Sept. 13, 1966 H. T. M. RICE 3,272,143

DEMAND FUEL REGULATOR AND PRIMING PUMP

Filed May 20, 1963 2 Sheets-Sheet 1

FIG. 1.

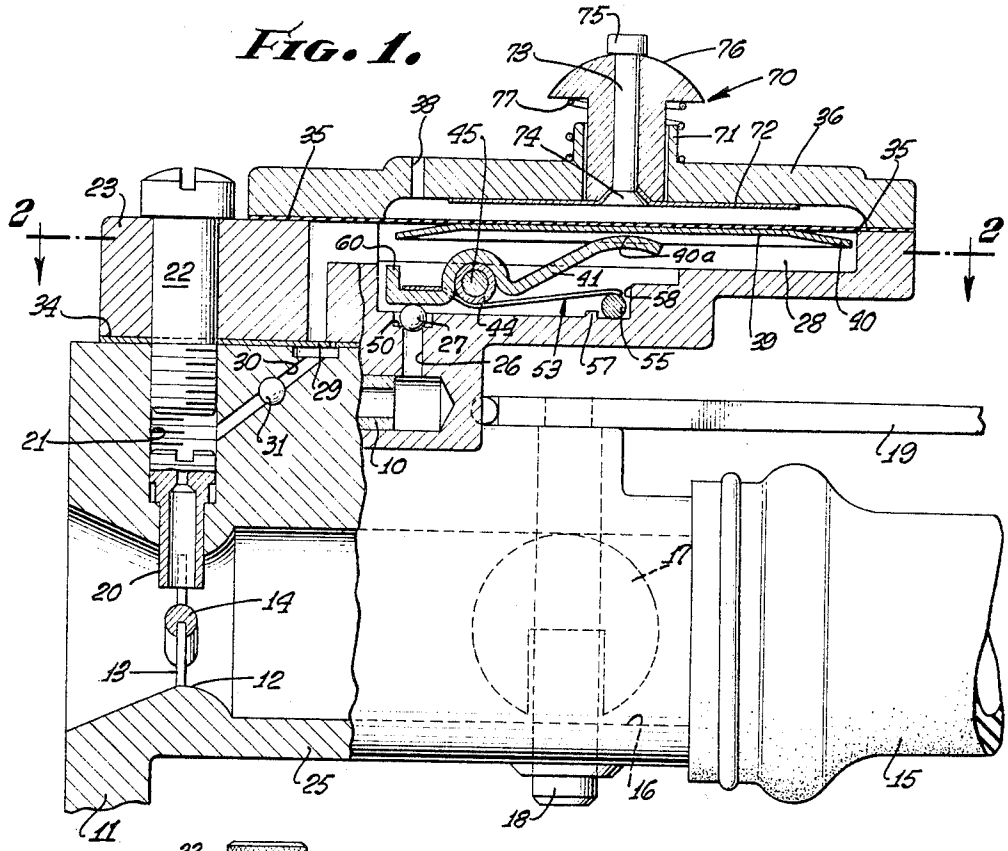
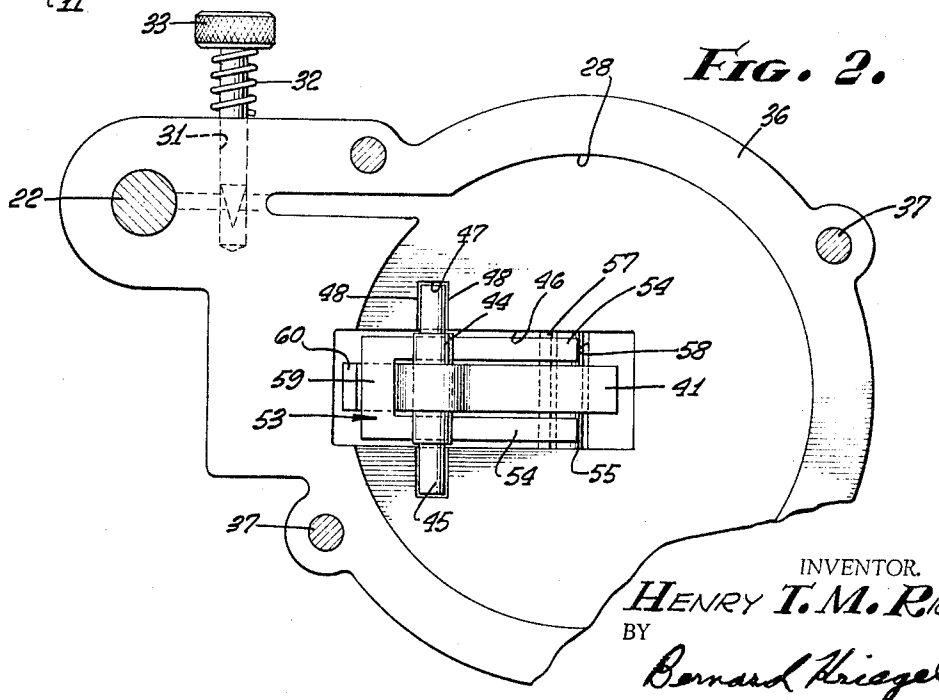


FIG. 2.



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Filed May 20, 1963 2 Sheets-Sheet 2

FIG. 3.

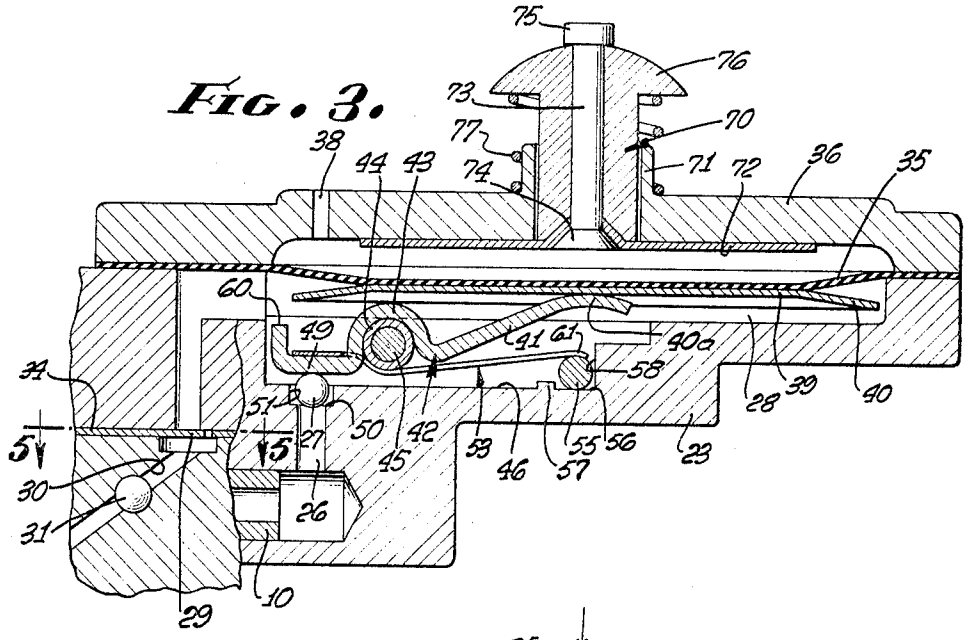


FIG. 4.

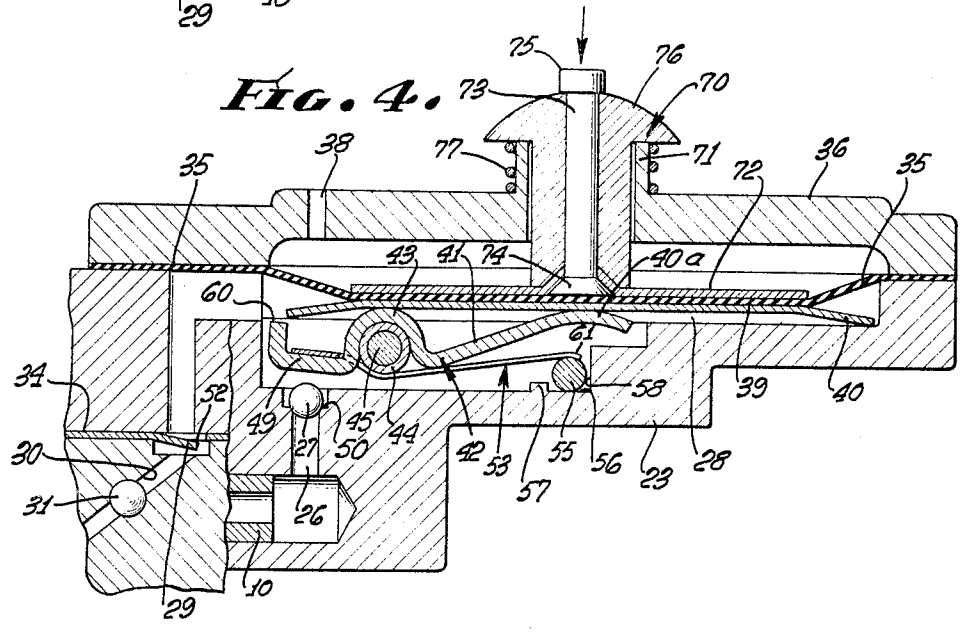
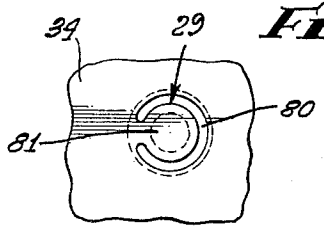


FIG. 5.



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3,272,143

DEMAND FUEL REGULATOR AND PRIMING PUMP

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Filed May 20, 1963, Ser. No. 281,438
11 Claims. (Cl. 103—150)

The present invention relates to apparatus for supplying fuel to internal combustion engines, and more particularly to regulators for controlling the passage of fuel to the carburetors of such engines.

An object of the invention is to provide a demand fuel regulator for supplying fuel at a substantially constant pressure, and which is also capable of functioning as a priming pump in aid of starting the engine with which it is associated

Another object of the invention is to provide a demand fuel regulator for controlling the supply of fuel to an engine, and which also embodies a priming pump, the pump being normally in an ineffective position free from interference with the functioning of the fuel regulator.

A further object of the invention is to provide a demand fuel regulator embodying a diaphragm responsive to engine vacuum in controlling the supply of fuel to the engine, in which the same diaphragm is utilized as a pump device for forcing fuel to the engine, as under engine starting conditions.

This invention possesses many other advantages, and has other objects which may be made more clearly apparent from a consideration of a form in which it may be embodied. This form is shown in the drawings accompanying and forming part of the present specification. It will now be described in detail, for the purpose of illustrating the general principles of the invention; but it is to be understood that such detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

Referring to the drawings:

FIGURE 1 is a longitudinal section, parts being shown in side elevation, of a demand fuel regulator and priming pump apparatus in combination with a carburetor;

FIG. 2 is a section taken along the line 2—2 on FIG. 1;

FIG. 3 is a view of the regulator and pump portion of the apparatus disclosed in FIG. 1, with the pump in an ineffective position, but with the regulator in an intermediate position;

FIG. 4 is a view similar to FIG. 3 disclosing the regulator being operated as a pump mechanism;

FIG. 5 is a fragmentary section taken along the line 5—5 on FIG. 3.

The demand fuel regulator and priming pump illustrated in the drawings is adapted to receive fuel through a suitable inlet line 10 and to deliver the fuel to a carburetor suitably connected with the intake of an internal combustion engine (not shown). As disclosed, the carburetor includes a venturi 11 having a throat portion 12 in which a throttle plate 13 is pivotally mounted, the plate being attached to a rod 14 suitably pivoted in the body 25 of the carburetor. Air from a suitable inlet line 15 passes into the air inlet 16 of the carburetor body, which is controlled by a choke plate 17 secured to a rod or pin 18 pivotally mounted in the body 25 and having a choke lever 19 attached thereto for determining the position of the choke plate 17 in the inlet air passage 16. Air flowing through the inlet past the choke 17 flows through the throat of the venturi 11, creating a suction therewithin and drawing fuel thereinto for admixture with the air for delivery to the engine cylinder or cylinders. The

fuel flows through a carburetor jet 20 threadedly mounted in a threaded bore 21 in the carburetor body 25 and communicating with the venturi throat 12. The threaded bore is closed by a screw plug 22 which also serves to secure the casing or housing 23 of the demand fuel regulator and priming pump apparatus to the carburetor body 25.

Fuel, such as gasoline, from a suitable tank (not shown) or other supply, flows through the fuel inlet line 10 into an inlet passage 26 in the diaphragm case 23. From this inlet passage, the fuel can flow past an inlet valve element 27 such as a ball, into a shallow chamber 28 from where it flows past a discharge valve or check valve 29 into an outlet passage 30 in the carburetor body that discharges into the threaded bore 21 of the carburetor, the fuel flowing through the carburetor jet passage 20 and into the venturi throat 12. Flow of fuel from the regulator outlet 30 is controlled by an adjusting needle valve 31 threadedly secured in the carburetor body 25 and extending across the passage 30. A suitable compression spring 32 bears against a knurled head 33 of the needle valve and against the carburetor body 25 to retain the needle valve in its position of adjustment across the passage 30.

The screw plug 22 engages the diaphragm case 23 and holds the latter in sealed relation to the carburetor body, a suitable gasket 34 being interposed between the casing and carburetor bodies to prevent leakage therebetween. The diaphragm case has a rubber or rubber-like diaphragm 35 extending across its chamber, which is held in place by a cover plate 36 suitably secured to the case by a plurality of screws 37. One side of the flexible or elastic diaphragm 35 is open to atmosphere through a hole 38 extending through the cover plate. Bearing against the other side of the diaphragm and disposed in the regulator chamber 28 is a diaphragm plate 39 extending substantially across the full diameter of the chamber, but having its outer margin 40 inclined in an outward direction away from the diaphragm so as to permit the portion of the diaphragm between its outer point of engagement with the plate 39 and the case to flex as a result of operation of the regulator.

The mid-portion of the diaphragm plate 39 bears against a curved or concaved portion 40*a* of one arm 41 of a lever 42, the inner portion of this arm merging into a saddle portion 43 of the lever disposed around and in engagement with a bushing 44 rotatably mounted on a fulcrum pin 45 extending across a cavity 46 in the diaphragm case 23 below the chamber, the pin being received within transverse grooves 47 in the case and being firmly secured thereto, as by peening over the case material 48 on opposite sides of the grooves against the end portions of the pin. The saddle portion 43 of the lever mergers into another lever arm portion 49 that bears against the inlet ball valve element 27, which is movable downwardly into engagement with a companion valve seat 50 surrounding the inlet passage 26. The valve element is disposed withing a confining counterbore 51 in the case below the cavity 46 to prevent the ball from becoming disassembled with respect to the lever arm 49.

The partial vacuum developed by air passing through the venturi throat 12, which creates a corresponding vacuum in the diaphragm chamber 28, tends to result in inward movement of the diaphragm 35 and plate 39, to rock the lever 42 and bushing 44 about the axis of the fulcrum pin 45, thereby allowing the ball 27 to be removed from its companion seat 50 and permitting fuel to flow into the diaphragm chamber 28, displacing the discharge valve 29 from its companion seat 52 and flowing into the outlet passage 30 and to the needle valve 31, flowing around the latter and through the carburetor jet 20 into the venturi portion 11 of the carburetor. Such

movement is resisted by a flat leaf spring **53** of generally U-shape. The opposed arms **54** of the spring are arranged on opposite sides of the plane of movement of the lever **42** and engage the underside of the bushing **44**, with the free ends of the arms contacting a roller **55** extending transversely of the arms and bearing against the bottom **56** of the diaphragm case. The roller can roll along the bottom of the case, its movement in one direction, as to the left as seen in FIGS. 1, 3 and 4, being limited by a stop rib **57** projecting upwardly from the diaphragm case. Its roling movement in the opposite direction is limited by engagement with an end wall **58** of the case, or by engagement of the ends of the spring arms **54** with the case. The intermediate or interconnecting portion **59** of the U-shaped leaf spring bears upon the lever arm **49** substantially opposite the ball **27**, the movement of the spring to the left, as seen in FIGS. 1, 3 and 4, being limited by an upwardly projecting stop hook **60** formed on the lever arm.

The leaf spring has the free ends **61** of its arms in contact with the anti-friction roller **55**, the intermediate portions of the arms contacting the fulcrum bushing **44** and its transverse or web portion **59** engaging the arm **49** of the lever, the spring being under tension so that it urges the ball **27** into engagement with its seat **50** to prevent flow of fuel through the passage **26** and into the chamber **28** of the regulator. Assuming suction or partial vacuum to be present in the diaphragm chamber **28**, the diaphragm plate **39** and the elastic diaphragm **35** are moved inwardly by the predominating atmospheric pressure, causing the lever **42** and bushing **44** to rock about the axis of the fixed fulcrum pin **45**, and against the force of the spring **53**, to remove the arm **49** of the lever from contact with the ball **27**, allowing the fuel to unseat the ball and flow around the latter into the diaphragm case **23**, filling the latter and then flowing outwardly past the discharge check valve **29** into the outlet passage **30** for continued flowing around the needle valve **31**, and through the carburetor jet **20** into the venturi **11**.

The regulator can maintain the fuel in the chamber **28** and on the high pressure side of the needle valve **31** substantially constant. If the suction in the chamber increases momentarily, as, for example, by opening the throttle plate **13**, the diaphragm plate **39** and diaphragm **35** move inwardly to a greater extent to rock the lever **42** and bushing **44** about the fulcrum pin **45** and against the force of the spring **53** to a greater extent, allowing the ball **27** to move to a greater extent away from its valve seat **50**, thereby allowing fuel to flow into the chamber **28** at a greater pressure and decreasing the vacuum in the chamber, whereupon the lever mechanism will offset the spring force to a lesser extent, allowing the lever arm **49** to move in the opposite direction and close the inlet valve **27** partly. On the other hand, if the pressure in the diaphragm chamber were to increase, as by virtue of a lesser demand for fuel by the engine, then the diaphragm **35** and diaphragm plate **39** would move in an outward direction, allowing the spring **53** to shift the ball valve element **27** toward a closed position, thereby decreasing the flow of fuel into the diaphragm chamber **28** and resulting in a decrease in pressure therein. Accordingly, the fuel in the diaphragm chamber is maintained at a substantially constant pressure, since, if the flow is at a greater pressure, the suction in the chamber **28** decreases, causing the diaphragm to close the inlet valve partially. Similarly, if fuel flows in at a lesser pressure, the suction in the chamber increases and the diaphragm **35** opens the valve **27** to a greater extent. Accordingly, constant pressure is maintained on the high pressure side of the carburetor needle adjusting valve **31**.

The demand fuel regulator illustrated can also function as a priming pump to force fuel into the outlet passage **30** and past the needle valve **31** into the carburetor jet **20**. As shown, a plunger **70** is reciprocably mounted in the cover plate **36** above the diaphragm **35**, being suitably guided by the main body of the cover plate and by a boss **71** integral therewith and extending outwardly therefrom. To the inner end of the plunger is secured a flat actuating plate **72** above the diaphragm **35** and adapted to engage the latter. This actuating plate **72** is attached to the plunger **70** by a pin **73**, the inner head **74** of the pin engaging a central portion of the actuating plate and the outer end of the pin having a head **75** engaging the outer portion of the plunger head **76**. The actuating plate **72** and plunger **70** are normally urged in an outward direction, so that the actuating plate **72** engages the inner surface of the cover plate **36** and is free from contact with the diaphragm **35**, by a helical compression spring **77** bearing against the exterior of the cover plate **36** and against the plunger head **76**. Normally, the spring maintains the plunger **70** in its outward and ineffective position, allowing the regulator to function in a normal manner in controlling the supply of fuel to the carburetor in the manner described above.

In employing the demand fuel regulator as a priming pump, the plunger **70** is depressed against the force of its spring **77**, the actuating plate **72** bearing against the diaphragm **35** and shifting the latter inwardly, which will rock the lever **42** about its fulcrum pin **45** free from engagement with the inlet ball valve element **27**, the pressure developed in the chamber **28** moving such ball valve element into engagement with its companion seat **50**, or to a closed position. At the same time, the pressure developed in the diaphragm chamber acts on the discharge valve element **29** and shifts it out of engagement from its seat **52**. As disclosed, the discharge valve device **29** is provided by the gasket **34** clamped between the diaphragm housing **23** and the carburetor body **25**, as by making an arcuate severing cut **80** (FIG. 5) around a substantial portion of the periphery of the diaphragm check valve member, leaving gasket material **81** at one side thereof to provide a flexible hinge. The discharge valve **29** is in the form of a flapper valve that can move downwardly from engagement with its companion valve seat **52** provided on the case or housing **23**, the flapper check valve element being capable of shifting back into engagement with such seat.

As described, the depression of the plunger **70** and corresponding depression of the diaphragm **35** and diaphragm plate **39** closes the inlet valve **27** and shifts the discharge check valve **29** to open position. Release of the force on the plunger **70** will cause its spring **77** to shift it upwardly, the diaphragm **35** tending to return to its initial position and creating a suction or vacuum in the chamber **28** capable of pulling fuel from the inlet line **10** and the inlet passage **26** into the diaphragm chamber. During such upward or outward movement of the diaphragm **35**, the discharge valve **29** is shifted automatically to closed position, but the inlet valve **27** is open. Subsequent depression of the plunger **70** will now cause its actuating plate **72** to bear against the diaphragm **35**, depressing the latter and causing it to function as a piston to force the fuel from the chamber **28** to the discharge valve **29**, unseating the latter and flowing through the outlet passage **30** and around the needle valve **31** and through the carburetor jet **20** into the venturi throat **12**, and to the internal combustion engine. Several reciprocations of the plunger **70** are usually sufficient to insure the injection of an adequate supply of fuel to the engine, so that its rotation by the engine starter (not shown) will result in its starting.

After the priming pump has been actuated to insure the supply of adequate starting fuel to the engine, the force on the plunger **70** is released, its spring **77** shifting it to its outermost and ineffective position, as disclosed in FIG. 1. The starting of the engine then causes the demand fuel regulator to function in its normal manner in supplying fuel to the carburetor and to the engine. As shown in FIG. 3, the plunger **70** is still in its inactive position, but the diaphragm **35** is in its partially depressed

condition, the inlet valve **27** being enabled to be opened as a result of the partial vacuum in the chamber **28**, so that fuel can flow past the inlet valve thereinto and past the discharge valve **29** to the carburetor. As shown in FIG. 4, the plunger **70** has been fully depressed, which is at the end of a pump stroke, the pressure imposed by the plunger **70** on the diaphragm **35** and on the fuel in the chamber **28** closing the inlet valve **27** and automatically opening the discharge or check valve **29**, so that fuel is delivered to the carburetor.

It is, accordingly, apparent that a demand fuel regulator has been provided which is capable of performing its normal function of insuring the supply of fuel to the engine under substantially constant pressure conditions, and which is also adapted for use as a priming pump to facilitate starting of the engine. The adaptation of the demand fuel regulator for priming purposes has been accomplished in a very simple and economical manner, merely by the incorporation of the discharge check valve **29** in the outlet line and the plunger actuator **70–76** that consist of relatively few parts.

The demand fuel regulator illustrated in the drawings is both described and claimed in my United States patent application, Serial No. 108,647, filed May 8, 1961, for "Demand Fuel Regulator," now Patent No. 3,151,627. The present application embodies a modification of the regulator illustrated in the drawings of the above-identified application by incorporating therein the above described priming pump feature.

I claim:

1. In a fuel regulator and priming pump: housing means having a chamber therein provided with an inlet passage and a single outlet passage; an inlet valve controlling flow of fuel from said inlet passage into said chamber; a discharge valve controlling flow of fluid from said chamber into said outlet passage; valve actuating means engaging said inlet valve and urging said inlet valve to closed position; diaphragm means secured to said housing means across said chamber and engageable with said valve actuating means to shift said valve actuating means in response to the pressure in said chamber to control opening of said inlet valve; said diaphragm means being constructed and arranged to shift in said housing in a direction to draw fuel from said inlet passage past said inlet valve into said chamber; and means engageable with said diaphragm means for reciprocating said diaphragm means in said chamber to alternately enable said discharge valve to close and draw fuel from said inlet passage past said inlet valve into said chamber and enable said inlet valve to close and discharge fuel from said chamber past said discharge valve into said outlet passage.

2. In a fuel regulator and priming pump: housing means having a chamber therein provided with an inlet passage and a single outlet passage; an inlet valve controlling flow of fuel from said inlet passage into said chamber; a discharge valve controlling flow of fluid from said chamber into said outlet passage; valve actuating means engaging said inlet valve and urging said inlet valve to closed position; fluid pressure responsive means in said chamber engaging said valve actuating means and responsive to the fluid pressure within said chamber to shift said valve actuating means and control opening of said inlet valve; said fluid responsive means being constructed and arranged to shift in said housing in a direction to draw fuel from said inlet passage past said inlet valve into said chamber; and means engageable with said fluid pressure responsive means for reciprocating said fluid pressure responsive means in said chamber to alternately enable said discharge valve to close and draw fuel from said inlet passage past said inlet valve into said chamber and enable said inlet valve to close and discharge fuel from said chamber past said discharge valve into said outlet passage.

3. In a fuel regulator and priming pump: housing means having a chamber therein provided with an inlet passage and a single outlet passage; an inlet valve controlling flow of fuel from said inlet passage into said chamber; a discharge valve controlling flow of fluid from said chamber into said outlet passage; valve actuating means engaging said inlet valve and urging said inlet valve to closed position; diaphragm means secured to said housing means across said chamber and engageable with said valve actuating means to shift said valve actuating means in response to the pressure in said chamber to control opening of said inlet valve; said diaphragm means being constructed and arranged to shift in said housing in a direction to draw fuel from said inlet passage past said inlet valve into said chamber; an actuator slidable in said housing means and engageable with said diaphragm means; said actuator being shiftable inwardly of said housing means to shift said diaphragm means in said chamber in a direction to close said inlet valve and discharge fuel from said chamber past said discharge valve into said outlet passage; and means for shifting said actuator outwardly of said housing means to enable said diaphragm means to shift in said chamber in the opposite direction to enable said discharge valve to close and to draw fuel from said inlet passage past said inlet valve into said chamber.

4. In a fuel regulator and priming pump: housing means having a chamber therein provided with an inlet passage and a single outlet passage; an inlet valve controlling flow of fuel from said inlet passage into said chamber; a discharge valve controlling flow of fluid from said chamber into said outlet passage; valve actuating means engaging said inlet valve and urging said inlet valve to closed position; fluid pressure responsive means in said chamber engaging said valve actuating means and responsive to the fluid pressure within said chamber to shift said valve actuating means and control opening of said inlet valve; said fluid responsive means being constructed and arranged to shift in said housing in a direction to draw fuel from said inlet passage past said inlet valve into said chamber; an actuator slidable in said housing means and engageable with said fluid pressure responsive means; said actuator being shiftable inwardly of said housing means to shift said fluid pressure responsive means in said chamber in a direction to close said inlet valve and discharge fuel from said chamber past said discharge valve into said outlet passage; and means for shifting said actuator outwardly of said housing means to enable said fluid pressure responsive means to shift in said chamber in the opposite direction to enable said discharge valve to close and to draw fuel from said inlet passage past said inlet valve into said chamber.

5. In a fuel regulator and priming pump: housing means having a chamber therein provided with an inlet passage and a single outlet passage; an inlet valve controlling flow of fuel from said inlet passage into said chamber; a discharge valve controlling flow of fluid from said chamber into said outlet passage; valve actuating means engaging said inlet valve and urging said inlet valve to closed position; diaphragm means secured to said housing means across said chamber and engageable with said valve actuating means to shift said valve actuating means in response to the pressure in said chamber to control opening of said inlet valve; said diaphragm means being constructed and arranged to shift in said housing in a direction to draw fuel from said inlet passage past said inlet valve into said chamber; plunger means slidable in and projecting from said housing means and engageable with said diaphragm means; the outer portion of said plunger means being adapted to have inward force exerted thereon to shift said diaphragm means in said chamber in a direction to close said inlet valve and discharge fuel from said chamber past said discharge valve into said outlet passage; and spring means engaging said plunger means for shifting said plunger means outwardly of said housing means to enable said diaphragm means to shift in said chamber in the opposite direction to enable said

discharge valve to close and to draw fuel from said inlet passage past said inlet valve into said chamber.

6. In a fuel regulator and priming pump: housing means having a chamber therein provided with an inlet passage and a single outlet passage; an inlet valve controlling flow of fuel from said inlet passage into said chamber; a discharge valve controlling flow of fluid from said chamber into said outlet passage; valve actuating means engaging said inlet valve and urging said inlet valve to closed position; fluid pressure responsive means in said chamber engaging said valve actuating means and responsive to the fluid pressure within said chamber to shift said valve actuating means and control opening of said inlet valve; said fluid responsive means being constructed and arranged to shift in said housing in a direction to draw fuel from said inlet passage past said inlet valve into said chamber; plunger means slidable in and projecting outwardly of said housing means and engageable with said fluid pressure responsive means; the outer portion of said plunger means being engageable by the hand of a person for shifting inwardly of said housing means to shift said fluid pressure responsive means in said chamber in a direction to close said inlet valve and discharge fuel from said chamber past said discharge valve into said outlet passage; and spring means engaging said plunger means for shifting said plunger means in a direction outwardly of said housing means to enable said fluid pressure responsive means to shift in said chamber in the opposite direction to enable said discharge valve to close and to draw fuel from said inlet passage past said inlet valve into said chamber.

7. In a fuel regulator and priming pump: a case having a chamber therein provided with an inlet passage and a single outlet passage; said case providing an inlet valve seat surrounding said inlet passage and an outlet valve seat surrounding said outlet passage; an inlet valve element engageable with said inlet seat; a discharge valve element engageable with said outlet seat; diaphragm means secured to said case across said chamber; spring means urging said inlet valve element into engagement with said inlet seat; a fulcrum pin supported in said chamber; a lever pivoted on said pin and having a first arm engaging said diaphragm means and a second arm engaging said inlet valve element, said spring means bearing against said pin and second arm to urge said inlet valve element into engagement with said inlet seat; said diaphragm means being constructed and arranged to shift in said case in a direction to draw fuel from said inlet passage past said inlet valve element into said chamber; and means engageable with said diaphragm means for reciprocating said diaphragm means in said chamber to alternately enable said discharge valve element to close against said outlet seat and draw fuel from said inlet passage past said inlet valve element into said chamber and enable said inlet valve element to close against said inlet seat and discharge fuel from said chamber past said discharge valve element into said outlet passage.

8. In a fuel regulator and priming pump: a case having a chamber therein provided with an inlet passage and a single outlet passage; said case providing an inlet valve seat surrounding said inlet passage and an outlet valve seat surrounding said outlet passage; an inlet valve element engageable with said inlet seat; a discharge valve element engageable with said outlet seat; diaphragm means secured to said case across said chamber; spring means urging said inlet valve element into engagement with said inlet seat; a fulcrum pin supported in said chamber; a lever pivoted on said pin and having a first arm engaging said diaphragm means and a second arm engaging said inlet valve element, said spring means bearing against said pin and second arm to urge said inlet valve element into engagement with said inlet seat; said diaphragm means being constructed and arranged to shift in said case in a direction to draw fuel from said inlet passage past said inlet valve element into said chamber; plunger means reciprocable in said case and engageable with said diaphragm means for shifting said diaphragm means inwardly of said chamber to close said inlet valve element against said inlet seat and discharge fuel from said chamber past said discharge valve element into said outlet passage; and spring means engaging said plunger means for shifting said plunger means outwardly of said case to allow said diaphragm means to move in a direction outwardly of said chamber to enable said discharge valve element to close against said outlet seat and to draw fuel from said inlet passage past said inlet valve element into said chamber.

9. In a fuel regulator and priming pump: a case having a chamber therein provided with an inlet passage and a single outlet passage; said case providing an inlet valve seat surrounding said inlet passage and an outlet valve seat surrounding said outlet passage; an inlet valve element engageable with said inlet seat; a discharge valve element engageable with said outlet seat; diaphragm means secured to said case across said chamber; spring means urging said inlet valve element into engagement with said inlet seat; a fulcrum pin supported in said chamber; a lever pivoted on said pin and having a first arm engaging said diaphragm means and a second arm engaging said inlet valve element, said spring means bearing against said pin and second arm to urge said inlet valve element into engagement with said inlet seat; said diaphragm means being constructed and arranged to shift in said case in a direction to draw fuel from said inlet passage past said inlet valve element into said chamber; plunger means reciprocable in said case and engageable with said diaphragm means for shifting said diaphragm means inwardly of said chamber to close said inlet valve element against said inlet seat and discharge fuel from said chamber past said discharge valve element into said outlet passage; spring means engaging said plunger means for shifting said plunger means outwardly of said case to allow said diaphragm means to move in a direction outwardly of said chamber to enable said discharge valve element to close against said outlet seat and to draw fuel from said inlet passage past said inlet valve element into said chamber; said spring means being adapted to shift said plunger means in a direction outwardly of said case to a position free from engagement with said diaphragm means to permit normal operation of said diaphragm means in controlling passage of fluid from said inlet passage into said chamber.

10. In a fuel regulator and priming pump: a case having a chamber therein provided with an inlet passage and a single outlet passage; said case providing an inlet valve seat surrounding said inlet passage and an outlet valve seat surrounding said outlet passage; an inlet valve element engageable with said inlet seat; a discharge valve element engageable with said outlet seat; diaphragm means secured to said case across said chamber; spring means urging said inlet valve element into engagement with said inlet seat; a fulcrum pin supported in said chamber; a lever pivoted on said pin and having a first arm engaging said diaphragm means and a second arm engaging said inlet valve element, said spring means bearing against said pin and second arm to urge said inlet valve element into engagement with said inlet seat; said diaphragm means being constructed and arranged to shift in said case in a direction to draw fuel from said inlet passage past said inlet valve element into said chamber; a plunger reciprocable in said case and extending outwardly thereof; an actuating plate in said case secured to said plunger and adapted to engage said diaphragm means whereby inward movement of said plunger shifts said diaphragm means inwardly of said chamber to close said inlet valve element against said inlet seat and discharge fuel in said chamber past said discharge valve element into said outlet passage; and spring means engaging said plunger to shift said plunger and actuating plate in a direction outwardly of said case to allow movement of said diaphragm means in such outward direc-

tion to enable said discharge valve element to close against said outlet seat and to draw fuel from said inlet passage past said inlet valve element into said chamber.

11. In a fuel regulator and priming pump: a case having a chamber therein provided with an inlet passage and a single outlet passage; said case providing an inlet valve seat surrounding said inlet passage and an outlet valve seat surrounding said outlet passage; an inlet valve element engageable with said inlet seat; a discharge valve element engageable with said outlet seat; diaphragm means secured to said case across said chamber; spring means urging said inlet valve element into engagement with said inlet seat; a fulcrum pin supported in said chamber; a lever pivoted on said pin and having a first arm engaging said diaphragm means and a second arm engaging said inlet valve element, said spring means bearing against said pin and second arm to urge said inlet valve element into engagement with said inlet seat; said diaphragm means being constructed and arranged to shift in said case in a direction to draw fuel from said inlet passage past said inlet valve element into said chamber; a plunger reciprocable in said case and extending outwardly thereof; an actuating plate in said case secured to said plunger and adapted to engage said diaphragm means whereby inward movement of said plunger shifts said diaphragm means inwardly of said chamber to close said inlet valve element against said inlet seat and discharge fuel in said chamber past said discharge valve element into said outlet passage; spring means engaging said plunger to shift said plunger and actuating plate in a direction outwardly of said case to allow movement of said diaphragm means in such outward direction to enable said discharge valve element to close against said outlet seat and to draw fuel from said inlet passage past said inlet valve element into said chamber; said spring means being adapted to shift said plunger and actuating plate in an outward direction to engage said actuating plate with said case free from engagement with said diaphragm means to permit normal actuation of said diaphragm means in regulating the flow of fuel past said inlet valve element into said chamber.

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