Nov. 7, 1933. F. E. RUDOLPH 1,934,379

OIL BURNER

Filed May 11, 1931

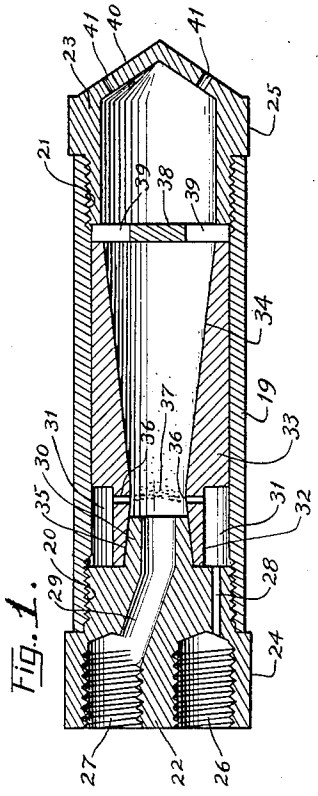


Fig. 1.

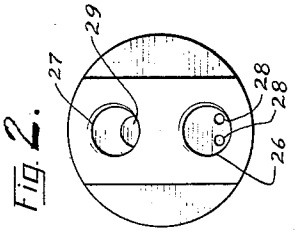


Fig. 2.

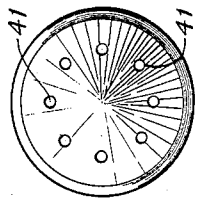


Fig. 3.

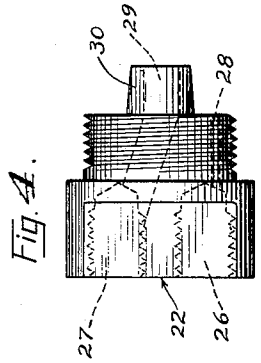


Fig. 4.

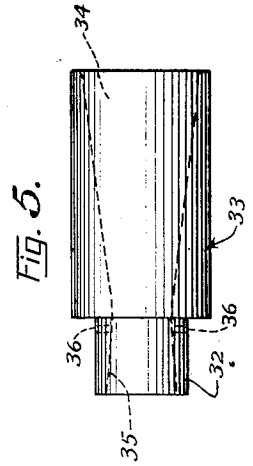


Fig. 5.

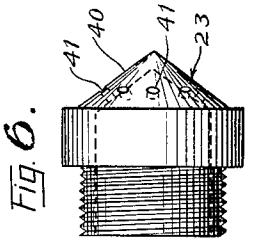


Fig. 6.

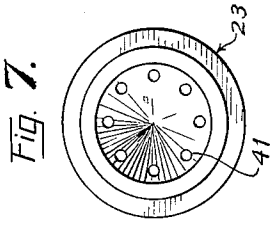


Fig. 7.

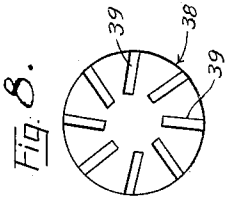


Fig. 8.

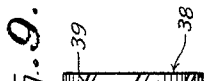


Fig. 9.

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UNITED STATES PATENT OFFICE

1,934,379

OIL BURNER

Fred E. Rudolph, Chicago, Ill., assignor, by direct and mesne assignments, to Miracle Burner Corporation, Chicago, Ill., a corporation of Illinois

Application May 11, 1931. Serial No. 536,337

6 Claims. (Cl. 158—75)

This invention relates to fuel burners and more particularly to oil burners, although certain features thereof may be employed with equal advantage for other purposes.

It contemplates more especially provision of novel means for directing liquid fuel along a predetermined path with varying velocity for effecting complete atomization and oxidation to insure the complete combustion thereof.

Numerous types of oil burners have heretofore been proposed, but these have not proven very satisfactory for the consumption of low grade oils which constitute the by-products of known processes of cracking oils. In fact, it has heretofore been thought impossible to burn such low grade fuels which finally result from commercial cracking processes, and many years of research have been unsuccessful in the combustion thereof for commercial purposes with the consequent generation of the highest possible heat of combustion necessary to acquire practical efficiencies therewith.

The difficulty in efficiently burning low grade fuels of the character mentioned, resides for the most part in the inability to affect the complete atomization thereof and combining the required air therewith to produce a homogeneous mixture conducive to complete and efficient combustion. Complete atomization effected by high velocity movement in the presence of a dispersing medium, have proven exceedingly satisfactory, and this accompanied by retarding velocity of movement prior to combustion, is productive of hitherto unforeseen results.

One object of the present invention is to simplify the construction and improve the operation of devices of the character mentioned.

Another object is the provision of means for discharging fuel along a predetermined path to effect the complete atomization and twirling movement with consequent diffusion in the presence of air or other oxidizing mediums.

Still another object is to provide a burner which will have a high fuel velocity discharge in the presence of a dispersing medium for effecting complete atomization, emulsification and subsequent discharge in a twirling path.

A further object is the provision of means for completely atomizing fuel at a high velocity with the consequent discharge thereof at an appreciably reduced velocity for effective co-mingling with air in the path thereof.

A still further object is to provide means for completely atomizing and emulsifying fuel and imparting molecular activity thereto in the presence of air for effective co-mingling prior to combustion.

Still a further object is to provide an extremely simple and improved combination of elements for effectively preparing low grade fuels for combustion in a completely emulsified state with increased thermal efficiency.

Other objects and advantages will appear from the following description of an illustrated embodiment of the present invention.

In the drawing:

Figure 1 is a sectional view in elevation of the burner element embodying features of the present invention.

Figure 2 is an end view in elevation of the device shown in Figure 1.

Figure 3 is a front view of a hollow cone spray shown in Figure 1.

Figure 4 is a side view in elevation of the steam and oil inlet nipple.

Figure 5 is a side view in elevation of the venturi mixing chamber.

Figure 6 is a side view in elevation of the hollow cone spray shown in Figure 3.

Figure 7 is an end view of the cone spray shown in Figure 6 when viewed from the interior thereof;

Figure 8 is a front view of an impeller disk arranged for disposition in the path of the fuel; and

Figure 9 is an edge view of the impeller disk shown in Figure 8.

The structure selected for illustration comprises an oil burner having an elongated cylindrical tube or burner shell 19 which is threaded internally at both ends 20 and 21 thereof for the reception of a correspondingly threaded nipple 22 and spray device 23. These serve as closures for the elongated tube 19, and the peripheries 24 and 25, respectively, thereof serve as a complement to the interior of the casing 16 for aligned telescopic placement therein.

As shown, the nipple 22 is provided with threaded inlets 26 and 27, in this instance two, which communicate with ports 28 and 29 leading through the opposite side thereof for communication with the interior of the cylindrical casing or burner shell 19. It is to be noted that the port 29 is comparatively large and terminates in an axial nipple projection 30, while the oil ports 28, in this instance two, are exceedingly smaller so as to effect the issuance of oil or liquid fuel at a high velocity for entry within an annular fuel chamber 31 defined by the reduced neck 32 which communicates with the throat of a mixing

chamber 33. The mixing chamber body 33 is of cylindrical exterior configuration of corresponding size with the interior of the burner shell 19 for confinement therein, and the interior thereof is provided with a frustro conical bore 34 diverging at the discharge end thereof. The bore 34 communicates with an outwardly, oppositely tapered connecting bore 35 which is complemental to the nipple projection 30 for frictional engagement therewith. In this position, the steam port 29 communicates directly with the frustro conical bore 34 defining a Venturi-shaped mixing chamber within the member 33, thus serving as a Venturi passage for progressive decreased velocity of the mixture passing therethrough.

It is to be noted that in order to inject a spray of fuel within the mouth or throat of the venturi 34 for projection in the path of the steam issuing from the port 29, diametrically opposite ports 36, in this instance two, are provided in the neck 32 proximate to the shoulder defined by the mixing chamber body 33. It will thus be noted that the ports 36 communicate with the annular chamber 31 for the reception of fuel such as oil issuing from the ports 28 to present a circular film 37 directly in the path of the steam port 29. Steam under pressure issues from the port 29 to disperse the fuel film 37 for effecting complete atomization and molecular activity to the resulting mixture which proceeds at an instantaneously high velocity to promote the diffusion at the entrance of the venturi 34.

With this arrangement, the diffusion and atomization of the fuel is instantaneously effected and promoted by the consequent high velocity in the vicinity of the Venturi mouth, and thereafter the velocity is decreased for consequent discharge through an impeller plate 38. The impeller plate 38 is of circular configuration for confinement within the burner shell 19, it being disposed in adjacent contact with the discharge end of the mixing chamber 33 to impart a twirling movement to the mixture issuing therethrough. The twirling movement is occasioned by obliquely disposed slots 39 which are spirally arranged in the impeller plate 38 so as to produce and impart a twirling movement to the issuing liquid fuel.

As stated, the hollow cone spray 23 threadedly engages the extremity 21 of the burner shell 19 to maintain the impeller plate 38 in position and to guide and direct the fuel spray issuing therethrough. This is effected by providing a cone shaped end 40 thereon of any desired angularity as commercial practice may dictate for the reception of circumferentially spaced apertures 41 therein. The apertures 41 are preferably spaced at sufficient distances so as to preclude any destructive interference between the sprays, as well as provide for complete aeration conducive to complete oxidation and ensuing combustion. The angularity of the cone piece 40 is dependent largely upon the desired expanse of the resulting flame which should clear a refractory annulus spaced sufficiently from a cone shield comprising a part of the burner support to admit air therebetween.

It is thus apparent that the fuel is completely atomized, the maximum diffusion is effected at high velocity, and the velocity subsequently reduced prior to issuance or discharge in a twirling path for flaring combustion. Air is admitted around the burner shell 16 and preferably twirling movement imparted thereto for effecting complete turbulance, thereby resulting in complete combustion of the lowest grades of fuel oil.

It is to be noted that air may be substituted in lieu of the steam for this purpose, and any number of such expedients may be resorted to as commercial practice may dictate for any particular installation.

Various changes may be made in the embodiment of the invention herein specifically described without departing from or sacrificing any of the advantages of the invention as defined in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a burner sprayer of the character described, a member forming a venturi, radial liquid inlets immediately to the rear of the Venturi throat, said member having an enlarged chamber at the front of said throat, an atomizing medium inlet arranged axially of the venturi immediately to the rear of the liquid inlets, said atomizing inlet having a diameter less than the diameter of the Venturi throat.

2. In a burner sprayer of the character described, a member forming a venturi, radial liquid inlets immediately to the rear of the Venturi throat, said member having an enlarged chamber at the front of said throat, an atomizing medium inlet arranged axially of the venturi immediately to the rear of the liquid inlets, said atomizing inlet having a diameter less than the diameter of the Venturi throat, and an impeller disposed transversely of said enlarged chamber to impart a twirling movement to the mixture issuing therethrough.

3. In a burner sprayer of the character described, a member forming a venturi, radial liquid inlets immediately to the rear of the Venturi throat, said member having an enlarged chamber at the front of said throat, an atomizing medium inlet arranged axially of the venturi immediately to the rear of the liquid inlets, said atomizing inlet having a diameter less than the diameter of the Venturi throat, an impeller disposed transversely of said enlarged chamber to impart a twirling movement to the mixture issuing therethrough, and an apertured cap detachably associated with said enlarged chamber for directing the discharge of the mixture therefrom.

4. In a burner sprayer of the character described, an enlarged chamber having a reduced axial throat at one end thereof, radial liquid fuel inlets provided in said throat immediately to the rear of said enlarged chamber, an atomizing medium inlet arranged axially of said throat immediately to the rear of said liquid fuel inlets, said atomizing inlet having a diameter less than the diameter of said throat.

5. In a burner sprayer of the charatcer described, an enlarged chamber having a reduced axial throat at one end thereof, radial liquid fuel inlets provided in said throat immediately to the rear of said enlarged chamber, an atomizing medium inlet arranged axially of said throat immediately to the rear of said liquid fuel inlets, said atomizing inlet having a diameter less than the diameter of said throat, and an impeller disc disposed transversely of said enlarged chamber proximate to the discharge end thereof to impart a twirling movement to the mixture issuing therethrough.

6. In a burner sprayer of the character described, an enlarged chamber having a reduced

axial throat at one end thereof, radial liquid fuel inlets provided in said throat immediately to the rear of said enlarged chamber, an atomizing medium inlet arranged axially of said throat immediately to the rear of said liquid fuel inlets, said atomizing inlet having a diameter less than the diameter of said throat, an impeller disc disposed transversely of said enlarged chamber proximate to the discharge end thereof to impart a twirling movement to the mixture issuing therethrough, and an apertured discharge cap in threaded engagement with said chamber to maintain said impeller disc in position and direct the discharge from said chamber.

FRED E. RUDOLPH.