Nov. 14, 1933. W. W. WILLIAMS 1,934,755

BURNER ASSEMBLY

Filed May 27, 1931 2 Sheets-Sheet 1

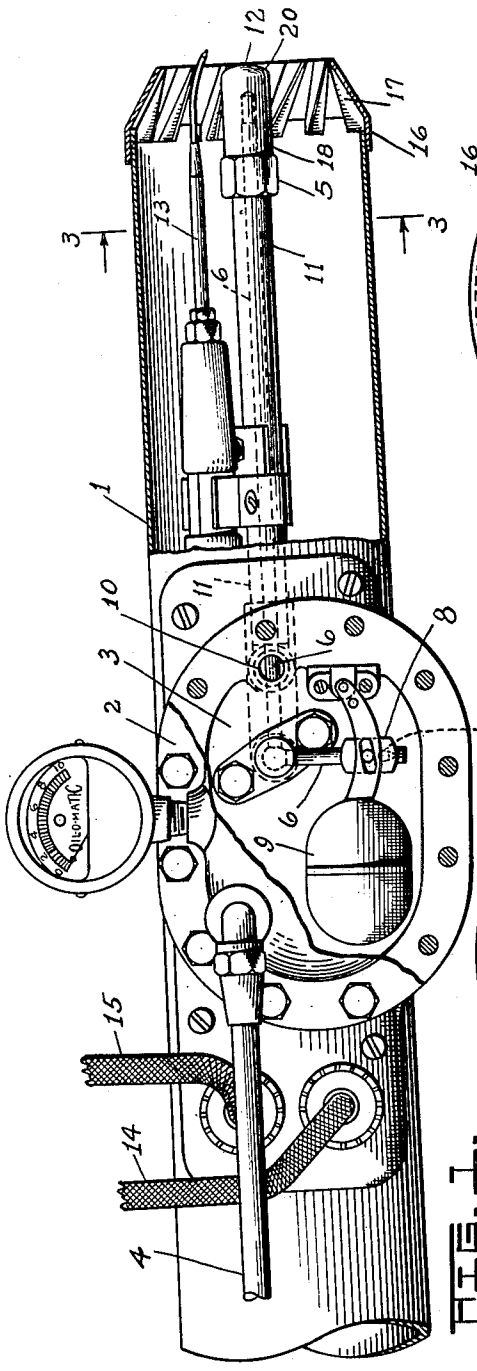


FIG. 1.

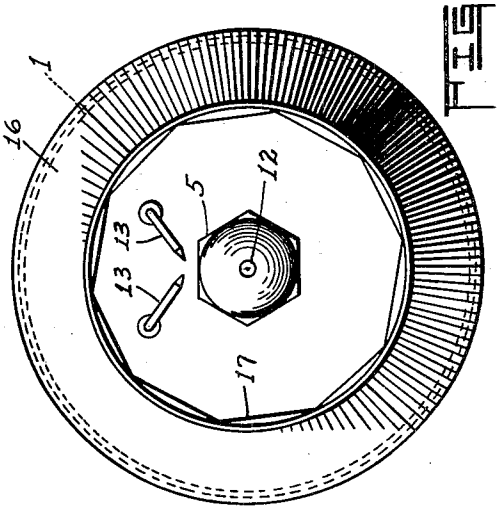


FIG. 2.

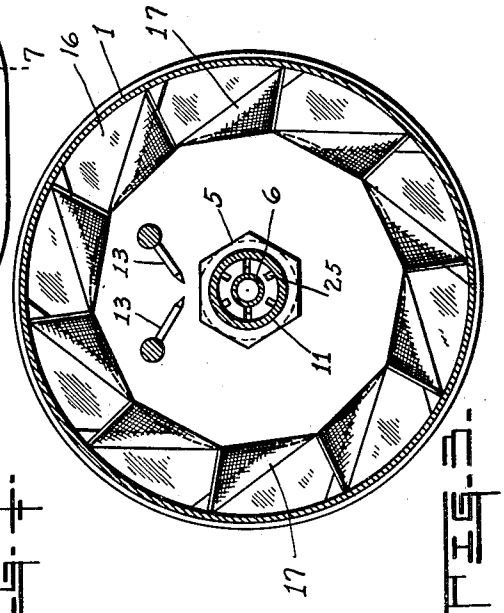


FIG. 3.

INVENTOR
WALTER W. WILLIAMS
BY Langdon Morris
ATTORNEY

Nov. 14, 1933. W. W. WILLIAMS 1,934,755

BURNER ASSEMBLY

Filed May 27, 1931 2 Sheets-Sheet 2

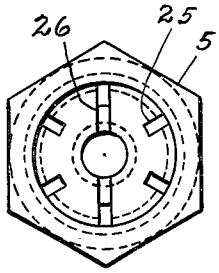


FIG. 5.

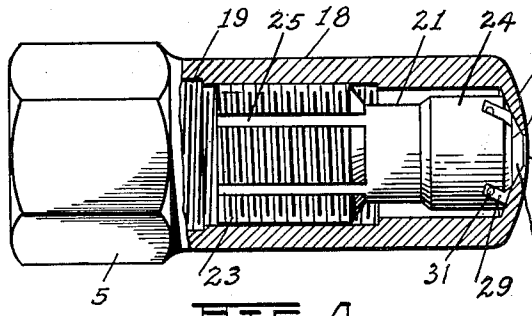


FIG. 4.

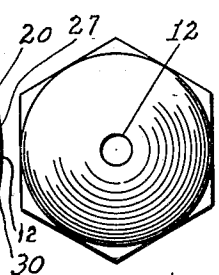


FIG. 6.

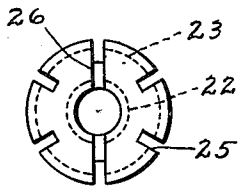


FIG. 8.

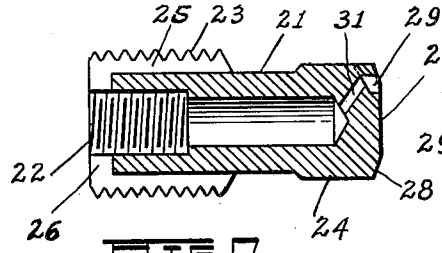


FIG. 7.

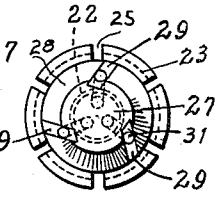


FIG. 9.

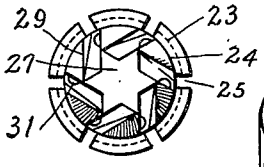


FIG. 11.

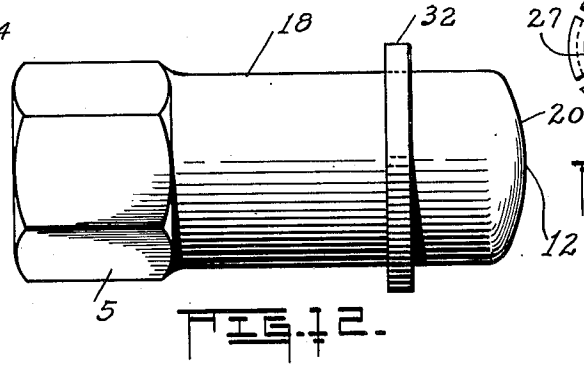


FIG. 12.

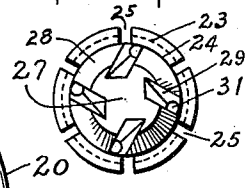


FIG. 10.

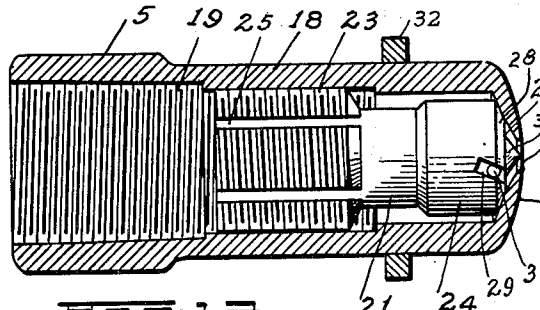


FIG. 13.

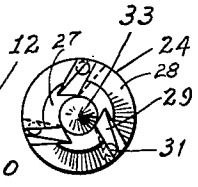


FIG. 14.

INVENTOR
WALTER W. WILLIAMS
BY Langston Moore
ATTORNEY

Patented Nov. 14, 1933 1,934,755

UNITED STATES PATENT OFFICE

1,934,755

BURNER ASSEMBLY

Walter W. Williams, Bloomington, Ill.

Application May 27, 1931. Serial No. 540,416

5 Claims. (Cl. 299—115)

This invention relates to improvements in fluid fuel burning mechanisms and more particularly to that mechanism which relates to the production of the flame, customarily called in the trade, the burner assembly.

In fluid fuel burners of the type in which the fuel is delivered under pressure through a fuel pipe within a surrounding air or draft pipe to discharge the fuel at the open end of the draft pipe through a nozzle to atomize the fuel in the presence of air under pressure forced through the draft pipe, when the fuel ignites, considerable noise caused by the combustion occurs, and if the flame burns in close proximity to the end of the nozzle, the nozzle not only becomes heated and the heat from the nozzle and flame is sufficient to carbonize upon the nozzle such particles of the atomized fuel which may collect thereon as a result of eddies in the air current during the operation of the burner, or may have collected thereon by oozing from the nozzle opening while the burner is idle, such carbonization being liable to encroach upon the nozzle opening and eventually clogging it and preventing efficient, and at times, the entire discharge of the fuel.

It is an object of this invention to produce a device of this character which will reduce the noise of combustion, permit the flame to burn at a fixed distance in advance of the nozzle, and eliminate the possibility of carbonization of the fuel upon the end of the nozzle.

With these and other objects in view, reference is had to the accompanying sheets of drawings which illustrate preferred embodiments of this invention, with the understanding that minor detail changes may be made therein without departing from the scope thereof.

In the drawings:

Figure 1 is a fragmentary view in side elevation of a portion of a draft pipe with parts broken away illustrating partly in section and partly in side elevation the operative parts of the burner assembly.

Figure 2 is an enlarged view in end elevation of the nozzle and of the draft pipe.

Figure 3 is an enlarged view in section taken upon the line 3—3, Figure 1, looking in the direction of the arrows.

Figure 4 is an enlarged detail view of the nozzle illustrated in Figure 2 with parts broken away illustrating the nozzle in vertical central section and the contained oil spiral in elevation.

Figure 5 is a view in elevation of the left hand end of Figure 4.

Figure 6 is a view in elevation of the right hand end of Figure 4.

Figure 7 is a view in vertical central section of the oil spiral.

Figure 8 is a view in elevation of the left hand end of Figure 7.

Figure 9 is a view in elevation of the right hand end of Figure 7.

Figures 10 and 11 are views corresponding to Figure 9 of modified forms thereof.

Figure 12 is a view in side elevation of a modified form of nozzle.

Figure 13 is a view in central longitudinal vertical section of Figure 12 illustrating a modified form of oil spiral in place within the nozzle.

Figure 14 is a view in end elevation of the modified form of oil spiral illustrated in Figure 13.

While this invention may be applied to various types of oil burner mechanism, it has been successfully demonstrated in connection with that type of oil burning mechanism disclosed in this applicant's prior pending application, Serial No. 435,424, filed March 13, 1930 which matured into Patent No. 1,831,277, November 10, 1931, and for convenience, the drawings illustrate an embodiment of this invention in such a type of fluid fuel burner.

Since this invention relates only to that part of a fluid fuel burner called the burner assembly, it is not thought necessary to illustrate or describe a complete burner and therefore reference is made to the disclosure in this applicant's said prior application.

Figure 1 illustrates a portion of the draft pipe 1 which supports upon one side a casing 2 enclosing a chamber 3 for the reception of the fluid fuel under pressure delivered through pipe 4. The fluid fuel is delivered from this chamber under the pressure of the air to the nozzle 5 preferably in the manner disclosed in the applicant's said prior application, that is by providing a fluid fuel pipe 6 which is arranged centrally of the draft pipe and leads from the nozzle to the interior of the chamber 3, terminating near the bottom thereof and provided with a graduated port 7 surrounded by a valve sleeve 8 controlled by a float 9 to increase the opening of the port as the level of the fluid fuel within the chamber rises. The air accumulating in the chamber 3 above the level of the fuel is conveyed through the port 10 through an air pipe 11 surrounding the fuel pipe 6 to the nozzle 5.

The fluid fuel is discharged through the nozzle opening 12 into the path of air travelling through the draft pipe 1 under pressure and is

preferably ignited by means of a jump spark ignition including spaced apart electrodes 13 supported upon the air pipe 11 and insulated therefrom as shown in Figure 1, the electrodes being connected by wires 14 and 15 leading to an ignition device or source of electricity.

Fluid fuel atomized under pressure and in the presence of air under pressure when ignited and burning under such conditions causes a distinct noise of combustion. It is preferable to impart a whirl to the atomized fuel as it is forced out of the nozzle and a whirl in the opposite direction to the air forced out of the end of the draft pipe to more completely mingle the oil with the proper portion of air to form a combustible mixture and it has been found that by the proper control of the air from the draft pipe the noise of combustion is reduced. In this instance the applicant has found that by terminating the draft pipe in what might be called a conical cap 16 which contracts the end of the draft pipe, as shown in Figure 1, with the sides of the cap sloping at an angle of about 30° and providing the interior of the cap with a plurality of vanes 17 arranged equi-distant from each other at an angle of about 45° to the travel of the air through the draft pipe and with the lower edges of the vanes parallel to the axis of the draft pipe, a whirl is imparted to the air passing therethrough to contact with the opposite whirl of the atomized fuel leaving the nozzle to complete combustion and the contracted cap containing the whirl imparting vanes also directs the air forced through the draft pipe in a downward direction causing it to impinge upon the opposite whirling spiral of fuel in such a manner that when the fuel is ignited, the noise of combustion is greatly reduced.

The fuel nozzle 5 is shown in detail in Figures 4 to 9 inclusive and includes a cylindrical casing 18 screw threaded at one end 19 to receive and secure the air pipe 11 thereto, the opposite end of which is provided with a closure having a convex outer surface 20 with a central discharge aperture or opening 12. The interior of the nozzle casing is shouldered and the intermediate portion is screw threaded to receive what may be termed a fuel spiral, shown in detail in Figure 7 which includes the cylindrical casing 21 screw threaded interiorly at one end 22 to receive and secure the end of the fuel pipe 6 and exteriorly screw threaded as at 23 to engage the screw threaded portion of the nozzle casing 18. The other end is provided with a closure or head 24, the exterior diameter of which is less than the inner diameter of that end of the nozzle casing 18 and slightly greater than the intermediate portion of the casing 21 between the closure head 24 and the screw threaded portion 23. The screw threaded portion 23 is provided with preferably six longitudinal slots 25 or passageways through which air from the air pipe 11 may pass to the interior of the nozzle housing therebeyond. Two of these diametrically opposite slots may be continued across the end of the screw threaded portion 23 to form a tool engaging slot 26 for the proper insertion of the oil spiral within the nozzle.

The closure 24 terminates in a flat surface 27 at right angles to the axis of the casing 21, the corners of which are cut away to provide a surface at a frusto conical surface 28 at an angle to the said axis to join the cylindrical outer surface of the main body of the closure 24. The closure of the nozzle casing 18 is formed upon the interior with a corresponding surface to be contacted by the conical end 28 of the spiral and form a seal therewith and the nozzle closure is tapered from this seal to form an edge about the nozzle opening 12. A plurality of air passages 29 are formed in the end closure or head 24 of the fuel spiral leading at an angle to the axis of the spiral from the space within the nozzle casing 18 through the flat surface 27 of the head to communicate with the chamber 30 formed between this flat surface and the nozzle closure behind the nozzle discharge opening 12. The bottom of each of these air passages 29 is connected to the interior of the air spiral casing 21 preferably by sloping fuel passageways 31 whereby the fuel from the fuel pipe 6 is caused to be contacted by the air from the air pipe 11 and oil and air are ejected from the nozzle through the opening 12. Any preferred number of air passages 29, each provided with a fuel passage 31, may be employed. Figure 9 illustrates three of such passages; Figure 10, four; and Figure 11, six. It is preferable to construct these passages 29 at an angle as shown.

It is preferable to construct the nozzle discharge opening 12 of a diameter approximately ⅛ of an inch and the relation of the air passages 29 in the closure head 24 and the air passages 25 in the screw threaded portion 23 of the fuel spiral 21 so that the pressure of the air from the chamber 3 passing through the air pipe 11 will be greater, approximately one-half pound, than the pressure of the fluid fuel passing through the fuel pipe 6. The fluid fuel as it leaves the fuel passageways 31 will be contacted by the air under pressure forced through the passageways 29 in the head of the oil spiral which will break the fluid fuel into particles and whirl it into the chamber 30 and out over the edges of the nozzle opening 12 in the form of a whirling cone of increasing diameter.

The whirling particles of the atomized fuel unite with the air under pressure leaving the draft pipe to form a combustible mixture and when a spark is caused to jump across, the electrode 13 will ignite and burn with a flame which remains at a fixed distance in front of the nozzle and sufficiently distant therefrom to prevent carbonization of the convex surface 20 surrounding the nozzle opening.

While no means have been shown for supplying fluid fuel and air under pressure through the pipe 4, it is preferable to employ the means shown in the applicant's said prior application, however it is not necessary to this invention that the air under pressure and fluid fuel be delivered in the manner described in said application. As far as this invention is concerned, any controlled means for supplying the fluid fuel to the pipe 4 and any form of air compressor for delivering air under pressure through pipe 4, either to the chamber 3 or to the respective air and fuel pipes directly, may be employed without departing from the scope of this invention.

Figure 12 illustrates a modified exterior to the nozzle 5 which includes securing upon the outer surface of the cylindrical casing 18 approximately half way between the longitudinal center and the discharge opening 12, a ring 32 projecting outwardly from the cylindrical surface a distance approximately equal to the nozzle discharge opening. This projecting ring has the effect upon contact by the air under pressure passing through the draft pipe 1 to divert a portion passing thereover to sweep about the convex surface 20 of the nozzle closure whereby any of the atomized fuel

that may have become attached thereto from any cause will be immediately wiped off and will prevent any collection thereafter so that the nozzle will be maintained free of carbonization of the fuel while the burner is in operation.

Figure 13 illustrates a modification to the fuel spiral 21 which includes the provision of a conical projection 33 extending from the flat surface 27 of the head 24 which is concentric with the axis of the spiral casing 21, the apex of which terminates flush with the nozzle opening 12 so that the sides of the cone are spaced apart and are substantially parallel to the portion of the nozzle closure tapering away from the nozzle opening 12. This conical projection acts to spread the flame and directs the air and oil passing thereover through the nozzle opening with a greater velocity.

What I claim is:

1. In a fluid fuel burning mechanism, a fuel pipe surrounded by an air pipe leading from a source of fuel and a source of air under pressure, respectively, to a burner nozzle, said nozzle including a tubular casing secured at one end to the air pipe and having the other end converging to provide a restricted discharge opening, a tubular fuel spiral of less diameter mounted within the nozzle casing having a transverse end wall peripherally beveled in engagement with the converging nozzle closure to form a tip chamber and having an interior chamber connected to said fuel pipe, a plurality of angular air passages tangential to the tip chamber provided in the form of grooves upon exterior portion of the fuel spiral in engagement with the nozzle closure, and a corresponding number of fuel passages leading from said chamber, each opening into one of said air passages, whereby the fuel as it leaves the fuel passages in the spiral will be contacted by the air forced through the air passages, be broken into particles and whirled through the nozzle opening.

2. In a fluid fuel burning mechanism, a fuel pipe surrounded by an air pipe leading from a source of fuel and a source of air under pressure, respectively, to a burner nozzle, said nozzle including a tubular casing secured at one end to the air pipe and having the other end converging to provide a restricted discharge opening, a tubular fuel spiral of less diameter having an enlarged portion provided with longitudinal air passages therein, mounted within the nozzle casing and enlarged head having a transverse end wall peripherally beveled in engagement with the converging nozzle closure to form a tip chamber and having an interior chamber connected to said fuel pipe, a plurality of angular air passages tangential to the tip chamber provided in the form of grooves upon the exterior portion of the beveled fuel spiral in engagement with the converging nozzle closure, and a corresponding number of fuel passages leading from said chamber, each opening into one of said air passages, whereby the fuel as it leaves the fuel passages in the spiral will be contacted by the air forced through the air passages, be broken into particles and whirled through the nozzle opening.

3. In a fluid fuel burning mechanism, a fuel pipe surrounded by an air pipe leading from a source of fuel and a source of air under pressure, respectively, to a burner nozzle, said nozzle including a tubular casing secured at one end to the air pipe and having the other end converging to provide a restricted discharge opening, a tubular fuel spiral of less diameter having an enlarged portion provided with longitudinal air passages therein, mounted within the nozzle casing and enlarged head having a transverse end wall peripherally beveled in engagement with the converging nozzle closure to form a tip chamber between the head and closure and having a chamber connected to said fuel pipe, a plurality of angular air passages tangential to the tip chamber provided in the form of grooves upon the exterior portion of the fuel spiral in engagement with the converging nozzle closure, and a corresponding number of fuel passages leading from said chamber, each opening into one of said air passages, whereby the fuel as it leaves the fuel passages in the spiral will be contacted by the air forced through the air passages, be broken into particles and whirled through the nozzle opening.

4. In a fluid fuel burning mechanism, a fuel pipe surrounded by an air pipe leading from a source of fuel and a source of air under pressure, respectively, to a burner nozzle, said nozzle including a tubular casing secured at one end to the air pipe and having the other end converging to provide a restricted discharge opening, a tubular fuel spiral of less diameter having an enlarged portion provided with longitudinal air passages therein, mounted within the nozzle casing and enlarged head having a transverse end wall peripherally beveled in engagement with the converging nozzle closure to form a tip chamber between the head and closure and having a chamber connected to said fuel pipe, a plurality of angular air passages tangential to the tip chamber provided in the form of grooves upon the exterior portion of the fuel spiral in engagement with the converging nozzle closure, and a corresponding number of fuel passages leading from said chamber, each opening into one of said air passages, whereby the fuel as it leaves the fuel passages in the spiral will be contacted by the air forced through the air passages, be broken into particles and whirled through the nozzle opening.

5. In a fluid fuel burning mechanism, a fuel pipe surrounded by an air pipe leading from a source of fuel and a source of air under pressure, respectively, to a burner nozzle, said nozzle including a tubular casing secured at one end to the air pipe and having the other end converging to provide a restricted discharge opening, a tubular fuel spiral of less diameter having an enlarged portion provided with longitudinal air passages therein, mounted within the nozzle casing and enlarged head having a transverse end wall peripherally beveled in engagement with the converging nozzle closure to form a tip chamber between the head and closure and having a chamber connected to said fuel pipe, a plurality of angular air passages tangential to the tip chamber provided in the form of grooves upon the exterior portion of the fuel spiral in engagement with the converging nozzle closure, and a corresponding number of fuel passages leading from said chamber, each opening into one of said air passages, said head provided with a concentric conical projection entering the tip chamber between the head and the converging nozzle closure and terminating in line with the discharge opening, whereby the fuel as it leaves the fuel passages in the spiral will be contacted by the air forced through the air passages, be broken into particles and whirled through the nozzle opening.

WALTER W. WILLIAMS.