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J. O. HELVERN ET AL

2,385,513

FUEL SYSTEM

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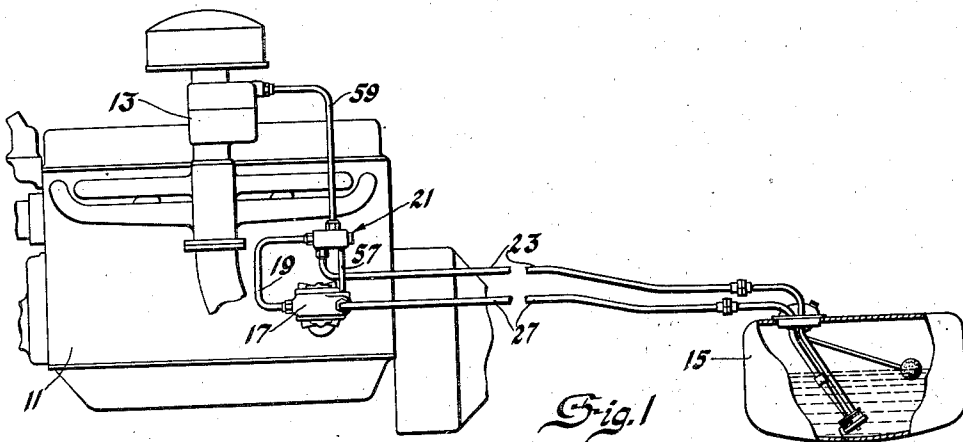


Fig. 1

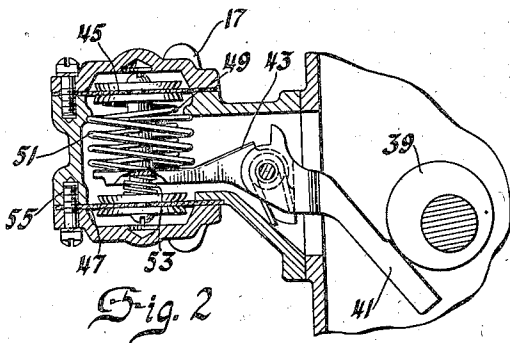


Fig. 2

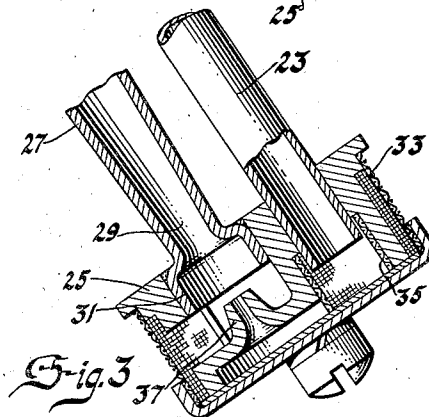


Fig. 3

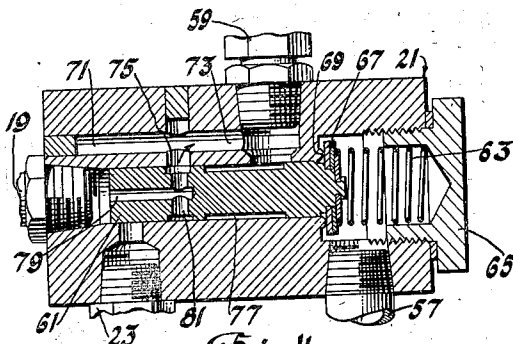


Fig. 4

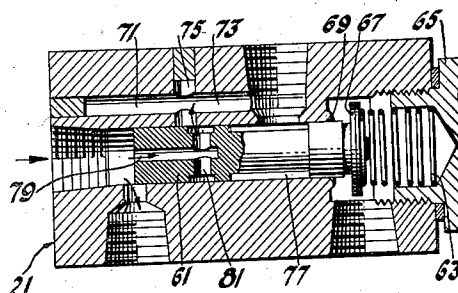


Fig. 5

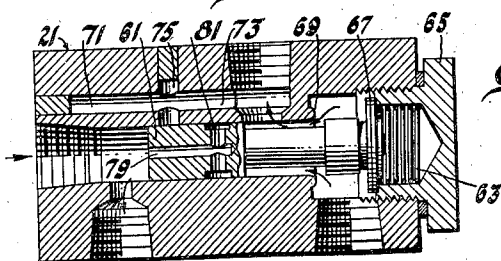


Fig. 6

Inventors

James O. Helvern &
Everett L. Baugh

By

Blackburn, Spencer & Hunt
Attorneys

UNITED STATES PATENT OFFICE

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FUEL SYSTEM

James O. Helvern and Everett L. Baugh, Dayton,
Ohio, assignors to General Motors Corporation,
Detroit, Mich., a corporation of Delaware

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6 Claims. (Cl. 158—36.3)

The engine fuel system which is the subject matter of this application may be described as an improvement over that of a prior filed application Serial No. 456,797 now Patent No. 2,367,055. Like the system earlier designed it employs a conduit for the flow of fuel which conduit includes as parts thereof a circulating pump, preferably driven by the engine, and a venturi serving to draw into the fuel column from a reservoir a quantity of fuel commensurate with the quantity withdrawn for the operation of the engine.

The improvement which constitutes the subject matter relates to the provision for priming the system.

It has for its object a positive priming action by which fuel is pumped directly from the tank to the carburetor before air is fully exhausted from the system.

Secondly, if the conduit be considered as comprising two pipes between the pump and reservoir only one of these pipes need be filled with fuel before the carburetor is supplied. In consequence the engine is quickly started and thus providing a greater circulating pump capacity for priming.

The novel priming valve makes unnecessary the check valve in the pipe leading to the carburetor of the former design. This is desirable in that the movable member of the novel valve is held closed during the early priming stage by a relatively heavy spring thus providing a more nearly positive seal. After this initial priming the member is moved to a wide open position by fluid pressure, thus reducing wire drawing and loss of pressure. It also avoids the need of the air dome which was used in the earlier design because of the check valve. Also throttling of the high pressure to the venturi caused by the priming valve of the earlier design is largely avoided, the throttling being reduced to the wide open position of the new valve.

The location of the priming valve adjacent or as a part of the pump makes it accessible for inspection and repair.

Other advantages will be apparent from the description which follows.

In the drawing:

Fig. 1 is a view in side elevation.

Fig. 2 is a vertical transverse section through the circulating pump.

Fig. 3 is a transverse section through the part of the system adjacent the bottom of the fuel tank.

Figs. 4, 5 and 6 are vertical sections through

the priming valve showing its movable member in three positions.

Referring to the drawing the engine is marked 11, the carburetor 13 and the fuel tank 15. Numeral 17 is applied to the circulating pump. It delivers fuel under pressure through pipe 19 to a valve identified as whole by numeral 21. In the normal operation of the engine fuel leaves the valve by way of pipe 23 which extends through the top of the tank and to and into a cage 25 near the bottom wall. The fuel returns to the circulating pump through a pipe 27, this pipe including a venturi 29, the lower flared end 31 of which is received in the cage as shown. The cage is surrounded by a screen 33 through which fuel may pass from the tank to enter the narrow region of the venturi. From the lower end of pipe 23 the fuel passes through a screen 35 and up through a nozzle 37 immediately below the venturi. Insofar as the construction of the cage is concerned it will be seen that this improved design differs from the earlier design mainly by the omission of the priming device in the cage including a movable member and spring. There are thus no movable parts in the relatively inaccessible part of the system.

The circulating pump shown is like that of the earlier design. It is operated by the engine cam 39 and includes the levers 41, 43 connected diaphragms 45 and 47 and springs 49, 51, 53 all housed within a casing 55. From the pump adjacent its inlet from pipe 27 is a pipe 57 for supplying the carburetor. Instead of being directly connected to the carburetor it is connected to valve 21 and from the valve a pipe 59 is connected to the carburetor.

More for the purpose of clear disclosure than to show the production form the valve is shown separate from the pump. In production the valve may and probably will be made a part of the pump.

The valve has a longitudinal passage within which reciprocates a valve member 61 normally biased to the position shown in Fig. 4 by a spring 63 within an enlarged part of the passage and in abutment against a threaded plug 65. A disc 67 on the member 61 engages a seat 69 on the valve body around the member 61. A passage 71 in the valve body communicates with a radial passage 73 which opens into pipe 59. A radial passage 75 connects the main passage with passage 71. The movable valve member is reduced centrally to form an annular channel 77 and it has

at one end an axial passage 79 communicating with radial passages 81.

The operation of the system is this. Fig. 4 shows the position of the parts of the valve when the engine is at rest. When the engine starts under the influence of the starting motor the pump diaphragms reciprocate. Fuel is drawn up through pipe 27 and the air and fuel is exhausted through pipe 19. As soon as pipe 27 is filled with fuel, the carburetor is supplied through pipe 59, since the position of valve member 61 provides a fluid path through passages 79, 81, 71, 73. In this position the outlet to pipe 23 is closed. As the engine begins to rotate on its own power the pump action becomes more effective and the pressure acting on member 61 moves it against spring 63 to the position shown by Fig. 5 where the outlet to the carburetor is partially open. Also pipe 23 is partially opened to permit fuel to fill the pipe 23. When the pipe 23 is filled the pressure is built up sufficiently to move member 61 to the position shown in Fig. 6. In this position the opening from passage 79 to 71 is closed and there is a free flow through the valve between pipes 19 and 23. At the same time the annular groove 77 moves to a position such that pipe 57 from the pump may discharge fuel through the valve to pipe 59 and supply the carburetor. Under these circumstances there is a continuous flow of fuel through the valve. The engine requirements are supplied through pipes 57 and 59 and the necessary replenishment is taken in from the tank through the venturi. The improved valve thus facilitates the starting since only a part of the conduit system need be primed before the carburetor is supplied. A check valve in the pipe leading from the pump is no longer needed.

The location of the priming valve adjacent to or as a part of the pump makes it of easy access for inspection and repair.

There is no appreciable throttling of the pipe to the venturi since the valve member completely opens the passage to pipe 23. Wire drawing in the passage from the pump to the carburetor is avoided by the omission of any check valve.

We claim:

1. A fuel system to supply an engine with fuel from a tank, said system having a main conduit and a branch conduit, a circulating pump with high pressure and low pressure sides and located within and constituting a part of said main conduit, a pipe also constituting a part of said main conduit connecting said tank to the low pressure side of the pump, mechanism associated with said pipe and operable to add fuel to said pipe from said tank, a priming valve having a passage therein, said passage having inlet and outlet openings, a second pipe connecting said inlet opening with the high pressure side of the pump, a third pipe connecting the outlet opening with said mechanism whereby said second and third pipes with said passage constitute a part of said first conduit, a member movable in said passage to a first position where it cuts off flow between said inlet and outlet openings, said priming valve having a third opening, said movable member constructed to provide communication between said inlet opening and third opening when in said first position, said branch conduit being connected to said third opening for supplying said engine, said priming valve having a fourth opening, con-

nected to the low pressure side of the pump, said movable member having a second position in which said inlet and outlet openings communicate and in which said third and fourth openings also communicate.

2. The invention defined by claim 1, together with yielding means to bias said valve member to its first described position.

3. The invention defined by claim 1, said mechanism being a venturi.

4. In a fuel supply system for an engine, a tank, a pump, a priming valve having an elongated passage, a main conduit, said main conduit having a first part extending from adjacent the bottom of said tank to said pump inlet, a second part connecting said pump outlet to said elongated passage in said valve, a third part extending from said valve passage and into said tank, a venturi in said tank connecting the adjacent ends of said first and third parts of the main conduit, a second conduit connecting the inlet side of said pump to said valve passage, a third conduit communicating with said valve passage and adapted to supply fuel to the engine, a movable valve member in said valve passage and a spring to bias said valve member to a position wherein it prevents a flow of fluid between said second and third parts of said main conduit, said valve member having a valve passage there-through whereby fluid may flow from the second part of the main conduit to the third conduit to facilitate priming.

5. The invention defined by claim 4, said second and third conduits having axially spaced openings into said valve passage, said valve member having a surface portion fitting the bore of said passage and adapted in one position to close communication between the openings to the second and third conduits and also having a recess to connect said last named openings when moved by fluid pressure against the resistance of said spring whereby fluid may flow from the second conduit to the third conduit.

6. A fuel system to supply an engine from a tank of fuel, said system including a main conduit having first, second and third parts, a pump having an inlet and an outlet, said first part connecting the tank to the pump inlet, a priming valve having a passage with first, second, third and fourth spaced openings communicating therewith, said second part of the main conduit connecting the pump outlet with the first valve passage opening, said third part connecting the second valve passage opening to the tank, Venturi means connected to said first and third conduit parts and adapted to supply said first part with fuel from the tank, a movable member in said valve passage adapted when in one position to close communication between said first and second passage openings, conduit means connected to the third valve passage opening for supplying fuel to the engine and another conduit means connecting the fourth valve passage opening to the pump adjacent its inlet, and spring means to bias said movable member to above mentioned position, to open communication between the first and third valve passage openings and to close off communication between the third and fourth passage openings.

JAMES O. HELVERN.
EVERETT L. BAUGH.