

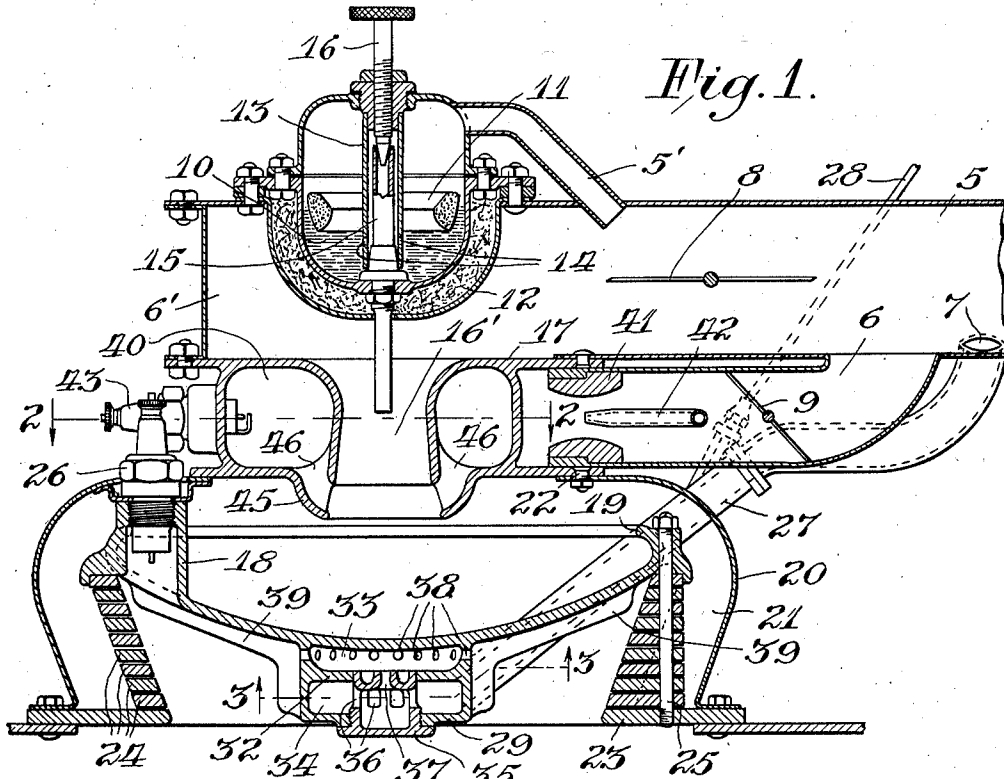
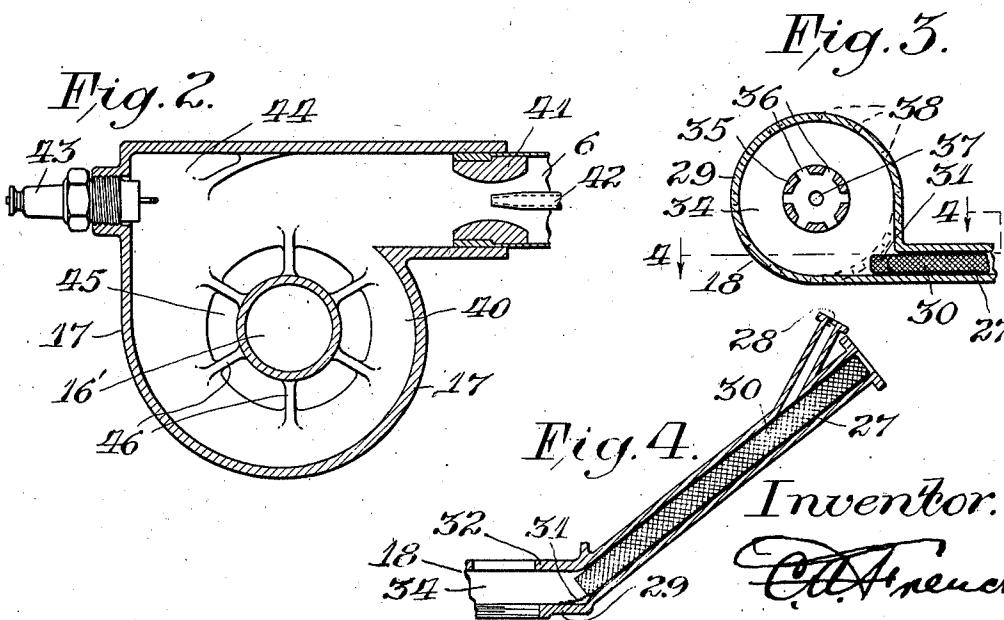
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VAPORIZING BLUE FLAME BURNER

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UNITED STATES PATENT OFFICE

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VAPORIZING BLUE-FLAME BURNER

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My invention relates to fuel burners and particularly to a burner in which the heavier grades of fuel oil (kerosene, distillate, etc.) may be vaporized and burned with a silent, clean blue flame, there being no carbon deposits or sticky residue left from the fuel, since the combustion is always complete. Fuel which is being vaporized in contact with a rapidly moving current of air does not decompose enough to form any tar or solid carbon deposits.

My improved burner is designed for generating steam in automotive steam power plants, but the principles involved are very broad and may be embodied in burners of many kinds. The embodiment of my invention shown in the drawings has three principal parts, namely, the starting up burner or preheater, the running or main burner, and the pilot burner. The starting up burner is supplied with air under light pressure and fuel of a density such that sufficient of it will be vaporized when sprayed into the air to form a combustible mixture. This mixture, which is very rich, is ignited and burns with additional air to heat the vaporizing surface of the main burner. The firing up burner is then extinguished and the main burner lighted. Heat from the main burner keeps the vaporizing surface hot and also heats the pilot light, which is now supplied with air and fuel and burns continuously to keep the vaporizing surface hot when the main burner is turned off.

Referring now to the drawings—

Fig. 1 is a vertical section through a preferred form of my invention;

Fig. 2 is a horizontal section through the vaporizing bowl of the firing-up burner taken substantially on the line 2—2 of Fig. 1;

Fig. 3 is a section on the line 3—3 of Fig. 1 showing the vaporizing drum of the pilot light; and

Fig. 4 is a section on the line 4—4 of Fig. 3 showing the fuel and air supply passage for the pilot light.

An air pipe 5 supplies air to the main burner and through two branches 6 and 7 to the firing-up and pilot burners respectively. The main air pipe and the passage to the

firing-up burner are controlled by suitable means such as the throttle valves 8 and 9 respectively. The air pipe 5 terminates in a chamber 6' on top of the burner and supports a fuel chamber 10 in which fuel is maintained at a constant level by the float 11 and to which air is supplied by a branch pipe 5'. (The float valve is not shown, but I prefer using a float and valve similar to that commonly used in carburetors for internal combustion engines.) The fuel chamber is lagged with asbestos or other heat insulating material 12 to protect it from heat from the burner and prevent vaporization of the fuel. Inside the fuel chamber is a vertical tube 13 having a series of perforations 14 at its lower end and surrounding a nozzle 15 controlled by a needle valve 16 at its upper end and at its lower end discharging into an air nozzle or passage 16' extending from the air chamber 6' through the body 17 of the preheater into the vaporizing bowl 18 of the main burner. The vaporizing bowl is comparatively shallow and has its upper edge turned inward to form a flange 19 which prevents the escape of unvaporized fuel from the bowl. The bowl is closed at the top by the preheater 17 and is surrounded by a casing 20 spaced from the bowl to form an annular passage 21 for the air and vaporized fuel and secured at its upper edge to the preheater 17 by bolts 22 and at its lower edge being secured to the lower section 23 of a series of spaced rings 24 which form the burner grating and are secured to the vaporizing bowl by bolts or studs 25. The casting forming the vaporizing bowl or body of the main burner carries a spark plug 26 in proximity to the grating 24 to ignite the vaporized mixture issuing through the narrow openings between the rings.

The pilot light is preferably cast integral with the vaporizing bowl and comprises a passage 27 drilled in the casting and connecting at its upper end to the air pipe 7 and fuel pipe 28. The passage 27 discharges tangentially at its lower end into the vaporizing drum 29 and contains a fuel distributor or equalizer 30 which may be formed from asbestos wicking or fine wire gauze, the lower end 31 of which extends for a short distance

on the bottom of the drum to spread the fuel. The drum 29 is divided by a partition 32 into a combustion chamber 33 and a lower vaporizing chamber 34. A plug 35 connects the two chambers and leads the vaporized fuel and air to the upper chamber where it burns and from whence the products of combustion are spread by a series of openings 38 over the bottom of the bowl 18, serving to keep the bowl hot when the main burner is shut off. The plug 35 contains slots 36 for stopping the rotary motion of the fuel vapor and air and a nozzle 37 through which the combustible mixture issues into the combustion chamber 33. The bottom of the bowl 18 has a plurality of radial ribs 39 which serve to distribute the products of combustion from the pilot burner and also assist in the absorption and distribution of heat over the bowl.

The air pipe 6 leading to the firing-up burner or preheater discharges tangentially into the volute drum 40 formed in the body 17 and has a restricted throat or venturi 41 into which fuel is discharged from a nozzle 42, preferably in a fine spray. A spark plug 43 secured in a pocket 44 formed in the drum serves to ignite the mixture. The drum has a central discharge nozzle 45 concentric with the nozzle 16' and a plurality of direction vanes 46 which serve to stop the whirling motion of the flame in the drum and direct it downward through the nozzle 45 where it encounters the stream of air from the nozzle 16'.

I will now describe the operation of my burner, first describing the operation of the firing-up burner, then the main burner, and last the pilot light, that being the order in which the three parts or units normally function.

Air is supplied to the pipe 5 and the dampers 8, 9 adjusted so that the air is divided about equally between the passage 6 and chamber 6'. Fuel is sprayed through the nozzle 42 into the throat of the venturi and mixes with the air entering the drum 40 from pipe 6, about 50 per cent excess fuel being supplied so that the mixture is rich. The rich mixture is ignited by the plug 43 and has a rotary motion as it approaches the center where its whirling is stopped by the vanes 46 and the burning mixture directed downward and inward by the nozzle 45 straight into the jet of air from the nozzle 16', thus producing a blow torch effect. The flame is directed downward at high velocity and spreads out evenly over the vaporizing bowl 18 which is heated hot enough in a few seconds to start the main burner. The fuel and air supply to the volute 40 are now cut off and all air diverted past the damper 8.

Fuel in the reservoir is maintained at a constant level by the float 11 and the top of the nozzle 15 is a predetermined distance above the fuel level. Air diverted through

the pipe 5' exerts a slight pressure on the fuel to raise it in the tube 13 above the level in the float chamber. The air flowing through nozzle 16' has an aspirating effect tending to draw fuel through the nozzle. The height of the upper end of nozzle 15 above the fuel level is arranged so that the pressure due to air through the passage 5' and the aspirating effect of the air past nozzle 15 are just sufficient to raise the fuel in the tube 13 and discharge the amount of fuel required for proper operation of the burner. The main burner is designed to be fully on when burning or fully off, there being no intermediate stages. Thus when the damper 8 is closed to any considerable degree or if the air pressure drops any considerable amount, no fuel will be supplied through nozzle 15.

The bowl 18 having been heated from the preheater and the latter shut off, air and fuel in the proper proportions for best combustion are discharged from the nozzles 16' and 15 onto the vaporizing bowl with considerable force. As the fuel is vaporized, the vapors mix with air and pass over the edge 19 into the annular space 21 and thence through the grating 24 where the mixture is ignited by the plug 26 and burns with a clean blue flame which impinges on the bottom of the bowl and pilot burner heating both hot. The main burner then continues in operation as long as air at normal pressure and fuel are supplied to the nozzles 16' and 15.

When the main burner has been in operation for a brief time, fuel is admitted to the screen lining of the passage leading to the pilot light, and the pilot lighted from the main burner. The air and fuel enter tangentially into the lower chamber 34 of the pilot drum where the fuel is vaporized and mixed with the air, the heavier components of the fuel being held against the outer heated surface of the drum by centrifugal action until vaporized. The vaporized mixture flows through the apertures 36 and nozzle 37 into the chamber 32 where it burns and the products of combustion pass out of the openings 38 along the bottom of the bowl, keeping it hot and at the same time serving to ignite the main burner when it is turned on. The amount of fuel consumed by the pilot light is so small that it will not flow evenly through the passage 27, therefore I have provided the screen or wick 30 which assures an even distribution of the fuel and prevents its being fed in varying quantities to the pilot light. Without some means of assuring an even distribution of fuel, the jar and vibration of the burner when used for automotive purposes would cause the fuel to be fed unevenly which would result in the burner going out or in poor combustion and a smoky flame. The air supply pipe

7 for the pilot is between the source of air supply and throttle 8 so that the air supply to the pilot cannot be turned off. After being started the pilot burns continuously and keeps the bowl 18 hot so that the main burner can be started instantaneously. The pilot light is extinguished only when the burner is to be shut down for a considerable period, and when burning serves as an igniter for the main burner when again starting up after a short shut down.

While I have described in detail one form of my invention, it will be understood that this is but illustrative and that I claim as my invention all modifications and variations that may fall within the scope of my claims or be considered the equivalents thereof.

What I claim is:

1. In a device of the class described, the combination of a main burner having a vaporizing drum, a separate preheater drum above the vaporizing drum, means for forcing a rich mixture of air and fuel directly into the preheater drum, means for igniting the mixture therein, a nozzle discharging the burning mixture downwardly directly into the vaporizing chamber of the vaporizing drum and an air nozzle directing a stream of air into the burning mixture and into the vaporizing drum.

2. In a burner, the combination of a preheater, means for forcing a rich mixture of air and fuel therein, means for igniting the mixture in the preheater, a centrally disposed downwardly directed air nozzle in the preheater, means for supplying air thereto, and a nozzle surrounding the air nozzle and discharging the burning mixture downwardly into the stream of air therefrom.

3. In a burner, the combination of a preheater having a tangential inlet, means for supplying a rich mixture to the inlet, means for igniting the mixture in the preheater, the preheater having a central discharge nozzle directed downwardly and inwardly, an air nozzle within the discharge nozzle for directing a stream of air downwardly into the burning mixture from the discharge nozzle, means for supplying air to the air nozzle, and means for excluding air from said preheater independently of said air nozzle.

4. In a burner, the combination of a vaporizing drum, a fuel chamber and an air chamber above the drum, concentric fuel and air nozzles discharging from the respective chambers to the drum, means for supplying air to the air chamber, means for diverting a part of the air to the fuel chamber, and means for heating the drum.

5. In a burner, the combination of a shallow vaporizing drum, means for heating the drum, an annular grating secured to the drum, a casing surrounding the drum and grating and providing an annular passage leading from the drum to the grating, means for sup-

plying a mixture of fuel and air to the drum under pressure, and means for igniting the vaporized mixture issuing from the grating.

6. In a burner, the combination of a shallow vaporizing drum having an inturned edge, means for heating the drum, means discharging a mixture of fuel and air against the center and bottom of the drum, a casing surrounding the drum and spaced therefrom, a grating spaced from the casing and secured to the drum, whereby the vaporized fuel and air will overflow the edge of the drum into the space within the casing and through the grating, and means to ignite the vaporized mixture on the discharge side of the grating.

7. In a burner, the combination of a vaporizing drum, a burner means positioned adjacent the drum for directing gases of combustion therefrom to the vaporizing drum, means for supplying a mixture of fuel and air thereto, means for burning the vaporized mixture from the drum, a second drum secured to the lower side of the vaporizing drum substantially in the path of the gases of combustion from the burner means and discharging radially outward thereover, and means for supplying fuel and air to the second drum, the mixture from the second drum being ignitable by said gases of combustion.

8. In a burner, the combination of a vaporizing means, an enclosed fuel chamber, a nozzle extending therefrom for supplying fuel to said means, and communicating with said chamber above the normal fuel level, and air pressure and vacuum means for causing fuel to rise in said chamber and to discharge into said nozzle.

9. In a burner, an integral casting providing a main vaporizing drum, a second vaporizing drum, a tangential supply passage leading to the second drum, a plurality of ribs on the main drum, the second drum having a plurality of openings discharging outward between the ribs.

10. In a burner, the combination of a shallow vaporizing bowl having an in-turned edge near its periphery, means for heating the bowl, means for discharging fuel against the bottom of the bowl, a main burner positioned below said bowl, said main burner forming the main source of heat for heating purposes for which the burner is adapted, said main burner also heating the under side of the bowl, and means for conducting vaporized fuel from said bowl to said main burner.

11. In a burner, the combination with a main burner vaporizing drum, of a pilot burner provided with a partition dividing the drum into upper and lower chambers and having a central opening therein, a connector secured in the central opening and having lateral openings communicating with the lower chamber and a nozzle communicating with the upper chamber, a tangential inlet to the

lower chamber, and discharge passages in the circumference of the upper chamber.

12. In a burner of the class described, a vaporizing bowl, a pilot burner for heating the bowl, means for discharging fuel against the walls of the bowl whereby the fuel is vaporized, a main burner positioned below said bowl whereby the bowl is also heated, said main burner forming the main source of heat for heating purposes for which the burner is adapted, and means for conducting vaporized fuel from said bowl to said main burner.

13. In a burner of the class described, a vaporizing bowl, means for heating said bowl, means for discharging fuel against the walls of said bowl whereby the fuel is vaporized, a main burner positioned in operative relation with the vaporizing walls of said bowl whereby the vaporizing walls of the bowl are heated directly by the flame of said main burner, said main burner forming the main source of heat for heating purposes for which the burner is adapted, and means for conducting vaporized fuel from said bowl to said main burner.

Signed at Columbus, Ohio, this 24th day of May, 1923.

CHARLES A. FRENCH.

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