

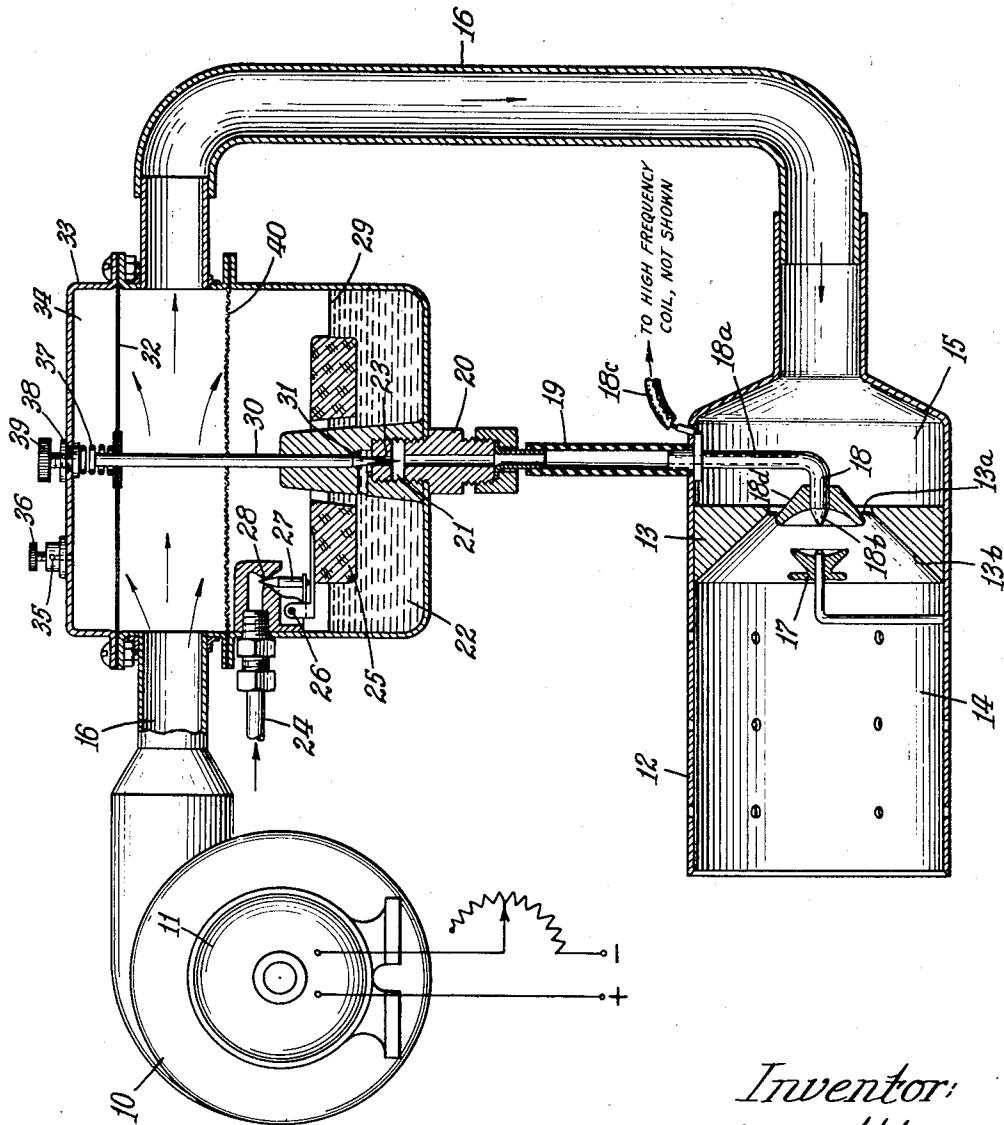
Nov. 14, 1950

H. B. HOLTHOUSE

2,529,942

FUEL FEED CONTROL FOR OIL BURNERS

Filed Feb. 28, 1946



Inventor:
Harry B. Holthouse

By Harvey M. Gillespie
Att'y

UNITED STATES PATENT OFFICE

2,529,942

FUEL FEED CONTROL FOR OIL BURNERS

Harry B. Holthouse, Chicago, Ill., assignor, by
mesne assignments, to Vapor Heating Corpora-
tion, a corporation of Delaware

Application February 28, 1946, Serial No. 650,326

2 Claims. (Cl. 261—30)

1 This invention relates to improved means for controlling the delivery of liquid fuel and air into a combustion chamber.

A principal object of the invention is to provide a simplified proportioning device which will function to modulate the delivery of liquid fuel to a fire chamber in accurate proportions to the delivery of combustion air thereto, whereby correct proportions of fuel and air for effecting complete combustion may be maintained for high and low flame by controlling the volume or pressure of combustion air delivered to said fire chamber.

A further and more specific object of the invention is to provide a simplified control means for proportionately varying the supply of liquid fuel to a burner in proportion to variations in the delivery of air to said burner.

According to the present invention, the combustion air is delivered to the burner under pressure from a suitable source, and this pressure is utilized to increase the flow of liquid fuel through a delivery orifice of a supply chamber to the burner and to simultaneously vary the effective area of the fuel delivery orifice in proportion to changes in the said air pressure and thereby maintain a uniform mixture of fuel and air for high and low flame operation of the burner.

It is, therefore, a specific object of the invention to provide an improved control apparatus of simplified construction which will function in the manner hereinabove described to proportionately vary the supply of liquid fuel to a burner in proportion to variations in the pressure of the combustion air delivered to the burner.

One approved form of apparatus for attaining the objects of the invention is illustrated in the accompanying drawing wherein:

The said source of combustion air under pressure is a blower 10 which is preferably operated by a variable speed electric motor 11 so that the volume and pressure of the combustion air may be varied by varying the operating speed of the motor.

The burner is shown diagrammatically as composed of a shell 12 provided with a partition 13 which divides the shell into a fire chamber 14 and an air receiving chamber 15. The air receiving chamber is connected to the blower 10 by means defining an air passage 16 leading from the blower 10 to the air receiving chamber 15. It will be seen, therefore, that by varying the speed of operation of the motor 11, the volume of combustion air delivered to the burner can be varied.

The liquid fuel may be conditioned for combustion, either atomized or vaporized, by any

2 suitable means, since the fuel conditioning means per se does not constitute a part of the present invention, the present invention being confined to the means for controlling the delivery of fuel and air so as to maintain a desired mixture. For the purpose of convenience of illustration, the present invention is disclosed in connection with a means for conditioning the fuel for combustion, which is constructed and operates in accordance with the disclosure in United States Letters Patent 2,227,714 and 2,331,912. It will be sufficient, therefore, to describe the fuel conditioning and ignition system quite briefly. The said means for conditioning the said fuel, as shown herein, comprises a cathode 17 which is grounded to the shell 12 and positioned in spaced relation to an anode 18. This element is formed with a fuel duct 18a therein for delivering the liquid fuel to a tapered nozzle end 18b where it is discharged at pressures slightly above atmospheric into the burner. The fuel is ignited by an electrostatic discharge which is maintained across the space between the cathode 17 and the anode 18. A wire 18c is connected to the said anode and leads to a suitable source of high frequency electric current. The end of the anode may be provided with a hood 18d which is positioned in the opening 13a of partition 13 and deflects the combustion air outwardly along the conical face 13b of said opening. The anode 18 is connected by means of a conduit 19 made of rubber or other electrical insulation with a conduit fitting 20, the latter of which is threaded into a passage 21 communicating with the interior of a fuel supply chamber 22. The passage 21 is restricted, preferably by means of a screw plug formed with a central orifice 23 therein, defining the maximum area of the fuel discharge opening leading from the fuel supply chamber into the fuel conduit 19. Liquid fuel is supplied to the chamber 22 from a supply pipe 24. A float 25 is hingedly supported at 26 to control a needle valve 27 for opening and closing the fuel supply port 28 so as to maintain a constant level of fuel in the chamber 22. The level of fuel is indicated by the reference character 29 and is a substantial distance above the discharge orifice. Consequently, the fuel will flow by gravity through the orifice and into the delivery conduit 19. The volume of this flow is preferably increased by subjecting the body of liquid fuel in the chamber 22 to the pressure of the combustion air in conduit 16. While the air pressure exerted on the body of liquid fuel will increase its flow

through orifice 23, such increased flow will not be proportional to the increased pressure.

In order to maintain a flow of liquid fuel which will be proportional to the delivery of combustion air at different pressures, the invention, in addition to utilizing the pressure on the fuel body to accelerate its flow through the orifice 23, also provides means for automatically varying the effective area of the orifice 23 in response to variations in the air pressure so that the flow of fuel due to both the air pressure on the fuel and variations in the area of the discharge orifice will be proportional to the said air pressure.

The effective area of the fuel discharge orifice 23 is controlled by a needle valve 30, the lower end 31 of which is tapered so that by raising or lowering the valve, the tapered end portion will proportionately increase or diminish the effective area of the orifice 23. The needle valve 30 is secured to a diaphragm 32 which is subject to the pressure of the combustion air as it passes from the blower to the burner. In order to provide a simplified construction for utilizing the air pressure to control the flow of fuel, the chamber 22 is preferably interposed in and forms a part of the conduit defining the air passage 16. The lower portion of said air passage extending through the chamber 22 is defined by the liquid level 29 and the upper limit of said air passage is defined by the flexible diaphragm 32. Any increase in the air pressure will increase the flow of fuel through the orifice 23 and simultaneously exert pressure upwardly against the diaphragm 32 to move the valve 30 upwardly and thereby increase the effective area of the discharge orifice 23. The movement of the diaphragm 32 will be proportional to air pressure within the chamber 22 and consequently, the automatic adjustment of the area of the fuel discharge orifice 23 will result in varying the amount of fuel so that the amount delivered to the burner will be proportional to the volume of air delivered.

The diaphragm 32 is clamped in place between lateral flanges formed in the upper end of chamber 22 and a closure cap 33. The space 32 intervening between the diaphragm and the said cap is open to the atmosphere through a bleed port 35. This port may be adjusted by means of an adjusting screw 36. Preferably, a compression spring 37 surrounds the upper portion of the needle valve 30 and seats against the diaphragm 32. The other end of the spring seats against a head portion 38 of an adjusting screw. The compression of the spring 37 may be adjusted by turning a nut 39 in an appropriate direction.

In order to prevent entrance of dust or other foreign matter into the lower portion of the fuel supply chamber 22, a screen diaphragm 40 is extended across a chamber 22 between the liquid level 29 and the air passage from the blower. This screen also functions as a fire screen to prevent ignition of fuel in chamber 22 in the event of back fire.

While the several novel principles of the present invention are illustrated in connection with one specific form of apparatus, it is to be understood that the apparatus herein shown is merely for the purpose of illustration and not intended as a limitation of the invention except insofar as the specific structure is specified in the claims.

I claim:

1. In a control apparatus for maintaining a uniform mixture of liquid fuel and air comprising means for supplying said air under pressure

including a variable speed blower and a conduit leading therefrom to a predetermined location, a liquid fuel supply chamber interposed in and forming a part of said air conduit, whereby the fuel in the chamber is subjected to the air pressure maintained in said conduit, a fuel delivery conduit leading from a delivery orifice in said chamber to said predetermined location, a diaphragm positioned across said chamber and defining a wall portion of said conduit so as to respond directly to variations in the air pressure, a valve for controlling the outlet orifice secured to said diaphragm and adapted to proportionately vary the effective area of the fuel delivery orifice in relation to variations of the air pressure, and means for damping both the valve opening and valve closing movements of the diaphragm comprising means defining an air chamber positioned above the diaphragm having a restricted opening to the atmosphere and a valve for varying the effective size of said restricted opening.

2. In a control apparatus for maintaining a uniform mixture of liquid fuel and air comprising means for supplying said air under pressure including a variable speed blower and a conduit leading therefrom to a predetermined location, a liquid fuel supply chamber interposed in and forming a part of said air conduit, whereby the fuel in the chamber is subjected to the air pressure maintained in said conduit, a fuel delivery conduit leading from a delivery orifice in said chamber to said predetermined location, a diaphragm positioned across said chamber and defining a wall portion of said conduit so as to respond directly to variations in the air pressure, a valve for controlling the outlet orifice secured to said diaphragm and adapted to proportionately vary the effective area of the fuel delivery orifice in relation to variations of the air pressure, and means for damping both the valve opening and valve closing movements of the diaphragm comprising means defining an air chamber positioned above the diaphragm having a restricted opening to the atmosphere, a valve for varying the effective size of said restricted opening, a compression spring positioned to bear on the upper face of the diaphragm and means for adjusting the compression of said spring.

HARRY B. HOLTHOUSE.

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