

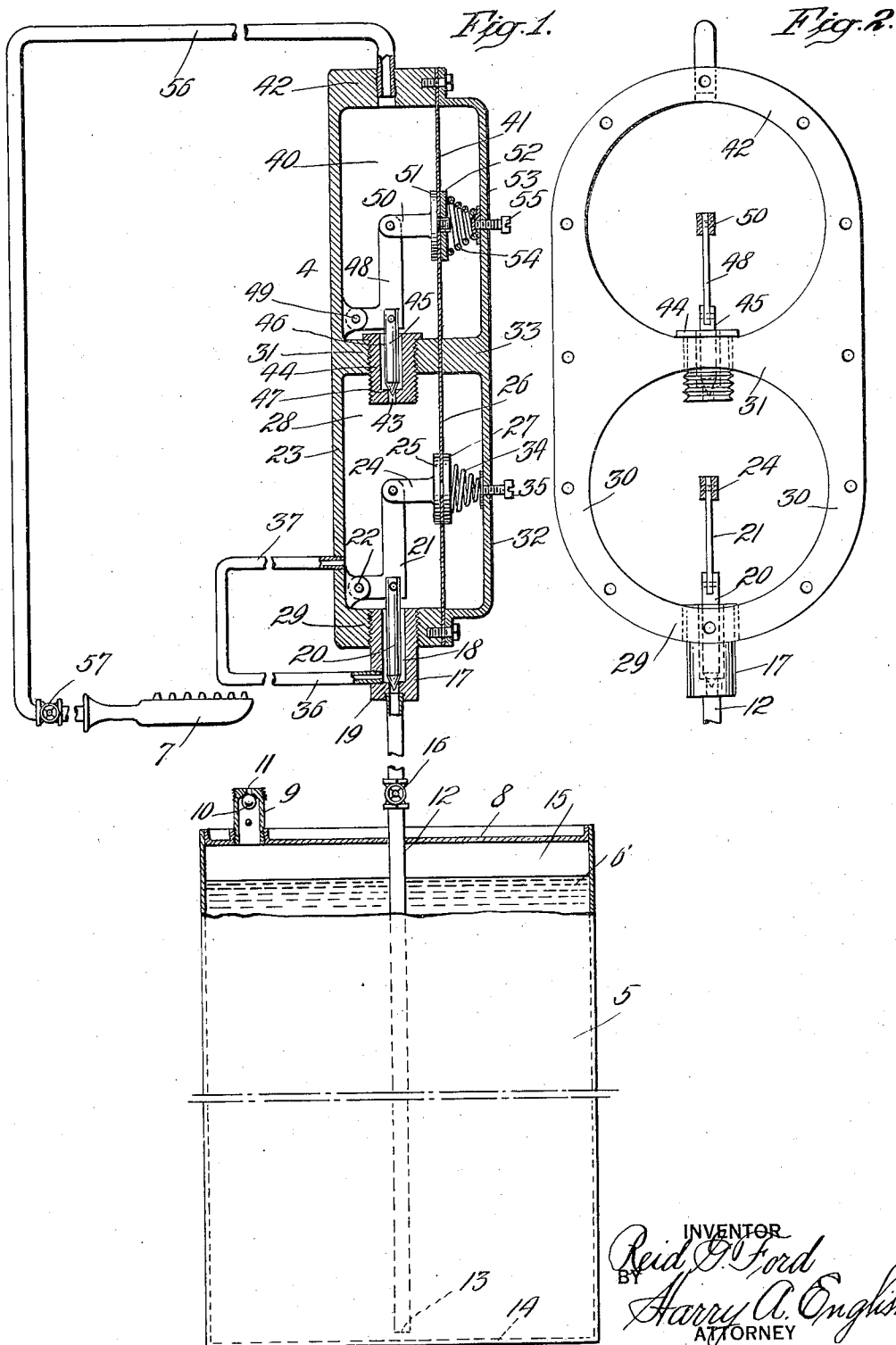
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APPARATUS FOR PREPARING HYDROCARBON MIXTURES FOR COMBUSTION

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APPARATUS FOR PREPARING HYDROCARBON MIXTURES FOR COMBUSTION

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The invention relates to an improvement in apparatus for preparing hydrocarbon mixtures for combustion. By the term "hydrocarbon mixtures" is meant those hydrocarbons of which the ingredients are of different degrees of volatility.

The general object of the present invention is to improve upon the construction and operation of apparatus for preparing mixed liquid hydrocarbons for combustion whereby such hydrocarbons may be burned in stoves adapted for burning manufactured or natural gas without in any manner altering the construction or mode of operation of such stoves. A specific object of the invention is to produce an apparatus of this character which will deliver to the stove a steady stream of thoroughly mixed gases at a substantially uniform pressure, whereby the flame at the burners will be of substantially uniform size and intensity, irrespective of the number of burners in operation. Another object of the invention is to simplify the construction and arrangement of such apparatus to make it more compact and smaller and cheaper to manufacture and maintain in operation. These and other objects of the invention which will appear as the description proceeds are accomplished in the improved apparatus for preparing hydrocarbon mixtures for combustion hereinafter fully described and particularly pointed out in the appended claims.

In the accompanying drawings illustrating the preferred form of the invention, Fig. 1 is a vertical, longitudinal section through the improved apparatus and showing it connected with the burner of a standard gas stove and with a tank for containing the supply of liquid hydrocarbon mixture; and Fig. 2 is a front elevation of the apparatus with the cover and diaphragms removed and with the parts connected with the diaphragms shown in section.

As illustrated in the drawings the improved apparatus for preparing hydrocarbon mixtures for combustion comprises a casing generally indicated at 4 which is connected with a tank 5 for containing the supply of liquid hydrocarbon mixture 6 and with a burner 7 of usual construction adapted to

burn gas. The tank 6 is a closed receptacle provided at its top end 8 with a filling inlet 9 controlled by a ball check valve 10. When the tank 5 has been filled almost to its top end 8 with the liquid hydrocarbon mixture and the hose or other filling fitting connected with the inlet 9 removed, the liquid immediately begins to gasify and as the gas accumulates in the space in the top of the tank its pressure is soon sufficient to force the ball 10 against and close the opening 11 in the inlet 9. The liquid hydrocarbon is drawn from the tank 5 by a vertically arranged pipe 12 the open lower end 13 of which is arranged relatively close to the bottom 14 of the tank so that no heavy ends are permitted to accumulate in the bottom of the tank. The vapor tension generated in the space 15 is sufficient to force the liquid hydrocarbon upwardly through the pipe 12. A valve 16 is located in the pipe 12 to control the passage-way therethrough.

At its upper end the pipe 12 is connected with the lower end of a valve casing 17 which is in the form of a nipple screwed into the lower end of the casing 4. The nipple or valve casing 17 is provided with an axial bore 18 and in the lower end of this bore is formed a valve seat 19 against which a needle valve 20, forming part of a reducing valve, is adapted to seat. The needle valve 20 is pivotally connected at its upper end with an arm or lever 21 fulcrumed at 22 on the rear wall 23 of the casing 4. The upper or free end of lever 21 is pivotally connected with the stem 24 of a disk 25 secured to the center of a circular diaphragm 26 by a nut 27. The diaphragm forms the front wall of a chamber 28 of which the rear wall is formed by the lower end of the rear wall 23 of the casing 4 and of which the other walls are formed by the bottom 29, the side walls 30 and the partition 31 of the casing. Interposed between the nut 27 and the lower part 32 of the cover 33 of the casing 4 is a spring 34 the tension of which may be adjusted by a screw 35.

The liquid hydrocarbon mixture which enters the nipple 17 is conducted by a by-pass 36 into close proximity with the burner 7 so

that the heat of the flame will convert the liquid hydrocarbon into gas. It will be understood that some of the liquid hydrocarbon entering the nipple 17 converts immediately into gas and passes upward through the passage 18 into the chamber 28. The spring 34 is adjusted to permit a pressure of about three ounces in the chamber 28. The liquid hydrocarbon in the tank 5 is under about 40 to 50 pounds pressure, consequently the lighter constituents of the mixture pass into the gaseous state on entering the reduced pressure area of the chamber 28 and passage 18. The gas into which the liquid passing through the by-pass 36 is converted by the flame of the burner 7 is conducted by the upper section 37 of the by-pass 36 into the chamber 28. If the liquid hydrocarbon passing through the pipe 36 does not entirely convert into gas and drops or particles of the liquid are entrained in the gas conducted into the chamber 28 these particles of liquid will accumulate in the passage 18 and again be conducted past the burner 7.

The gas which accumulates in the chamber 28 is not supplied directly to the burners. It has been found that such gas contains particles of unconverted liquid hydrocarbon which when entering the area adjacent to the burners converts into gas and causes the flames to expand suddenly. In other words, the gas fed to the burners directly from the expansion area where the liquid hydrocarbon is converted into gas gives a non-uniform and unsteady flame. I overcome this difficulty, which has heretofore proven so objectionable in burning mixed hydrocarbons, by providing an area of dry gas from which the supply for the burners is drawn. For this purpose I provide the dry gas chamber 40 in the upper part of the casing 4. The chamber 40 is formed by the upper part of the rear wall 23 of the casing, by the diaphragm 41, and by the partition 31, the upper parts of the side walls 30 and the top 42 of the casing.

Dry gas in the upper part of the chamber 28 enters the chamber 40 through the opening 43 in a nipple 44 threaded into the partition 31. The opening 43 is controlled by a needle valve 45, forming part of a reducing valve, located vertically in a passage 46 in the nipple 44. The valve 45 seats against an annular valve seat 47 surrounding the opening 43. The upper end of the valve 45 is pivotally connected with an arm or lever 48 fulcrumed at 49 on the upper part of the rear of the casing 4. The upper or free end of the lever is pivotally connected with the outer end of a stem 50 projecting from a disk 51 secured to the center of a circular diaphragm 41 by a nut 52. Interposed between the nut 52 and the upper part 53 of the cover 33 is a spring 54 the tension of which is regulated by the screw 55. The spring 54 is adjusted to permit a pressure of three ounces in the dry gas

chamber 40, this being about the pressure at which manufactured and natural gas is supplied to gas stoves used in domestic service. From the upper part of the chamber 40 the dry gas is conducted to the burner 7 through the pipe 56 in which is located a valve 57.

The mode of operation of the improved apparatus for preparing liquid hydrocarbon mixtures for combustion has been indicated in connection with the description of the construction and arrangement of its parts and is briefly as follows: The chamber 28 being empty, or below the predetermined pressure, the spring 34 moves the diaphragm 26 and unseats the valve 20, upon which the pressure of the gas in the space 15 forces liquid hydrocarbon from the bottom of the tank up through the pipe 12 and into the bore 18 and bypass 36. Under the reduced pressure in the passage 18 some of the liquid, the more volatile constituents thereof, immediately passes into the gaseous state and enters the chamber whereas the liquid remainder flows through the by-pass 36 past the burner 7. (If the apparatus has not yet been used, another source of heat will be applied to the by-pass 36 until gas enters the burner 7.) The chamber 40 being below the predetermined pressure, the gas accumulating in chamber 28 enters chamber 40, whence it is conducted to burner 7. The gas in chamber 40 contains no particles of liquid hydrocarbon and the adjustment of the spring 54 assures the delivery of a constant stream of this dry gas at a uniform pressure to the burner. Hence the burner 7 will give a steady flame. When the flame is turned down or extinguished by manipulating valve 57, the pressure building up in chamber 40 will close valve 45 and in turn the pressure building up in chamber 28 will close valve 20. As the gas in chamber 40 is consumed the tension of the spring 54 will again open valve 45, and as the gas supply in chamber 28 is reduced, valve 20 is again opened to admit liquid hydrocarbon into by-pass 36. It will be understood that this mode of operation is indefinitely repeated while the burners are in use. But whether one or more burners are used, the apparatus quickly adjusts itself to the demand and supplies a steady stream of dry gas at uniform pressure.

Having thus described the invention what I claim as new is:

1. In combination with a supply of liquid hydrocarbon and a gas burner, an apparatus for converting liquid hydrocarbon into gas comprising a chamber, a pipe leading from the supply of liquid hydrocarbon into the chamber, a reducing valve for controlling the passage through the pipe, a by-pass leading from the chamber to a point adjacent to the burner and then back into the chamber, said by-pass serving to conduct liquid hydrocarbon to the point adjacent to the burner and to

conduct the resulting gas into the chamber, a dry gas chamber, a passageway between the two chambers, a reducing valve for controlling the passageway, and a pipe leading from the dry gas chamber to the burner.

5 2. In combination with a supply of liquid hydrocarbon and a gas burner, an apparatus for converting liquid hydrocarbon into gas comprising, a chamber, a pipe leading from
10 the liquid hydrocarbon into the bottom of the chamber, a reducing valve for controlling the passage through the pipe, a by-pass leading from the point at which the pipe enters the chamber to a point adjacent to the burner and
15 then into the chamber at a point above the point where the pipe enters the chamber, said by-pass serving to conduct liquid hydrocarbon to the point adjacent to the burner and to conduct the resulting gas into the chamber,
20 a dry gas chamber located above the first chamber, a passageway between the two chambers, a reducing valve for controlling the passageway, and a pipe leading from the dry gas chamber to the burner.

25 3. In combination with a supply of liquid hydrocarbon and a gas burner, an apparatus for converting liquid hydrocarbon into gas comprising, two chambers, one superposed above the other, a pipe leading from the supply of liquid hydrocarbon into the bottom of
30 the lower chamber, a by-pass for conducting liquid hydrocarbon from the point at which the pipe enters the chamber to a point adjacent to the burner and for conducting the resulting gas into the chamber, a passage-
35 way leading from the top of the lower chamber into the bottom of the upper chamber, a reducing valve for controlling the passage-way, and a pipe leading from the top of the upper chamber to the burner.

40 4. In combination with a supply of liquid hydrocarbon and a gas burner, an apparatus for converting liquid hydrocarbon into gas comprising, two chambers, one superposed above the other, a valve casing having a vertical
45 passageway located in the bottom of the lower chamber, said passageway extending downwardly from the bottom of the chamber, a valve seat in the lower end of the passageway, a valve forming part of a reducing valve
50 adapted to seat against the valve seat, a pipe leading from the supply of liquid hydrocarbon into the lower end of the passageway, through the valve seat, a by-pass leading from
55 the lower end of the passageway to a point adjacent to the burner and then into the lower chamber at a point above the bottom thereof, a valve-controlled passageway leading from the top of the lower chamber into the bottom
60 of the upper chamber, and a pipe leading from the top of the upper chamber to the burner.

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