Dec. 8, 1931. R. RASMUSSEN ET AL 1,835,333

FLUID NOZZLE

Filed March 18, 1931

Fig. 1.

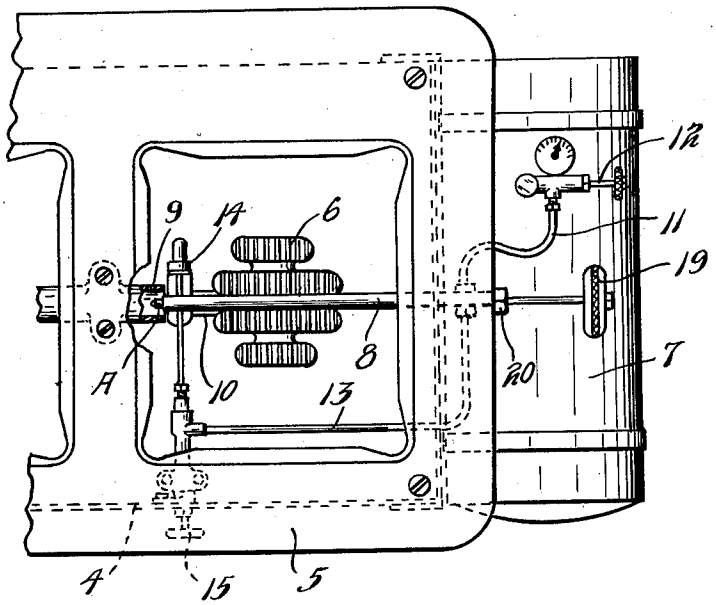


Fig. 2.

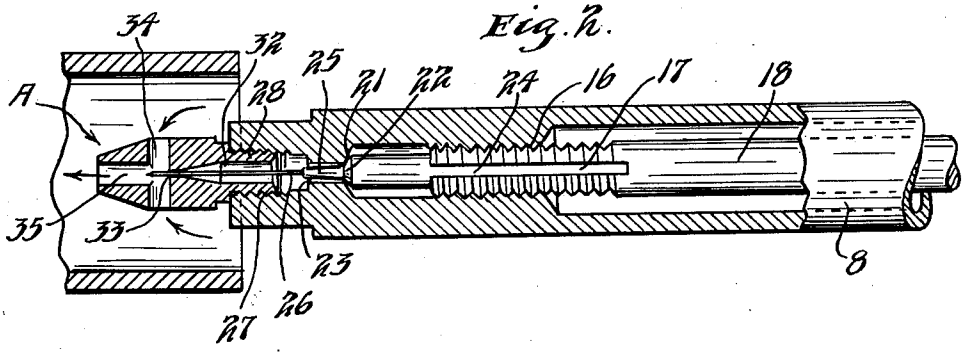
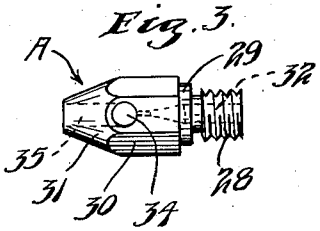


Fig. 3.



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UNITED STATES PATENT OFFICE

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FLUID NOZZLE

Application filed March 18, 1931. Serial No. 523,442.

This invention relates to fluid nozzles, the word "fluid" being taken throughout the specification and claims to be broad enough to cover both gas and liquid.

It is the primary purpose of this invention to provide a fluid nozzle having a fluid discharge orifice, and means for centering the stream of fluid discharged from the nozzle to project the same straight forwardly from the nozzle irrespective of whether the orifice is perfectly formed or not and irrespective of whether a cleaning or regulating needle that may be extended through the orifice is centrally located in the orifice or not.

In gasoline stoves and the like, it has been the common practice to apply a small plug or cap forming a nozzle to the outer end of the main fuel supply pipe and to provide this plug or cap with a small orifice through which a cleaning or regulating needle extends, the needle being mounted for longitudinal movement relative to the orifice for the purpose of removing obstructions from the orifice, as well as to regulate the quantity of fuel emitted from the orifice either in vaporized or liquid state. Under normal circumstances the vaporized fuel is discharged from this orifice into a tube open to the air at one end, which tube forms a mixing chamber for the vaporized fuel and air prior to the passage of the mixture to the burner of the stove or the like. It has been exceedingly difficult to construct a needle so perfect that the point of the needle will, at all times, remain in alinement with the central axis of the orifice to properly regulate the flow of the vaporized fuel therethrough. In using a needle with the nozzle having the discharge orifice, it was found that almost invariably the point of the needle would rest against the wall of the orifice of the nozzle, thereby causing a crooked stream of vaporized fuel to be discharged from the orifice. This stream would often strike the side of the tube forming the mixing chamber and part of the stream would there condense into liquid form or would not properly mix with the air so that imperfect combustion of the mixture would take place. It was also often found that the fluid emitted from the orifice would take such a crooked path that as a result, a portion of the fuel charged into the tube forming the mixing chamber would pass out of the open end of the tube. To correct these difficulties in all types of fluid nozzles, the present nozzle was developed.

The invention consists in the novel parts and novel combinations of parts hereinafter defined in the claims and described in the following specification, made in connection with the accompanying drawings, wherein like reference characters refer to the same or similar parts throughout the various views and, in which,

Fig. 1 is a plan view of a portion of a gasoline pressure stove, having incorporated therein the novel fluid nozzle of the present invention;

Fig. 2 is a vertical section taken through the fluid nozzle, the main fuel supply pipe and a portion of the tube forming the mixing chamber; and

Fig. 3 is a plan view of the fluid nozzle.

Although the nozzle of the present invention is adapted for use in connection with oil burners, gasoline equipment of various types and in fact it is adapted for use as any type of a fluid nozzle for discharging either gases or liquids or both, in the drawings, the nozzle is illustrated as being used in connection with a gasoline stove.

Referring to the drawings, portions of a gasoline stove of standard construction are illustrated. This stove includes a frame 4 to which a top plate 5 is secured and this top plate is provided with a large opening below which a main burner 6 is located. A gasoline supply tank 7 may be secured to one end of the frame 4 and this tank is adapted to contain the gasoline under air pressure. A main fuel supply pipe 8 suitably supported as from the frame 4 is provided and this pipe extends across the burner 6 above the same and terminates within a tube 9 supported from the plate 5 and forming a mixing chamber where the vaporized fuel discharged from the pipe 8 is adapted to be mixed with air prior to combustion at the main burner 6 and at other similar burners. A conduit 10 extends downwardly from the tube 9 and runs to the main

burner 6. A liquid fuel conduit 11 controlled by a valve 12, runs from a point adjacent the bottom of the tank 7 to the pipe 8, while a second liquid fuel conduit 13 runs from the pipe 8 to supply fuel to a Bunsen burner 14 controlled by a valve 15 and located beneath the discharge end of the pipe 8 to heat the liquid fuel in the pipe 8 and vaporize the same at the time of initially starting the stove and before the burner 6 is set in operation. After the main burner 6 is set in operation it will heat the pipe 8 to vaporize the fuel therein.

The right end of the tube 9 as viewed in the drawings, is open to permit the entrance of air into the mixing chamber formed by the tube. The pipe 8 has adjacent but inwardly spaced from its outer end, a reduced screw threaded portion 16 with which the screw threaded portion 17 of a rod 18 projecting through the pipe 8 engages. The rod 18 extends outwardly from the rear end of the pipe 8 and carries a handle 19 permitting the rod to be readily turned and a packing gland 20 encompassing the rod 18 closes the rear end of the pipe 8. Forwardly from the reduced screw threaded portion 16, the pipe 8 is provided with another reduced portion forming a valve seat 21 with which a shoulder 22 forming a valve adjacent the outer end of the rod 18 is adapted to engage at times to close off the passage of fluid through a small opening 23 adjacent the forward end of the pipe 8. It should be here specified that one or more grooves 24 are cut in the screw threaded portion 17 of the rod 18 to permit the passage of the fluid to the forward end of the pipe. The rod 18 forward of the valve 22 has a small conical portion 25 in which a needle 26 is secured. This needle normally projects outwardly through a screw threaded bore 27 at the extreme forward end of the pipe 8.

The nozzle of the present invention designated as an entirety by the letter A, is applied to the extreme outer end of the pipe 8 and for this purpose the nozzle is provided adjacent its rear end with an exteriorly screw threaded portion 28 which is screwed within the screw threaded bore 27 of the pipe 8. Forwardly from the screw threaded portion 28 the nozzle is provided with a short cylindrical portion 29 and forward of this cylindrical portion, the nozzle is provided with an enlarged polygonal-shaped portion 30 adapted to receive a wrench to permit the nozzle to be readily attached to the pipe 8. Forwardly of the polygonal-shaped portion, the nozzle flares inwardly and forwardly to form a conical portion 31, terminating at the forward end of the nozzle. A rear passage 32 extends from the rear end of the nozzle forwardly for some little distance and terminates in a fine orifice 33, which in the embodiment shown, is spaced somewhat more than half the length of the nozzle forwardly from the rear end of the same. The passage 32 has a rear cylindrical portion of relatively large diameter respective to the diameter of the orifice 33 and from the cylindrical portion, the passage 32 tapers inwardly and forwardly to the orifice 33. The needle 26 extends through the rear passage 32 and it normally projects through the orifice 33. By turning the rod 18, the needle 26 may be moved longitudinally of the nozzle A and this needle will act to not only regulate the quantity of fluid that may pass through the orifice 33, but it will also act to clean the orifice to prevent the obstruction of the orifice by small particles of carbon, sediment or the like. The nozzle A is drilled to form an air opening 34 which extends across the nozzle diametrically of the same from side to side thereof at right angles to the central longitudinal axis of the rear passage 32. The orifice 33 communicates with the central portion of this air opening 34. The air supply opening 34 may or may not be approximately of the same diameter as the cylindrical portion of the rear passage 32, but it is desirable that the diameter of the air opening 34 be many times the diameter of the orifice 33. A forward passage 35 is drilled through the nozzle to extend from the air opening 34 to the forward end of the nozzle and this forward passage is concentric with the rear passage 32 and, accordingly, extends directly ahead of the orifice 33. The diameter of the passage 35 is preferably the same as the diameter of the air draft opening 34.

In operating the stove after the Bunsen burner 14 has been burning for some time to heat the outer end of the pipe 8 and vaporize the liquid fuel therein, the rod 18 will be turned to retract the valve 22 from the seat 21 and thereby permit the flow of the vaporized fuel through the rear passage 32 and discharge orifice 33 of the nozzle A. The main burner 6 may then be lit. The vaporized fuel will be forced under air pressure in the tank 7 through the orifice 33 and will run in a stream forwardly through the forward passage 33 of the nozzle. Air will be drawn into the tube 9 forming the mixing chamber through its open rear end and a portion of this air will be drawn into the air supply opening 34 of the nozzle as indicated by the arrows Fig. 2. This air will be carried forwardly through the forward passage 35 of the nozzle and it will mix to a large extent with the vaporized fuel prior to discharge from the passage 35. The air drawn into the passage 35 will act to center the stream of vaporized fuel emitted from the orifice 33 and running through the forward passage 35, irrespective of whether or not the stream of fuel is initially directed straight forwardly from the orifice 33 to the center of the forward passage 35. The combined stream of vaporized fuel and air will

be emitted from the forward passage of the nozzle in a direction straight forwardly from the nozzle. Irrespective of whether the orifice 33 is perfectly formed or not and irrespective of whether the needle 26 is exactly centrally located in the orifice 33 and rear passage 32 or whether the needle 26 rests against one side of the orifice 33, the stream of vaporized fuel and air discharged from tne nozzle A is bound to run directly forwardly from the forward end of the nozzle due to the provision of the air draft opening 34 and the forward passage 35 in the nozzle. The stream of vaporized fuel and air emitted from the forward end of the nozzle A, will be carried into the central portion of the tube 9 where additional air will be mixed with the same to produce a most efficient combustible mixture. This mixture will, of course, be carried to the main burner 6, or to similar burners where combustion will take place. As the stream of fluid emitted from the nozzle A runs directly into the central portion of the tube 9, the vaporized fuel will not strike the sides of the tube 9 and no condensation of the liquid fuel will take place in the chamber formed by the tube 9 and a proper admixture of all the fuel with air will take place. Also there will be no tendency for the stream of fuel to run outwardly through the rear open end of the tube 9. It is also found that even if the liquid fuel is not perfectly vaporized prior to emission from the orifice 35, the stream of air admitted through the opening 34 will cause proper vaporization of the same.

The nozzle of the present invention has been amply demonstrated in actual practice and has been found to be extremely successful for the purposes intended. The orifice 33 of the nozzle need not be perfectly made and the needle 26 need not be perfectly made to be centrally located in the orifice 33 at all times. Perfect vaporization of the fuel and proper mixture of the fuel with air will take place.

It will be understood that after the main burner 6 has been set in operation, the Bunsen burner 14 will be closed off and the main burner 6 will act to heat the fuel running through the pipe 8.

As has been stated, the nozzle A can be used at any point where a fluid nozzle is required. Thus where liquid fuel alone is emitted from the nozzle without being first vaporized as in certain types of oil burners, the stream from the nozzle will be centered, caused to be projected straight forwardly from the nozzle and mixed with certain quantities of air.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the various parts without departure from the scope of the present invention.

What is claimed is:—

1. The combination with a fluid supply pipe and a needle at the forward end thereof, of a nozzle applied to the forward end of the pipe and having a rear passage extending forwardly from the rear end of the nozzle and terminating short of the forward end of the same in a small orifice into which said needle normally extends, said needle and nozzle being capable of relative movement, said nozzle having an air draft opening of much greater size than said orifice and with which said orifice communicates, said nozzle having a forward passage extending from ahead of said orifice through its forward end and of much greater size than said orifice whereby as fluid is emitted from said orifice, air will be drawn from said air opening into said forward passage to center the stream emitted from said forward passage in a straight line projecting therefrom irrespective of whether or not said needle is centered in said orifice.

2. The structure defined in claim 1, said air draft opening projecting from side to side of said nozzle at right angles to said forward passage.

3. The combination with a tube forming a mixing chamber and to which air may be supplied and a fluid supply pipe having an outlet end centrally located relative to the walls of said tube, of a nozzle applied to said end of said pipe and having a rear passage communicating with said pipe and projecting forwardly from the rear end of the nozzle and terminating short of the forward end of the nozzle in a small orifice, said nozzle having an air supply opening therein with which said orifice communicates and having a forward passage communicating with said air supply opening and projecting from ahead of said orifice through the forward end of the nozzle, said air supply opening and said forward passage being of considerably greater size than said orifice whereby as fluid is emitted from said orifice, air will be drawn through said air supply opening into said forward passage to mix with the fluid and cause the ejection of a mixed stream into said tube in a straight forwardly direction from said nozzle.

4. The combination with a tube forming a mixing chamber and to which air may be supplied and a fluid supply pipe having an outlet end centrally located relative to the walls of said tube, of a nozzle applied to said end of said pipe and projecting within said tube in centrally spaced relation from the walls thereof, said nozzle having a rear passage communicating with said pipe and projecting forwardly from the rear end of the nozzle and terminating short of the forward end of the same in a small orifice, a needle mounted in said pipe and normally projecting into said orifice, said needle being mount-

ed for longitudinal movement relative to said nozzle, said nozzle having an air supply opening therein with which said orifice communicates and said nozzle having a forward passage communicating with said air supply opening and projecting from ahead of said orifice through the forward end of the nozzle, said air supply opening and said forward passage both being of considerably greater size than said orifice whereby as fluid is emitted from said orifice, air will be drawn through said air supply opening into said forward passage to mix with the fluid and cause the ejection of a mixed stream in a straight direction from the forward end of the nozzle into said tube at the central portion thereof irrespective of whether or not said needle is centered in said orifice.

In testimony whereof we affix our signatures.

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KENNETH S. JENSON.