April 25, 1933. F. H. HEITGER 1,905,284

PUMP

Filed Sept. 27, 1928 3 Sheets-Sheet 1

Fig. 1.

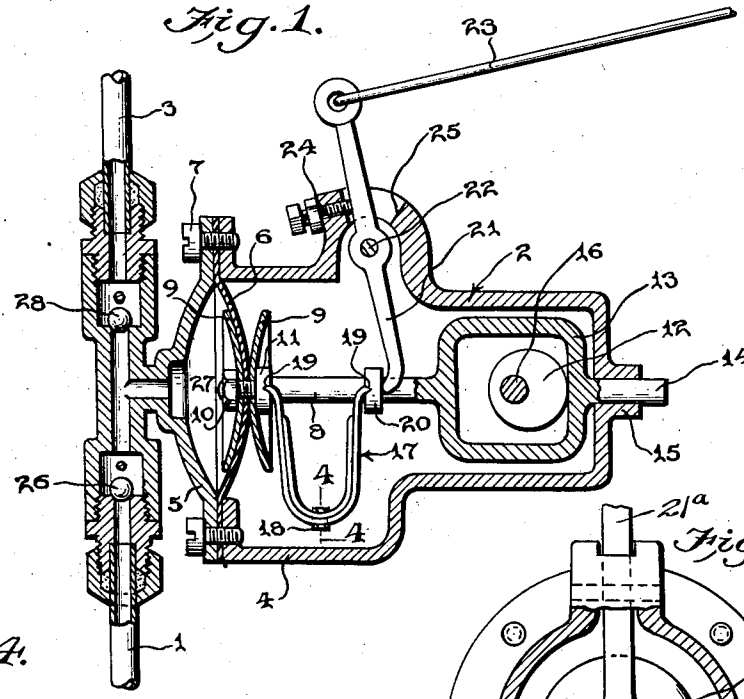


Fig. 4.

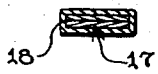


Fig. 2.

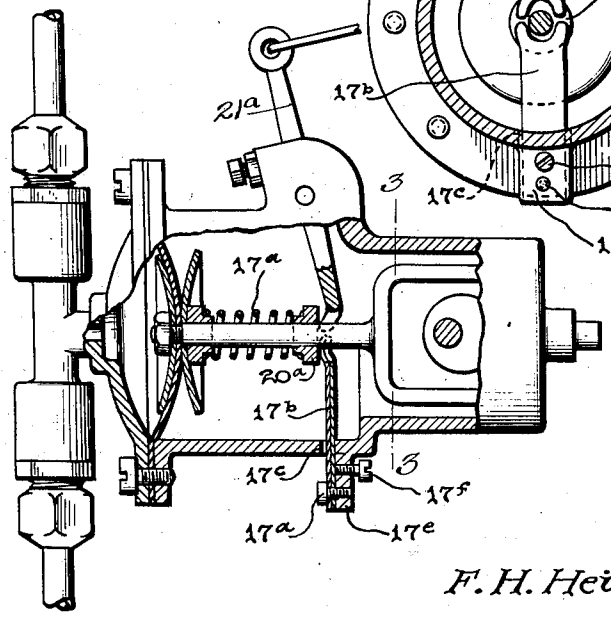
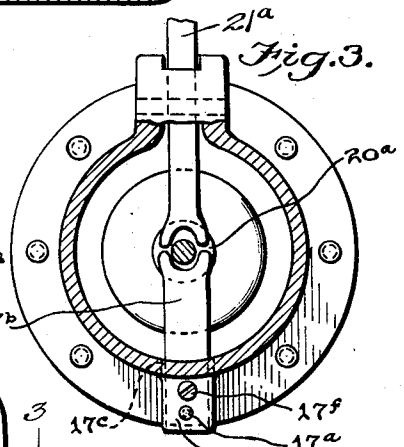


Fig. 3.



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Fig. 5.

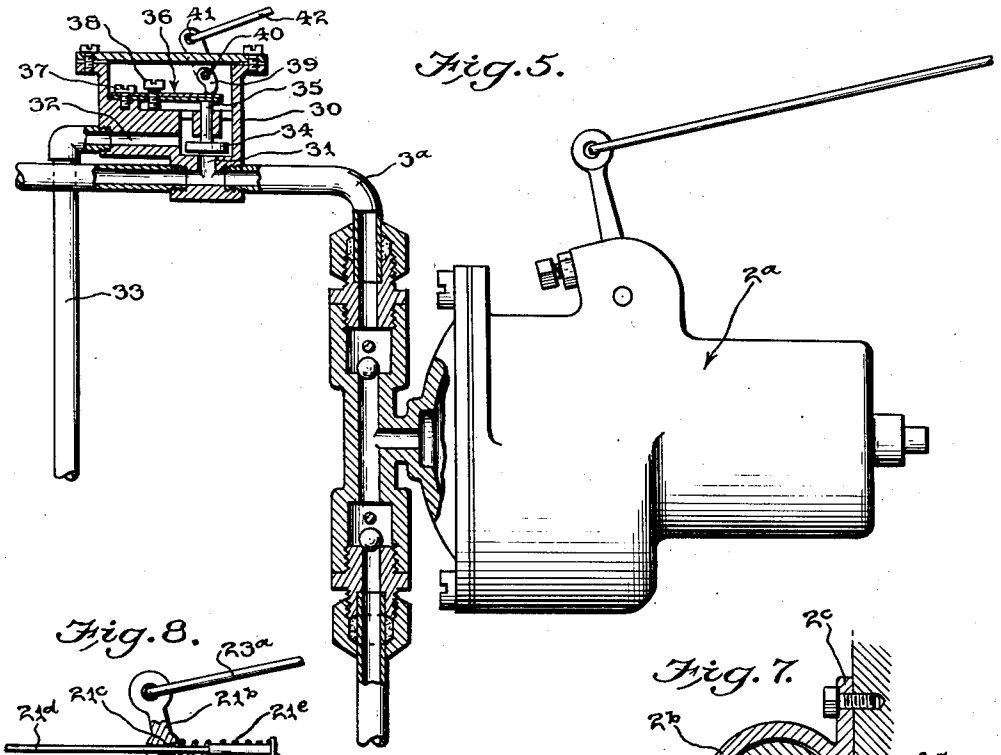


Fig. 8.

Fig. 7.

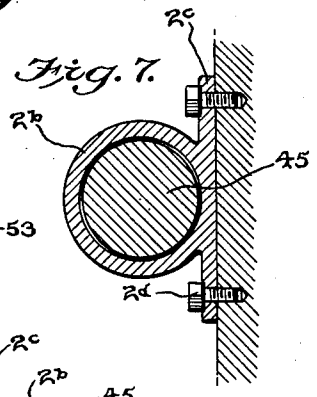


Fig. 6.

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Fig. 9.

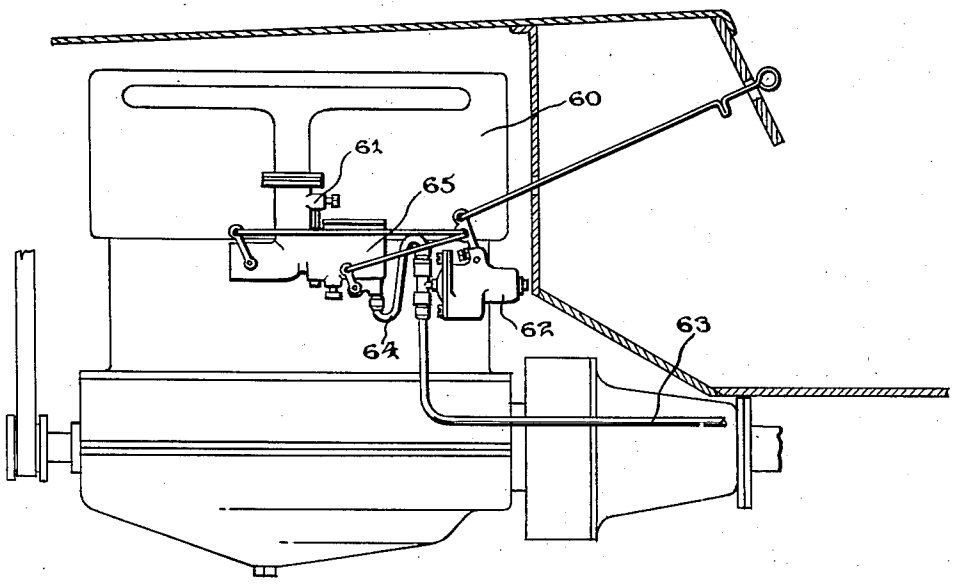


Fig. 10.

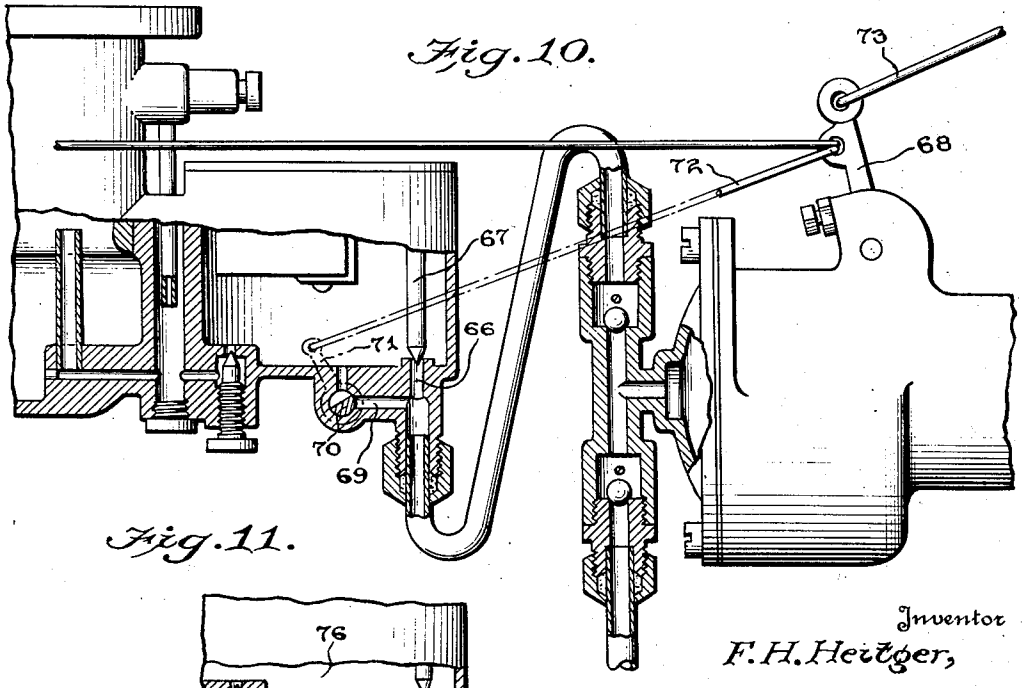
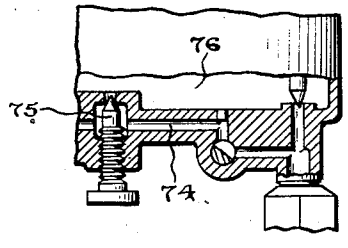


Fig. 11.



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UNITED STATES PATENT OFFICE

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PUMP

Application filed September 27, 1928. Serial No. 308,609.

This invention relates to improvements in pumping mechanism and more particularly to fuel feeding systems of the type in which the fuel is pumped from a low level supply direct to the constant level or float chamber of a carburetor.

Lately, it is becoming common practice to utilize a diaphragm pump for forcing the fuel, the diaphragm being flexible and flexed on the suction stroke by engine driven means, and being operated on its discharge stroke by resilient means, such as a spring. The diaphragm is usually made of a fibrous material treated so as to render it impervious to gasoline, etc., but this treating renders the material of the diaphragm more or less stiff as the temperature grows colder, so that the resilient means, (the spring which is calibrated properly for a normal temperature) fails to overcome this stiffness, and consequently, the diaphragm in cold weather fails to make its normal stroke or discharge rate.

It is the purpose of this invention to remedy this trouble by using suitable means such as a thermostatic element that is affected by a drop in temperature for compensating for the stiffness of the diaphragm, whereby as the temperature grows colder, the pressure exerted on this diaphragm by the resilient means may be stronger, this tending to maintain the pump pressure so that the rate of discharge to the constant level chamber may at such times, be maintained or increased over normal pressure or rate of discharge. The resilient means that actuates the diaphragm on its discharge stroke may itself be affected by temperature, or it may not be so affected, but be combined with an element which will be affected by temperature changes. In fact, the invention pertains broadly to means affecting the volume of fuel fed by a pump to a carburetor, and including a thermostatic element to control the volume of fuel fed by any type of pump to the carburetor, this thermostatic element being affected by changes of temperature, whereby the amount of fuel received by the carburetor may be maintained or increased. The construction may be such that at low temperatures, the volume of fuel fed to the carburetor may be the same as that at higher temperatures, or be greater than that fed at higher temperatures.

The invention may take many forms, and it is the primary object of the invention to combine a pump and a communicating carburetor with thermostatic means for automatically varying the amount of fuel received by the carburetor from the pump.

Another object of the invention is to combine such thermostatic control means with a manual control operable from a remote point, such as the dash board of an automobile, for manually controlling the variation of the pump feed in addition to thermostatically controlling the same.

A still further object is to combine with such manual control, means which may be attached to the manual control for operating the choker valve of the carburetor with the pump feed varying means.

Another object is to provide, in a combination of this character, means for by-passing the fuel fed by the pump to the carburetor float chamber, in order that the fuel may be fed directly to the float chamber without passing the float operated valve, or if desired, be fed directly to the carburetor nozzle without passing through said float chamber.

Other objects will appear as the invention is described in connection with the accompanying drawings.

Referring to the drawings,

Fig. 1 is a vertical sectional view of a diaphragm pump forming part of my invention, and including a resilient spring for operating the diaphragm on its discharge stroke; the spring being of thermostatic type, and means being combined therewith to permit the operator to vary the tension thereof from a remote point.

Fig. 2 is a similar view, partly in elevation, of a modification in which the spring is non-thermostatic, but combined with thermostatic means for placing tension thereon, and manually controlled means for also placing tension thereon.

Fig. 3 is a transverse vertical sectional

view of the modified pump, taken on Fig. 2.

Fig. 4 is a transverse vertical sectional view, taken on line 4—4 of Fig. 1.

Fig. 5 is an elevation partly in vertical section of any suitable pump, such as those illustrated in Figs. 1 and 2, combined with means for by-passing some of the fuel from the pump back to the source of supply for instance, such by-pass having means for controlling the same either thermostatically or manually.

Fig. 6 is a vertical sectional view of a modified pump including a solid piston and a diaphragm, the chamber between the piston and diaphragm communicating with the atmosphere and the communication passageway being controlled by a thermostatic valve which may, if desired, be manually actuated.

Fig. 7 is a transverse vertical sectional view of the pump shown in Fig. 6, taken on line 7—7 of that figure.

Fig. 8 is a detail view, partly in vertical section, of means for connecting the manual control to the choke valve of the carburetor for instance, such connecting means permitting the pump control to be actuated before the choke valve is put in operation.

Fig. 9 is a side elevation of an internal combustion engine provided with one form of fuel feeding means, made in accordance with my invention, but in which the carburetor is modified so as to by-pass the fuel fed by the pump, around the float controlled valve of the carburetor.

Fig. 10 is a side elevation, partly in vertical section, of a portion of the fuel feeding means shown in Fig. 9.

Fig. 11 is a vertical sectional view of a modification of the structure shown in Fig. 10, and illustrating the manner in which the pumped fuel may be by-passed directly to the main fuel nozzle of the carburetor.

In the embodiment of the invention illustrated in Fig. 1, 1 designates a pipe line through which fuel is drawn from a low level source by a pump 2, which forces the same through a conduit 3 to the float chamber or constant level chamber of a carburetor (not shown).

In this form of the invention, the pump casing is designated 4, and its cover 5, and between these parts, the edge of a diaphragm 6 is secured by suitable means, such as screws 7. A reciprocating rod 8 has a threaded extension which extends through the central portion of the diaphragm, and arranged on opposite sides of the diaphragm and mounted on this extension are metallic saucer-shaped disks 9 which guard the diaphragm against undue flexing. The parts 6 and 9 are secured to the rod 8 by a nut 10 which clamps the same against a collar 11, fixed on or integral with the rod.

The rod is moved toward the right on the suction stroke of the pump, by means of a cam 12 which engages a yoke 13 forming part of the rod, and as the rod reciprocates, its guide extension 14 slides in a bearing 15 in one end of the pump casing. The cam or eccentric 12 is fast on a shaft 16 that may be continuously driven by some part of the internal combustion engine with which the pump is used, so long as the engine is running.

The pressure or discharge stroke of the pump is caused by any suitable thermostatic spring, for instance, a U-shaped spring 17, made up of laminations of suitable metals, clamped together by some binding device 18. The ends of this spring engage respectively notches 19, cut in the abutment 11 and in an abutment 20 which is slidable along the rod 8. The movement of the abutment 20 toward the right is limited by a lever 21, pivotally mounted at 22 on the pump casing, and extending to the exterior of the casing. A control rod 23 is connected to the outer end of the lever, and may extend to the dash board of an automobile, for instance, and when the operator pulls the rod, the lever will be swung in a clockwise direction, and this will put additional tension on the spring 17.

The normal tension of the spring may be brought about by manipulating an adjustable stop screw 24, which engages threads formed in the pump casing, and abuts against the lever. The abnormal tensioning of the spring is limited by a fixed abutment 25 forming part of the casing.

As the diaphragm 6 is actuated, the fuel will be drawn past an intake valve 26, into the pumping chamber 27, and then be forced from this chamber past the outlet valve 28, into the line 3.

For an understanding of the operation of the device, let us assume that this pump is interposed in the pipe line leading from the fuel supply tank to the carburetor of an internal combustion engine driven automobile. When the engine is in operation, the eccentric 12 will move the yoke 13 in one direction to cause the diaphragm 6 to draw fuel through the line 1, and then the spring 17 will act on the diaphragm to force this fuel into the line 3 which conveys it to the float chamber of the carburetor. Now, if in cold weather, the diaphragm stiffens and has a tendency to work sluggishly at the same time, the thermostatic spring will tend to spread or lengthen with the result that increased tension will be placed on the diaphragm, and consequently, on the discharge stroke of the pump, the rate of discharge may be just the same as that in warm weather, or even greater if so desired. It will therefore be recognized that owing to the present invention, there will be no handi-

cap in the fuel feeding, due to the stiffening of the diaphragm.

As the present invention includes manumotive control means, as well as the thermostatic control, it may also be seen that the operator can increase the tension of the spring whenever desired, regardless of the temperature. This is an advantage particularly in starting the motor during cold weather, for the operator, by pulling on the rod 23, may considerably increase the tension of the spring, with the result that a greater amount of fuel may be pumped than normally. Of course, when the operator releases the rod 23, the spring 17 will expand and bring the lever back to its normal position, shown in Fig. 1.

Instead of using a thermostatic spring, I may produce the same results by employing an ordinary non-thermostatic spring, and combining this with a thermostatic element. Such a modification of the invention is shown in Figs. 2 and 3. In this example, the spring 17*a* is an ordinary coil spring, and I combine with its slidable abutment 20*a*, a thermostatic plate 17*b*. This plate may be made of leaves of suitable metals, and one of its ends extends through an opening 17*c* in the pump casing, and is connected by a screw 17*d* to an ear 17*e* forming part of the casing. The normal tension of the plate may be adjusted by a screw 17*f* which engages threads in the ear and abuts against the thermostatic element.

As shown in these figures, the hand controlled lever 21*a* may also be employed if desired, for the purpose of adjusting the tension of the spring, regardless of the temperature.

It is believed that the operation of the modified form of the pump and its control means may be readily understood, in view of the explanation of the operation of the structure disclosed in Fig. 1.

As heretofore stated, the general object in view may be accomplished either with or without varying the tension of the diaphragm actuating spring, and in Figs. 5, 6 and 7, I have disclosed embodiments which will allow variation of the feed without altering the tension of any spring, if desired. For example, in Fig. 5, the pump 2*a* may be of the type shown in Figs. 1 or 2, or it may be the ordinary pump heretofore used, and not provided with any means for varying the tension of the diaphragm actuating spring. Regardless of the type of pump employed, the fuel is fed by the pump through a line 3*a* on its way to the carburetor (not shown), and means are located in this pipe line to by-pass, if desired, some of the fuel back to its source, and this by-pass is controlled either thermostatically, manually, or both thermostatically and manually. For example, a casing 30 is interposed in the pipe line and includes a port 31, through which the fuel may flow to a passageway 32 that leads to a conduit 33 which may return a portion of the fuel to the source of supply.

A valve 34 controls this port, and it may be carried by a sliding stem 35 that may be attached to, or otherwise moved with a thermostatic element 36. This element may also consist of laminations of suitable metals, and one end of the laminations may be secured by a screw 37 within the casing. Another screw 38 extends through the laminations and abuts against a fixed part of the casing. It may be employed to adjust the thermostat.

If desired, as before stated, an arm 39, mounted on a rock shaft 40 may be employed to permit the operator to adjust the valve 34, and if such a structure is used, the rock shaft will extend through one side of the casing and be provided with an outside arm 41 connected by a rod 42 to the dash board of the vehicle, to permit the operator to make adjustments from a remote point.

In the operation of this form of the invention, let us assume that the pump 20 is of the diaphragm type, and that the diaphragm tends to stiffen as the temperature lowers. Normally, the valve 34 will be in the position shown in Fig. 5, so that a portion of the fuel normally pumped will by-pass through 31, 32 and 33, back to the source of supply. In cold weather, the thermostat 36 will tend to force the valve downwardly, and close the by-pass, and consequently, even though the pump acts sluggishly, a normal fuel feed may be maintained through the pipe line 3*a*, due to the fact that the fuel normally by-passed is now fed directly through the pipe line posterior to the casing 30.

In the form of the invention shown in Figs. 6 and 7, the pump casing 2*b* may be provided with supporting ears 2*c* which receive screws 2*d* employed in mounting the pump. In this case, the pump has a solid piston 45 positively driven in both directions from a movable part of the engine by a rod or pitman 46. The diaphragm 47 in this example, is not directly connected with the piston, but is spaced from the latter by a chamber 48 which bleeds to atmosphere through ports 49 and 50. The port 49 is controlled by a thermostat 51, and in cold weather, this thermostat tends to close the port so that substantially the full pressure of the piston 45 is felt by the diaphragm 47 at such times. It is obvious that the degree of closing of the port 49 by the thermostat will govern the amount of pressure placed on the diaphragm by the piston.

At times, it may be desirable to vary the position of the thermostat from the dash board of the vehicle, and this may be accom-

plished by a lever 52 and a rod 53, the latter extending to the dash board.

If the pump control is so connected with the choke valve of the carburetor as to co-act with the latter, it is apparent that the feed of the pump may be varied at the same time as the choking of the carburetor, and in Fig. 8, I have shown a detail by which the pump control may be connected to the choke valve of the carburetor. In this instance, the control lever 21*b* of the pump is apertured at 21*c* to slidably receive a rod 21*d* which may extend to the carburetor choke valve lever (not shown). A spring 21*e* surrounds the rod and abuts at one end against an enlargement 21*f* on the rod, and at its other end, against the lever. With such a construction, it will be understood that when the operator pulls the control rod 23*a*, he will first vary the tension of the diaphragm actuating spring, and if he continues to pull on the rod, he will then cause the rod 21*d* to move the choke valve of the carburetor to closed position. Consequently, the rate of discharge of the pump may be increased if desired, at the same time as the carburetor is choked.

Under certain circumstances, it may be desired further to not alone control the pump with the choke valve of the carburetor, but it may also be desirable to by-pass some of the pumped liquid around the float controlled valve of the carburetor, and means for accomplishing this result are illustrated in Figs. 9 and 10. In this form of the invention, the internal combustion engine is designated 60, and 61 indicates generally the carburetor. The pump is shown at 62, and it forces fuel from the line 63 through the pipe 64 to the float chamber 65 of the carburetor. As shown in Fig. 10, the fuel normally pumped enters the float chamber through a port 66 which is controlled by the float actuated valve 67. When, however, the feed of the pump is varied or changed by operating the lever 68 of the pump, some or all of the fuel is by-passed through a by-pass conduit 69. This conduit is controlled by a valve 70 having an actuating arm 71 that is connected by a rod 72 to the lever 68. With this construction, it will be understood that when the lever 68 is moved in a clock-wise direction by the operator pulling on the control rod 73, the arm 71 will also be swung in a clock-wise direction, so that the fuel may travel through the by-pass instead of through the port 66.

The structure shown in Figs. 9 and 10 may also be modified as illustrated in Fig. 11, whereby any amount of the pumped fuel may be by-passed through the conduit 74, directly to the fuel nozzle 75 without entering the float chamber 76.

Those skilled in the art will recognize that numerous changes may be made in the details disclosed, and that the invention may be used for many purposes, without departing from the spirit of the invention as claimed.

What is claimed and desired to be secured by Letters Patent is:

1. A fuel pump having a flexible forcing member and a resilient element for actuating the same for its discharge stroke, and means including a thermostatic element for increasing the force of said resilient element.

2. In combination a pump having a thermo-resilient element for producing a pressure stroke and manually operated means for varying the force of the thermo-resilient element.

3. A fuel pump comprising a pump casing having a movable wall serving as the pump piston, means for moving said wall in one direction and a resilient thermostatic element for moving said wall in the opposite direction.

4. A fuel pump comprising a pump casing having a movable wall serving as the pump piston, positive means for moving said wall in one direction, a resilient thermostatic element for moving said wall in the opposite direction and manual means for varying the tension of said resilient thermostatic element.

5. A pump comprising a pump casing having a flexible wall serving as the pump piston, a rod connected to said wall, means for reciprocating said rod to move said wall in one direction and an abutment adjustably mounted in respect to said movable wall, a resilient thermostatic element disposed between said abutment and said movable wall for moving said wall in the opposite direction, and means for holding said abutment in adjusted position.

6. A pump comprising a pump casing having a movable wall serving as the pump piston, means for moving said wall in one direction, an adjustable abutment, a thermostatic resilient element disposed between said abutment and said movable wall for moving said wall in the opposite direction and means for holding said abutment in adjusted position.

7. A pump comprising a pump casing having a movable wall serving as the pump piston, a piston rod connected to said movable wall for moving said wall in one direction, a movably mounted abutment, a resilient thermostatic element disposed between said abutment and said movable wall for moving said movable wall in the opposite direction, a pivoted lever engaging said abutment and means for limiting the movement of said lever in one direction.

8. A pump comprising a pump casing having a flexible wall serving as the pump piston, a piston rod connected to said wall, an eccentric for reciprocating said piston rod to move said flexible wall in one direction

only, an abutment slidably mounted on said piston rod, a thermostatic resilient element disposed between said abutment and said movable wall, a pivoted lever having means for operating the same engaging said abutment and means for limiting the movement of said lever.

In testimony whereof I hereunto affix my signature.

FRANK H. HEITGER.