

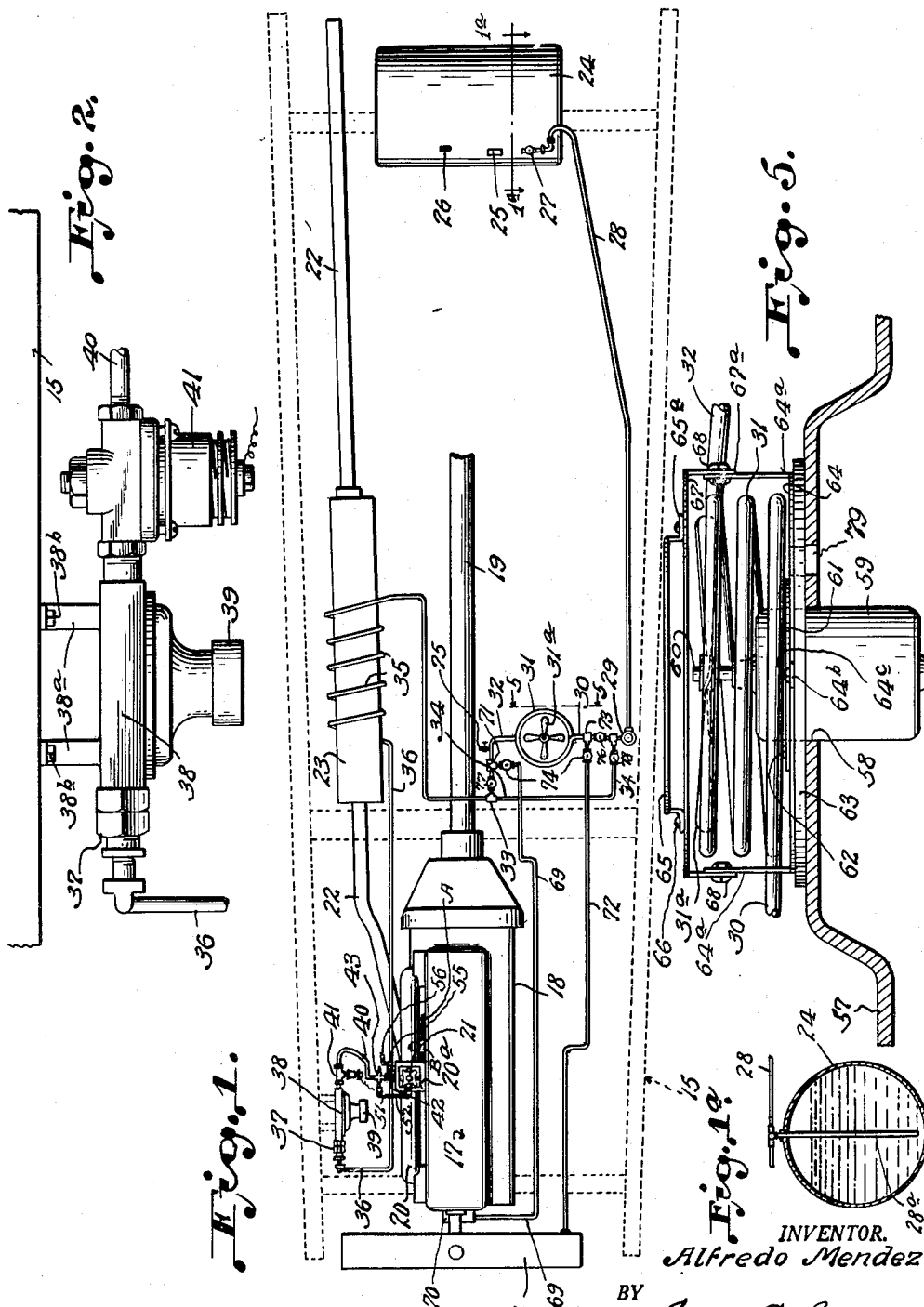
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A. MÉNDEZ
 PROPANE OR LIKE FUEL SUPPLY SYSTEM
 FOR INTERNAL-COMBUSTION ENGINES

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Filed June 29, 1950

2 Sheets-Sheet 1



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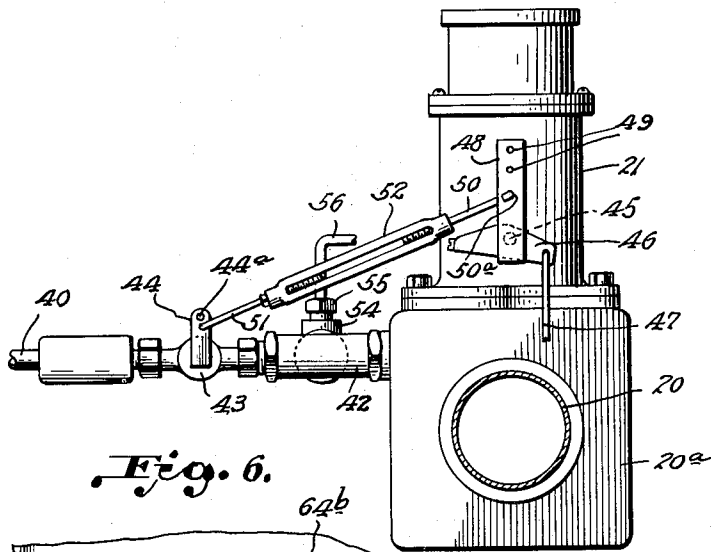


Fig. 3.

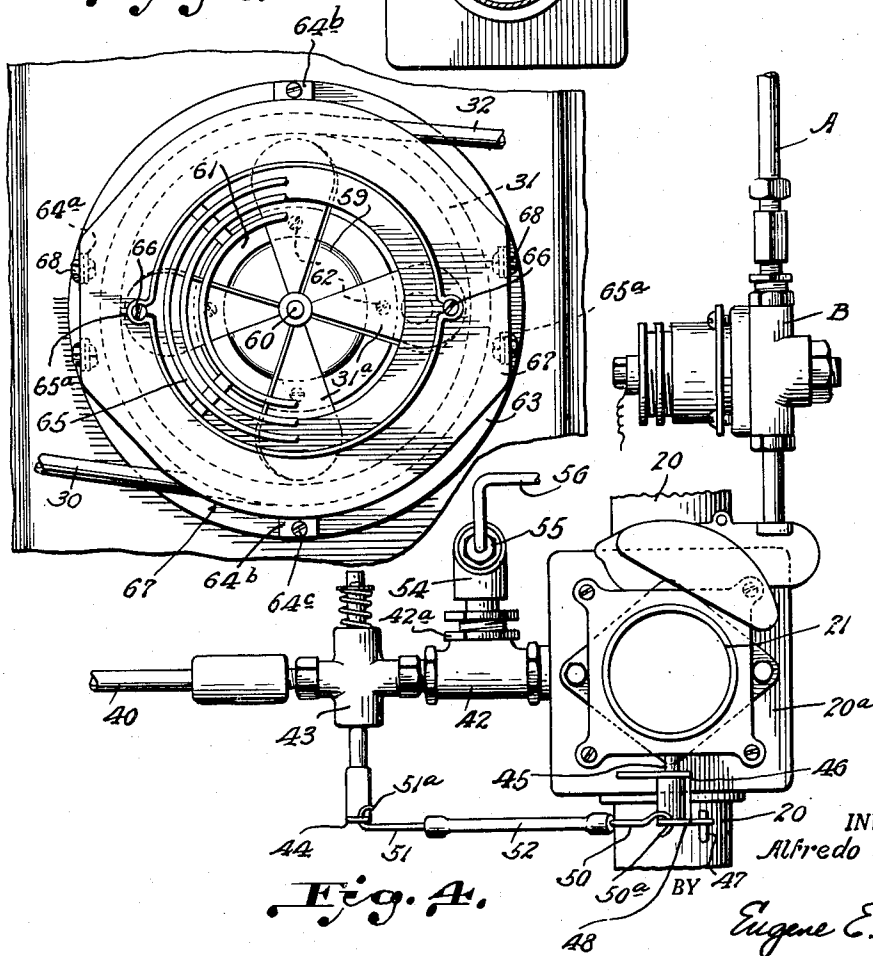


Fig. 4.

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PROPANE OR LIKE FUEL SUPPLY SYSTEM FOR INTERNAL-COMBUSTION ENGINES

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4 Claims. (Cl. 261—16)

This invention relates to the art of fuel supply means and systems for internal combustion engines, with particular reference to those used in motor vehicles although not limited thereto.

Although the petroleum hydrocarbons provide the most suitable internal combustion engine fuels, and present a wide range; yet in terms of consumption it is demonstrated that the greatest demand falls within a fairly limited scope—the gasoline fractions—so that an economic disparity exists in the use of the various available fuels.

The petroleum fractions, such as propane and butane, which have relatively low boiling points and are liquid only while under pressures higher than atmospheric, have been restricted in use. For instance, it has not been practical to employ such petroleum fractions in systems where engine mobility and portable load weights are factors of primary consideration, as in motor transport and in aviation. The mechanical requirements incident to the use of propane or the like impose burdens in the way of special apparatus and accessories which heretofore have been not only cumbersome, bulky, and heavy, but also expensive, often delicate, and difficult to maintain in proper condition.

It is therefore a primary object of my present invention to provide an internal combustion engine fuel feed supply means and system which will overcome the objections heretofore encountered in efforts to employ propane or the like as a motor fuel, the apparatus employed in my development being simple, inexpensive, light in weight and readily installed on motor vehicles without involving any great amount of time or expense or, for that matter, unusual skill.

The invention further contemplates a fuel supply means or system as characterized which includes a "heat exchanger" which may be used selectively as a cooler or heater for the interior of the vehicle.

Various other objects and advantages of the invention will be understood and appreciated upon reference to the accompanying drawings in connection with the detailed description of the illustrated embodiment of the invention which follows.

It is to be further emphasized that the invention resides in certain novel features of construction, combination and arrangement of parts, modes of operation, etc., which are dealt with in the drawings and detailed description.

In the drawings, wherein the same reference characters have been used to designate the same parts throughout the several views—

Fig. 1 is a diagrammatic view illustrating a fuel supply means or system embodying my invention, the outline of an automobile chassis being indicated in top plan.

Fig. 1a is a section on line 1a—1a of Fig. 1;

Fig. 2 is an enlarged plan view of the pressure regulator and solenoid cut-off valve which are incorporated in the propane supply line adjacent the intake manifold of the engine;

Fig. 3 is a cross-sectional view through the intake manifold showing the usual gasoline carburetor with conventional throttle control mounted thereon, and likewise the supply connection and throttle control of the propane supply line which has connection directly with the intake manifold;

Fig. 4 is a top plan view of the carburetor, intake manifold, and parts shown in Fig. 3;

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Fig. 5 is an enlarged side elevational view of the heat exchange coil and blower of Fig. 1 with the car floor in section (see 5—5 of Fig. 1); and

Fig. 6 is an enlarged top plan view of the parts shown in Fig. 5.

Referring to the drawings by reference characters and turning to Fig. 1, numeral 15 indicates an automobile chassis while 16 denotes the radiator, 17 the engine head, 18 the crank case, 19 the drive shaft enclosing casing, and 20 the fuel intake manifold having the conventional central enlargement 20a.

It is noted at this point that I contemplate, as will be more fully explained hereinafter, the selective use of either ordinary gasoline or propane type fuel. Hence the usual carburetor 21, gasoline supply line A and controls remain in place as best indicated in Figs. 3 and 4.

Coming now to my novel supply system for propane or other normally gaseous fuel at atmospheric temperatures, numeral 24 indicates the supply tank which may conveniently be mounted in the trunk compartment at the rear of the car, as suggested by the showing in Fig. 1.

The propane supply tank 24 will have the pressure gauge 25 and the relief valve 26 as usual. In carrying out the invention, the outflow pipe 28 from the tank 24 will have its inner end 28a terminating adjacent the bottom of the tank so that liquid fuel will be supplied to said line 28 as long as any remains in the tank. A valve 27, indicated in Fig. 1, controls the outflow of propane from the tank 24 through the pipe 25.

Assuming that the weather is excessively warm, the liquid propane supplied from the line 28 is discharged from the ordinary refrigerator-type expansion valve 29 through the line 30 directly to the refrigerating coil 31. At this point brief notice will be taken of the other pipes connected to the coil supply pipe 30 and the outflow pipe 32 therefrom. Such other pipes are shut off during hot weather so as to direct the discharge from expansion valve 29 into the refrigerating or heat exchange coil 31. Such other pipe connections joining with 30 and 32 will be discussed later on herein.

It is also noted in passing that Fig. 1 illustrates a motor driven fan 31a within the refrigerating or heat exchange coil through which the propane passes from the expansion valve 29. Such fan blows the cold air into the interior of the vehicle, automobile, airplane or boat in which the system happens to be installed.

More detailed reference to the heat exchange coil 31, fan 31a, etc., will be made presently.

Continuing now as to the propane fuel supply to the engine 17, the propane fuel passes from the outflow pipe 32 of coil 31 to the T-connection 33 of the branch line 34 and thence to the coil 35 which is disposed about the muffler portion 23 of the exhaust pipe 22 from the engine 17. Thus, the heat from the muffler 23 gasifies the propane fuel or the like, and same passes in gaseous form from the coil 35 through the pipe 36 to a conventional pressure regulator valve 38 which is secured to the side wall of the engine well of the chassis as at 38a and 38b (see Figs. 1 and 2). Pressure regulator 38 has the usual adjusting cup 39.

Figs. 2 and 4 best illustrate the propane supply line 40 from the pressure regulator 38 as having the throttle valve 43 adjacent to the connection 42 which communicates directly with the enlarged central portion 20a of the intake manifold 20 through the hole which usually receives the nipple end 54, 55 of the pneumatic operating line 56 of the windshield wiper motor (not shown).

As previously noted, the invention contemplates selective use of gasoline or a propane type fuel and the leaving of the regular gasoline carburetor 21 in place on manifold portion 20a. Thus, when propane is to be used as fuel, the gasoline supply through line A is cut off by the solenoid type valve B (Fig. 4) through operation of a dashboard-carried switch (not shown) and when gasoline is to be used as fuel the propane supply is similarly cut off by operation of the solenoid valve 41 (see Fig. 2). However, when propane is supplied to the engine as fuel and the gasoline supply is cut off, as stated, the gasoline carburetor 21 is made use of for supplying

the requisite amount of air to mix with the propane gas to assure proper combustion of the fuel in the engine cylinders, as will be shortly explained.

Referring to Figs. 3 and 4, it is noted that the carburetor 21 has the usual pivoted mount 45 for the throttle valve (not shown) extending outwardly from the carburetor wall, and on which the usual cleat 46 is secured to be controlled in standard fashion by the depending rod 47 which has the conventional connections (not shown) with the accelerator pedal located within the vehicle.

Since, as stated, the gasoline carburetor 21 with the gasoline supply A thereto cut off at B, is employed to supply air to intake manifold 20 when propane fuel is being used, simultaneous control of the carburetor throttle valve and the propane throttle valve 43 is necessary. Thus, I weld to the carburetor valve stem cleat 46 the upstanding strap metal strip 48 having the lineal series of apertures 49 therethrough. The hooked outer end 50a of a turnbuckle rod 50 is engaged in a selected one of the apertures 49, and the hooked end 51a of the other turnbuckle rod 51 is engaged in a selected hole 44a in the operating arm 44 of the propane throttle valve 43. A turnbuckle connection 52 takes on the threaded inner ends of the hooked turnbuckle rods 50, 51 so that relative adjustment of the throttle valve controls 44, 48-46 can be effected. Thus, it will be seen when the accelerator-controlled rod 47 is moved upwardly or downwardly, there will be simultaneous operation of the carburetor throttle valve controls 45, 46 and the propane throttle valve 43, 44—the former to admit air and the latter to admit a proportionate required amount of propane for proper combustion in the engine cylinders.

Referring to Figs. 3 and 4, the member 42 which connects the propane line to the intake manifold enlargement 20a is of T-formation and provides the branch 42a in which is secured the threaded nipple end 54 of the pneumatic operating line 55, 56 of the windshield wiper operating motor (not shown).

Turning now to the heat exchanger coil and assembly 31a which is diagrammatically illustrated in Fig. 1 (see Figs. 5 and 6) numeral 57 indicates the car body floor in which is cut the seat-defining hole 58 for the fan or blower motor 59, which latter is seated endwise in said hole 58 so that the armature shaft 60 projects upwardly substantially concentrically of the coil 31a and above the plane of the floor 57. The fan or blower element 31a is detachably secured on the projecting end of the armature shaft 60 of the motor in conventional fashion.

In the illustrated embodiment the motor is seen to be provided with a circumferential outwardly projecting stop flange 61 which functions to limit insertion of the motor into the hole or seat 58 in the car body floor 57. Screws 62 extend through motor flange 61, the contiguous bottom sheet metal annulus 64 of the coil and fan housing cage and the subjacent fiber mat 63 which is disposed as a vibration absorbing cushion upon the floor 57.

The coil and fan-enclosing cage is defined by the sheet metal bottom annulus 64 just referred to, the upstanding marginal sheet metal post extensions of said bottom annulus 64, the top annulus or ring 67, and the grille-like cover 65 which is carried by the latter. Screws 64c extending through lateral projections of bottom annulus 64 secure the coil and fan-enclosing cage in place independently of the blower motor 59.

Also, as indicated in Fig. 5, the top ring or annulus 67 has marginal, circumferentially spaced depending ears 67a which overlap the upper ends of the respective sheet metal posts 64a and are secured thereto by screws or the like 68.

The top grille of the coil and fan housing cage has several marginal downwardly offset apertured attaching feet through which screws 66 pass to fasten the grille to the top ring or annulus 67.

Referring to Fig. 1 again, this view illustrates how the heat exchange coil 31 may be included in a hot water circuit so as to serve as a heater in cold weather. In carrying out this phase of the invention a hot water supply pipe 69 has connection with the water pump 70 and line 32 from the coil 31 as indicated at 71; and the return pipe 72 to the radiator 16 has connection with the pipe 30 leading to the coil 31.

When the coil 31 is used for heating purposes or during mild weather when it is not needed for cooling, the valve 76 in the propane supply line 30 is closed so as to bypass

the coil 30 and transmit the fuel directly to the coil 35 about the muffler 23. In this condition of use the cut-off valve 77 in line 32 from coil 31 is operated to close said pipe 32.

Fig. 1 also indicates that the supply and return hot water lines 69, 72 each have cut-off valves 74 adjacent the T-connections 71, 73 with the respective propane lines 32a, 30 adjacent the coil 31. Fig. 1 likewise illustrates a drain petcock 75 in the propane line 32 from the coil 31 so that the latter can be drained of hot water or propane when necessary. It should be noted further that there is a cut-off valve 78 in the branch line 34 which, as stated, provides the propane bypass for the coil 31 when the latter is not to be used for refrigerating or cooling purposes.

The operation of my system will be briefly summarized as follows:

It will be apparent from Fig. 1 that the propane or other fuel which is normally gaseous at atmospheric temperatures may be passed from tank 24 to the engine intake manifold 20 through the expansion and regulator valves 29, 38, respectively, either by way of the cold disseminating coil or heat exchanger 31 or by way of the branch pipe 34. The portion 35 of the propane supply pipe which is coiled about the muffler 23 of exhaust pipe 22 effects vaporization of the fuel. However, it is to be emphasized that the coiling of the propane supply pipe about the muffler 25 is not absolutely necessary except in cold climates and is entirely superfluous in hot weather.

As illustrated, the engine 17 may be operated either on propane through line 28, 40, etc., or on gasoline from the usual supply through the pipe A to the carburetor 21 (see Figs. 3 and 4). When propane is used as the power fuel the gas supply line A is cut off by solenoid valve B of Figs. 3 and 4, an operating switch (not shown) being conveniently associated with the dashboard. However, when operating on propane supply, the adjustable link connection 52, 41 between the gasoline throttle control 46 and the propane throttle 44 enables the carburetor 21 to be employed for air admission purposes. Then when the driver selects gasoline for the power fuel the propane supply will likewise be cut off from the dash by operation of a suitable switch for closing the circuit of the solenoid valve 41 in the propane line, as best indicated in Fig. 2.

The heat exchanger coil 31 may be cut in to the branch circuit of the engine cooling system for heater use in the winter, at which time, of course, the propane supply will pass through branch 34 to muffler coil 35.

A suitable drain hole 79 may be provided through the floor 57, mat 63 and annulus 64 so as to provide for drainage of water or propane when the coil 31 is drained through petcock 75.

I claim:

1. In charge forming apparatus for internal combustion engines having a fuel charge conduit communicating with a cylinder and by which apparatus a liquid first fuel and a second gaseous fuel are selectively employed and mixed with air in the formation of a fuel charge, there being a unitary air admitting first fuel carburetor communicating with said conduit and having a cut-off-incorporating first fuel inlet means and a fuel charge flow controlling throttle valve and operating means therefor; the combination of a cut-off valve-incorporating second fuel supply means communicating with said fuel charge conduit solely at a point between said throttle valve and engine cylinder so as to be wholly independent at all times of control by said throttle valve, a flow control valve in said second fuel supply means and independent of said second fuel cut-off valve, an operating member connected to said second fuel flow control valve, and an operative connection between said operating member and said throttle valve operating means whereby operation of the throttle not only controls said second fuel control valve but also through operation of said throttle valve, when the first fuel supply is cut off, operates the throttle valve to supply air from the air inlet means of said first fuel charge forming means to mix with said second fuel in the formation of a fuel charge.

2. In charge forming apparatus for internal combustion engines having a fuel charge conduit communicating with a cylinder and by which apparatus a liquid first fuel and a second gaseous fuel are selectively employed and mixed with air in the formation of a fuel charge, there being a unitary air admitting first fuel carburetor communicating with said conduit and having a cut-off-incorporating first fuel inlet means and a fuel charge flow controlling throttle

valve and operating means therefor; the combination of a second fuel supply means communicating with said fuel charge conduit solely at a point between said throttle valve and engine cylinder so as to be wholly independent at all times of control by said throttle valve, a flow control valve in said second fuel supply means, an operating member connection to said second fuel flow control valve, and a manually separable operative connection between said operating member and said throttle valve operating means whereby operation of the throttle not only controls said second fuel control valve but also through operation of said throttle valve, when the first fuel supply is cut off, operates the throttle valve to supply air from the air inlet means of said first fuel charge forming means to mix with said second fuel in the formation of a fuel charge.

3. The combination set forth in claim 1, and said operative connection being adjustable whereby to vary the proportions of air and second fuel supplied to the engine cylinder.

4. The combination set forth in claim 2, and said operative connection being adjustable whereby to vary the proportions of air and second fuel supplied to the engine cylinder.

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