Jan. 12, 1937. G. E. PICKUP 2,067,412

LIQUID FUEL STOVE

Filed June 2, 1932

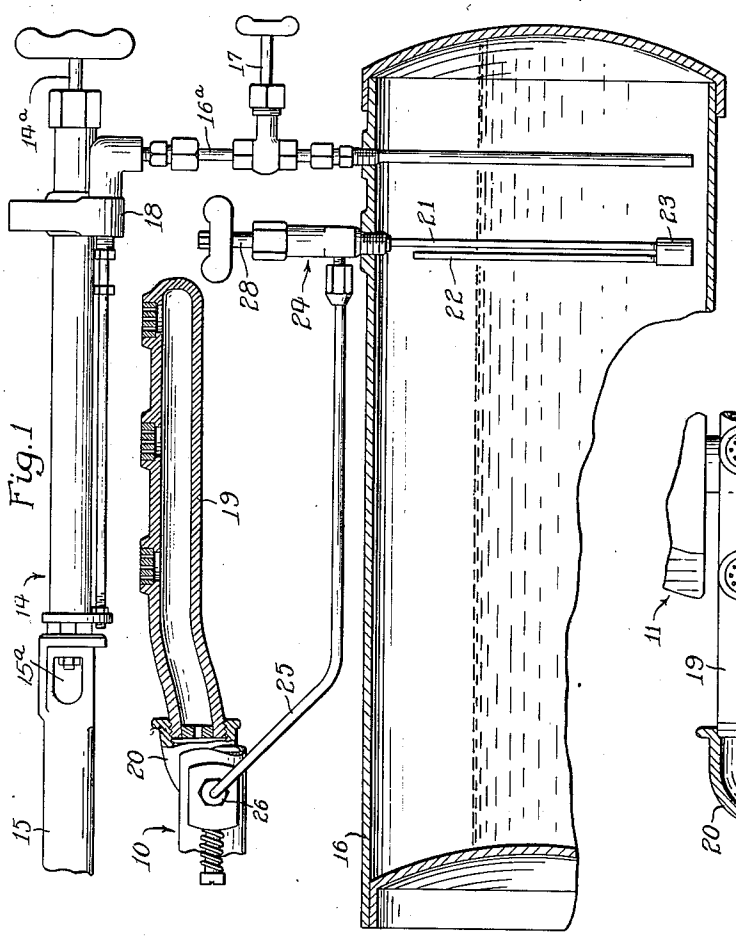


Fig. 1

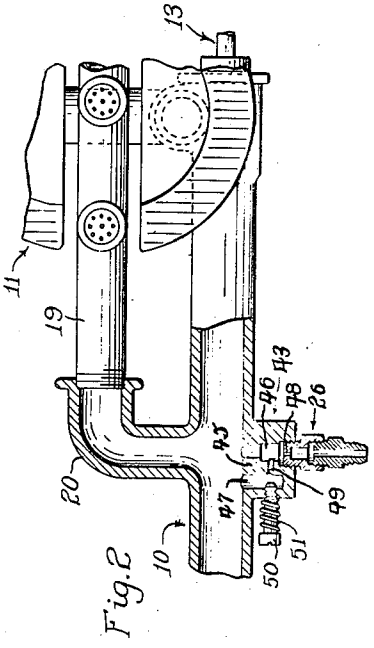


Fig. 2

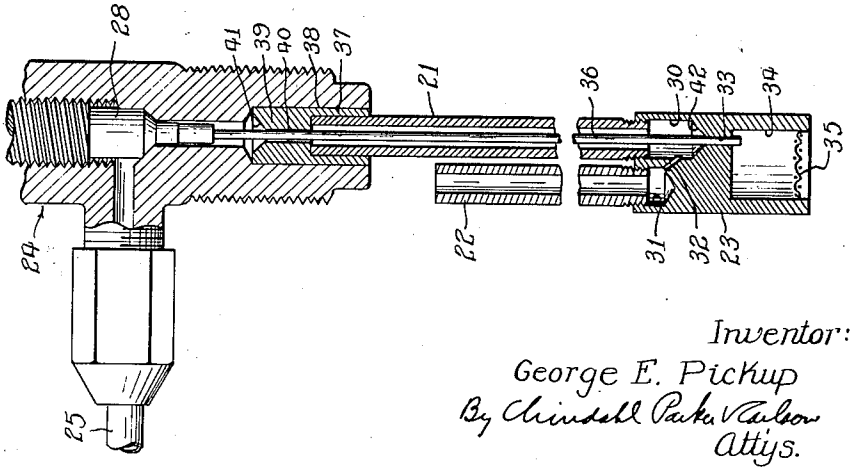


Fig. 3

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Patented Jan. 12, 1937 2,067,412

UNITED STATES PATENT OFFICE

2,067,412

LIQUID FUEL STOVE

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Application June 2, 1932, Serial No. 614,901

12 Claims. (Cl. 158—81)

The invention relates generally to liquid fuel stoves wherein the liquid fuel is fed to the generator by air pressure in the fuel tank, and more particularly the invention relates to pregenerating means for such stoves wherein a mixture of air and fuel vapor, supplied for a limited period of time and solely for starting purposes to the pregenerator burner, is taken from the top of the fuel supply tank.

The primary object of the invention is to provide such a fuel feeding and generating system embodying new and improved means for mixing the fuel vapor taken from the top of the supply tank with the proper proportion of air before it is conducted to the generator burner whereby more efficient combustion of the vapor is obtained and the pressure drop in the fuel supply tank during the pre-generation is materially reduced.

A further object of the invention is to provide a new and improved fuel feeding and generating system, in which air and fuel vapor are taken from the top of the tank and passed through a body of liquid fuel and then by novel means thoroughly mixed with secondary air to insure vaporization of any liquid fuel entrained therein and to produce a highly combustible and efficient fuel mixture for the pre-generating operation.

Another object is to provide a fuel supply device of this character which may be easily and economically constructed with a minimum amount of material, and which is efficient in operation.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawing which illustrates a preferred embodiment of the invention and in which:

Figure 1 is a fragmental elevational view taken partially in vertical section showing the fuel supply means of a liquid fuel stove embodying the features of the invention.

Fig. 2 is a fragmental plan view of a portion of the fuel supply means shown in Fig. 1.

Fig. 3 is an enlarged fragmental view of a fitting which comprises a portion of the fuel supply means.

In the form illustrated herein, the improved starter or pregenerator is used to initiate the operation of a burner system of a cooking stove having a manifold 10 arranged to conduct a mixture of gasified fuel and air to a plurality of cooking burners 11 (only one shown) under the control of suitable valves 13. The gasified fuel for the burners is supplied by a generator in the form of a tube 14 (Fig. 1) which discharges under the control of a valve 14a into an air mixer 15 connected to the manifold and having air inlets 15a. Liquid fuel from a closed supply tank 16 is fed by means of air pressure through a pipe 16a to the generator 14 under the control of a valve 17 (Fig. 1), and if desired, the passage of fuel may also be governed by a thermostatically operated valve (not shown) housed in a fitting 18 which forms the support for the forward end of the generator tube 14. Underlying the generator tube 14 and parallel thereto, is a generator burner 19 (Figs. 1 and 2) of elongated form which is preferably in constant communication with the manifold through an L-shaped conduit 20 (Fig. 2) formed on the manifold.

The starter or pregenerating means preferably utilizes the generator burner 19 and this burner is therefore initially supplied with a highly combustible mixture of air and fuel vapor. To supply such a mixture of air and fuel vapor, the air pressure within the tank 16 is preferably employed and to this end a valve controlled connection or passage is provided leading from the air space in the top of the tank 16 to the generator burner 19. This passage is formed by parallel tubes 21 and 22 and a connecter 23 within the tank 16, a fitting 24 and a pipe 25 connected with the manifold 10 by a discharge nozzle 26. After being discharged from the nozzle 26, the fuel vapor may pass through the elbow 20 to the generator burner 19.

In order to insure that the air taken from the top of the fuel tank will always carry the maximum quantity of fuel vapor, the passage from the tank 16 to the generator burner 19 is preferably of such a character that the air moving therethrough during the pregenerating operation will be conducted past or through a body of liquid fuel so that due to intimate contact with the liquid fuel, the air will become heavily laden with fuel vapor.

To this end the parallel tubes 21 and 22 are supported by the valve fitting within the tank 16 and communicate with each other at their lower ends through the connecter 23. The tube 21 is relatively long and is secured in the fitting 24 in alinement with a substantially vertical rotatable valve member 28, and the tube 21 serves to support the tube 22 through the medium of the connecting member 23. The connecting member 23 is preferably in the form of a cylindrical block having parallel screw threaded bores 30 and 31 extending into the upper end thereof

to receive the screw threaded lower ends of the tubes 21 and 22. Communication between the two tubes 21 and 22 is permitted by an angularly positioned bore 32 formed in the connecting member 23 between the bores 30 and 31. As will be evident from Fig. 1 of the drawing, the tube 22 terminates short of the top of the tank 16 so as to be positioned above the normal fuel level. Thus air may enter the upper end of the tube 22 and pass downwardly through the bores 31, 32, and 30 and thence upwardly through the tube 21 to the valve 28.

To insure maximum vapor saturation of the air moving through the tubes 21 and 22, provision is made for admission of liquid fuel into the tubes. This end is preferably attained by forming a liquid fuel inlet port 33 in the connecting member 23, the port 33 comprising a bore coaxial with the tube 21 and the bore 30. The port 33 communicates with a chamber 34 formed by counterboring the lower end of the connecting member 23 and the fuel entering the chamber 34 is strained by a screen 35 so as to prevent clogging of the port 33 by particles of foreign matter.

In order that a practical and serviceable drill may be employed in its formation, the port 33 is preferably of a relatively large diameter and a wire 36 is inserted into the port to restrict the effective area thereof. The wire 36 extends upwardly through the tube 21 and is connected to the coaxial valve member 28 so as to be moved in the rotation of the valve member.

The liquid fuel admitted through the port 33 enters the enlarged chamber formed by the bore 30 and the air passing through this bore comes into contact with or passes through the liquid fuel and the vapor content of the air is therefore increased. The air passing downwardly and angularly at high velocity through the restricted bore 32 is projected into or onto the upper surface of the liquid in the chamber formed by the bore 30 whereby to cause agitation of the liquid fuel and thorough vapor saturation of the air is therefore insured.

Vaporization of mechanically entrained liquid fuel carried upwardly through the tube 21 by the moving air is promoted through the provision of a section of reduced area in the passage. To provide such a reduced section in the passage a sleeve 37, positioned in a bore 38 in the valve fitting 24 in surrounding relation to the upper end of the tube 21, has a head 39 at its upper end through which a relatively small axial bore 40 extends. The wire 36 extends through the bore 40 and reduces the effective area thereof so that liquid fuel which may be entrained in the moving air is forced into intimate contact with the air and is vaporized before passing through the valve fitting.

The upper end of the head 39 is counterbored coaxially with the opening 40 to provide a sloping surface 41 which guides the wire 36 into the opening 40 in the assembly of the device. The lower end of the bore 30 in the connecting member 23 is provided with a similar sloping surface 42 to guide the wire into the port 33.

To provide for the most efficient utilization of the vapor and entrained liquid fuel carried to the nozzle 26, means is provided for thoroughly and intimately mixing secondary air from the manifold with the vapor before it reaches the generator burner 19. For this purpose the manifold 10 has a small housing 43 projecting therefrom having a transverse web 45 forming in the housing an elongated mixing chamber 46 and a parallel elongated chamber 47 both opening into the manifold 10. Into the chamber 46 the nozzle 26 is screw threaded so that vapor or liquid fuel discharged from the restricted opening 48 of the nozzle will be projected along the web 45 and past an opening 49 formed in the web. The passage of the vapor across the opening 49 serves to draw air from the manifold into the chamber 47 and through the opening 49 so that the proper proportion of fuel gas and air is provided for obtaining the maximum amount of heat from the vapor. Such additional air also serves to vaporize any liquid fuel which may be entrained with the vapor. In order that the combustible mixture thus produced may be utilized with the greatest efficiency, the chamber 46 of the housing 43 is positioned directly opposite the open end of the L-shaped conduit 20 leading to the generator burner 19.

The amount of air thus mixed with the vapor may be controlled by means of a screw 50 which extends through the wall of the housing through the chamber 47 and in alinement with the opening 49. Thus the screw may be adusted toward and away from the opening 49 to vary the effective area thereof and the screw 50 is held in adjusted position by an expansive spring 51 surrounding the screw and acting between the housing and the screw head.

The provision of a secondary air supply from the manifold, taken in connection with the vapor supply passage leading past or through a body of liquid fuel, has been found to eliminate pulsations in the flow of fuel during the pregenerating operation, so that a steady and efficient flame is produced which materially reduces the time required for the pregenerating operation.

The form and construction of the fitting and its associated tubes is also of advantage since accuracy is easily obtained in the various ports in a construction which requires less material than prior devices. Thorough and intimate mixture of the air with the liquid is insured and a maximum vapor content is obtained in the air passing from the tank.

This application constitutes a continuation in part of my prior application Ser. No. 418,467 filed January 4, 1930 and my prior application Serial No. 401,071 filed October 21, 1929.

I claim as my invention:

1. A fuel supply device for a liquid fuel stove starter, said device comprising a valve fitting having a passage therethrough and adapted to be secured in the top of a liquid fuel tank, a first tube communicating with said passage and projecting downwardly from said fitting, a second tube located beside said first tube and terminating short of the upper end of said first tube, a connecter joining and providing for communication between the lower ends of said tubes, said connecter having a bore therethrough alined with said first tube, a wire in said bore to reduce its effective area, and means in said fitting above said first tube cooperating with said wire to provide a section of reduced area in said passage.

2. A starter for liquid fuel stoves having a generator, a burner for heating the same and a fuel tank adapted to contain liquid fuel under pressure, said starter comprising means forming a passage from the upper part of said tank to said burner, said passage including a valve fitting secured to the top of said tank, a tube extending downwardly from said fitting into said tank and to a point below the normal fuel level therein, a fitting connected to the lower end of said tube

below the normal fuel level and providing an enlarged chamber the upper end of which opens into the lower end of said tube, said fitting defining at the lower end of said chamber an opening through which liquid fuel may pass to said chamber, and a second tube connected to said fitting and communicating at its upper end with the air space in the upper part of said tank, said fitting having a second chamber communicating with the lower end of the second tube and having a fine bore projecting downwardly from said second chamber to the first chamber and operative to cause a discharge of air in the form of a jet from the top of the tank into said first chamber.

3. In a liquid fuel stove, having a manifold, a generator discharging into said manifold, a burner for heating the generator connected with the manifold and a fuel tank adapted to contain liquid fuel under pressure, a starter for the stove comprising means forming a passage from the upper part of the tank to the burner, said means including a fitting defining a chamber forming part of the passage and located below the normal fuel level in the tank, said fitting having an opening through which liquid fuel may pass into said chamber and a fine downwardly sloping bore also forming part of the passage and arranged to cause the vapor from the top of the tank to discharge in the form of a jet into said chamber, and a housing on the manifold having two elongated chambers connecting with the interior of the manifold, said passage discharging into one of said chambers, and an aperture connecting said chambers through which air may be drawn and mixed with the vapor.

4. In a liquid fuel stove, the combination of a tank adapted to contain liquid fuel under pressure, a manifold, a generator tube connected to said tank to receive liquid fuel therefrom and arranged to discharge gasified fuel into said manifold, a cooking burner arranged to receive fuel from said manifold, a generator burner of elongated form disposed beneath said generator tube to extend longitudinally thereof and having a supply conduit opening into one side of said manifold, and means for supplying fuel in vapor form from said tank to said manifold at a point opposite said supply conduit of said generator burner, said means being operable to effect an intimate mixture of said vapor with the air in said manifold adjacent said point and to discharge the resulting mixture across said manifold and into said conduit.

5. In a fuel feeding and generating system for a liquid fuel stove, the combination of a fuel supply tank adapted to contain liquid fuel under pressure, a manifold, a generator arranged to discharge gaseous fuel into said manifold, a plurality of burners arranged to receive fuel gas from said manifold, one of said burners being positioned adjacent said generator to heat the same, a pipe for conducting liquid fuel to said generator from said tank, means forming an elongated mixing chamber communicating with said manifold, and a pipe communicating with said tank above the normal liquid fuel level therein and operative to discharge a stream of vapor into said chamber, one wall of said chamber having an opening therein through which air may be drawn by said vapor to be mixed therewith before it passes into said manifold.

6. In a fuel feeding and generating system for a liquid fuel stove, the combination of a fuel supply tank adapted to contain liquid fuel under pressure, a manifold, a generator arranged to discharge gaseous fuel into said manifold, a plurality of burners arranged to receive fuel gas from said manifold, one of said burners being positioned adjacent said generator to heat the same, means for conducting liquid fuel to said generator from said tank, a housing on the side of and opening into said manifold, a pipe having one end connected to said fuel tank above the normal fuel level therein so as to receive fuel vapor from the tank and its other end being connected to the outer end of said housing so as to discharge vapor from said tank through said housing and into said manifold transversely thereof, said housing having an opening therein through which air may be drawn to be mixed with said vapor, and a conduit connected to said generator burner and to said manifold directly opposite said housing to receive said vapor and air and conduct it to said burner.

7. In a fuel feeding and generating system for a liquid fuel stove, the combination of a fuel supply tank adapted to contain liquid fuel under pressure, a manifold, a generator arranged to discharge gaseous fuel into said manifold, a plurality of burners arranged to receive fuel gas from said manifold, one of said burners being positioned adjacent said generator to heat the same, means for conducting liquid fuel to said generator from said tank, a housing on the side of and opening into said manifold, said housing having a wall therein to divide the housing into two chambers both of which communicate with the manifold, a pipe having one end communicating with the tank above the normal liquid fuel level therein, the other end of said pipe being connected to said housing so as to discharge vapor into one chamber of said housing along said division wall, said division wall having an aperture therein through which air may be drawn from the other of said chambers to be mixed with said vapor, and a screw extending through the side of said housing with its inner end adjacent said aperture, said screw being adjustable to vary the effective size of said aperture.

8. In a fuel feeding and generating system for a liquid fuel stove, the combination of a fuel supply tank adapted to contain liquid fuel under pressure, a manifold, a generator arranged to discharge gaseous fuel into said manifold, a plurality of burners arranged to receive fuel gas from said manifold, one of said burners being positioned adjacent said generator to heat the same, means for conducting liquid fuel to said generator from said tank, a housing on the side of and opening into said manifold, said housing having a wall therein to divide the housing into two chambers both of which communicate with the manifold, and a pipe having one end communicating with the tank above the normal liquid fuel level therein, the other end of said pipe being connected to said housing so as to discharge vapor into one chamber of said housing along said division wall, said division wall having an aperture therein through which air may be drawn from the other of said chambers to be mixed with said vapor.

9. In a fuel feeding and generating system for a liquid fuel stove, the combination of a fuel supply tank adapted to contain liquid fuel under pressure, a manifold, a generator arranged to discharge gaseous fuel into said manifold, a plurality of burners arranged to receive fuel gas from said manifold, one of said burners being positioned adjacent said generator to heat the same, means for conducting liquid fuel to said

generator from said tank, means for conducting vapor from the upper part of said tank to said manifold for the purpose or pre-generation and means associated with the last mentioned means and operative to mix additional air with said vapor as it is discharged into said manifold to provide a more combustible fuel mixture.

10. In a fuel feeding and generating system for a liquid fuel stove, the combination of a fuel supply tank adapted to contain liquid fuel under pressure, a manifold, a generator arranged to discharge gaseous fuel into said manifold, a plurality of burners arranged to receive fuel gas from said manifold, one of said burners being positioned adjacent said generator to heat the same, means for conducting liquid fuel to said generator from said tank, means forming a passage for conducting vapor from the upper part of said tank to said manifold, and means associated with said passage for introducing additional air into said vapor before it passes into said manifold, said means being adjustable so that the quantity of air introduced may be varied.

11. In a fuel feeding and generating system for a liquid fuel stove, the combination of a fuel supply tank adapted to contain liquid fuel under pressure, a manifold, a generator arranged to discharge gaseous fuel into said manifold, a plurality of burners communicating with said manifold to receive fuel gas therefrom, one of said burners being positioned adjacent said generator to heat the same, means for conducting liquid fuel to said generator from said tank, means forming a passage for conducting vapor from the upper part of said tank to said manifold for the purpose of pre-generation, a portion of said passage between its ends being positioned to extend into the fuel in the tank and having an opening for receiving a quantity of fuel through which said vapor must pass in traveling through said passage, said passage discharging into said manifold opposite the point of communication with the one of said burners positioned to heat said generator, and means located at the point of discharge of the vapor into said manifold and operative to agitate and to mix additional air with the vapor as it is discharged to provide a more combustible fuel mixture.

12. In a fuel feeding and burner system for liquid fuel stoves and the like, the combination of a liquid fuel supply tank for containing liquid fuel under pressure, a burner, means for delivering air and vaporous fuel mixture to said burner, for starting the same, leading from the top of the tank into communication with the burner and including a valve fitting secured to the top of said tank, a tube extending downwardly from said fitting into said tank to a point below the normal fuel level therein, a mixer fitting connected to the lower end of said tube and having a pair of separate chambers one of which opens at its upper end into the lower end of said tube and has an opening of small flow capacity communicating through the mixer fitting to permit passage of fuel into said one chamber, a second tube connected at its lower end to the mixer fitting to communicate with the second chamber and at its upper end communicating with the air space above the fuel level in the upper part of said tank, said mixer fitting having a passage of smaller diameter than the passages in either of said tubes connecting said chambers to cause air which is directed by said second tube into said second chamber to be discharged into said one chamber in the form of a jet to agitate the liquid fuel in the latter chamber to cause fuel to be entrained in the air, and means beyond the upper end of said first mentioned tube for effecting further atomization of the fuel to prepare the air and fuel mixture for efficient combustion.

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