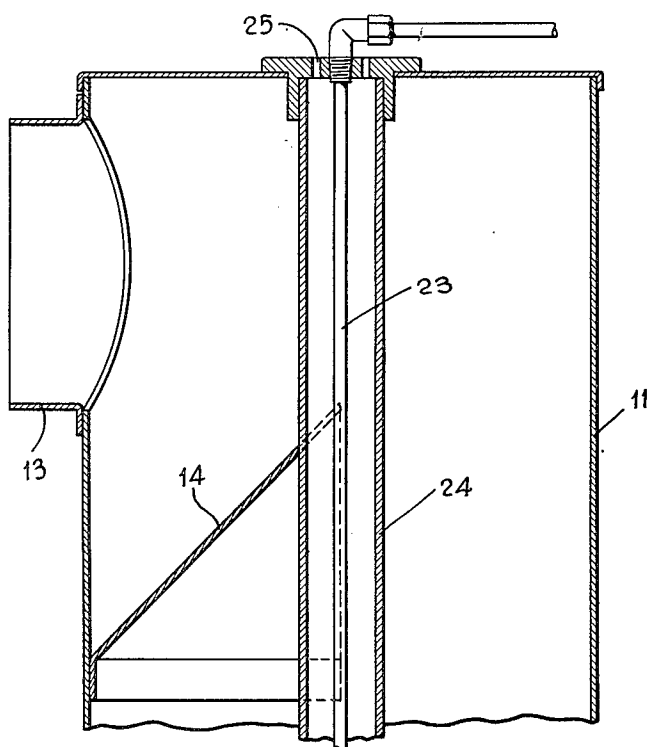


Fig. 1

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2,620,864

ROTARY OIL BURNER

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Application June 25, 1946, Serial No. 679,285

5 Claims. (Cl. 158—77)

1

My present invention relates to improvements in burners for fluid fuel, and has for an object the provision of mechanical means for imparting turbulence to the flame of the burner by rapid rotation of air adjacent the flame.

Another object of the invention is to provide a fluid-fuel burner which comprises means forming, in operation, a rotating combustion-chamber.

Another object is the provision, in an oil burner, of means rotatable to produce a combustible mixture of the oil and air and, after combustion of the mixture has been initiated, to impart turbulence to the resulting flame by rotation of air thereadjacent.

Another object is to provide, in an oil burner of the character described in the preceding object, rotatable means for receiving the oil and for discharging it by centrifugal force in the form of a spray; said means also serving, when the oil is received at low rate, as a low-fire burner.

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 view, in vertical section, of a furnace enhousing an oil burner embodying the invention; and

Figures 2 and 3 are fragmentary sectional views, to reduced scale, of the burner of Fig. 1, showing the flame produced under high- and low-fire conditions, respectively.

In Fig. 1 of the drawing, the numeral 11 indicates the cylindrical shell of a conventional furnace, which, for example, may be provided with a bonnet or housing (not shown) for heating air for distribution to spaces to be heated thereby; the furnace having an adjustable air-inlet 12, an outlet 13, and a baffle 14 for effecting proper distribution of the combustion gases. It is to be understood that the oil burner of this invention is in no way restricted to use in any special type of furnace and, in fact, can be operated in the open-air if desired.

Mounted on a platform 15 secured to the bottom wall of the furnace is an electric motor 16. Firmly mounted on the shaft 17 of the motor is a metallic cup 18 which carries a bowl-like structure 19 of thin heat-resistant metal; the cup projecting through a large opening 20 in the bottom wall of the structure and being joined thereto by a conical sleeve 21 welded to the parts.

The hollow structure 19 and cup 18 constitute

2

a typical oil burner according to this invention; the burner being arranged in the furnace centrally of a chute 22, attached to the furnace wall, for supplying secondary combustion air. In operation, the burner is constantly rotated at high speed (conveniently, 1550 R. P. M. when the diameter of the structure is 6 inches) and its parts are therefore carefully balanced and concentrically disposed about the axis of rotation; only a small amount of rotational energy then being required (the motor in the example mentioned being rated at $\frac{1}{75}$ H. P.).

Fuel, such as ordinary stove-oil, is supplied (from a reservoir, not shown) to the cup 18 of the burner by a pipe 23 extending through the top wall of the furnace and spacedly surrounded within the furnace by a sleeve 24 having openings 25 and 26 at its respective top and bottom ends for downward circulation of cooling air.

The upper portion of the side wall of cup 18 is formed to provide an inner surface 27 tapered slightly outwardly in the direction of the rim 28 of the cup; the inner surface 29 of the lower portion of the side wall being oppositely tapered to provide at the side of the cup a trap or reservoir for fuel-oil held therein by centrifugal force when the burner is in operation, the surface of the oil being indicated by the broken lines 30. This reservoir serves to stabilize ejection of oil from the cup, and also another purpose hereinafter to be described.

In operation of the burner, the oil travels up the inner side-surface of the cup and is projected or sprayed from its rim 28 toward the side wall 31 of the structure 19 generally in the plane of the rim of the cup. Air for combustion of the oil is supplied through openings 33 in the bottom wall 32 of the structure and other openings 33' in the conical sleeve 21; the flow of air adjacent the exterior of the cup serving to prevent overheating of the same. The air entering through the bottom of the structure is rotated at high velocity due to the friction between it and the inner surfaces of the structure, the surface-speed of the side wall 31 being approximately 40 feet per second when its diameter is 6 inches and the speed of rotation 1550 R. P. M. Due to the high velocity of the air rotating below the plane of projection of the oil, the same is atomized and combined with the air to form a mixture suitable for proper combustion. It is to be borne in mind that the oil, as projected tangentially from the rim of the cup, has no rotary movement and is therefore in condition to be acted on by the rotating air. While, for proper operation of the burner, the inner surfaces of the structure can be quite

smooth, if desired they can be roughened or corrugated to effect greater agitation of the air and mixture.

To start the fire, the mixture is ignited by the flame of a taper or the like, or by suitable electric igniting means (not shown). Combustion takes place within the chamber defined by the interior surfaces of the structure 19 and, when the same has become sufficiently heated, the flame (under high-fire conditions) extends almost to the bottom wall 32 and, of course, upwardly from the open end or mouth 34 of the structure; the general appearance of the high-fire being indicated in Fig. 2.

After combustion is initiated, rotation of the air around and below the flame imparts such turbulence thereto that relatively complete combustion is effected. In normal high-fire operation of the burner, the flame does not extend into direct contact with the inner surfaces of the structure but is separated therefrom by a layer of rapidly-rotating air. While, in the arrangement illustrated, the turbulence of the flame is due mainly to the rotation of the air at the side wall of the structure, the effect is due in part to the rotation of the air adjacent the bottom wall, and it is therefore within the scope of this invention to provide a burner structure wherein turbulence of the flame is effected by any means for rotating the air adjacent the flame, as, for example, by a simple disk corresponding to the bottom wall 32.

The air is drawn through openings 33-33' into the combustion chamber by the up-draft of the fire; a fan 35, mounted on the cup 18 below the bottom wall, facilitating the flow of air into the chamber, and also (when the burner is arranged in a furnace as shown in Fig. 1) flow of secondary combustion air through the chute 22. The portion 36 of the side wall 31 adjacent the open end of the structure constitutes a baffle means and is inwardly inclined to improve combustion and to prevent oil, projected from the cup, from escaping upwardly without first being properly mixed with the air.

The size of the fire is controlled by varying the rate of supply of oil, as by conventional valve means (not shown). When the oil is supplied at a very low rate, none of it is discharged in liquid state from the rim of the cup; vaporization of the oil taking place within the cup so that it forms a combustible mixture with air drawn down by cavitation at the center of the cup and burns as a low-fire at and below the rim of the cup, as indicated in Fig. 3. The production of such low-fire is made possible by the reservoir formed at the side of the lower part of the cup by the tapered surface 29; the oil being supplied by centrifugal force from the bottom of the cup to this reservoir from which it rises, clinging to the upper surface 27, and mixes with the air.

Under all conditions of fire, including low-fire, combustion is so complete that the flame is smokeless and the production of heat very economical; further, the burner is relatively quiet in operation. If desired, the burner can be mounted in a horizontal position wherein it will operate in substantially the same manner as described; the oil then being supplied to the bottom of the cup through a hollow driving-connection.

The term "generally-circular," as employed in the claims in reference to the side wall 31 of the structure 19 or its equivalent, is intended to mean that all sections of the wall are de-

fined, in general, by surfaces of revolution, but that the wall is not necessarily straight-sided nor imperforate as shown.

The 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 oil-burner, comprising: a hollow structure defining internally a combustion chamber, said structure having an end wall and a side wall generally-circular in cross-section, the structure being open at its end opposite the end wall; means for supplying fuel-oil to said chamber; a member within the chamber for receiving and discharging said oil, said member having a discharge rim and being carried by said structure and arranged in coaxial and spaced relation to said side wall, said discharge rim being in a plane intermediate said end wall and the open end of the structure; means for supplying to the chamber air for combustion of said oil; a motor for rotating said structure about the axis of its side wall at a speed such that the oil is projected by centrifugal force from said rim toward said side wall and is atomized thereby, so that it burns within the chamber when ignited; and baffle means carried by said structure for impeding passage of the burning gases from the chamber.

2. A rotary oil-burner, as defined in claim 1, and wherein said baffle means comprises an annular constriction of said side wall.

3. A rotary oil-burner, as defined in claim 1, and wherein said baffle means is formed by an inwardly inclined portion of said side wall adjacent the open end of the structure.

4. A rotary oil-burner, comprising: a hollow structure defining internally a combustion chamber, said structure having an end wall and a side wall generally-circular in cross-section, the structure being open at its end opposite the end wall; a relatively-deep cup generally-circular in cross-section and secured to said end wall centrally thereof and with its open end facing the open end of the structure, the rim of said cup being in a plane between the planes of said end wall and the open end of the structure, the open end of the cup being substantially unobstructed; means for supplying fuel-oil to the inner region of said cup; means for supplying to said chamber air for combustion of said oil; and a motor for rotating the structure about the axis of its side wall at a speed such that the oil, when supplied at full rate, is projected by centrifugal force from the rim of the cup toward the side wall of the structure and is atomized thereby to form a mixture which, when ignited, produces flame within the chamber and at the open end thereof; the internal periphery of said cup being enlarged near its closed end to form a reservoir for fuel-oil held there by centrifugal force, said cup serving when the oil is supplied at low rate as a low-fire burner the flame of which is produced within the outer end of the cup and at the rim thereof.

5. A rotary oil-burner, as defined in claim 4, and wherein the interior side-surface of said cup tapers outwardly, in the direction of the closed end of the cup, from a plane intermediate the ends of the cup to form said reservoir.

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5

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