Feb. 7, 1928. 1,658,582

R. R. WATERMAN

VAPORIZING APPARATUS FOR LIQUID FUELS

Filed April 22, 1926 2 Sheets-Sheet 1

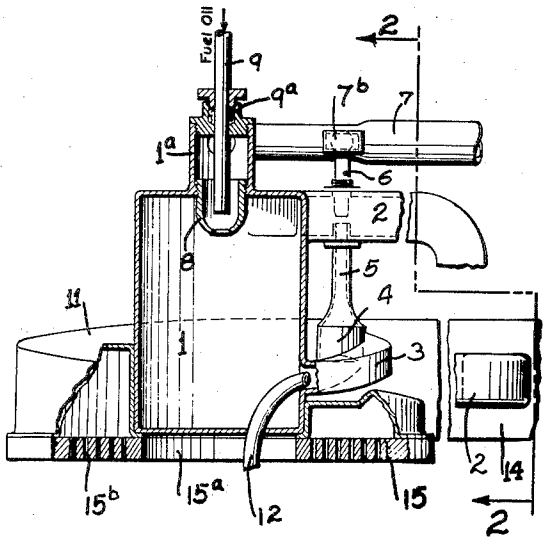


FIG. 3.

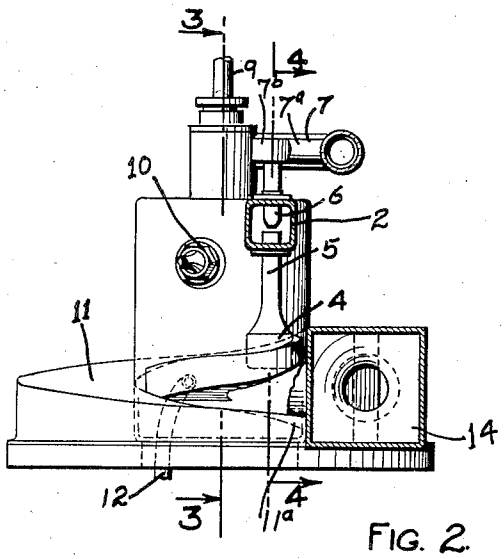


FIG. 2.

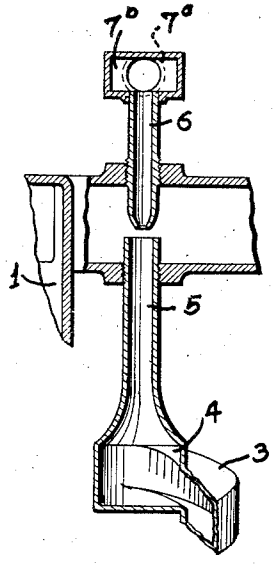


FIG. 4.

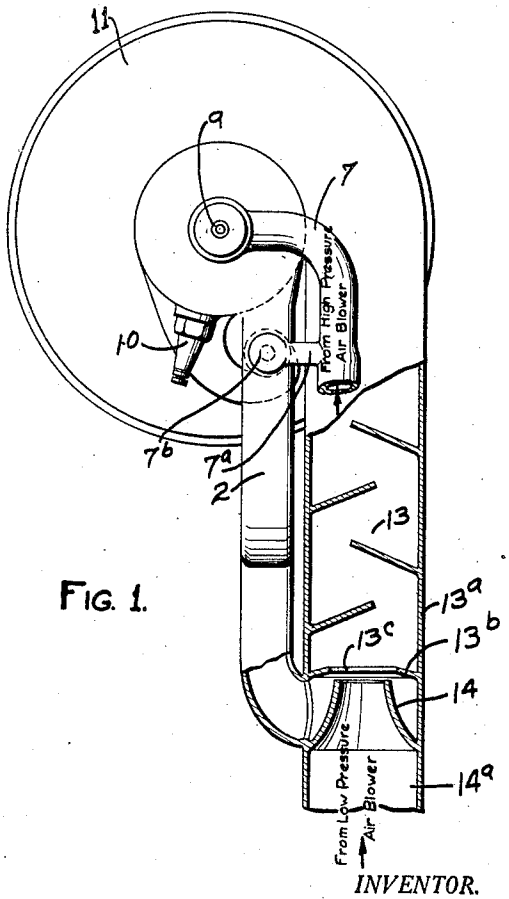


FIG. 1.

INVENTOR.
RUSSELL R. WATERMAN
BY A. B. Bowman
ATTORNEY

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R. R. WATERMAN

VAPORIZING APPARATUS FOR LIQUID FUELS

Filed April 22, 1926 2 Sheets-Sheet 2

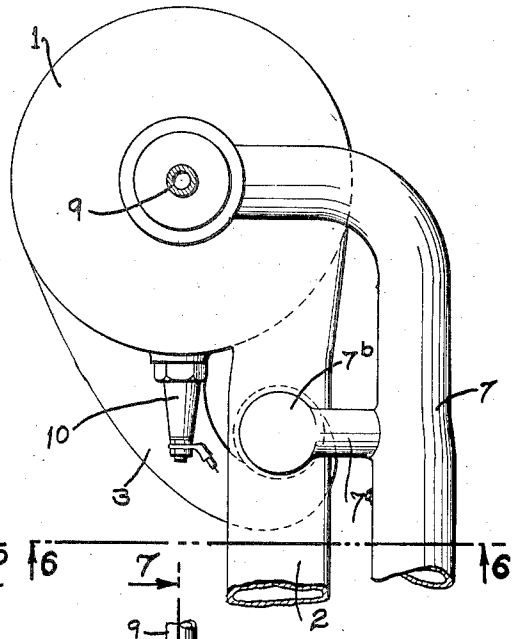


FIG. 5.

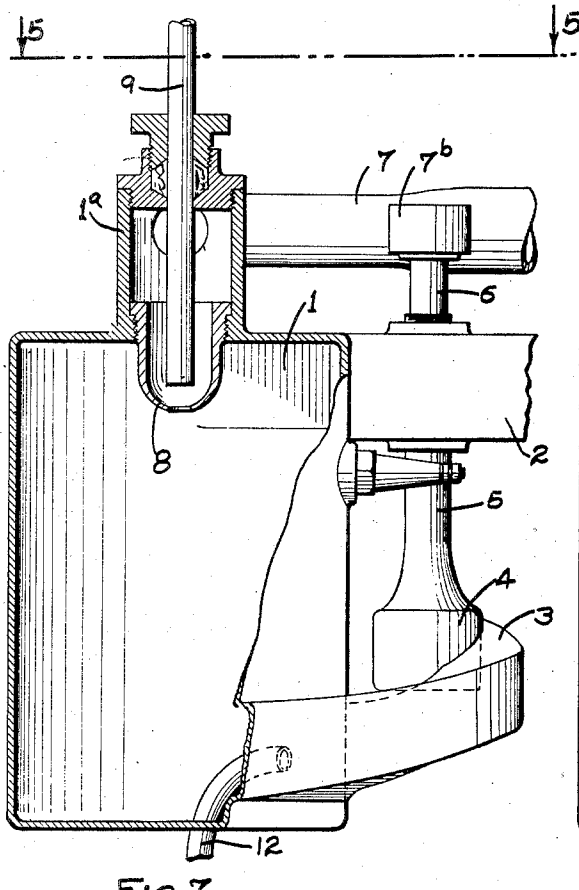


FIG 7

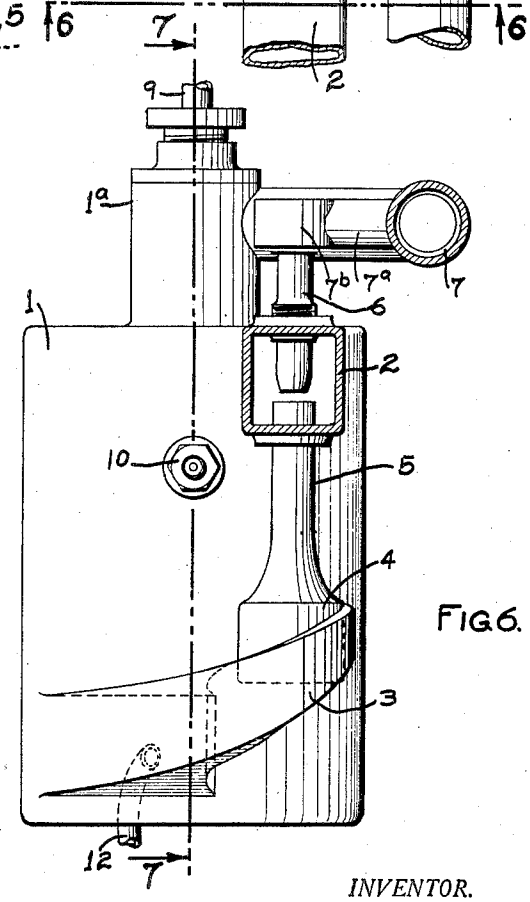


FIG 6.

INVENTOR.
RUSSELL R. WATERMAN
BY A.B. Bowman
ATTORNEY

Patented Feb. 7, 1928. 1,658,582

UNITED STATES PATENT OFFICE.

RUSSELL R. WATERMAN, OF LONG BEACH, CALIFORNIA, ASSIGNOR TO FARMERS' NATIONAL BANK, TRUSTEE, OF GREENVILLE, OHIO, A CORPORATION OF OHIO.

VAPORIZING APPARATUS FOR LIQUID FUELS.

Application filed April 22, 1926. Serial No. 103,811.

My invention relates to vaporizers for vaporizing hydrocarbon fuels, and the objects of my invention are: first, to provide a vaporizer for vaporizing hydrocarbon fuels in which the vaporizing is accomplished by means of the main gases intermingling with the partially or completely burned products of combustion of initially burned fuels; second, to provide a vaporizer of this class in which an initial fuel is vaporized and burned, then intermingled with fresh fuel for vaporizing the fresh fuel in the vaporizer; third, to provide a vaporizer of this class in which the pilot or initial burner is positioned centrally on the main burner; fourth, to provide a vaporizer of this class which is quickly and easily ignited; fifth, to provide a novelly constructed vaporizer of this class; sixth, to provide a novelly constructed combination vaporizer and burner; and, seventh, to provide an apparatus of this class which is very simple and economical of construction, durable, easy to operate, efficient in its action and which will not readily deteriorate or get out of order.

With these and other objects in view as will appear hereinafter, my invention consists of certain novel features of construction, combination and arrangement of parts and portions as will be hereinafter described in detail, and particularly set forth in the appended claims, reference being had to the accompanaying drawings and to the characters of reference thereon which form a part of this application in which:

Figure 1 is a top or plan view of my vaporizer shown in connection with the burner showing some of the parts broken away and in section to facilitate the illustration. Fig. 2 is a side elevational view thereof showing some of the parts broken away and in section through 2—2 of Fig. 3 to facilitate the illustration. Fig. 3 is a sectional view through 3—3 of Fig. 2. Fig. 4 is a fragmentary sectional view on an enlarged scale through 4—4 of Fig. 2. Fig. 5 is a top or plan view on an enlarged scale of a fragmentary portion of the vaporizer separate and apart from the burner and showing a section through 5—5 of Fig. 7. Fig. 6 is a side elevational view thereof with section through 6—6. Fig. 7 is a fragmentary sectional view through 7—7 of Fig. 6.

Similar characters of reference refer to similar parts and portions throughout the several views of the drawings.

The main vaporizing chamber member 1, vaporizing chamber outlet conductor 2, pilot expansion nozzle 3, mixing volute 4, injector tube 5, air nozzle member or injector nozzle 6, high pressure air pipe 7, distributor air nozzle 8, fuel feed conductor 9, ignition plug 10, distributing volute 11, burner lighting tube 12, mixing vane chamber 13, mixing venturi 14 and main burner grating 15 constitute the principal parts and portions of my vaporizer and burner.

The main vaporizer chamber member 1 is a hollow, cylindrical member enclosed at both ends. It is provided on its upper end with an extended housing portion 1^a in which is mounted the distributor air nozzle 8 which extends downwardly into the vaporizing chamber 1 as shown best in Fig. 3 and Fig. 7 of the drawings. Mounted in the upper portion of this housing is a stuffing box 9^a formed around the fuel oil pipe 9. Communicating with one side of this housing 1^a is one end of the high pressure air pipe 7, the other end of which communicates with a blower not shown. Extending from one side of this high pressure air pipe 7 is a branch 7^a which is provided with an enlarged portion 7^b from the center of which is extended downwardly the air nozzle or injector nozzle 6 which passes through the upper wall of the vaporizing chamber outlet conductor 2 and extends downwardly to and near the middle thereof. This vaporizing chamber outlet communicates with the upper end of the vaporizing chamber on one side and its other end communicates with the chamber surrounding the mixing chamber venturi 14 as shown best in Fig. 1 of the drawings. Communicating with the interior of the vaporizing chamber 1 near the lower side is a pilot expansion tube 3 which connects with a mixing volute 4 from which extends upwardly the injector tube 5 which is fitted into the lower side of the outlet tube 2 directly below the air nozzle or injector nozzle 6 and leaving a slight space between the end of said air nozzle and said injector tube 5. Mounted in the one side of the vaporizing chamber 1, preferably near its upper side, is an ignition plug 10 for the purpose of igniting the gases in the vaporizing chamber. Mounted in the lower side of the vaporizing

chamber 1, communicating with the pilot expansion nozzle 3, and extending out through the lower side of the vaporizing chamber 1, is a lighter tube 12 which is adapted to light the main burner. The main burner grating 15 is an annular plate provided with a large central hole 15^a over which is mounted the vaporizing chamber 1 and this grating member 15 is provided with a plurality of suitable size perforations 15^b in that portion surrounding the central hole 15^a. Mounted over this burner grating 15 with its lower side open is the distributing volute whose minimum height is at the point 11^a and gradually increases in height around the vaporizing chamber 1 until it reaches the portion enclosing the mixing vanes 13, then extends outwardly and is provided with staggered mixing vanes 13 which are adapted to cause the fuel mixture passing therethrough to be agitated from side to side and thoroughly to mix the fuel mixture in its passage way to the burner grating. This mixing chamber portion 13^a is provided in its end with a partition 13^b with a large orifice 13^c centrally therein and mounted back of this partition is the mixing venturi 14. Communcating with the venturi 14 is the low pressure air conductor 14^a which communicates with a low pressure blower not shown. The operation of the vaporizer is as follows: air is furnished by a blower or otherwise through the conductor 14^a, venturi 14 past the vanes 13 to the burner grating 15. At the same time, air, preferably under higher pressure than that supplied to conductor 14^a, is furnished by a blower or otherwise through the conductor 7. The fuel is introduced through the fuel feed pipe 9 to the nozzle 8 in which it is distributed and atomized sufficiently to be ignited by the ignition plug 10 and burned, by partial combustion, sufficiently to furnish vapor for the nozzle 6 and the tube 5 to eject sufficient vapor from the outlet tube 2 to supply the pilot expansion tube 3, which ignites from the vaporizing chamber 1 and burns backfired in the expansion nozzle 3 with sufficient heat in the flame and products of combustion to vaporize the required amount of fuel being induced from the nozzle 8. This type of vaporizer lights instantly and can be used either to supply an independent main burner or can be combined with the main burner as shown in Fig. 1, 2 and 3 of the drawings in which the lighter tube 12 is used to ignite the main burner. It will be here noted that this type of vaporizer requires a smaller pilot flame in the tube 3 because some of the vaporizing heat is furnished by the main fire of the burner and conducted into the vaporizer 1. The adjustment of the flame in the expansion tube 3 is accomplished by adjusting the volume or exchanging the nozzles 5 and 6 to the required size. The generated vapor is taken out through the conductor 2, then to the venturi 14 and mixed with the proper amount of air for combustion and is further mixed as it passes through the mixing vanes 13 and the homogeneous mixture is distributed to the main burner 15 through the distributing volute 11. The main fire is ignited by the ignition tube 12 which is a bleeder from the interior of the vaporizing chamber 1.

Though I have shown and described a particular construction, combination and arrangement of parts and portions, I do not wish to be limited to this particular construction, combination and arrangement but desire to include in the scope of my invention the construction, combination and arrangement substantially as set forth in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a vaporizer of the class described, a vaporizing chamber, a distributing nozzle mounted in the upper end thereof, a fuel oil feed conductor communicating with said distributing nozzle, a high pressure air conductor communicating with said vaporizing chamber above said distributing air nozzle, an outlet from said vaporizing chamber, a pilot expansion tube communicating with said vaporizing chamber near its lower end, an injector tube communicating with said expansion tube and extending into the outlet from said vaporizer, an injector air nozzle extending from said high pressure tube and into said outlet from said vaporizer adjacent the end of said injector tube and means for igniting the gas in said vaporizing chamber.

2. In a vaporizer of the class described, a vaporizing chamber, a distributing air nozzle mounted in the upper end thereof, a fuel oil feed conductor communicating with said distributing air nozzle, a high pressure air conductor communicating with said vaporizing chamber above said distributing air nozzle, an outlet from said vaporizing chamber, a pilot expansion tube communicating with said vaporizing chamber near its lower end, an injector tube communicating with said expansion tube and extending into the outlet from said vaporizer chamber 1, an injector air nozzle extending from said high pressure tube and into said outlet from said vaporizer chamber adjacent the end of said injector tube, means for igniting the gas in said vaporizing chamber, a burner grating provided with a central hole over which said vaporizer chamber is mounted, a volute with its lower side open mounted over said grating around said chamber, a conductor communicating with said volute, a venturi in said conductor communicating with the outlet from said vaporizing chamber.

3. In a vaporizing apparatus of the class

described, a main vaporizing chamber, an outlet conductor from the upper side thereof, a distributing air nozzle mounted therein, a fuel oil feed conductor communicating with said nozzle, a high pressure air conductor communicating with said nozzle, an injector tube in said outlet from said vaporizer communicating with the lower side of said vaporizing chamber, an injector air nozzle communicating with said high pressure air conductor and with the upper end of said injector tube, and a low pressure air conductor to which the outlet conductor from said vaporizing chamber communicates.

4. In a vaporizing apparatus of the class described, a main vaporizing chamber, an outlet conductor from the upper side thereof, a distributing air nozzle mounted therein, a fuel oil feed conductor communicating with said nozzle, a high pressure air conductor communicating with said nozzle, an injector tube in said outlet from said vaporizer communicating with the lower side of said vaporizing chamber, an injector air nozzle communicating with said high pressure air conductor and with the upper end of said injector tube, a low pressure air conductor to which the outlet conductor from said vaporizing chamber communicates, and a venturi in said low pressure air conductor at the inlet from said outlet conductor from said vaporizer.

5. In a vaporizing apparatus of the class described, a main vaporizing chamber, an outlet conductor from the upper side thereof, a distributing air nozzle mounted therein, a fuel oil feed conductor communicating with said nozzle, a high pressure air conductor communicating with said nozzle, an injector tube in said outlet from said vaporizer communicating with the lower side of said vaporizing chamber, an injector air nozzle communicating with said high pressure air conductor and with the upper end of said injector tube, a low pressure air conductor to which the outlet conductor from said vaporizing chamber communicates, a venturi in said low pressure air conductor at the inlet from said outlet conductor from said vaporizer, and a plurality of mixing vanes in said conductor.

6. In a vaporizing apparatus of the class described, a main vaporizing chamber, an outlet conductor from the upper side thereof, a distributing air nozzle mounted therein, a fuel oil feed conductor communicating with said nozzle, a high pressure air conductor communicating with said nozzle, an injector tube in said outlet from said vaporizing chamber, communicating with the lower side of said vaporizing chamber, an injector air nozzle communicating with said high pressure air conductor and with the upper end of said injector tube, a low pressure air conductor to which the outlet conductor from said vaporizing chamber communicates, a venturi in said low pressure air conductor at the inlet from said outlet conductor from said vaporizer, and a plurality of mixing vanes in said low pressure air conductor, a burner grating, a distributing volute over said burner grating communicating with said low pressure conductor.

7. In a vaporizing apparatus of the class described, a main vaporizing chamber, an outlet conductor from the upper side thereof, a distributing air nozzle mounted therein, a fuel oil feed conductor communicating with said nozzle, a high pressure air conductor communicating with said nozzle, an injector tube in said outlet from said vaporizer communicating with the lower side of said vaporizing chamber, an injector air nozzle communicating with said high pressure air conductor and with the upper end of said injector tube, a low pressure air conductor to which the outlet conductor from said vaporizing chamber communicates, a venturi in said low pressure air conductor at the inlet from said outlet conductor from said vaporizer, a burner grating, a distributing volute over said burner grating communicating with said low pressure conductor, and vanes in said low pressure conductor between the burner grating and the outlet from said vaporizer.

8. In a vaporizing apparatus of the class described, a main vaporizing chamber, an outlet conductor from the upper side thereof, a distributing air nozzle mounted therein, a fuel oil feed conductor communicating with said nozzle, a high pressure air conductor communicating with said nozzle, an injector tube in said outlet from said vaporizer communicating with the lower side of said vaporizing chamber, an injector air nozzle communicating with said high pressure air conductor and with the upper end of said injector tube, a low pressure air conductor to which the outlet conductor from said vaporizing chamber communicates, a venturi in said low pressure air conductor at the inlet from said outlet conductor from said vaporizer, a plurality of mixing vanes in said low pressure air conductor, a burner grating, a distributing volute over said burner grating communicating with said low pressure conductor, and means communicating with the interior of the vaporizer for lighting said burner.

9. In a vaporizing apparatus of the class described, a main vaporizing chamber, an outlet conductor communicating therewith, a distributing nozzle directed therein, a fuel feed conductor communicating with said nozzle, a high pressure air conductor communicating with said nozzle, an expansion member communicating with said outlet conductor, and an injector directed into said expansion member and communicating with

said high pressure conductor and said outlet conductor.

10. In a vaporizing apparatus of the class described, a main vaporizing chamber, an outlet conductor communicating therewith, a distributing nozzle directed therein, a fuel feed conductor communicating with said nozzle, a high pressure air conductor communicating with said nozzle, an expansion member communicating with said outlet conductor, and an injector directed into said expansion member and communicating with said high pressure conductor and said outlet conductor, said expansion member communicating also with said vaporizing chamber.

11. In a vaporizing apparatus of the class described, a main vaporizing chamber, an outlet conductor communicating therewith, a distributing nozzle directed therein, a fuel feed conductor communicating with said nozzle, a high pressure air conductor communicating with said nozzle, an expansion member communicating with said outlet conductor, an injector directed into said expansion member and communicating with said high pressure conductor and said outlet conductor, and a low pressure air conductor to which the outlet conductor from said vaporizing chamber communicates.

12. In a vaporizing apparatus of the class described, a main vaporizing chamber, an outlet conductor communicating therewith, a distributing nozzle directed therein, a fuel feed conductor communicating with said nozzle, a high pressure air conductor communicating with said nozzle, and an injector directed from said outlet conductor and communicating therewith and with said high pressure air conductor.

13. In a vaporizing apparatus of the class described, a main vaporizing chamber, an outlet conductor communicating therewith, a distributing nozzle directed therein, a fuel feed conductor communicating with said nozzle, a high pressure air conductor communicating with said nozzle, an injector directed from said outlet conductor and communicating therewith and with said high pressure air conductor, and a low pressure air conductor to which the outlet conductor from said vaporizing chamber communicates.

14. In a vaporizing apparatus of the class described, a main vaporizing chamber, an outlet conductor communicating therewith, a distributing nozzle directed therein, a fuel feed conductor communicating with said nozzle, a high pressure air conductor communicating with said nozzle, an injector directed from said outlet conductor and communicating therewith and with said high pressure air conductor, a burner grating, a fuel distributing means positioned over said burner grating, a low pressure air conductor communicating with said fuel distributing means, and means for directing the gases from said outlet conductor into said low pressure air conductor.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 15th day of April, 1926.

RUSSELL R. WATERMAN.