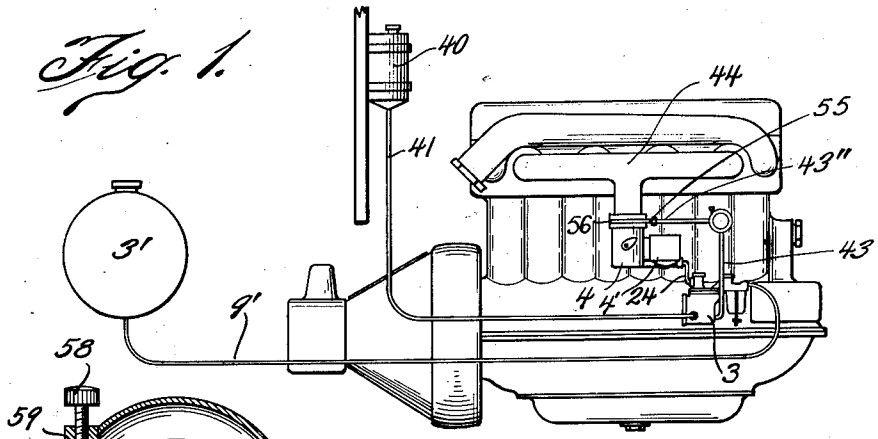
Nov. 8, 1938. B. J. HASKINS 2,136,079

DEVICE FOR FEEDING FLUID TO THE MOTOR PORTIONS OF INTERNAL COMBUSTION ENGINES

Filed Feb. 8, 1935

Fig. 1.



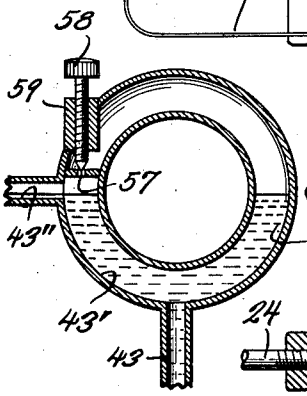


Fig. 3.

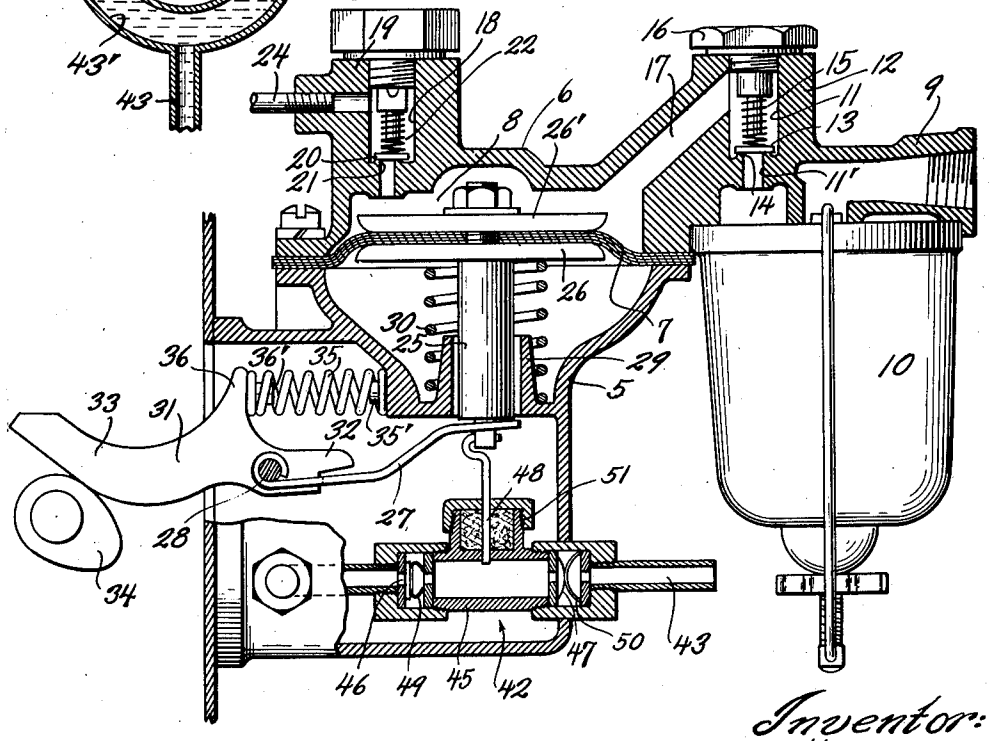


Fig. 2.

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DEVICE FOR FEEDING FLUID TO THE MOTOR PORTIONS OF INTERNAL COMBUSTION ENGINES

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17 Claims. (Cl. 123—198)

The invention relates to a device for determining the quantity of liquid such as lubricant, anti-knock compound or carbon removing compound supplied to the motor portions of an internal combustion engine, that is, to the combustion chambers and the parts exposed thereto.

An object of the invention is to perfect a novel and improved device of the character described delivering positively metered quantities of liquid.

Another object is to provide a device of the character described supplying liquid to the motor portions in quantities proportional to the operation of the motor as indicated by the fuel consumption thereof.

Yet another object is to provide a device supplying liquid to the motor portions in quantities substantially proportional to the fuel consumption and injected through the intake manifold beyond the carbureter.

A further object of the invention is to provide a device of the character described having feeding means adapted readily to be incorporated in and actuated by the fuel pump now standard equipment on most automobiles.

A further object is to provide a device of the character described having a check-valve controlled chamber and a reciprocable displacement member extending into the chamber and means for reciprocating the displacement member operating positively to force the member into the chamber to the limit of its movement and to withdraw the member only to an extent proportional to the fuel consumption of the motor.

Yet a further object of the invention is to provide a device of the character described having means for injecting an increased amount of liquid upon starting of the motor.

Other objects and advantages will become apparent from the following detailed description taken in connection with the accompanying drawing, in which

Fig. 1 is a diagrammatic view showing a metering device, embodying features of the invention, connected to the fuel supply system of an automobile.

Fig. 2 is an enlarged vertical sectional view of a fuel pump having the metering means of the device incorporated therein.

Fig. 3 is an enlarged sectional view of the auxiliary reservoir shown in Fig. 1.

While the invention is susceptible of various modifications and alternative constructions, it is shown herein and will be described hereinafter in a preferred embodiment. However, it is not intended that the invention is to be limited thereby to the specific construction disclosed but it is intended to cover all modifications and alternative constructions falling within the spirit and scope of the invention as defined by the appended claims.

In the drawing, the invention is illustrated as incorporated in a fuel pump 3 functioning to draw fuel from the supply tank 3' of an automobile and discharge the same to the carbureter 4 of the internal combustion engine, such a pump being common equipment on a large proportion of the automobiles manufactured. The fuel pump comprises a casing 5, housing an operating mechanism, and a cover 6 fitting over the top of the casing and providing the passages for the flow of fuel through the pump. Clamped between the casing 5 and the cover 6 is a fabric diaphragm 7 constituting one wall of a pump chamber 8 located in the cover. To provide an intake passage, the cover 6 is formed with a threaded port 9 for the reception of a pipe 9' leading to the fuel tank, and depending from the cover, in communication with the port 9, is a fuel bowl 10 of usual construction. From the fuel bowl the intake passage extends upwardly through a bore 11 formed in a stud 12 on the cover and housing a disk check valve 13. The valve 13 seats on a shoulder 14 formed by a reduction 11' of the bore in the stud and is yieldably pressed against the seat by a coiled compression spring 15 abutting the valve 13 at one end and a cap screw 16, threaded into the bore of the stud, at the other end. The inlet passageway is completed by a duct 17 communicating at one end with the bore 11 and at the other end with the pump chamber 8.

Discharge from the pump chamber takes place through a bore 18 formed in a stud 19 on the cover and also housing a disk check valve 20. Like the valve 13, the valve 20 seats on a shoulder 21, formed by a reduction in the bore 18, and is yieldably urged to seated position by a coiled compression spring 22 abutting the valve at one end and at the other end abutting a cap screw 23 threaded into and closing the bore in the stud. The bore 18 communicates with a pipe 24 leading to the fuel bowl 4' of carbureter 4 and is controlled by the usual float valve. It is believed apparent from the foregoing that the check valve 13 permits flow of fuel into the pump chamber 8 but prevents return flow and that check valve 20 in the discharge passage prevents return flow into the pump chamber and permits discharge therefrom but that such discharge is actually controlled by the float valve of the carbureter.

The diaphragm 7 is actuated to enlarge and

decrease the size of the pump chamber 8 thereby alternately to draw fuel through the intake passage and the check valve 13 and to discharge fuel through the discharge passage and the check valve 20. This pulsating movement is imparted to the diaphragm 7 by means of a rod 25 fast at its upper end with a disk 26 secured to the underside of the diaphragm 7 and at its lower end connected to a lever 27 pivoted on a pin 28. The disk 26 is attached to the diaphragm by means of a second disk 26' disposed above the diaphragm and bolted to the disk 26. The rod 25 extends through an annular flange 29 integral with a web portion of the casing 5 and forming a seat for one end of a coiled compression spring 30 which at its other end abuts the disk 26 urging the diaphragm upwardly to decrease the size of the pump chamber and effect a discharge of fuel therefrom.

The rod 25 is moved downwardly positively but is urged upwardly only by the yieldable force of the spring 30. To that end a crank 31 is also pivoted on the pin 28 and has an arm 32 overlying the pivoted end of the lever 27 and an arm 33 extending outwardly of the housing 5 for engagement with a cam 34 of the engine to be supplied with liquid. Thus as the crank is rocked by the cam 34 in a clockwise direction (Fig. 2) the arm 32 engages the lever 27 to draw the rod 25 downwardly but when the arm is rocked in a counterclockwise direction the arm 32 moves independently of the lever 27. A spring 35 abutting the web portion of the casing 5 at one end and at the other end abutting a third arm 36 of the crank 31 retains the arm 33 in contact with the cam 34. A stud 35' projecting from the web portion and a stud 36' on the arm 36 are encircled by the end coils of the spring to retain the same in place.

It is believed apparent from the foregoing that the rod 25 is repeatedly and forcibly drawn downwardly to enlarge the pump chamber 8 and thereby draw fuel into the chamber. Upward movement of the rod, however, is imparted by the spring 30 entirely independently of the crank 31 and dependent upon the discharge of fuel from the pump chamber. Such discharge, as pointed out above, is controlled by the float valve of the carbureter, discharge taking place when the float valve is opened and no discharge taking place when the float valve is closed. Thus the extent of movement of the rod 25 is proportional to the fuel consumption of the engine with which the pump is associated.

The fact that the rod 25 has a reciprocatory movement proportional to the amount of fuel consumed is utilized in perfecting a simple device having means for supplying quantities of liquid, such as lubricant etc., to the motor portions of an engine in proportion to the amount of fuel consumed. Hereinafter the phrase "motor portions" is intended to mean the combustion chambers and parts exposed thereto. Herein the device comprises a supply reservoir 40, for lubricant, anti-knock compound, carbon removing compound or other liquid to be fed to the engine, which is connected by means of a conduit 41 through suitable controlling means generally designated 42 and conduit 43 to the intake manifold 44 of the engine. Interposed between the conduits 41 and 43 and preferably housed within the casing 5 of the fuel pump is the controlling means generally designated 42. This means comprises a short section of conduit 45, the inlet to which is controlled by a check valve 46 and the outlet of which is controlled by a check valve 47, and a plunger 48 projecting into the section transversely thereof and connected to the rod 25. A spring 49 urges the valve 46 to closed position and a spring 50 urges the valve 47 to closed position. The plunger 48 projects into the conduit section 45 through a housing 51 containing suitable packing to prevent escape of liquid around the plunger as it is reciprocated.

As the plunger 48 moves outwardly of the conduit section 45, due to a discharge of fuel from the pump chamber 8, resulting in an upward movement of the rod 25 proportional to the amount of fuel discharged, liquid flows by gravity into the chamber formed between the check valves 46 and 47. The spring 49 holding valve 46 closed is very weak so as to be overcome by the weight of the column of liquid in the conduit 41. Then as the crank 31 positively moves the rod 25 downwardly the plunger 48 is forced into the conduit section 45 displacing a corresponding quantity of liquid which is discharged through the check valve 47 into conduit 43.

Herein the conduit 43 terminates in a vertically disposed annular member forming an auxiliary reservoir for storing an additional charge of liquid to be injected upon starting of the motor. This annular member provides a branch passage 43' leading upwardly from conduit 43 which communicates with a horizontal conduit 43'' terminating in a nipple 55 formed on a washer 56 inserted between the carbureter 4 and the intake manifold 44. The conduit 43'' communicates with branch 43' at a side or vertical portion of the annular member. A branch 43^a, the remainder of the annular member, constitutes the auxiliary reservoir for storing the additional charge of liquid. Interposed in the branch 43^a of the annular member just above the point of communication of the conduit 43'' with the branch 43' is a restricted orifice 57 providing for communication of the top of the branch 43^a with the intake manifold. This orifice is in the nature of an air bleed connection for gradually transmitting the pressure or suction in the manifold to the top portion of the branch 43^a. The size of the orifice may be controlled by means of a needle valve 58 threaded into a stud 59 formed on the annular member.

The operation of the device briefly is as follows: reciprocation of the plunger 48 forces liquid from the chamber formed between check valves 46 and 47 into the conduit 43, the liquid rising in the conduit and filling the branches 43' and 43^a to the level of the horizontal conduit 43''. Once the conduit has been filled to the top of the branch 43' further displacement of liquid by the plunger 48 causes a corresponding amount to overflow into the horizontal conduit 43'' from where it is drawn by suction into the manifold and the upper motor portions. Under normal operating conditions the conduit 43 and branch 43' are filled approximately to the top of the branch 43', the suction of the manifold merely drawing the liquid which overflows into the conduit 43'' and being incapable of lifting liquid from the branch 43'. Under normal operating conditions the liquid in the branch 43^a also is approximately at the level of the conduit 43'' because the suction in the manifold has bled through the orifice 57 to equalize the depression in the upper portion of the branch 43^a with the depression in the manifold.

Upon stopping of the motor the condition within the manifold changes from depression to substantially atmospheric pressure but this change, due to the restricted orifice 57, is not immediately communicated to the upper portion

of the branch 43a. Thus there exists a pressure differential which causes the liquid in the branch 43a to rise slightly and the liquid in the branch 43' to fall. This prevents discharge of liquid after the motor has stopped. Gradually pressure equilibrium is again obtained between the manifold and the upper portion of the branch 43a by bleed through the orifice 57 and the liquids in the branches assume the same level. Upon starting of the motor the annular member functions to inject an additional charge of liquid. Starting of the motor creates a depression in the manifold which is not immediately communicated to the branch 43a and as a result the liquid in the branch 43a is under atmospheric pressure while the liquid in branch 43' is in a depression. As a result the atmospheric pressure in the branch 43a forces the liquid stored in the branch into the manifold thus providing an additional desirable quantity of liquid at that time. Upon continued operation of the motor the pressure again equalizes by bleed through the orifice 57 and as the pressure equalizes the liquids in the branches seek the same level.

If the motor is running rapidly or under heavy load so as to consume a large quantity of fuel, the reciprocatory movement of the rod 25 is correspondingly large and each stroke of the plunger 48 will accordingly be large and displace a corresponding amount of liquid. When the motor is idling and the fuel consumption is low, there is little movement of the rod 25 and correspondingly the displacement by the plunger 48 is smaller and a smaller quantity of liquid is supplied to the upper motor. Thus it is apparent that I have provided an extremely simple means for supplying positively metered quantities of liquid to the upper motor in proportion to the fuel consumption of the motor. Not only is the device simple but it is readily incorporated in present day equipment of automobiles with practically no modification of such equipment and utilizing the inherent movement of certain parts thereof.

I claim as my invention:

1. A combined fuel pump and liquid feeding device comprising, in combination, a casing, a cover for the casing having a recess therein, a diaphragm clamped between the casing and the cover to form one wall of a fuel pumping chamber, an inlet passageway leading to said pumping chamber, an outlet passageway communicating with the carbureter for the engine and controlled by the float valve therein, a rod connected to said diaphragm, driving means forcibly and repeatedly moving said rod in a direction to enlarge the pumping chamber, resilient means urging said rod in a direction to decrease the size of the pumping chamber to effect a discharge of fuel therefrom, a liquid supply reservoir, a conduit leading from said reservoir to the intake manifold of the engine to supply variable quantities of liquid thereto, a portion of said conduit being housed within the casing, means forming a chamber in that portion of the conduit housed within the casing including a plunger connected to said rod and extending into the chamber to discharge quantities of liquid therefrom varying in accordance with the movement of said rod and independently of the movement of said driving means.

2. A combined fuel pump and other liquid feeding device for an internal combustion engine comprising in combination, a casing, a cover for the casing having a recess therein, a flexible diaphragm secured between the casing and the cover forming one side of a fuel pumping chamber, an inlet passageway for the pumping chamber, a check valve in said passageway permitting flow of fuel to the chamber but preventing flow of fuel therefrom, a discharge passageway communicating with a carbureter for the engine and controlled by the float valve of the carbureter, a check valve in said passageway permitting discharge from the pumping chamber but preventing return flow to the pumping chamber, a rod connected to the said diaphragm, means adapted to be actuated by the engine effective forcibly and repeatedly to move said rod to the limit of its movement in a direction to enlarge the pumping chamber, but ineffective to move said rod in a direction to decrease the pumping chamber, a spring urging said rod in a direction to decrease the pumping chamber and discharge fuel therefrom, a liquid supply reservoir, a conduit leading from said reservoir to the upper motor portions of the engine to supply variable quantities of liquid thereto, and means controlling the flow of liquid through said conduit housed within the casing comprising a section of conduit forming a chamber and a plunger extending into the chamber and directly connected to said rod for movement with the rod.

3. A device for supplying lubricating liquid to the motor portions of an internal combustion engine comprising a liquid reservoir, a conduit leading from below the level of the liquid in the reservoir to the intake manifold of the engine, means responsive to the quantity of fuel consumed by the engine, and means interposed in said conduit operating positively to discharge to the manifold quantities of liquid variable in proportion automatically to the quantity of fuel consumption of the engine as determined by said first mentioned means.

4. A device for supplying auxiliary liquid to the motor portions of an internal combustion engine comprising a liquid reservoir, means leading from the reservoir to the motor portions of the internal combustion engine and means for controlling the flow of liquid through said first mentioned means comprising means for forming a chamber and a plunger extending into the chamber transversely thereof and reciprocable in a positive direction to discharge quantities of liquid therefrom and retractible in a negative direction to a variable extent, and means responsive to the quantity of fuel demanded by the engine controlling the extent of retraction of said plunger.

5. A device for supplying auxiliary liquid to the motor portions of an internal combustion engine comprising a liquid reservoir, a conduit leading from the reservoir to the intake manifold of the engine, and means for controlling the flow of liquid through the conduit in proportion to the consumption of fuel by the engine comprising a pair of check valves interposed in the conduit forming a chamber and a reciprocating plunger extending into the chamber transversely thereof, the amplitude of reciprocation being determined in accordance with the quantity of fuel consumed to displace varying quantities of liquid.

6. A device for supplying auxiliary liquid to the motor portions of an internal combustion engine comprising a liquid reservoir, a first conduit communicating at one end with the reservoir, a second conduit communicating at one end with the motor portions of the internal combustion engine, a conduit section interposed between the

remaining ends of said conduits, a check valve permitting flow from the reservoir to said conduit section but preventing return flow, a check valve permitting flow from said conduit section to said second conduit but preventing return flow and a plunger extending into said conduit section transversely thereof and reciprocable positively to discharge quantities of liquid from said conduit section and having its movement in a negative direction controlled by the quantity of fuel demanded by the engine.

7. A device for discharging liquid to the motor portions of an internal combustion engine comprising a main liquid reservoir, means drawing liquid from said main reservoir and discharging the same in measured quantities to the intake manifold of the internal combustion engine and an auxiliary device including a reservoir connected between the intake manifold and said discharging means for passing a supply of liquid to the motor portions as determined by said discharging means and operating upon starting of the engine to discharge to the manifold a quantity of liquid additional to that discharged by the first means.

8. A device for discharging quantities of liquid to the motor portions of an internal combustion engine comprising, in combination, a main liquid reservoir, means for controlling the quantity of liquid discharged, a first conduit leading from said main reservoir to said controlling means and a second conduit leading from said controlling means to the intake manifold of the internal combustion engine, said second conduit including means providing an auxiliary liquid reservoir for passing a normal supply of liquid to the engine and operating to discharge an added quantity of liquid upon starting of the engine.

9. A device for discharging liquid to the motor portions of an internal combustion engine comprising a main reservoir, means for controlling the quantity of liquid supplied to the internal combustion engine, a first conduit connecting said main reservoir and said controlling means, a second conduit connecting said controlling means and the internal combustion engine, and means including an auxiliary reservoir for passing a normal supply of liquid to the engine and operating by the creation of a pressure differential upon the starting of the engine to inject an additional quantity of liquid.

10. In a device for supplying liquid to the motor portions of an internal combustion engine, means for controlling the quantity of liquid discharged to the engine, a first conduit communicating at one end with said means, a second conduit communicating at one end with the intake manifold of the engine and a vertically disposed annular member connected to the remaining ends of said conduits to provide a double passage therebetween, said first conduit communicating with said annular member near the lowermost portion thereof and said second conduit communicating with said member at one side thereof, dividing the member thereby into a lower and upper passage, the upper passage of said member containing a restricting orifice and the other branch passage being unrestricted.

11. A combined fuel pump and device for controlling other liquid supplied to an internal combustion engine comprising, in combination, a casing, means within the casing forming a pumping chamber, a discharge passage leading from the pumping chamber to a carbureter for the engine and controlled by the float valve of the carbureter, means operable to force fuel to the carbureter comprising a reciprocatable pump member and a constantly operating releasable power means for actuating said member in a direction to fill the chamber, a resilient means for actuating the member independently of the power means and in a direction to empty the chamber, said resilient means having the amplitude of its throw limited by the flow of fuel to the carbureter, a fluid feeding means in the casing having a reciprocating element for supplying a fluid to the combustion portions of the engine, said element being directly and positively connected with the reciprocating member.

12. In combination with an internal combustion engine, a combined fuel pump and device for controlling other liquid supplied to the internal combustion engine comprising, in combination, a casing, means within the casing forming a pumping chamber, a discharge passage leading from the pumping chamber to a carbureter for the engine and controlled by the float valve of the carbureter, means operable to move fuel to the carbureter comprising a reciprocatable fluid delivery member in the pump chamber, a lever operable to drive said member to a uniform retracted position and a resilient means for driving the member through the delivery stroke to a position determined in its amplitude by the fuel demand of the engine, a power means releasably engaging said lever to drive said delivery member to retracted position, and a fluid feeding means within the casing for supplying an auxiliary fluid in proportion to the fuel demand, said feeding means having a reciprocating element for moving the fluid, said element being impelled by the power means when driving the fluid positively and moved by the resilient means to the beginning of the stroke a distance in proportion to said fuel demand of the engine.

13. A combined fuel and auxiliary fluid supply system for a hydrocarbon combustion engine, comprising a carbureter, a casing housing a fuel pump and an auxiliary pump, a first pumping member in the fuel pump for driving the fuel, a power means for retracting the member preparatory to a pumping stroke and a resilient means associated with the member to supply the force for the pumping stroke to the exclusion of said power means, said resilient means being restricted in the amplitude of its stroke by the flow of fuel through the carbureter, a second pumping member for driving the fuel through the auxiliary pump being positively and directly connected to the first member and actuated in a pumping direction by the power means and retracted to a starting position by the resilient means of the fuel pump, and conduit means for connecting the auxiliary pump with the combustion portion of the engine.

14. A combined fuel pump and auxiliary fluid pump for a hydrocarbon combustion engine, a casing housing said pumps, separate conduit means for connecting the pumps with the combustion portion of the engine, the fuel pump having a fluid displacement member for driving the fuel, a power means for retracting the member preparatory to a pumping stroke and a resilient means associated with the piston to supply the force for the pumping stroke, a pumping element for driving the fuel in the auxiliary pump being directly connected to the fluid displacement member and actuated in a pumping direction by the power means and retracted to a starting position by the resilient means of the fuel pump.

15. A combined fuel and auxiliary fluid supply system for an engine comprising a casing housing a fuel pump, a reciprocating displacement member in the pump and a releasable power means to move said member to a retracted position, a resilient means to thrust said member through the pumping cycle independently of said power means, means for varying the amplitude of the stroke of said member in proportion to the fuel demand of the engine, said fluid system including an auxiliary pump housed in the casing and an auxiliary reservoir between said auxiliary pump and the engine, the auxiliary pump having a pumping element directly and positively connected with the displacement member of the fuel pump and having the amplitude of its stroke automatically determined by the variation of the stroke of the displacement member, the auxiliary reservoir being in direct communication with the auxiliary pump and the engine and operable to continuously pass fluid to the engine at a rate automatically determined by the fuel consumption of the engine, said reservoir having a lower free passage and an upper restricted passage therein operable jointly as a storage chamber for an excess quantity of fluid for immediate delivery upon the starting of said engine.

16. A combined fuel and auxiliary fluid supply system for an engine comprising a fuel pump, a reciprocating displacement member in the pump, a releasable power means to move said member to a retracted position and a resilient means to thrust said member through the pumping cycle independently of said power means, means for varying the amplitude of the throw of said member in proportion to the fuel demand of the engine, said fluid system comprising a fluid delivery member housed in the casing and an auxiliary reservoir between said delivery member and the engine, a plunger in the delivery member directly connected with the displacement member of the fuel pump and having the amplitude of its stroke automatically determined by the displacement member, said reservoir being in direct communication with the engine and operable to continuously pass fluid therethrough to the engine at a rate determined by the fuel consumption of the engine, and means in the reservoir operable to store an excess quantity of fluid for immediate delivery upon the starting of said engine.

17. The combination with a fuel pump, in a fuel feeding system of the carburetion type for an internal combustion engine, having a member reciprocable in proportion to the amount of fuel consumed, of a liquid feeding device comprising a reservoir for a supply of liquid, means including a conduit connecting the reservoir with the motor portions of the engine, and feeding means disposed in said conduit comprising means forming a chamber and a plunger extending into said chamber and positively and directly connected to said reciprocable member to displace varying quantities of liquid dependable in magnitude upon the movement of the member.

BUTLER J. HASKINS.