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FUEL OIL SYSTEM FOR INTERNAL-COMBUSTION ENGINES

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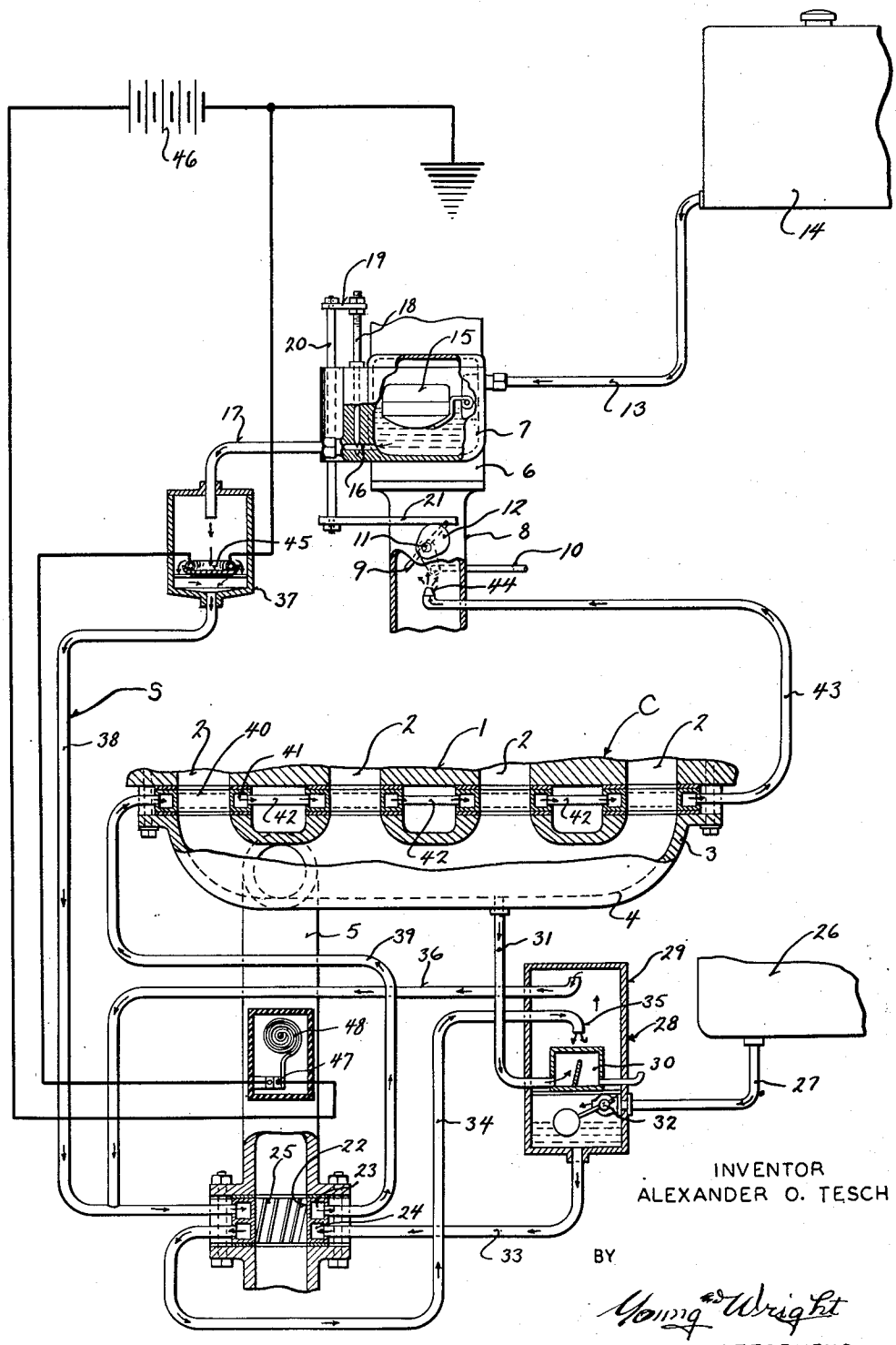

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FUEL OIL SYSTEM FOR INTERNAL-COMBUSTION ENGINES

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This invention appertains to a novel fuel system for internal combustion engines, and is an improvement over my prior Patent No. 2,400,664 issued to me May 21, 1946.

One of the primary objects of my present invention is the provision of means for vaporizing heavy hydrocarbons, such as kerosene, fuel oil and the like, and to combine the same with water vapor or steam to produce, with air in the carburetor, a combustible mixture capable of successful use in internal combustion engines of the type now in common use, without forming any appreciable amount of carbon or other deposits.

Another salient object of my invention is to provide means for initially heating the fuel oil and water separately from the exhaust of the engine and then combining the vapor or steam from the water with the heated fuel oil and thereafter raising the temperature of the mixture produced from the exhaust manifold prior to the introduction thereof into the carburetor.

A further object of my invention is the provision of means for super-heating the water vapor or steam prior to the introduction thereof into the heated fuel line.

A still further object of my invention is the provision of means, controlled by a switch operated thermostat for preheating the fuel electrically upon the initial starting of the engine and prior to the warming up of the exhaust manifold and pipe.

A still further important object of my invention is the provision of automatically controlling the amount of fuel flow from the bowl of the carburetor to the fuel line according to the opening and closing of the throttle valve.

A still further important object of my invention is the provision of novel heating rings or collars for the fuel and water incorporated directly in the exhaust manifold and the exhaust pipe, so as to insure the obtaining of the maximum amount of heat from the products of combustion to insure the vaporizing of the fuel mixture.

With these and other objects in view, the invention consists in the novel construction, arrangement and formation of parts as will be hereinafter more specifically described and claimed and illustrated in the accompanying drawing, in which drawing,

The figure is a diagrammatic view showing the principles of my system for using a heavy hydrocarbon fuel incorporated with an internal combustion engine.

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Referring to the drawing in detail, the letter S generally indicates my improved fuel system for use with an internal combustion engine C.

As the internal combustion engine can be of any well known type now in use, the same will not be described in detail, but the same includes an engine block 1 having exhaust outlets 2, which communicate with the branches 3 of an exhaust manifold 4. Leading from the exhaust manifold 4 is an exhaust pipe 5. Forming a part of the fuel system S and the engine C is a carburetor 6 including a bowl 7 into which initially flows the liquid fuel. Extending from the carburetor 7 and leading to the intake manifold (not shown) for the engine is the fuel charge intake pipe 8. The flow of the fuel mixture through the pipe 8 to the intake manifold is controlled by the usual throttle valve 9. The throttle valve 9 is opened and closed by means of an operating rod 10. The throttle valve 9 is of the butterfly type and includes a rock shaft 11 which carries the valve, and in accordance with my invention the rock shaft 11 has secured thereto an operating cam 12. The purpose and operation of this cam will be more fully set forth.

Liquid fuel flows in the ordinary manner into the carburetor bowl 7 through a supply pipe 13 which leads from a tank 14. A float operated needle valve is provided for governing the flow of the fuel from the pipe 13 into the bowl. The bowl has communicating therewith a outlet port 6 which communicates with a fuel delivery pipe 17. The flow of fuel through the port 16 is governed by a needle valve 18. This needle valve 18 is slidably supported by a part of the bowl 7 and is connected by a strap 19 with a lift rod 20 which is also preferably slidably carried by a part of the carburetor bowl. The lower end of the lift rod 20 has rigidly secured thereto a right angularly extending lift arm 21 which rests upon the cam 12. As the throttle valve 9 is opened, the cam raises and lifts the rod 20 and the needle valve 18 moves therewith. Consequently, the needle valve 18 opens and closes with the opening and closing movement of the throttle valve, and as the throttle valve opens wide more fuel will flow from the bowl into the pipe 17. In accordance with my invention, I incorporate in the length of the exhaust pipe 5 a hollow ring or collar 22 having separate annular chambers 23 and 24. The ring or collar 22 is of a type that can be readily clamped between sections of the exhaust pipe 5, and consequently, the collar or ring forms a part of the exhaust pipe and the products of combustion pass

through the collar. The inner surface of the collar or ring 22 can be provided with fins 25 for the quick transmission of heat from the exhaust to the walls of the chambers 23 and 24. The chamber 23 constitutes means for preheating the fuel from the exhaust and the chamber 24 constitutes means for preheating water and, as brought out in the objects of the specification, I propose to use steam in my fuel mixture. Adjacent to the engine C I arrange a tank 26 for water and the tank is connected, by means of a pipe 27 with the lower end of a heater 28. The heater includes a casing 29 having arranged centrally therein and above the bottom wall thereof a heater chamber 30. The heater chamber 30 is connected by a tube or pipe 31 with the exhaust manifold 4, so that hot exhaust gases will fill the heater housing 30 and effectively raise the interior temperature of the casing 29, and as the engine warms up the heater housing 30 becomes red hot. The amount of water flowing into the heater casing 29 is controlled by a float operated valve 32 and as the water in the heater casing rises and falls, the valve will be opened and closed, and in effect the float operated valve maintains a constant level of water in the heater casing. The water in the heater casing flows by gravity into the chamber 24 of the ring or collar 22 through a pipe 33 and the water flowing around the chamber is turned into vapor and this vapor is led out of the ring by a pipe 34 which extends into the heater casing 29. The pipe 34 terminates in a downturned nipple 35 which is disposed directly above the housing 30 so that the vapor will impinge upon the heated housing and this serves as means for superheating or drying the generated steam. The steam rises to the top of the casing 29 and is drawn out through a pipe 36. The means for preheating the fuel is as follows: The fuel conduit pipe 17 leading from the bowl 7 is led from the casing, by means of a pipe 38 to the chamber 23 of the ring or collar where the fuel is heated and vaporized. It is preferred to introduce the heated steam into the fuel line 38 just prior to the entrance of the fuel from the pipe 38 into the chamber 23 and consequently, the steam conduit pipe 36 is connected with the pipe 38.

The vaporized mixture is taken from the chamber 23 by a pipe 39, and the mixture is now further heated and vaporized by means of a series of hollow rings 40. There is a ring for each exhaust outlet 2 of the engine block and the rings 40 are clamped against the engine block and around the exhaust outlets 2 by means of the branches 3 of the exhaust manifold 4. Each ring includes an interior annular heating chamber 41 and the chambers of the rings are connected by short lengths of tubes 42. The fuel mixture conducting pipe 39 connects with the interior of one ring 40 and the opposite end ring 40 has communicating with its chamber 41 a pipe 43 which leads into the fuel charge intake pipe 8. The pipe terminates in an outlet nozzle 44 adjacent to the throttle valve.

In operation of the fuel system, the steam and fuel is vaporized in the chamber 23 and is then further heated and vaporized in the rings 40, and this vaporized mixture is introduced into the carburetor by the nozzle 44. The mixture when combined with the air in the carburetor is highly combustible and the steam effectively functions to reduce the formation of carbon deposits so that a smooth running engine will be had.

If the engine is started on fuel oil and not on gasolene, it is preferred to heat the fuel by an electric heating element until the engine has warmed up and the exhaust manifold and exhaust pipe become hot. This is accomplished by placing an electric heating element 45 in the casing 37 directly below the outlet of the pipe 17. The electric heating element can be placed in circuit with an electric energy source, such as a storage battery 46. Obviously, fuel oil dropped on the electric heating element 45 will become heated and vaporize and will be drawn into the carburetor. At this particular time, no steam will be supplied to the fuel. Flow of current to the electric heating element 45 is automatically cut off when the exhaust pipe reaches a predetermined temperature, and I accomplish this by means of a switch 47 placed in the length of one of the electric wires, which is in circuit with the electric heating element 45 and the battery 46. One of the switch points of the switch 47 is movable and is carried by the arm of a thermostat 48 placed in close contact with the exhaust pipe 5. The thermostat 48 can be of the bimetallic type if such should be preferred.

From the foregoing description, it can be seen that I have provided means for effectively vaporizing heavy hydrocarbon fuel and combining the same with steam to permit the successful use of such fuel with an internal combustion engine.

It is to be understood that the present invention can be modified so that the engine can be started on gasolene and thereafter switched to fuel oil when the engine heats up. The control of the flow of the gasolene and the fuel oil can be controlled by thermostats. This feature of starting the engine on gasolene and then using fuel oil after the warming up of the engine has been brought out in my original patent previously referred to.

If preferred, and in some instances, I may run a tube directly through the exhaust pipe or manifold to heat the fuel mixture and in this instance, I may eliminate the rings 40.

Changes in details may be made without departing from the spirit or the scope of my invention, but what I claim as new is:

1. In a fuel system for internal combustion engines of the type including an engine block having exhaust outlets, an exhaust manifold including branches for the exhaust outlets and an exhaust pipe, a carburetor having a fuel charge supply pipe, a fuel nozzle extending into said pipe, a tank for liquid fuel, a tank for water, a ring incorporated in the length of the exhaust pipe including separate chambers, means for supplying water to one chamber from the water tank, means for supplying fuel from the fuel tank to the other chamber, a casing, a heater housing heated from the exhaust manifold in said casing, means for leading water vapor from the first chamber of the heater housing against said heater casing, a tube leading from the upper end of said casing for supplying vapor to the other chamber, a series of interconnected rings incorporated between the branches of the exhaust pipe and the exhaust outlets and each including an interior chamber, means connecting the last mentioned chamber of the first mentioned ring with one of the series of rings and means connecting the chamber of another of the series of rings with the nozzle.

2. In fuel system for internal combustion engines as defined in claim 1, and said carburetor including a throttle valve and means actuated from the throttle valve for controlling the flow of fuel to the first mentioned ring.

3. In a fuel system for internal combustion engines, a carburetor provided with a fuel charge outlet pipe, a nozzle for vaporized fuel in said pipe, a tank for fuel, a tank for water, a ring adapted to be incorporated in the length of an exhaust pipe leading from the engine having separate interior chambers, means for supplying water from the water tank to one chamber, means supplying fuel from the fuel tank to the other chamber, means leading water vapor from the first chamber to the second chamber and means leading the mixed vapor from the second chamber to the nozzle, and means for super-heating the vapor from the first chamber prior to the introduction thereof into the second chamber.

4. In a fuel system for internal combustion engines as defined in claim 3, and means for heating the mixture from the second chamber prior to the supplying of the mixture to the nozzle.

5. In a fuel system for internal combustion engines, a carburetor provided with a fuel charge outlet pipe, a nozzle for vaporized fuel in said pipe, a tank for fuel, a tank for water, a ring adapted to be incorporated in the length of an exhaust pipe leading from the engine having

separate interior chambers, means for supplying water from the water tank to one chamber, means supplying fuel from the fuel tank to the other chamber, means leading water vapor from the first chamber to the second chamber, means leading the mixed vapor from the second chamber to the nozzle, and means for electrically heating the fuel prior to the warming up of the engine.

6. In a fuel system for internal combustion engines, a carburetor provided with a fuel charge outlet pipe, a nozzle for vaporized fuel in said pipe, a tank for fuel, a tank for water, a ring adapted to be incorporated in the length of an exhaust pipe leading from the engine having separate interior chambers, means for supplying water from the water tank to one chamber, means supplying fuel from the fuel tank to the other chamber, means leading water vapor from the first chamber to the second chamber, means leading the mixed vapor from the second chamber to the nozzle, and thermostatically controlled electric heating means for the fuel.

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