

Dec. 29, 1942.

J. OLLIG

2,306,897

CARBURETOR

Filed June 7, 1939

3 Sheets-Sheet 1

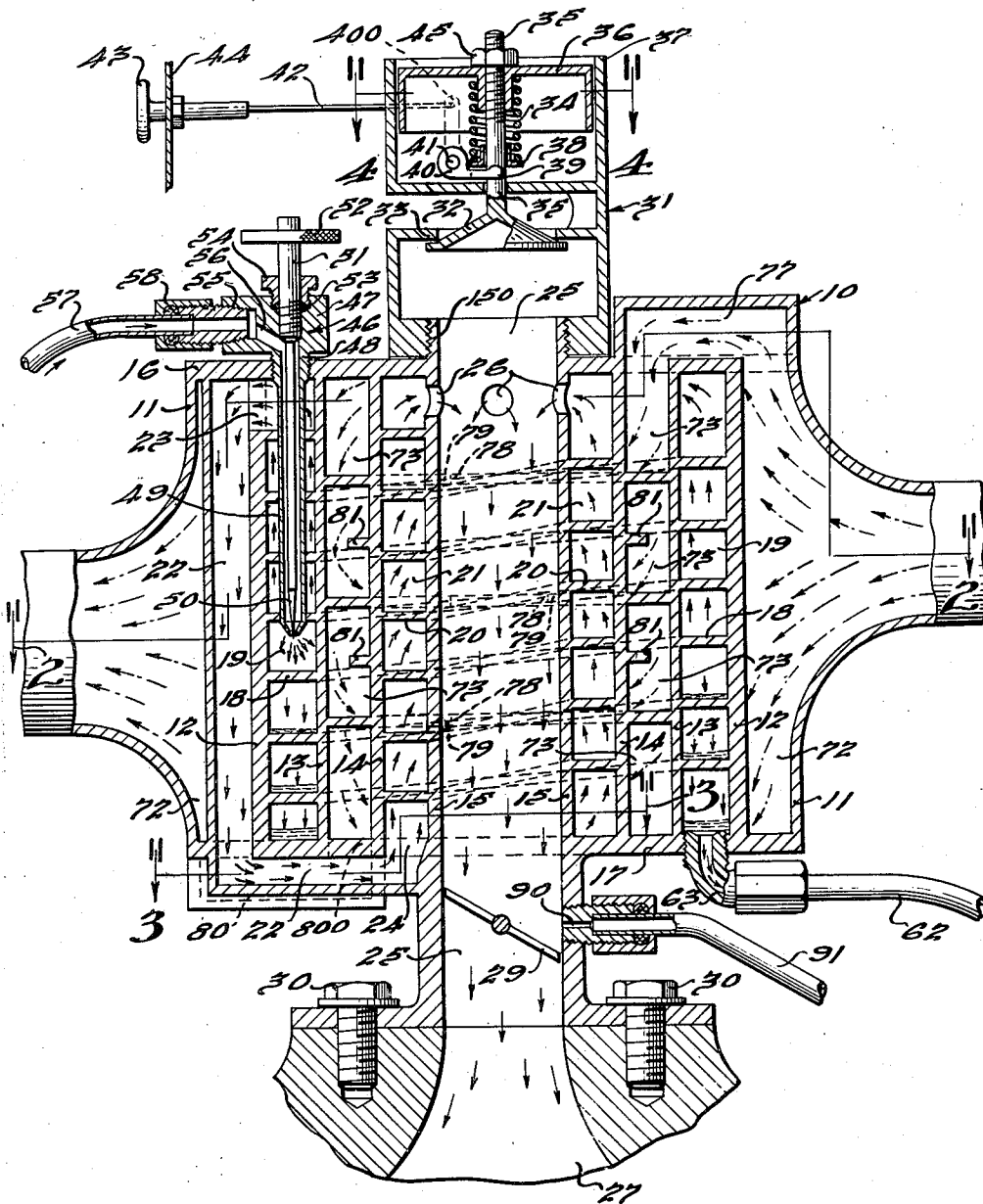


FIG. 1.

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Dec. 29, 1942.

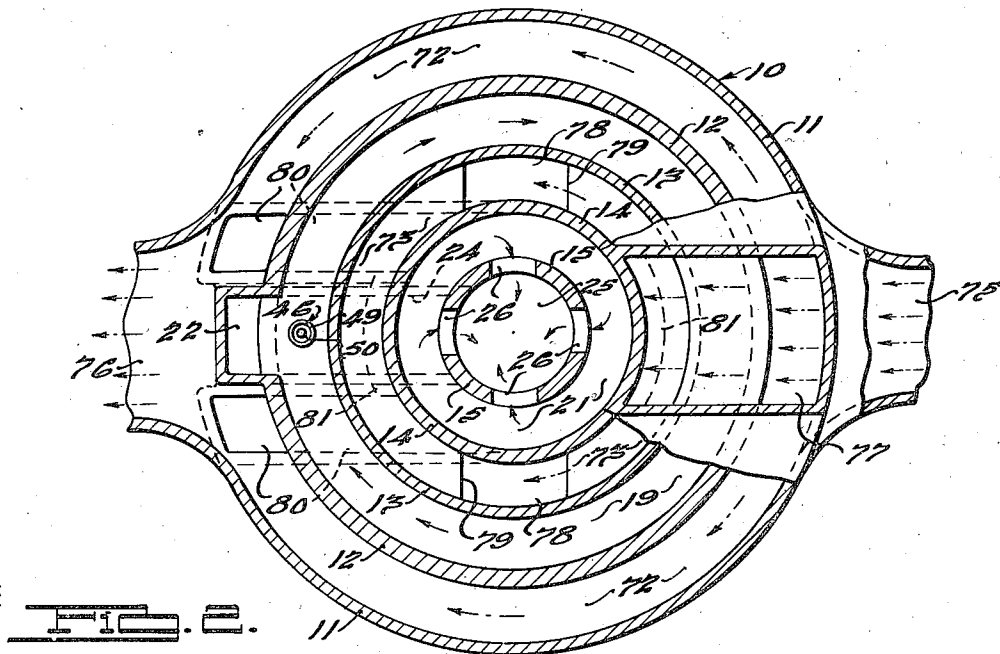
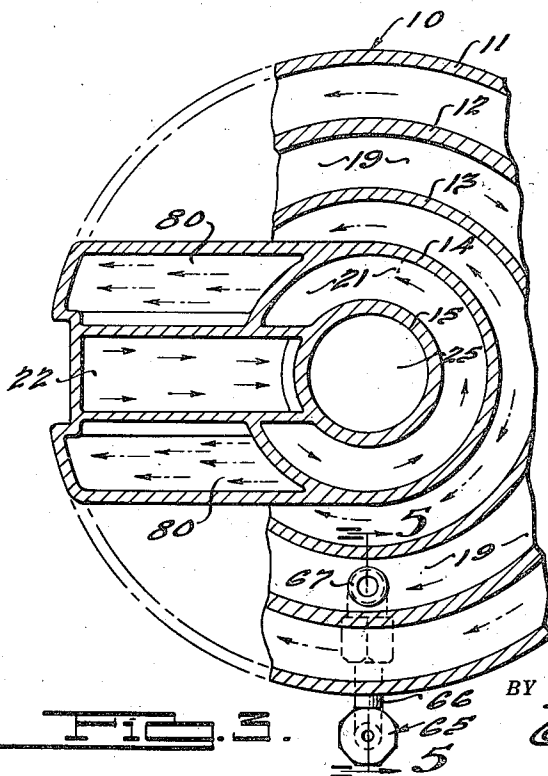
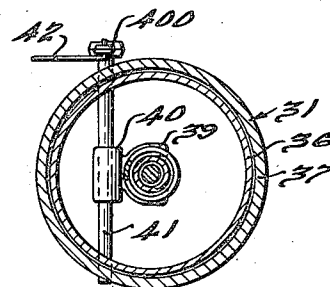
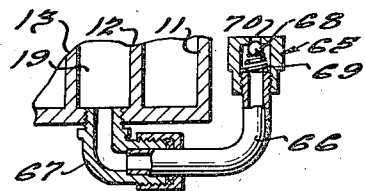
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3 Sheets-Sheet 2



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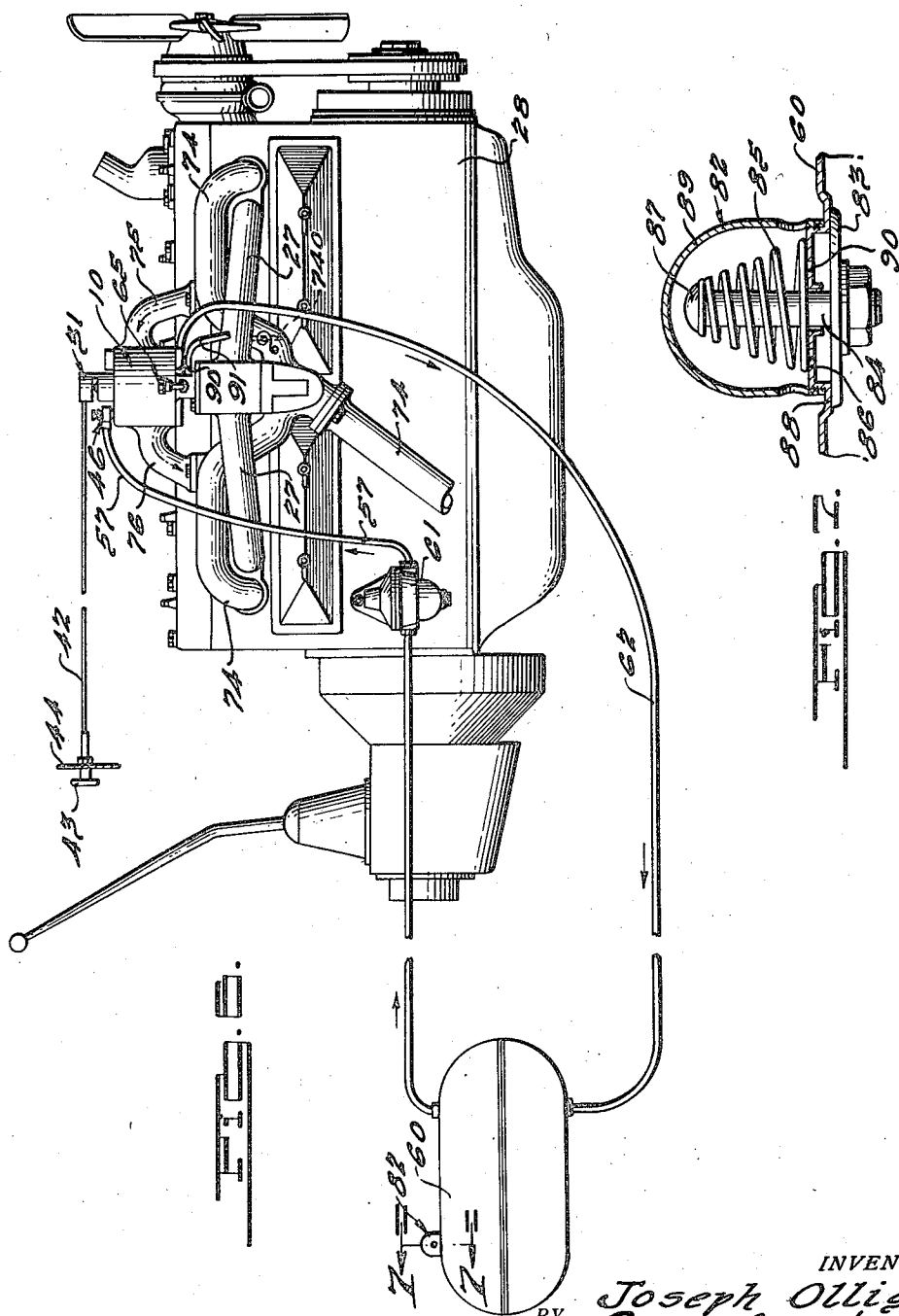
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CARBURETOR

Filed June 7, 1939

3 Sheets-Sheet 3



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CARBURETOR

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Application June 7, 1939, Serial No. 277,873

9 Claims. (Cl. 48-107)

This invention relates to carburetors and to carburetion systems for internal combustion engines.

Internal combustion engines operated on highly volatile fuels such as gasoline and the like have become extremely efficient due largely to the complete vaporization of the fuel employed which assures the burning of the entire amount of fuel entering the cylinders of the engine. To operate the ordinary internal combustion engine on low-grade fuels such as Diesel oil, fuel oil or the like requires a carburetion means which will supply to the engine a fuel-air mixture of like characteristics to the mixture obtained when gasoline and like highly volatile fuels are employed.

With the foregoing in view, the primary object of the invention is to provide a simple and effective carburetor and carburetion system for internal combustion engines which will permit the use of Diesel oil, fuel oil or the like in place of the highly volatile fuels such as gasoline in internal combustion engines and maintain substantially equivalent engine performance to that obtained when gasoline and like highly volatile fuel is used.

Another object of the invention is to provide a carburetor and carburetion system for internal combustion engines which will admit of the use of Diesel oil, fuel oil or the like low-grade fuels in place of gasoline and deliver to the engine a correctly balanced effectively vaporized fuel-air mixture which will burn completely after entering the cylinders of the engine and leave no more carbon deposits than when gasoline is used as fuel.

Another object of the invention is to provide a carburetor and carburetion system for internal combustion engines wherein fuel is supplied thereto in quantities equal to or slightly more than is drawn from the carburetor by the engine, the surplus being drawn from the carburetor and preferably returned to the fuel tank.

Another object of the invention is to provide a carburetor and carburetion system for internal combustion engines wherein fuel is supplied thereto from a fuel tank under pressure and atomized and vaporized in a pre-heated chamber, and wherein excess fuel not vaporized in the carburetor is returned to the fuel tank.

Other objects of the invention will become apparent by reference to the following detailed description taken in connection with the accompanying drawings, in which:

Fig. 1 is a vertical sectional view of a carburetor embodying the invention.

Fig. 2 is a horizontal sectional view taken on the line 2-2 of Fig. 1.

Fig. 3 is a fragmentary horizontal sectional view taken on the line 3-3 of Fig. 1.

Fig. 4 is a horizontal sectional view taken on the line 4-4 of Fig. 1 showing the manual control means for making the automatic choke means employed inoperative.

Fig. 5 is a vertical sectional view taken on the line 5-5 of Fig. 3 showing the air bleeder valve employed to prevent a vacuum from being created in the vaporization chamber of the carburetor.

Fig. 6 is a side elevational view of an engine including its fuel tank showing a carburetor and the carburetion system embodying the invention installed thereon.

Fig. 7 is a vertical sectional view taken on the line 7-7 of Fig. 6 disclosing the vacuum relief valve employed on the fuel tank in the particular embodiment of the invention shown in Fig. 6.

Referring now to the drawings wherein like numerals refer to like and corresponding parts throughout the several views, a carburetor 10 embodying the invention is disclosed in detail in Figs. 1 to 5, inclusive, and comprises, in general, a cylindrical housing 11 having a plurality of spaced preferably concentric cylindrical walls 12, 13, 14 and 15 therein, and a generally circular top 16 and bottom 17. A spirally disposed spacer 18 between the cylindrical walls 12 and 13 forms an ascending spiral vaporization chamber 19. A spirally disposed spacer 20 between the cylindrical walls 14 and 15 forms an ascending spiral pre-heat chamber 21 to which the said vaporization chamber 19 is connected by means of a vaporized fuel pass 22 provided between the port 23 at the top of the spiral vaporization chamber 19 and the port 24 at the bottom of the spiral pre-heat chamber 21.

Fuel under pressure is forced into the spiral vaporization chamber 19 preferably at a point substantially midway between the top and bottom of the carburetor through a suitable nozzle 25 threaded through the top 16 of the carburetor 10 and telescoped through several convolutions of the said spirally disposed spacer 18 between the said cylindrical walls 12 and 13 which, together with the said spirally disposed spacer 18, form the said ascending spiral vaporization chamber 19. Fuel which is vaporized in the spiral ascending vaporization chamber 19 and pre-heated in the spiral ascending pre-heat chamber 21 is drawn into the throat 25 of the said carburetor 10 through the ports 26 near the top of the cylindrical wall 15 between the said ascend-

ing spiral pre-heat chamber 21 and the carburetor throat 25. The said vaporized pre-heated fuel is drawn from the carburetor throat 25 into the intake manifold 27 of an engine 28 under control of a butterfly valve 29 or the like. The carburetor 10 is preferably secured to the intake manifold 27 by such suitable means as the studs 30.

Automatic choke means 31 communicating with the carburetor throat 25 is preferably threaded on a collar 150 extending upwardly from the cylindrical wall 15 of the carburetor 10. The said automatic choke 31 preferably comprises a poppet-type air valve 32 normally held closed against its seat 33 by a spring 34 disposed around the stem 35 of the said valve 32. A piston 36 threaded to the said valve stem 35 loosely fitted in a cylinder 37 supported over the air valve 32 and seat 33 prevents the said air valve 32 from fluttering. The spring 34 has an annular guide and seat 38 at the bottom thereof which is supported on the bifurcated end 39 of the choke control lever 40 pivoted on a pivot pin 41 disposed through the cylinder 37 as best shown in Figs. 1 and 4. A Bowden wire 42 connects the choke control arm 400 to a choke control knob 43 mounted on the vehicle dash 44 or other control panel mounted spaced from the carburetor 10. The threading of the valve stem 35 with respect to the piston 36 provides means for adjusting the normal compression of the choke valve spring 34. A lock nut 45 maintains the choke valve spring in adjustment. The pulling out of the choke control knob 43 raises the bifurcated end 39 of the choke control lever 40, increases the compression of the choke valve spring 34, and increases the vacuum required within the throat 25 of the carburetor 10 to open the air valve 32 through which air is admitted to the said throat 25 of the carburetor 10. A suitable air filter, not shown, may be mounted around and over the automatic choke means if desired.

The fuel nozzle 46 preferably comprises a head 47 externally threaded at 48 for engagement into the top 16 of the carburetor 10 centrally over the space between the cylindrical walls 12 and 13 which, together with the said spirally disposed spacer 18, form the ascending spiral vaporization chamber 19. A hollow stem 49 depending from the head 47 of the fuel nozzle 46 extends through several of the convolutions of the said spacer 18 and is pointed at its lower end as best shown in Fig. 1. A spray regulating needle 50 having an enlarged shank 51 is disposed centrally and in concentric spaced relationship through the hollow stem 49 of the fuel nozzle 46 and is threaded in the head 47 thereof. A preferably knurled adjustment nut 52 is fixed on the extending end of the shank 51 of the spray regulating needle 50. Suitable packing 53 disposed around the needle shank 51 in a suitable recess formed in the top of the head 47 of the said nozzle 46 is compressed by a packing nut 54 threaded in the top of the head 47 to provide a leak-proof joint around the extending end of the enlarged shank 51 of the spray regulating needle 50. The said head 47 of the fuel nozzle 46 is suitably bored and threaded at 55 and diagonally counterbored at 56 to admit of connecting a pressure fuel supply line 57 thereto by means of a suitable fitting 58 and to provide a communicating passage from the said fuel line fitting 58 to the hollow stem 49 of the said nozzle 46.

Fuel from a fuel tank 60 and a fuel pump 61

enters the carburetor 10 at a point approximately half way up the ascending spiral vaporization chamber 19 preferably under a pressure of approximately 80 pounds per square inch from the pressure fuel supply line 57 through the fuel nozzle 46 which is adjusted by the knurled adjustment nut 52 to the proper or desired spray which causes the majority of the fuel to be broken up into a vapor which is drawn upwardly and spirally through the ascending spiral vaporization chamber 19, through the pass 22 to the bottom of the ascending spiral pre-heat chamber 21, upwardly and spirally through the ascending spiral pre-heat chamber 21, through the mixing throat 25 of the said carburetor 10 and into the intake manifold 27 of the engine 28 by the suction of the pistons thereof. Fuel not vaporized in the said ascending spiral vaporization chamber 19 runs by gravity in an opposite direction to the movement of the vaporized fuel down the said ascending spiral vaporization chamber 19 to the bottom thereof from whence the said unvaporized fuel is preferably returned to the fuel tank 60 through the return fuel line 62 connected by a suitable fitting 63 to the bottom 17 of the carburetor 10 directly below the lowest point of the ascending spiral vaporization chamber 19.

The fuel which is sprayed into the ascending spiral vaporization chamber 19 expands as it is vaporized and ascends the spiral vaporization chamber 19, however, in order to avoid a reversal of flow of vaporized fuel through the carburetor when unvaporized fuel is drawn back to the fuel tank or otherwise withdrawn from the bottom of the ascending spiral vaporization chamber 19 of the carburetor 10, an air bleeder valve 65 disposed slightly above the bottom of the said ascending spiral vaporization chamber 19 is connected thereto by an air bleeder line 66 and a suitable fitting 67, see Figs. 3 and 5. The said air bleeder valve 65 may be of any suitable construction such as a ball check 68 normally urged by a light compression spring 69 to close an air bleeder port 70 in the top of the housing of the air bleeder valve 65. The compressive strength of the said spring 69 of the air bleeder valve 65 is such as will permit the valve to open and compensate for the displacement in the ascending spiral vaporization chamber 19 when unvaporized fuel is drawn from the bottom thereof through the return fuel line 62 to the fuel tank 60.

The carburetor 10 is provided with exhaust gas chambers 72 and 73 through which exhaust gases from the exhaust manifold 74 of the engine 28 pass for the purpose of heating the ascending spiral vaporization chamber 19 and the ascending spiral pre-heat chamber 21. The exhaust manifolding 74 of the engine 28 is preferably provided with such means as a thermostatic controlled butterfly valve 740 to cause more or less of the exhaust gases from the engine 28 to enter the carburetor 10 through the exhaust gas conductor 75 and leave the said carburetor 10 through the exhaust gas conductor 76.

A portion of the exhaust gases entering the carburetor 10 through the exhaust gas conductor 75 travels through the outer exhaust gas chamber 72 located between the outer housing 11 of the said carburetor 10 and the cylindrical wall 12 spaced concentrically therein and out the said carburetor 10 through the exhaust gas conductor 76. However, the remainder of the exhaust gases entering the carburetor 10 through the ex-

haust gas conductor 75 travel through the exhaust gas over-pass 77 to an inner exhaust gas chamber 73 located between the concentric cylindrical walls 13 and 14 of the said carburetor 10, through exhaust gas ports 73 cut through vertically spaced horizontally disposed annular partitions 79 in the inner exhaust gas chamber 73, through exhaust gas ports 800 into and through the exhaust gas under-passes 80 disposed on each side of the vaporized fuel pass 23 and into the exhaust gas conductor 76. The size and location of the exhaust gas chambers and passes may of course be varied to suit the particular engine for which the carburetor disclosed herein is designed, it being important to provide sufficient but not too much heat to the walls of the vaporization chamber 19 and the pre-heat chamber 21. All or any suitable portion of the exhaust gases from the engine 28 may be employed as heating medium for the said vaporization chamber 19 and the pre-heat chamber 21, and, if desired, other heating mediums such as oil burner means, electric means and the like may be used. However, it has been found most desirable to employ a portion or all of the exhaust gases from the engine 28 as means for providing heat to the walls of the vaporization chamber 19 and the pre-heat chamber 21. Such suitable means as fins 81 extending into the inner exhaust gas chamber 73 integral with the cylindrical wall 14 of the pre-heat chamber 21 may be employed to increase the heat transfer from the exhaust gases traveling through the inner exhaust gas chamber 73 to the said cylindrical wall 14 of the pre-heat chamber 21.

The passage of fuel and vaporized fuel through the carburetor 10, through the fuel line from the fuel tank 60 to the carburetor 10, and from the carburetor 10 to the fuel tank 60 is shown by full line arrows throughout the drawings. The passage of exhaust gases through the carburetor 10 is shown by dot and dash arrows throughout the drawings.

The fuel tank 60 is preferably hermetically sealed by a vacuum relief valve 82 as best shown in Fig. 7 which opens when the fuel pump 61 creates a vacuum in the said fuel tank 60 greater than necessary to draw unvaporized fuel from the bottom of the ascending spiral vaporization chamber 19 through the unvaporized fuel return line 62. The vacuum relief valve 82 prevents the fuel tank 60 from collapsing in the event the air bleeder valve 65 fails to function. The said vacuum relief valve 82 is composed of a valve disc 83 mounted on a valve stem 84 around which is disposed a suitable compression spring 85 supported on an apertured valve stem guide disc 86. The said compression spring 85 engages the upper headed end 87 of the valve stem 84 and normally maintains the valve disc 83 against an annular seat 88 formed in the top of the fuel tank 60. A suitably apertured housing 89 is disposed over the vacuum relief valve mechanism to prevent dirt from entering the fuel tank 60 through the air ports 90 in the valve stem guide disc 86.

A suitable starting jet 91 may be employed through which fuel is supplied in a fine stream directly to the throat 25 of the carburetor 10 just above the butterfly valve 29 as indicated in Fig. 1. The starting jet fuel supply line 92 may be run from the fuel pump 61 in any suitable manner, not shown, and may be conveniently valved to admit fuel under pressure there-

through at the will of the operator of the engine 28.

In the novel carburetor and carburetion system herein disclosed fuel is pumped under pressure into a heated vaporization chamber adapted to permit vaporized fuel to be drawn therefrom to a pre-heat chamber where the vaporized fuel is pre-heated while passing therethrough to the mixing throat of the carburetor, the unvaporized fuel being collected in a sump in the bottom of the vaporization chamber and returned to the fuel tank. It has been found that the embodiment of the invention disclosed herein functions with high efficiency on low-grade fuels such as Diesel oil, fuel oil and the like leaving the cylinders of the engine with which the novel carburetor and carburetion system has been used free from carbon deposits. Immediate response to acceleration both when light and under load is accomplished in automotive vehicles equipped with and employing the improved carburetor and carburetion system disclosed herein.

Obviously, the vaporization chamber and the pre-heat chamber may be combined and considered as one chamber, in which event, the combined vaporization chamber and pre-heat chamber would be termed a vaporization chamber which would be heated sufficiently to expand fuel jetted, sprayed or nozzled therein.

Although but one embodiment of the invention has been disclosed and described herein, it is to be understood that many changes including the size, shape, arrangement and detail of the various parts thereof may be made without departing from the spirit of the invention, and it is not intended to limit the scope of the invention other than by the terms of the appended claims.

I claim:

1. In a fuel system for internal combustion engines including a carburetor, a manually sealed fuel tank including valve means which will open at a predetermined sub-atmospheric pressure and means for supplying fuel therefrom under pressure to said carburetor, the said carburetor comprising a heated ascending helical vaporization chamber and a mixing chamber disposed centrally within the said helical vaporization chamber, the said helical vaporization chamber having a port at the upper portion thereof communicating with the said mixing chamber, means for injecting fuel entering the carburetor into the said helical vaporization chamber at a point below the said port communicating with said mixing chamber causing a portion of the said fuel to vaporize and expand in said helical vaporization chamber and pass in its vaporized and expanded state into the said mixing chamber, and means connected between the low point of the said helical vaporization chamber and said fuel tank through which unvaporized fuel is withdrawn to said fuel tank responsive to vacuum created therein by the said means employed to supply fuel to the said carburetor.

2. In a fuel system for internal combustion engines including a carburetor, a manually sealed fuel tank including valve means which will open at a predetermined sub-atmospheric pressure and means for supplying fuel therefrom under pressure to said carburetor, the said carburetor comprising an ascending helical vaporization chamber and an ascending helical pre-heat chamber disposed centrally within said helical vaporization chamber and a mixing chamber disposed centrally within the said helical pre-heat chamber, a vaporized fuel pass between the top

of the said helical vaporization chamber and the said helical pre-heat chamber, the said helical pre-heat chamber having a port at the upper portion thereof communicating with the said mixing chamber, means for injecting fuel entering the carburetor into the said helical vaporization chamber at a point below the said vaporized fuel pass communicating with the said helical pre-heat chamber causing a portion of the said fuel to vaporize and expand in said helical vaporization chamber and pass in its vaporized and expanded state through the said helical pre-heat chamber into the said mixing chamber, and means connected between the low point of the said helical vaporization chamber through which unvaporized fuel is withdrawn to said fuel tank responsive to vacuum created therein by the said means employed to supply fuel to said carburetor.

3. In a fuel system for internal combustion engines including a carburetor, a manually sealed fuel tank including valve means which will open at a predetermined sub-atmospheric pressure and means for withdrawing fuel from the said fuel tank and supplying said fuel to the said carburetor under pressure, the said carburetor comprising a vaporization chamber and a mixing chamber, the said vaporization chamber having a port at the upper portion thereof communicating with the said mixing chamber, means for injecting fuel entering the carburetor into the said vaporization chamber at a point below the said port communicating with said mixing chamber causing a portion of the said fuel to vaporize and expand in said vaporization chamber and pass in its vaporized and expanded state into the said mixing chamber, and a fuel return line connected to the low point of the said vaporization chamber and to said fuel tank through which unvaporized fuel is withdrawn from the said vaporization chamber to said fuel tank by vacuum created in said fuel tank by the said means for supplying fuel under pressure to said carburetor.

4. In a fuel system for internal combustion engines including a carburetor, a normally sealed fuel tank including valve means which will open at a predetermined sub-atmospheric pressure and means for withdrawing fuel from the said fuel tank and supplying said fuel to the said carburetor under pressure, the said carburetor comprising an ascending helical vaporization chamber and a mixing chamber disposed centrally within the said helical vaporization chamber, means for heating said vaporization and mixing chambers, the said helical vaporization chamber having a port at the upper portion thereof communicating with the said mixing chamber, means for injecting fuel entering the carburetor into the said helical vaporization chamber at a point below the said port communicating with said mixing chamber causing a portion of the said fuel to vaporize and expand in said helical vaporization chamber and pass in its vaporized and expanded state into the said mixing chamber, and a fuel return line connected to the low point of the said helical vaporization chamber and to said fuel tank through which unvaporized fuel is withdrawn from the said helical vaporization chamber to said fuel tank by vacuum created in said fuel tank by the said means for supplying fuel under pressure to said carburetor.

5. In a fuel system for internal combustion engines including a carburetor, a normally sealed fuel tank including valve means which will open at a predetermined sub-atmospheric pressure and means for withdrawing fuel from the said

fuel tank and supplying said fuel to the said carburetor under pressure, the said carburetor comprising vaporization chamber and pre-heat chamber and a mixing chamber, means for heating said vaporization, pre-heat and mixing chambers, a vaporized fuel pass between the top of the said vaporization chamber and said pre-heat chamber, the said pre-heat chamber having a port at the upper portion thereof communicating with the said mixing chamber, means for injecting fuel entering the carburetor into the said vaporization chamber at a point below the said vaporized fuel pass communicating with said pre-heat chamber causing a portion of the said fuel to vaporize and expand in said vaporization chamber and pass in its vaporized and expanded state through the said pre-heat chamber into the said mixing chamber, and a fuel return line connected to the low point of the said vaporization chamber and to said fuel tank through which unvaporized fuel is withdrawn from the said vaporization chamber to said fuel tank by vacuum created in said fuel tank by the said means for supplying fuel under pressure to said carburetor.

6. In a fuel system for internal combustion engines including a carburetor, a normally sealed fuel tank including valve means which will open at a predetermined sub-atmospheric pressure and means for withdrawing fuel from the said fuel tank and supplying said fuel to the said carburetor under pressure, the said carburetor comprising an ascending helical vaporization chamber and an ascending helical pre-heat chamber disposed centrally within said helical vaporization chamber and a mixing chamber disposed centrally within the said helical pre-heat chamber, means for heating said vaporization, pre-heat and mixing chambers, a vaporized fuel pass between the top of the said helical vaporization chamber and said helical pre-heat chamber, the said helical pre-heat chamber having a port at the upper portion thereof communicating with the said mixing chamber, nozzle means for injecting fuel entering the carburetor into the said helical vaporization chamber at a point below the said vaporized fuel pass communicating with the said helical pre-heat chamber causing a portion of the said fuel to vaporize and expand in said helical vaporization chamber and pass in its vaporized and expanded state through the said helical pre-heat chamber into the said mixing chamber, and a fuel return line connected to the low point of the said helical vaporization chamber and to said fuel tank through which unvaporized fuel is withdrawn from the said helical vaporization chamber to said fuel tank by vacuum created in said fuel tank by the said means for supplying fuel under pressure to said carburetor.

7. In a carburetor for operating internal combustion engines on low-grade fuel such as Diesel oil, fuel oil and the like, an ascending helical shaped vaporization chamber, and a mixing chamber disposed centrally within said helical vaporization chamber, means for directing hot exhaust gases from said engine into contact with said helical vaporization chamber whereby to heat the same, means for injecting more fuel than consumed by said engine into said helical vaporization chamber wherein a portion of the said fuel vaporizes and expands, the said helical vaporization chamber having a port at the upper portion thereof communicating with said mixing chamber through which the said vaporized and expanded fuel passes into said mixing chamber, and means connected to the low point of the said

vaporization chamber through which surplus unvaporized fuel is withdrawn therefrom.

8. In a carburetor for operating internal combustion engines on low-grade fuel such as Diesel oil, fuel oil and the like, a vaporization chamber, a pre-heat chamber and a mixing chamber, means for directing hot exhaust gases from said engine into contact with said vaporization chamber and said pre-heat chamber whereby to heat the same, means for injecting more fuel than consumed by said engine into said vaporization chamber wherein a portion of the said fuel vaporizes and expands, a vaporized fuel pass between the said vaporization chamber and the said pre-heat chamber through which vaporized and expanded fuel passes into said pre-heat chamber, the said pre-heat chamber having a port communicating with said mixing chamber through which the said vaporized and expanded fuel passes into said mixing chamber, and means connected to the low point of the said vaporization chamber through which surplus unvaporized fuel is withdrawn therefrom.

9. In a carburetor for operating internal combustion engines on low-grade fuel such as Diesel oil, fuel oil and the like, an ascending helical

vaporization chamber and an ascending helical pre-heat chamber disposed centrally within said spiral vaporization chamber and a mixing chamber disposed centrally within said spiral pre-heat chamber, means disposed between said helical vaporization chamber and said helical pre-heat chamber for directing hot exhaust gases from said engine into contact with said helical vaporization chamber and said helical pre-heat chamber whereby to heat the same, means for injecting more fuel than consumed by said engine into said helical vaporization chamber wherein a portion of the said fuel vaporizes and expands, a vaporized fuel pass between the top of the said helical vaporization chamber and the bottom of the said helical pre-heat chamber through which vaporized and expanded fuel passes into said helical pre-heat chamber, the said helical pre-heat chamber having a port at the upper portion thereof communicating with said mixing chamber through which the said vaporized and expanded fuel passes into said mixing chamber, and means connected to the low point of the said vaporization chamber through which surplus unvaporized fuel is withdrawn therefrom.

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CERTIFICATE OF CORRECTION.

Patent No. 2,306,897.

December 29, 1942.

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, lines 40 and 65, and page 4, first column, line 20, claims 1, 2 and 3, respectively, for "manually" read --normally--; page 4, second column, line 43, claim 6, strike out "nozzle"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 23rd day of February, A. D. 1943.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.

CERTIFICATE OF CORRECTION.