July 28, 1931. E. R. GODWARD 1,816,430

VAPORIZER

Filed July 30, 1930 2 Sheets-Sheet 1

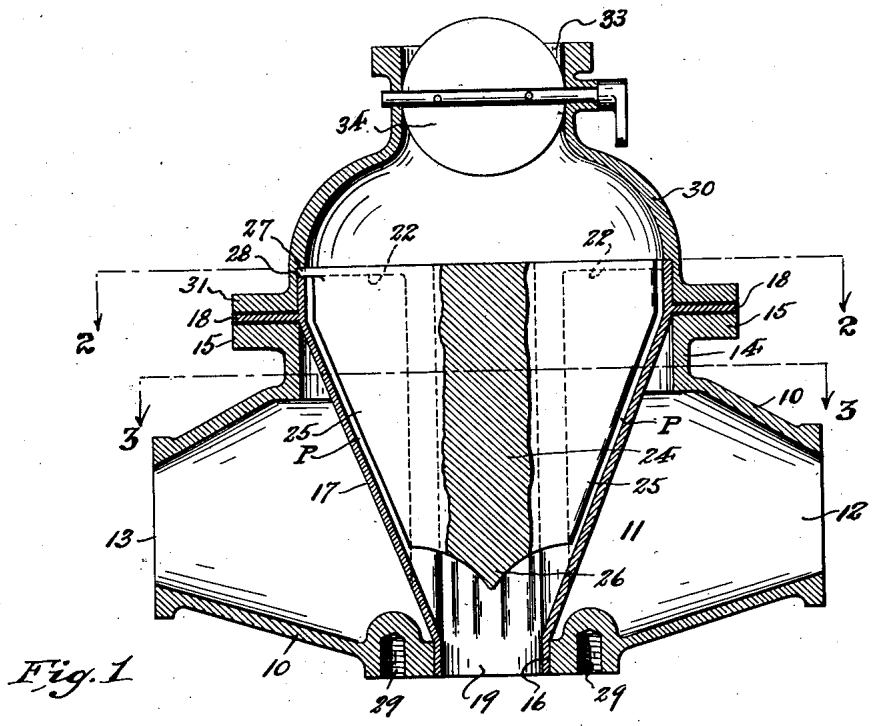

Fig. 1

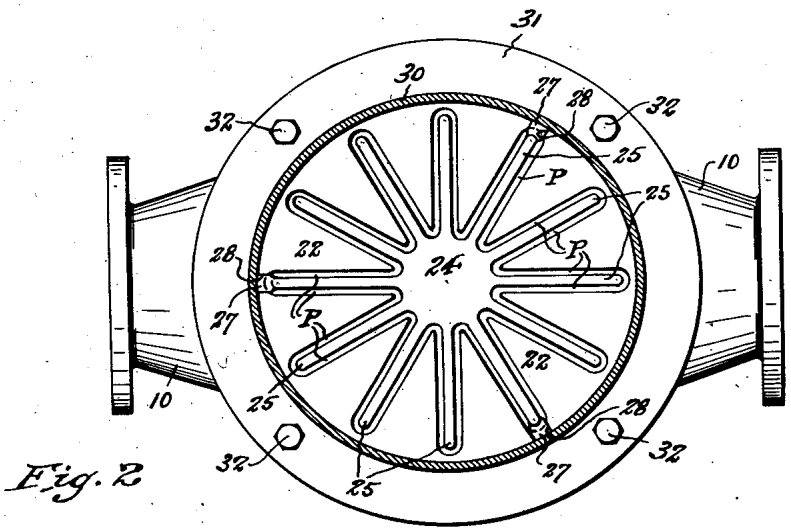

Fig. 2

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July 28, 1931. E. R. GODWARD 1,816,430

VAPORIZER

Filed July 30, 1930 2 Sheets-Sheet 2

Fig. 3

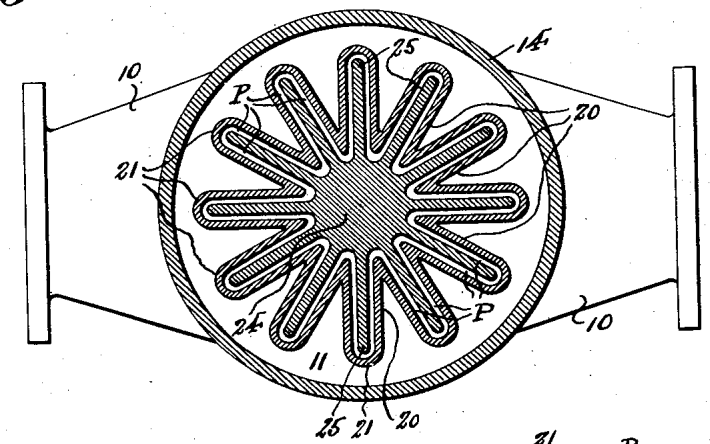


Fig. 4

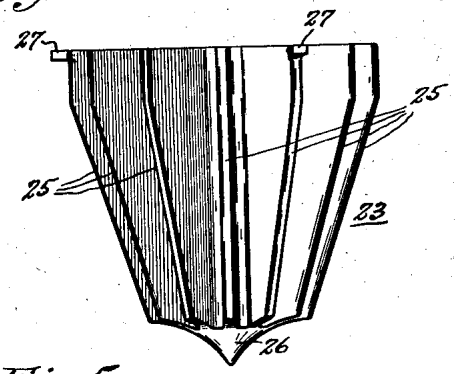
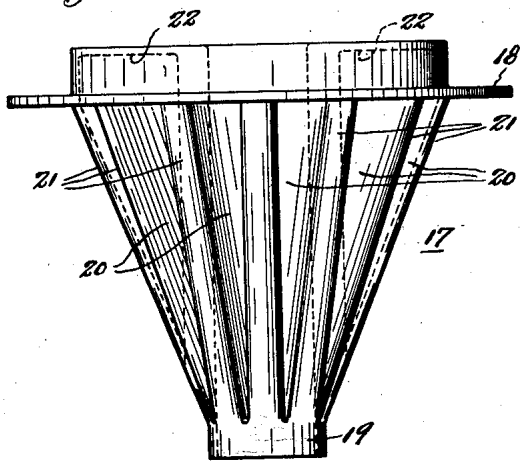


Fig. 5



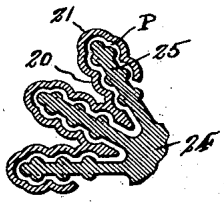


Fig. 6

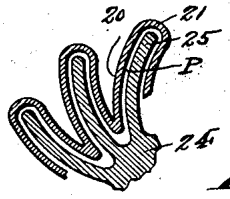


Fig. 7

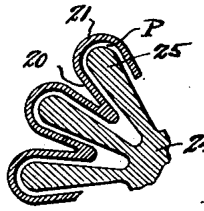


Fig. 8

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Patented July 28, 1931 1,816,430

UNITED STATES PATENT OFFICE

ERNEST ROBERT GODWARD, OF NEW YORK, N. Y., ASSIGNOR TO THE ECLIPSE PETROL ECONOMISER SYSTEM COMPANY, LIMITED, OF CHRISTCHURCH, NEW ZEALAND

VAPORIZER

Application filed July 30, 1930. Serial No. 471,852.

This invention relates, generally, to improvements in means for vaporizing liquid fuel mixtures, and especially for vaporizing fuel mixtures having a low grade fuel constituent.

The invention has for its principal object to provide a novel construction of vaporizer having heated surfaces, contiguous to which the fuel mixture flows, said surfaces being so designed that the area thereof is very large in proportion to the volume of fuel mixture delivered to the vaporizer from a metering device or carbureter, while at the same time the fuel mixture passages are so arranged as to divide the mixture into comparatively thin sheet-like streams subject to more or less expansion due to the increasing cross-sectional area of the passages toward their discharge ends.

I have found that in treating fuel mixtures having a low grade fuel constituent for use in internal combustion engines, that it is necessary to collect more heat from exhaust gases for transfer to the mixture streams than is required for more volatile liquid fuels. It was consequently necessary to provide a greater area of heat transfer surface subject to contact at one side with hot exhaust gases as the source heat and subject to contact at the other side with the fuel mixture for the transfer of heat thereto, while at the same time reducing to a minimum the path of heat conduction and making the same as direct as possible. The greater quantity of heat thus rendered available for transfer to the fuel mixture tends to off-set temperature drops in the fuel mixtures due to the vaporization of the liquid fuels and thus assures the desired amount of heat adequate to maintain the desired vaporizing effect upon the low grade fuel utilized. In addition to the great area of heat transfer surface exposed directly to the heat source, I have also arranged means for reducing the volume of fuel mixture passing through the vaporizer to a relatively thin or sheet-like mass contiguous to and in contact with the entire extent of the heat transfer surface, which at the same time, due to the funnel-like formation of the bounding heat transfer surfaces, there is assured a progressively increasing capacity in the passages adapted to allow for both expansion of the vaporized fuel mixture and retardation of movement thereof, whereby deposit of unvaporized liquid particles on the heat transfer surfaces may take place to the end that the said particles may be quickly vaporized, and returned in vaporized state to the on-going vaporized fuel mixture discharged from the apparatus.

Other objects of this invention, not at this time more particularly enumerated, will be understood from the following detailed descripton of the same.

An illustrative embodiment of this invention is shown in the accompanying drawings, in which:—

Figure 1 is a longitudinal vertical section of a vaporizing apparatus made according to this invention; Figure 2 is a horizontal section, taken on line 2—2 in Figure 1; Figure 3 is another horizontal section, taken on line 3—3 in Figure 1; Figures 4 and 5 are respectively elevations or side views of the central spreader and passage forming core and the heat transfer jacket, which when assembled together provide the comparatively thin fuel mixture passage contiguous to the heat transfer walls of said jacket; and Figures 6, 7 and 8, are respectively fragmentary horizontal sectional views showing possible variations of the cooperating cross-sectional contours of the assembled core and jacket.

Similar characters of reference are employed in the above described views, to indicate corresponding parts.

Referring to said drawings, the vaporizing device comprises a main or outer casing 10, the interior 11 of which provides a heat-

ing chamber through which a heating medium, such e. g. as the exhaust gases from an internal combustion engine, may be circulated. Said casing 10 is provided with an intake opening 12 at one point, to which a heating medium supply conduit (not shown) may be connected, and with an outlet opening 13 at another point, to which a heating medium discharge conduit (not shown) may be connected.

Provided at the upper side or end of said casing 10 is an opening or neck 14 having an outwardly directed flange 15 at its mouth. At the bottom side or end of said casing 10 is an opening 16 of reduced diameter.

The reference character 17 indicates an inverted conical heat transfer jacket having at its upper large end a supporting flange 18 to seat upon the flange 15 of the casing neck 14, whereby said jacket extends downwardly through the interior of said heating chamber 11. The lower end of said jacket terminates in an intake throat 19 which fits telescopically into the bottom opening 16 of the casing. The sides of the jacket are indented to provide sector-like cavities 20 spaced around the circumference thereof, thus providing a plurality of vertically extending hollow radial members 21 extending outwardly from the central axial portion thereof. The cavities 20 are closed at their upper ends by top wall portions 22, but the interiors of the hollow radial members 21 are upwardly open.

The reference character 23 indicates an inverted conical passage forming core and fuel mixture spreader, the same comprising a cylindrical axial core member 24 from the sides of which radiate a plurality of passage forming arms or fins 25. The lower end of said core member 24 is formed to provide an inverted spreader cone 26. Connected with the upper end of said core 23 are hanger lugs 27 which engage in notches 28 at the upper end of the jacket 17, whereby the core 23 is operatively suspended within and properly spaced from the walls of said jacket. When the core is nested within the jacket, the arms or fins of the former extend into the hollow interiors of the radial members 21 of the latter, in such spaced relation to the internal sides thereof as to form comparatively thin interconnected fuel mixture passages contiguous to the walls of the jacket, while the spreader cone 26 is spaced above and in alignment with the intake throat 19 of said jacket. It will thus be obvious that the assembled jacket and core provides ascending fuel mixture passages P leading upwardly from the intake throat 19 to the upper discharge ends of the hollow interiors of said radial members 21, the loops of said passage increasing in extent toward the discharge points, while at the same time the radial members 21 bounding the passages provide a very considerable area of heat transfer wall exposed outwardly to direct contact with the heating medium circulated through the heating chamber 11, and having their inner surfaces contiguous to the stream of fuel mixture ascending the passage.

While in Figures 1 to 5 inclusive, the contours of the radial members 21 of the jacket and arms or fins 25 of the core are shown of simple straight sided contour, it will be obvious that other shape arrangements adapted to even further increase the area of heat transfer wall may be provided, examples of some possible variations in this respect being shown in Figures 6 to 8 inclusive.

In the use of the vaporizer apparatus of this invention, any suitable fuel mixture metering device or carbureter (not shown) is connected with the casing 10, to communicate with the intake throat 19 of the vaporizer unit; threaded bolt openings 29 in the marginal portion of the bottom casing opening being provided to receive fastening screws or bolts for thus connecting such carbureter or metering device in operative relation to the vaporizer. A vaporized fuel collecting dome 30, may be engaged with the upper end of the casing, the flange 31 thereof being seated on the jacket flange, and the parts being thereupon secured together by bolts or screws 32. Said collecting dome 30 is provided with a discharge throat 33, in which may be located a throttle valve 34, if desired. The discharge throat 33 is adapted to be connected in communication with the fuel charge intake manifold of an internal combustion engine.

In operation, the fuel mixture from the carbureter enters the intake throat 19, and striking the spreader cone 26 is deflected into the passages P, whereby the volume of ingoing mixture is flattened out into relatively narrow sheet-like formation, and is caused to travel upwardly contiguous to the hot jacket walls, which are heated by the hot exhaust gases circulated through the heating chamber 11 of the casing 10. Owing to the upwardly increasing cross-sectional extent of the passages P the fuel mixture is allowed to expand, and this effect together with the outward directional movement imparted to the fuel mixture by the spreader cone, will tend to throw unvaporized liquid fuel particles directly against and upon the hot jacket walls, contact with which will quickly tend to spread out the same while transferring heat thereto with rapid vaporizing effect thereupon. At the same time the air constituent of the fuel mixture will tend to follow the core wall surfaces and the most direct line of travel under the pull of internal combination engine suction. The great area of heated jacket wall will also radiate heat quickly and efficiently to the upwardly moving fuel mixture stream, so that vaporizing effect thereof upon the liquid fuel constituents is continuous dur-

ing the travel of the mixture through the passages P, and on discharge from the latter the mixture is reduced to a practically fully vaporized or gaseous mixture.

By regulating the volume of exhaust gases admitted into the heating chamber 11 (by any well known means), the amount of heat may be nicely controlled to assure efficient working of the apparatus under desired degree and quantity of heat necessary for best vaporizing effect, according to the particular kind or grade of liquid fuel employed, while at the same time eliminating undue temperature fluctuation or drop.

I am aware that various changes may be made in the arrangements and combinations of the several devices and parts, as well as in the details of the construction of the same, without departing from the scope of this invention as set forth in the foregoing specification and as defined in the appended claims. Hence, I do not limit my invention to the exact arrangements and combinations of the several devices and parts as described in the foregoing specification; nor do I confine myself to the exact construction of said parts as illustrated in the accompanying drawings.

I claim:—

1. A vaporizing apparatus, comprising a casing the interior of which is adapted to receive a heating medium, a jacket extending downwardly through said casing, said jacket having longitudinal extending and radially projecting hollow members the outer sides of which provide a large surface area for contact with the heating medium contained in said casing, a core conforming in shape to the interior cross sectional shape of said jacket and its radial members and adapted to nest therein in spaced relation to the internal surfaces thereof to thereby provide ascending intermediate fuel mixture passages of narrow cross section contiguous to the jacket walls, a fuel mixture receiving throat at the lower end of said jacket with which said passages communicate, and a vaporized fuel discharge means with which the upper ends of said passages communicate.

2. A vaporizing apparatus, comprising a casing the interior of which is adapted to receive a heating medium, a jacket extending downwardly through said casing, said jacket having longitudinal extending and radially projecting hollow members the outer sides of which provide a large surface area for control with the heating medium contained in said casing, a core conforming in shape to the interior cross sectional shape of said jacket and its radial members and adapted to nest therein in spaced relation to the internal surfaces thereof to thereby provide ascending intermediate fuel mixture passages of narrow cross section contiguous to the jacket walls, a fuel mixture receiving throat at the lower end of said jacket, said core having a spreader cone at its lower end to deflect the fuel mixture stream entering through said throat upwardly through said passages, and a vaporized fuel discharge means with which the upper ends of said passages communicate.

3. A vaporizing apparatus comprising a casing the interior of which is adapted to provide a heating chamber, said casing having means of ingress and egress for circulating a heating medium therethrough, an inverted conical hollow jacket member extending through said casing, the side walls of said jacket member having longitudinal sector-like indentations thereby forming radially projecting hollow members open at their upper ends and the outer sides of which provide a large surface area for contact with a heating medium circulated through said casing, a core member nested within said jacket member and having radial arms extending within the hollow members of the latter but spaced therefrom to provide narrow fuel mixture passages contiguous to the inner surfaces thereof, the lower end of said jacket member terminating in a fuel mixture receiving throat, said core having at its lower end a spreader cone opposed to said throat and adapted to deflect entering fuel mixture upwardly through said passages, and a vaporized fuel discharge means with which the upper ends of said passages communicate.

4. In a vaporizing apparatus, a hollow jacket member of substantially inverted conical shape having a fuel mixture intake at its small lower end and having its side walls indented with sector-like cavities to form intermediate hollow radial portions increasing in cross-sectional capacity toward their upper open ends, a core member having radial longitudinal fins conforming to said hollow radial portions, said core member being nested within said jacket member with its fins extending into said hollow portions of the latter to thereby form intermediate ascending passages contiguous to the walls of said hollow portions through which fuel mixture streams may pass, and means to hold a heating medium in contact with the outer sides of the hollow portions of said jacket member.

5. In a vaporizing apparatus, a hollow jacket member of substantially inverted conical shape having a fuel mixture intake at its small lower end and having its side walls indented with sector-like cavities to form intermediate hollow radial portions increasing in cross-sectional capacity toward their upper open ends, a core member having radial longitudinal fins conforming to said hollow radial portions, said core member being nested within said jacket member with its fins extending into said hollow portions of the latter to thereby form intermediate ascending passages contiguous to the walls of said hollow portions through which fuel mixture

streams may pass, said core member having a spreader cone at its lower end opposed to said fuel mixture intake of said jacket member and operative to deflect an entering fuel mixture stream uniformly upwardly through said ascending passages, and means to hold a heating medium in contact with the outer sides of the hollow portions of said jacket member.

In testimony, that I claim the invention set forth above I have hereunto set my hand this 23rd day of July, 1930.

ERNEST R. GODWARD.