June 19, 1923. 1,459,667

V. C. ANDERSON

VAPORIZER

Original Filed May 19, 1922

Fig. 2.

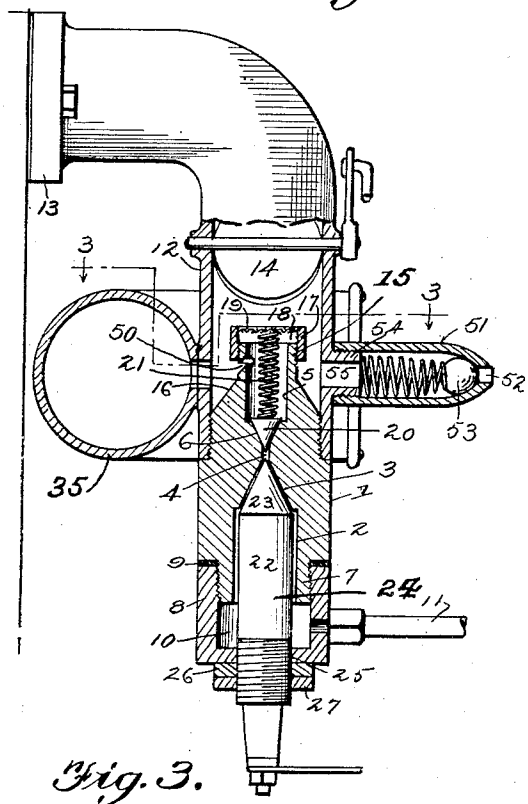


Fig. 1.

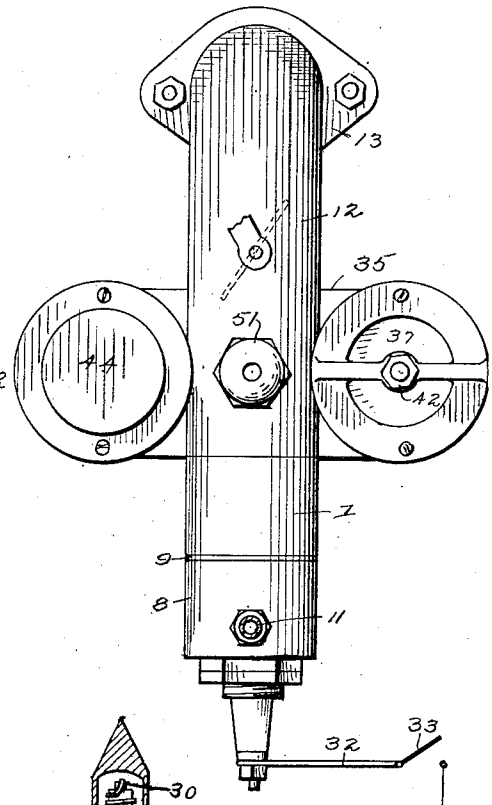
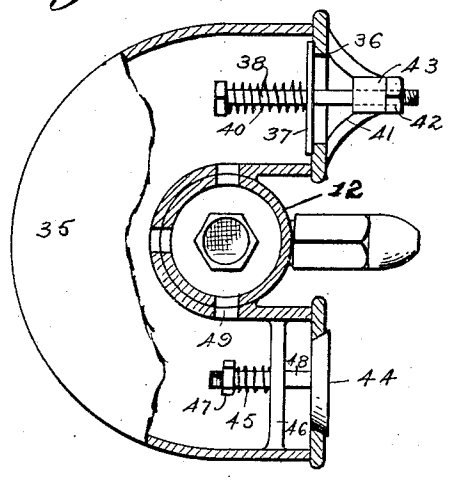


Fig. 3.



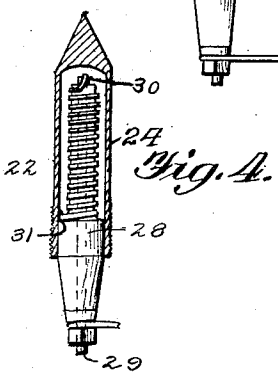


Fig. 4.

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UNITED STATES PATENT OFFICE.

VIRGIL C. ANDERSON, OF SEATTLE, WASHINGTON, ASSIGNOR TO FEDERAL GENERATOR ASSOCIATION, OF SEATTLE, WASHINGTON.

VAPORIZER.

Application filed May 19, 1922, Serial No. 562,184. Renewed May 11, 1923.

To all whom it may concern:

Be it known that I, VIRGIL C. ANDERSON, a citizen of the United States, and residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Vaporizers, of which the following is a specification.

This invention is directed to a fuel vaporizer for internal combustion engines, wherein there is provided a fuel flow control means, which is interiorly heated, and passed which the fuel is directed in a thin encircling film, to thereby insure a complete vaporization of the fuel.

The vaporizer as a whole is distinguished in this class of devices in that the usual float, float chamber, and needle valve for controlling the admission of fuel to the float chamber, are entirely dispensed with, and the flow of fuel through the vaporizer induced entirely by the suction of the engine, and controlled entirely by a manually adjustable needle valve, which is interiorly heated, and which is so arranged as to compel a flow of the fuel in a thin film about and lengthwise of said needle valve, in any and all positions of the needle valve.

The vaporizer of this invention includes a body formed with a fuel passage and a cup of relatively small interior dimensions, which is freely open to the main fuel supply, the cup adjustably supporting the needle valve which cooperates with the passage in the body to regulate the flow of fuel passing said valve. The needle valve is interiorly heated so that the fuel is vaporized during its travel through the needle valve.

The vaporizer also includes a mixing chamber arranged beyond the body and having adjustably secured thereto an annular angularly related chamber, with its respective ends controlled by an inwardly opening air admission valve and an outwardly opening explosion relief valve. This chamber has a series of communications with the mixing chamber, and the annular chamber as a whole is mounted for relative rotation with relation to the mixing chamber to thereby adjust the size of said communications, to regulate the air supply.

In the drawings:

Fig. 1 is a view in front elevation of the improved vaporizer.

Fig. 2 is a vertical section partly in elevation of the same.

Fig. 3 is a transverse section on line 3—3 of Fig. 2.

Fig. 4 is a longitudinal section of the needle valve, illustrating particularly the heating means therefor.

The improved fuel vaporizer comprises a body 1, preferably but not necessarily of solid form, in which opening through the lower end is formed a central circular bore 2 of conical form at the upper end as at 3, to provide a valve seat, this lower passage communicating through a restricted channel 4 with an upper circular bore 5 opening through the upper end of the body and formed at its lower end, adjacent and in communication with the restricted channel 4, with a conical valve seat 6.

The lower end of the body 1 is diametrically reduced to provide an exteriorly threaded extension 7, on which is removably secured a cup member 8. The member 8, which may be secured to the body with an interposed sealing gasket 9 to prevent leakage, has a diameter substantially equal to the maximum diameter of the body, and the bottom of the cup member is arranged below the bottom of the body to thereby provide a fuel chamber 10, which however merely serves the function of a fuel well, being of comparatively small dimensions. The fuel supply pipe 11, with or without a check valve as desired, which leads directly from the storage supply, as the main fuel tank or vacuum tank, which ever system is used, is directly and removably connected to the cup member 8, to thereby establish open communication between the main fuel supply and the well 10.

Immediately above the line of the restricted channel 4, the body is slightly reduced diametrically and threaded to receive what may be termed the mixing chamber. This mixing chamber is in the form of a sleeve member 12 removably secured upon the body and having an exterior diameter corresponding to that of the body. This sleeve 12 in addition to forming the mixing chamber is extended beyond the mixing chamber area and appropriately curved, being terminally provided with the usual flange 13 whereby the vaporizer as a whole may be secured to the engine or to the intake manifold, as the case may be. The usual butter-

fly valve 14 is mounted in this sleeve extension beyond the mixing chamber, for the usual purpose.

The upper end of the body 1 is materially reduced in diameter providing an exteriorly threaded wall 15 surrounding the central bore 5, said body being of conical formation from said wall 15 to the inner surface of the mixing chamber, as at 16. A diffuser 17, preferably in the form of a nut, is threaded upon the wall 15, the interior opening 18 of which support is bridged by a diffusing element as an appropriate metal screen 19. A valve 20 is arranged to cooperate with the seat 6, this valve opening in the upper direction under the suction of the engine against the tension of a comparatively light spring 21. The important detail of the present invention resides in what will be hereinafter termed a needle valve indicated generally as 22, which comprises a metallic body having an upper conical valve end 23, adapted to cooperate with the valve seat 3, and a cylindrical body 24 having a diameter slightly less than that of the bore 2 in the body. The needle valve is threaded at 25 through the bottom wall of the cup member and is provided beyond the cup member with the usual limiting nut 26 and lock nut 27, whereby the needle valve when adjusted is rigidly held to said adjustment. The needle valve is of hollow construction to receive an insulating section 28 through which extends a metallic conductor 29. The inner end of this conductor 29 is connected to one terminal of a wire 30 adapted to be coiled about the insulating section 28 and connected at its opposite terminal at 31 to the exterior metallic shell of the needle valve. The conductor 29 is connected through an external lead 32 and a switch 33, which may be located convenient to the driver, wtih the usual storage battery 34, so that upon closing the switch, the needel valve will become heated.

It is of course apparent that in the adjustment of the needle valve to or from its seat 3, the passage of vapor through the restricted channel 4 may be controlled at will, but it is to be particularly noted that the restricted annular area formed throughout the length of that portion of the needle valve within the bore 2, remains constant in all adjustments of the needle valve, so that under the suction of the engine, there is a thin film of liquid fuel brought into contact with the heated needle valve to insure the necessary vaporization.

Combined with and forming an essential part of the vaporizer described, is an air inlet and control means. This means is here shown as a cylindrical partly annular casing 35, arranged as a body to partly encircle the mixing chamber with the inner wall of such casing bearing for limited rotative movement on the exterior wall of the mixing chamber. The ends of the casing 35, which are approximately in the same plane transverse the vaporizer, are provided with air inlet means and back fire exit means. For example, one such end is formed with an air inlet opening 36 controlled by a disc valve 37 slidably mounted upon a rod 38 and normally held closed by a spring 40. The disc valve 37 opens inwardly being guided by a web 41, the rod 38 being adjustable exteriorly of the casing by means of a nut 42 cooperating with a sleeve 43 supported on the casing and through which the rod 38 passes. The normal spring pressure on the disc valve 37 may be thus adjusted for obvious purposes. The opposite end of the casing is provided with an outwardly opening valve 44 held in normally closed position by a spring 45 bearing between a transverse web 46 and a nut 47 on the valve stem 48. This valve yields under any internal pressure in the casing, as for example, a back fire, to permit the escape of such without damage.

The inner wall of the casing 35, and the wall of the mixing chamber, are formed at appropriate points with openings 49, which when in register, provide a means of communication between the air casing and mixing chamber. The air admitted through these openings is partly directed through an opening 50 formed in the wall of the body leading to the bore 5 below the diffuser, the admitted air being further directed in part around the diffuser support and mixing with the vapor above said diffuser. The air is thus permitted to mix with the vapor at two distinct points, tending to a more effective intermixing.

As previously stated, the air casing is mounted for limited rotative adjustment on the mixing chamber, so that thereby the relative size of the inter-communication between the air casing and mixing chamber can be controlled by regulating the degree of registration between the respective sets of openings 49.

The mixing chamber is also provided with an additional automatic control inlet for air, including a tubular member 51 having an entrant opening 52 governed by an inwardly acting spring pressed ball valve 53. The member 51 is removably connected upon a threaded extension 54 extending from the mixing chamber between the ends of the air casing, the wall of the mixing chamber having an opening 55 through which air is admitted from the tubular member 51.

The vaporizer as a whole dispenses entirely with the usual float chamber, float, and the inlet needle valve control for such chamber. These parts are the source of annoyance and irregular operation as the float is subjected to vibrations incident to the jar-

ring of the vehicle in travel, and hence the supply in the float chamber is sufficiently irregular to interfere with the proper supply to the cylinders. The vaporizer herein described contemplates no control to the supply between the main tank and throttle valve except through the needle valve and cut off 20, or in other words, the engine supply is drawn directly from the main supply through the suction of the engine. The liquid fuel in its passage passed the cylindrical portion of the needle valve is forced into a thin encircling film, and as the metallic needle valve is heated, the fuel is readily, quickly, and uniformly vaporized. Thus the suction of the engine draws the liquid fuel up into this thin film area to the point where the heat of the needle valve vaporizes such fuel. The cut off 20 merely serves as a check when the engine is not operating. The air supply is automatic, though capable of regulation. The various parts of the device are readily and conveniently separable for repair or replacement.

Claims:

1. A vaporizer for internal combustion engines, including a fuel well, a needle valve for controlling the flow of fuel therefrom, a mixing chamber arranged above the needle valve, means for heating said needle valve, a cut off arranged above the needle valve, an annular air casing surrounding the mixing chamber and having adjustable communication therewith, an inwardly opening valve carried by said chamber, and an outwardly opening valve carried by said chamber.

2. A vaporizer for internal combustion engines, including a body, a heated needle valve operating therein, a cup member removably secured to the lower end of the body, a mixing chamber removably secured to the upper end of the body, said cup member, body, and mixing chamber, being of uniform exterior diameter, and a cylindrical partly annular air casing rotatably mounted on and surrounding the mixing chamber, said air casing being adapted for communication with the mixing chamber.

3. A vaporizer for internal combustion engines, including a body, a heated needle valve operating therein, a cup member removably secured to the lower end of the body, a mixing chamber removably secured to the upper end of the body, said cup member, body, and mixing chamber, being of uniform exterior diameter, a cylindrical partly annular air casing rotatably mounted on and surrounding the mixing chamber, said air casing being arranged for communication with said chamber, and an independent air inlet leading to the mixing chamber.

4. A vaporizer for internal combustion engines, including a body formed with a restricted fuel passage, a valve seat below the passage, a valve seat above the passage, and a longitudinal bore extending from the lower valve seat, a well removably secured on the lower end of the body, a needle valve adjustably mounted in the wall of the well, means for heating the needle valve, said needle valve extending through the longitudinal bore and cooperating with the lower valve seat, an upwardly opening valve cooperating with the upper valve seat, and a diffuser removably connected to the body and arranged beyond the upper open end thereof.

5. A vaporizer for internal combustion engines, including a body formed interiorly with a restricted fuel passage, a valve seat below the passage, a valve seat above the passage, and longitudinal bores opening through the respective ends of the body beyond the valve seats, a well removably secured on the lower end of the body, a mixing chamber removably secured on the upper end of the body, valves cooperating with the respective valve seats, means for heating one of said valves, a diffuser removably secured upon the upper end of the body, an air inlet casing surrounding and having communication with the mixing chamber, the wall of the bore above the upper valve seat in the body being formed with an air inlet opening disposed below the diffuser, and means for delivering fuel to the well.

6. A vaporizer for internal combustion engines, comprising a body formed with a fuel channel, a heated element defining with the body a restricted fuel space leading to the channel, said heated element being operative to regulate the flow of fuel from said restricted fuel space to the channel, and normally closed means adapted to open under engine suction to control the flow from said channel.

7. A vaporizer for internal combustion engines, comprising a body formed with a fuel channel, a manually adjustable needle valve controlling the flow to said channel, means for heating said valve to vaporize the fuel passing thereby, and normally closed means adapted to open under engine suction to control the flow from said channel.

8. A vaporizer for internal combustion engines, comprising a body formed with a fuel channel, valves at opposite ends of said channel, one of said valves being manually adjustable and the other of said values being opened by engine suction, and means for heating one of said valves to vaporize the fuel passing thereby.

9. A vaporizer for internal combustion engines, comprising a body formed with a longitudinal bore, and a restricted channel at one end of said bore, a needle valve adjustable in the bore and controlling the flow to said channel, said bore defining a narrow

fuel passage surrounding the needle valve and remaining constantly uniform in all positions of the needle valve, and a cut-off responsive to engine suction to control the flow from said restricted channel.

10. A vaporizer for internal combustion engines, comprising a body formed with a longitudinal bore, and a restricted channel leading from the bore, said body above said restricted channel being formed with an upper circular bore of greater diameter than the channel, a needle valve operating in the longitudinal bore and manually adjustable to control one end of the channel, means for heating said needle valve to vaporize the fuel passing thereby, a cut-off cooperating with the opposite end of the channel and adapted to be opened under engine suction, and air admission means mounted on the body and communicating with the upper circular bore above the cut-off.

In testimony whereof I affix my signature.

VIRGIL C. ANDERSON.