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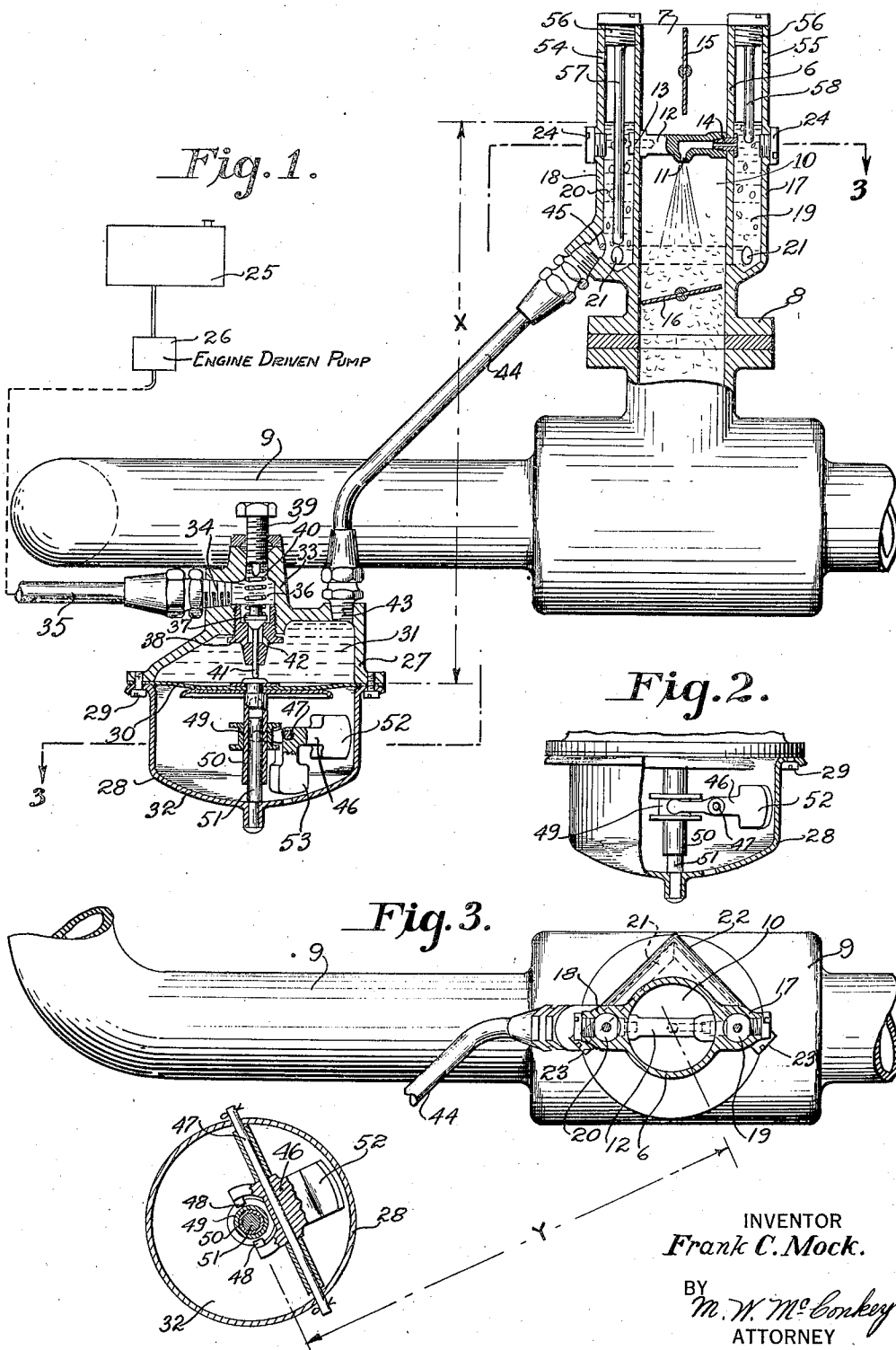
F. C. MOCK

1,933,379

CHARGE FORMING DEVICE

Filed July 17, 1930

2 Sheets-Sheet 1



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Fig. 4

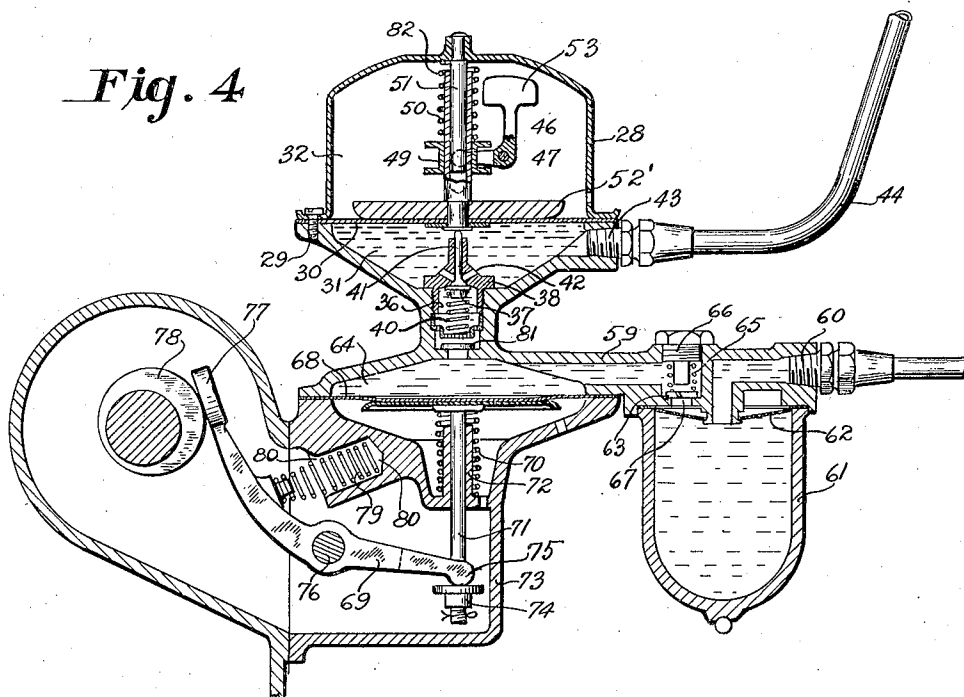
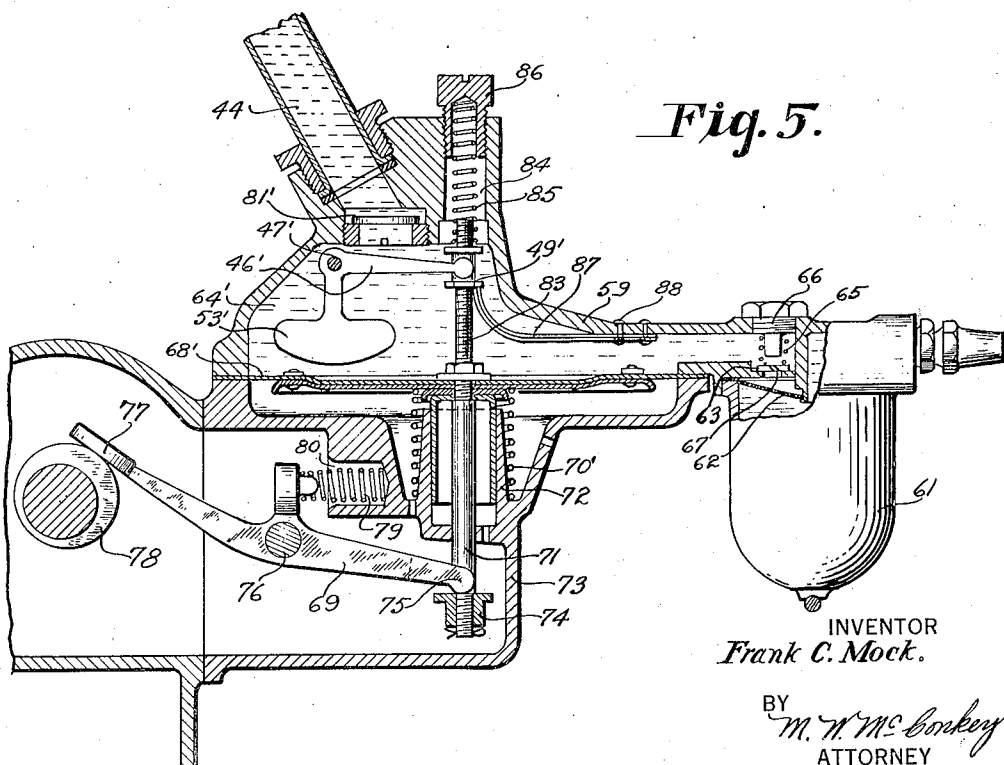


Fig. 5.



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CHARGE FORMING DEVICE

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11 Claims. (Cl. 158—36.4)

This invention relates to charge-forming devices, and more particularly to means of the constant level type for supplying a combustible fluid to an internal combustion engine.

One of the objects of the present invention is to provide novel means for supplying fuel to an internal combustion engine which is simple in construction, certain in operation, and relatively inexpensive to manufacture.

Another object of the invention is to provide apparatus of the above character embodying means for maintaining a substantially constant fuel level irrespective of road shock, inclination, acceleration or deceleration of the vehicle on which the apparatus is mounted.

A further object is to provide novel carburetor means which is so constructed as to insure even engine operation regardless of the use of fuel containing light ends which boil at relatively low temperatures.

Another object consists in providing novel fuel pumping means whereby a substantially constant level is maintained without the use of extra diaphragms or the commonly used float mechanism.

Other objects include the provision of a novel fuel supply system wherein both fuel pumping means and means for maintaining a predetermined fuel level are embodied in a simple, compact and unitary structure; the provision of a novel down-draft carburetor in which a substantially constant fuel level is maintained without the use of a float; and the provision of novel compensating means for counteracting the inertia effect of the fuel column upon the fuel level of a carburetor due to movements of the vehicle upon which it is installed.

These and other objects will appear more fully from a consideration of the detailed description of the invention which follows. Although several embodiments of the present invention are described and illustrated in the accompanying drawings, it is to be expressly understood that these drawings are for the purposes of illustration only and are not to be construed as a limitation of the scope of the invention, reference being had for this purpose to the appended claims.

In the drawings, wherein like reference characters indicate like parts throughout the several views,

Fig. 1 is a side elevation, partly in section, of one embodiment of the present invention, wherein the fuel level controlling device is mounted beneath but offset in a fore-and-aft direction from the carburetor;

Fig. 2 is a side view of a fuel level controlling

device similar to that shown in Fig. 1 but located directly beneath the carburetor and having a portion of the casing broken away to show a variation in the compensating means permissible when so located;

Fig. 3 is a sectional plan view taken on line 3—3 of Fig. 1;

Fig. 4 is a sectional side view of another embodiment of the invention disclosing a fuel level controlling mechanism combined in a unitary structure with a common form of fuel pump; and

Fig. 5 is a sectional side view of still another form of the invention wherein a single diaphragm performs the functions of both a fuel pump and a fuel level controlling device.

Referring now to Figs. 1 and 3, there is disclosed therein a novel carburetor of the down-draft type and means for supplying fuel thereto embodying one form of the present invention. As shown, the carburetor comprises a vertical, substantially cylindrical body or casing 6 having an air inlet 7 at its upper end and a flange 8 at its lower end whereby connection may be made in any suitable manner to the intake manifold 9 of an internal combustion engine. The interior of casing 6 constitutes a carbureting chamber 10 in which liquid fuel discharged from a fuel nozzle or jet 11 is vaporized and mixed with air entering through inlet 7 and then supplied to the cylinders of the engine through intake manifold 9.

Nozzle 11 is formed by drilling a suitable axial passage from one end of a substantially cylindrical member 12 to intersect with a suitable radial hole in said member located approximately at the midpoint thereof. Member 12 is then positioned transversely of carbureting chamber 10, intermediate the ends of casing 6, and secured thereto, with the radial outlet of nozzle 11 directed vertically downward, by any suitable means such as a screw 13 engaging the solid end of member 12 and a hollow screw 14 which is threaded into the interior of the axial passage. A suitable choke valve 15 is provided adjacent air inlet 7 and a similar throttle valve 16 is located adjacent the connection of carburetor casing 6 with intake manifold 9, both of these valves functioning in the well-known manner to control the supply of combustible mixture to the engine.

In order that fuel may be supplied to nozzle 11 in an efficient manner, and in order that this supply may be dependably maintained under all conditions of operation, a novel form of fuel supply chamber is provided, the functioning of which is later to be described. As shown, car-

buretor casing 6 is cast with two diametrically opposite, lobular projections 17 and 18 which are bored out from the upper ends thereof so as to form a pair of fuel wells 19 and 20. These two wells 19 and 20 are connected so as to form a single fuel chamber, by means of a suitable passageway 21 machined in a triangular projection 22 which is cast integrally with carburetor casing 6 and the lower extremity of lobular projections 17 and 18, the ends of said passageway being closed by threaded plugs 23.

When the carburetor thus described is assembled, fuel wells 19 and 20 are aligned with the fore-and-after axis of the vehicle, and transverse member 12 in which nozzle 11 is formed is so positioned that the axial passage therein is connected to fuel well 19 through the hollow screw 14, screw 13 thus lying within well 20. Suitable openings are provided in the walls of wells 19 and 20 to allow the securing of member 12 in its proper place, said openings being normally closed by threaded plugs 24.

It has been discovered in a study of the problem presented by the requirement for efficient fuel supply for internal combustion engines that the desired proportion of fuel to air throughout a wide range of operating conditions can be obtained by the use of a carburetor having a fuel nozzle or jet within the air passage or carbureting chamber with its outlet slightly below the level of the fuel which is supplied thereto, so that the force of gravity exerted upon this small amount of fuel above the level of the fuel nozzle adds a constant assisting head to the suction head normally provided by the engine. Such a construction, however, is impractical in a fuel system using either gravity feed from the main tank or a vacuum tank, or with a float mechanism for maintaining a constant fuel level, because, when the engine is stopped, the contents of the tank or float chamber will drain out of the nozzle, an obviously serious defect.

In the present invention, however, novel means have been provided in combination with an engine driven fuel pump and a down-draft carburetor of the type described, whereby the level of the fuel supplied to the carburetor nozzle during operation of the engine may be established and maintained at a substantially constant level slightly above the outlet of the nozzle, and since the fuel pump operates only when the engine is running, the amount of fuel which spills from the nozzle when the engine stops is reduced to an amount which constitutes just a good priming charge for a subsequent starting operation.

In the embodiment shown in Figs. 1 and 3, fuel is supplied to the carburetor from a suitable tank or reservoir 25 by means of a pump 26 which may be of any desired type but is preferably driven by the engine. Interposed in the supply line between pump 26 and the carburetor there is provided a novel form of fuel level controlling means which is adapted to maintain the fuel level in wells 19 and 20 at a substantially constant height above the outlet of fuel nozzle 11 and under all conditions of operation. As shown, this control device comprises, in general, a ported body member 27, a substantially cup-shaped closure member or bowl 28 which is adapted to be removably secured to body member 27 as by screws 29, and a flexible, liquid-tight diaphragm 30 secured at its periphery between the abutting flanges of members 27 and 28 and dividing the interior of the casing thus formed into a fuel chamber 31 above

said diaphragm and a compensating chamber 32 below.

Body member 27 is provided with a central, upwardly extending boss 33 having a fuel inlet port 34 to which fuel is supplied from pump 26 through a length of the usual copper tubing 35. The interior of boss 33 forms a valve chamber 36, the bottom portion of which is closed by a control valve 37 which seats downwardly upon a valve seat 38 threaded into the interior of the bottom of boss 33, while the upper end is closed by a screw 39 threaded into the interior of the upper end of boss 33. Interposed between the bottom of screw 39 and the top of valve 37 there is provided a suitable spring 40 which tends to maintain said valve closed upon its seat 38, the compression of said spring being adjustable by means of screw 39. Valve 37 is provided with a downwardly extending valve stem 41, the lower end of which is adapted to contact with the center of diaphragm 30 and to be actuated by it in a manner later to be described. It is to be noted here, however, that when valve 37 is lifted upwardly off of seat 38 against the pressure of spring 40, any fuel which is supplied from pump 26 to valve chamber 36 through inlet 34 will pass downwardly past valve 37 and through a plurality of radially disposed passages 42 formed in valve seat 38 into fuel chamber 31. Body member 27 is also provided with a fuel outlet port 43 through which fuel may be supplied from chamber 31 to fuel well 20 of the carburetor by means of a pipe or tube 44, the upper end of which discharges into fuel well 20 through an inlet port 45 which is located slightly higher than passageway 21 leading to fuel well 19 for a purpose later to be described.

From a consideration of the structure thus far described, it will be understood that when pump 26 is operating fuel will be supplied through chamber 31 to fuel well 20 as long as valve 37 is open. It is also apparent that the upper surface of diaphragm 30 is subject at all times to the pressure exerted by the weight of the column of fuel contained in chamber 31, pipe 44, and fuel wells 19 and 20. It would therefore be possible, by a proper calibration of diaphragm 30 and by the provision of suitable means tending to urge it upwardly, to actuate valve 37 in such a manner as to automatically maintain the level of the fuel in fuel wells 19 and 20 at a substantially constant height relative to the outlet of nozzle 11.

In metering fuel with a carburetor having a single nozzle or jet of the type described herein, the provision of an air passage large enough for efficient operation at high speeds necessarily results in a very low suction at low speeds, and it is consequently necessary, in order that the fuel may be supplied at an adequate rate at low speeds, that the net fuel level, or critical hydrostatic head, at the nozzle be maintained within approximately one-sixteenth to one-half of an inch under all conditions of operation—when climbing or descending, under acceleration or deceleration—or when the vehicle is subjected to sudden vertical movements such as those due to ground shock. Suitable means are therefore provided supplementing those already described, for maintaining the fuel level substantially constant irrespective of any change in the motion of the vehicle on which the carburetor is mounted. The term "acceleration" as used hereinafter in the description and claims is intended to include any change in velocity, whether an increase or a decrease, and in whatever direction.

Inclination of the vehicle in a fore-and-aft line is adequately compensated for by the novel arrangement of fuel wells previously described, since, by providing two wells equi-distant on either side of the nozzle in a fore-and-aft line, the mean height of the column of fuel therein remains undisturbed by fore-and-aft inclination.

In the structure disclosed in Figs. 1 and 3 wherein the fuel level controlling means is located below and offset in a fore-and-aft direction from the carburetor, it is evident that any acceleration, whether horizontal or vertical, positive or negative, of the vehicle carrying the fuel supply system, will, due to the inertia of the mass of fuel contained in chamber 31, pipe 44, and fuel wells 19 and 20, and to the resiliency of diaphragm 30, tend to change the fuel level in said wells from its normal, substantially constant level. Novel means have been provided, however, to compensate for this tendency, and, as shown, comprise a system of compensating weights which are so constructed as to exert a force on diaphragm 30 equal and opposite in direction to that exerted thereon by the mass of fuel. For this purpose, a three-armed compensating lever 46 is pivotally mounted within bowl 28 upon a suitable horizontal shaft 47 in such a position that the plane of lever 46 passes through the vertical axes of both diaphragm 30 and the carburetor. The inner horizontal arm of lever 46 is bifurcated and provided with a pair of lugs 48 forming a yoke adapted to engage a collared member 49 which is secured to a hollow spindle 50 riveted at its upper end to the center of diaphragm 30. A guide pin 51 projects upwardly from the bottom of bowl 28 within spindle 50 and serves to guide the latter in its vertical movement. The outer horizontal arm of lever 46 is provided with a weight 52, the mass of which is so calibrated that when acting about shaft 47 as a pivot it exerts, through lugs 48 and collared member 49, a force upon diaphragm 30 substantially equal and opposite to that exerted by the head X of fuel. The vertical arm of lever 46 is also provided with a weight 53, the mass of which is so calibrated as to compensate for the inertia effect of the column of fuel having an effective length Y.

It will now be understood that the normal height of the fuel level is not dependent solely upon the resiliency of diaphragm 30, but that when originally calibrated, the device is so constructed that the upward thrust of weight 52 and the resiliency of the diaphragm 30 combine to balance the gravitational effect of the weight of the fuel column when it reaches its predetermined height X, at which time valve 37 is fully closed under the action of spring 40 and the lower extremity of valve stem 41 is just contacting with the diaphragm. Thus, any decrease in the effective fuel head causes an immediate upward movement of diaphragm 30 and a consequent opening of valve 37, whereupon pump 26 is effective to restore the fuel column to its proper level.

In installations where it is possible to locate the fuel level controlling means so that the vertical axis of diaphragm 30 is in alinement with the vertical axis of the carburetor, the compensating mechanism may be modified to the extent illustrated in Fig. 2, wherein lever 46 is provided with only two arms, the vertical arm and weight 53 being omitted as unnecessary since the effective horizontal length Y of the fuel column is reduced to zero thereby eliminating any com-

ponent of force exerted by the inertia of the fuel column upon acceleration of the vehicle which might tend to move the fuel column between the level controlling means and the nozzle, and thus disturb the level.

Another novel feature of the carburetor disclosed in Fig. 1, which has not yet been mentioned, concerns the elimination of one of the factors seriously affecting efficient operation of internal combustion engines—namely, bubbles in the fuel. With modern cracking methods of gasoline production it is found very difficult, expensive and substantially impractical to remove all the light ends of the fuel which boil below 130 degrees Fahrenheit. Since the temperature under the hood of an internal combustion engine often exceeds this amount, especially in the summer, the unremoved light ends easily boil and form bubbles in the fuel which, in passing through the nozzle of the carburetor and into the combustible mixture, cause uneven and inefficient operation of the engine.

Novel means are therefore provided in the carburetor shown in Fig. 1 for removing these bubbles. As shown, and as previously described, the fuel inlet port 45 to fuel well 20 is located above the level of passageway 21 which connects wells 20 and 19. Well 20 is then provided with a vent 54 adjacent its upper end and located well above the normal fuel level. A similar vent 55 is provided for fuel well 19. With this construction alone, assuming that the upper ends of fuel wells 19 and 20 are closed by suitable threaded plugs 56, bubbles which may be formed in the fuel during its passage through pump 26 and the fuel level controlling means, will be removed in fuel well 20 without ever passing through passageway 21 to fuel well 19. Any bubbles which happen to pass through passageway 21, or which are formed therein due to a rise in temperature of the fuel in its passage around the carburetor, will enter fuel well 19 and be dissipated through vent 55.

In addition to the means just described, additional novel means are also provided by the present invention for eliminating bubbles from the fuel. It is a law of surface tension that a bubble in a liquid tends to assume a form having the smallest envelope for its volume, the result being that in a cylindrical tube, the bubble tends to draw across the tube and also to adhere under capillary action to the walls thereof. In an annular space, however, the bubble does not tend to fill the passage but instead, draws itself into a cushion-shaped spheroid, the result being that in an annular space the bubbles can rise freely and without violently disturbing the liquid in the column. A cylindrical pin 57 is therefore provided, preferably formed integral with plug 56, extending down the center of fuel well 20 with its lower end terminating just above the level of passageway 21. The provision of pin 57 in effect transforms cylindrical fuel well 20 into an annular chamber, and thereby induces the bubbles to assume the form of a cushion-shaped spheroid and to pass freely upward along the surface of the pin, ultimately dissipating themselves as gas through vent 54. A similar pin 58 may be provided in fuel well 19 but, if so, is preferably terminated just above the entrance to fuel nozzle 11 in order not to interfere with the free supply of fuel thereto. Pins 57 and 58 may serve the further purpose of reducing the volume of fuel that drains through the nozzle when the engine stops.

Referring now to Fig. 4, there is shown therein a novel arrangement of a fuel level controlling device of the diaphragm type described above combined in the same unitary structure with a diaphragm fuel pump of the well-known type. By thus combining these two devices in the same casing, manufacture is not only made more simple and less expensive, but the air dome which has been commonly used heretofore to equalize the pulsating pressure of the pump is eliminated, since the level controlling diaphragm will perform the same function and without being subject to the inherent defect of an air dome which fills with gasoline vapor during operation, expelling the air, and upon cooling is left filled with liquid.

In the form shown, the upper member 59 of the pump casing is provided with a fuel inlet port 60 to which fuel is supplied from any suitable source such as a reservoir 25 as shown in Fig. 1. The incoming fuel passes from inlet port 60 downwardly into a separator bowl 61 from which it is drawn by the suction of the pump upwardly through a fine-mesh strainer screen 62, past an inlet valve 63 and into pump chamber 64. Valve 63 is normally held closed upon its seat by a coil spring 65, the tension of which may be adjusted by screw 66, and is opened by the suction of the pump. Valve 63 is also provided with a restricted passage 67 therethrough for a purpose later to be described.

The pumping action of the fuel pump is derived from the motion of a flexible diaphragm 68 which operates in a well-known manner under the influence of an engine driven operating lever 69 and a coil spring 70. As shown, diaphragm 68 is provided with a spindle 71 secured to its midpoint and extending vertically downward through a supporting boss 72 and into lower member 73 of the pump casing. The lower end of spindle 71 is provided with a collared member 74 which is threaded thereon for adjustability and which is adapted to be engaged by the bifurcated end 75 of operating lever 69 on the downward stroke of the latter. Operating lever 69 is pivotally mounted upon a suitable shaft 76 and is provided at its upper end with a cam engaging surface 77 which is held in constant contact with an engine operated cam 78 by means of a coil spring 79 which is housed in a suitable recess 80 formed in casing member 73. Although the diaphragm 68 is thus moved positively downward by operating lever 69, the latter is free to move upward without contact with the diaphragm operating mechanism, leaving spring 70 as the only means effective to move diaphragm 68 in an upward direction. It is thus evident that the stroke of diaphragm 68 is automatically regulated depending upon the pressure opposing delivery from the pump chamber 64, which pressure is in turn dependent upon the level of the fuel in the carburetor.

Much difficulty has been experienced with pumps of this type due to freezing of the diaphragm in its lowermost position after the engine has stopped. In order to remedy this defect, the restricted opening 67 in valve 63 is provided in order to allow slow leakage of fuel from fuel chamber 64 back into bowl 61 under the action of spring 70 which thus forces diaphragm 68 back to its horizontal position.

Fuel is delivered from pump chamber 64 under the action of diaphragm 68 through a check valve 81 and into valve chamber 36 of the fluid level controlling means. The latter device is similar in

every respect to that disclosed in Fig. 1, except that it is inverted and the horizontal weight 52 shown in Fig. 1 is replaced by a weighted plate 52' secured to diaphragm 30. An additional spring 82 has also been provided between the top of bowl 28 and the top of collared member 49 in order to assist diaphragm 30 in its downward movement.

Since the structure shown in Fig. 4 may be substituted directly for pump 26 and the level controlling means shown in Fig. 1 without changing the method of operation, no further description of the embodiment shown in Fig. 4 is necessary.

Still another embodiment of the invention is illustrated in Fig. 5, the structure shown therein being a simplification of that shown in Fig. 4 in that diaphragm 30 has been eliminated by increasing the size of the pumping diaphragm and by a rearrangement of the compensating parts so that the one diaphragm performs the function of the two shown in Fig. 4. The construction of the pump itself is substantially the same as that of Fig. 4 and therefore will not be again described except to direct attention to the fact that pumping diaphragm 68', chamber 64', and spring 70' are of materially larger capacity than the corresponding parts in Fig. 4.

Spindle 71, however, has been provided with a threaded extension 83 extending upwardly into pumping chamber 64' coaxially with a vertical bore 84 formed in the top of pump casing member 59. A collared member 49' is threaded, for adjustability, onto extension 83 and is adapted to be engaged by the bifurcated horizontal arm of a compensating lever 46' which is pivotally mounted on a suitable shaft 47' and provided with a vertical arm having a weight 53'. A coil spring 85 is housed within bore 84 and exerts a downward pressure upon the upper collar of member 49', the upper end of said spring being seated within a recessed plug 86 which is threaded into bore 84 for adjustability of the spring. The discharge from pumping chamber 64' passes upward through a check valve 81' into a pipe 44' which leads to the carburetor. Valve 81' and pipe 44' are also larger than the corresponding parts shown in Fig. 4.

In this embodiment, springs 70' and 85, and the resiliency of the diaphragm, are so calibrated in connection with the weights of the operating parts, including check valve 81', that the desired fuel level in the carburetor fuel wells 19 and 20 is maintained by the action of diaphragm 68'. That is, when the fuel stands at the required level in the carburetor, the resistance offered to the opening of valve 81' plus the resistance to the outward movement of diaphragm 68' offered by spring 85 and the weight of the parts, just balances the upward thrust of spring 70', and no pumping action takes place. No vertical compensating weight is required in this embodiment because check valve 81' isolates the fuel column from the expansible pumping chamber and further because lever 69, through the intervention of spindle 71, maintains diaphragm 68' in proper position. Compensating lever 46' and weight 53', however, act in the same manner as previously described to counteract the effect of acceleration of the vehicle to alter the fuel level.

Novel means have also been provided in the embodiment shown in Fig. 5 for compensating for the effect of any change in density of the fuel which may be caused by the extreme range of temperatures under which an engine may be op-

erated. To this end, a thermostat spring 87, of any desired construction, is secured at one end to pump casing 59 as by rivets 88 and is so constructed that its other end engages the under side of the bottom collar of member 49', thereby tending to lift diaphragm 68'. The effect of the weight of the fuel in chamber 64' upon the top of diaphragm 68' is thus maintained constant throughout a wide range of operating temperatures, since when the engine is cold, spring 87 will assist spring 70' to raise the diaphragm and thereby decrease the volume of chamber 64' and compensate for the increased density of the fuel contained therein, and vice versa.

There is thus provided by the present invention a novel fuel supply system for an internal combustion engine wherein a substantially constant fuel level is maintained in the carburetor of the system under all conditions of operation, and irrespective of any acceleration of the vehicle upon which the system is mounted. A novel form of down-draft carburetor has been provided in which the normal suction head provided by the engine is augmented by a gravitational head of fuel and yet, when the engine is stopped, only a small quantity of fuel escapes from the nozzle of the carburetor due to this gravitational head. The carburetor herein disclosed is also so constructed that an inclination of the vehicle in a fore-and-aft direction will not affect the mean height of the fuel column, or vary the effective gravitational head. Combined with this novel form of carburetor there is provided a fuel level controlling device which eliminates the usual float mechanism and includes novel compensating means for counteracting the effect upon the height of the fuel column of acceleration of the vehicle. It is also disclosed by the present invention how novel fluid level controlling means of this type may be combined with a diaphragm fuel pump in a unitary and compact structure, simple and relatively inexpensive of manufacture. The effect of changes in fuel density under various operating temperatures has been compensated for by the provision of novel thermostatic means. Even and efficient engine operation has also been insured, regardless of the use of fuels containing light ends which boil at relatively low temperatures, by the provision of novel means within the carburetor for removing bubbles from the fuel.

It will be obvious that the invention is not limited to the forms shown in the drawings but is capable of a variety of mechanical embodiments. For example, the two compensating weights shown in Fig. 1 might be replaced by a single weight having a mass and lever arm so selected that its effect would at all times be equal to the resultant of the forces exercised by the two weights shown. Also, any suitable form of fuel pump might be substituted for the one shown in Fig. 4, although the specific form disclosed therein accentuates the simplicity of the novel form shown in Fig. 5. Various other changes, which will now appear to those skilled in the art, may be made in the form, details of construction and arrangement of the parts, without departing from the spirit of the invention, and reference is therefore to be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. In combination with a carburetor of the type having a fuel nozzle, spaced fuel wells at opposite sides of the nozzle and connected thereto, means for maintaining a substantially constant head of fuel in said wells above the outlet of said nozzle

irrespective of any inclination of the vehicle on which the carburetor is mounted, and additional means for maintaining said fuel head substantially constant irrespective of any acceleration, deceleration or vertical movement of said vehicle.

2. In combination with a carburetor of the down-draft type having a fuel nozzle and a fuel well adapted to supply fuel thereto, means for maintaining a substantially constant head of fuel above the outlet of said nozzle, and means for counteracting the effect upon said fuel head of an inclination of the vehicle on which the carburetor is mounted including a second fuel well having a free flowing connection with said first mentioned well.

3. In a carburetor, a carbureting chamber, a fuel nozzle discharging into said carbureting chamber, a fuel well having a connection to said nozzle, a second fuel well, a passage connecting the lower ends of said wells, a fuel supply inlet to said second well, said inlet being positioned above said passage, and vents adjacent the upper ends of each of said wells.

4. In a carburetor, a carbureting chamber, a fuel nozzle discharging into said carbureting chamber, a fuel well having a connection to said nozzle, a second fuel well, a passage connecting the lower ends of said wells, a fuel supply inlet to said second well, said inlet being positioned above said passage, a pin centrally disposed in each of said wells, and a vent adjacent the upper end of each of said wells.

5. In a carburetor, a fuel nozzle, a fuel well connecting with and adapted to supply fuel to said nozzle, means for supplying fuel to said well, and means for removing bubbles from the fuel supplied to said well comprising a pin centrally disposed in said well and extending downwardly below the normal fuel level, and a vent adjacent the upper end of said well.

6. In combination with a carburetor having a fuel well, means for supplying fuel to said well, and means for maintaining the level of fuel in said well substantially constant irrespective of any acceleration or deceleration of the vehicle on which the carburetor is mounted, said last named means comprising a flexible diaphragm, means for subjecting one side of said diaphragm to the pressure of the fuel supplied to said well, and a pivoted lever having a vertical arm provided with a weighted extremity and a horizontal arm operatively secured to the other side of said diaphragm.

7. In a fuel supply system for a vehicle, a casing, a fuel pump within the lower portion of said casing, a fuel supply line leading to said pump, a valve between said pump and the upper portion of said casing, a fuel discharge line extending diagonally upward from the upper portion of said casing to form a liquid column the hydraulic head of which will vary with the acceleration of the vehicle, and means controlling the actuation of said valve comprising a flexible diaphragm within the upper portion of said casing, one side of said diaphragm being subject to the varying pressure of the fuel in the fuel discharge line, and means including a weighted member so mounted that, due to its inertia, it will exert a pressure against the other side of said diaphragm equal and opposite to the inertia force of said liquid column.

8. In a fuel supply system for an internal combustion engine of the type having a carburetor adapted to be supplied with fuel at a substantially constant level, a combined fuel pump and level controlling device comprising a casing, a flex-

ible diaphragm within said casing, a fuel inlet to said casing adapted to admit fuel to one side of said diaphragm, means for actuating said diaphragm as a pump including engine driven means for positively moving the diaphragm in one direction and resilient means for urging it in the other direction, a fuel discharge line leading from said casing to the carburetor, and additional means for actuating said diaphragm independently of said pumping means, said last named means including a pivoted lever having a vertical arm provided with a weighted extremity and a horizontal arm having an operative connection with the diaphragm.

9. In combination with a carburetor of the type having a fuel well and a fuel nozzle adapted to be supplied with fuel therefrom, means for supplying and maintaining the fuel in said well at a substantially constant level relative to the outlet of said nozzle irrespective of the motions of the vehicle on which the carburetor is mounted, said means comprising a diaphragm displaced horizontally from said well and connected thereto by a diagonal conduit so as to be subject on one side to the pressure exerted by the weight of the column of fuel supplied to said well, and means including a weighted member so mounted that, due to its inertia, it will exert a force against the other side of the diaphragm tending to counteract the force exerted by the inertia force of the column of fuel during acceleration of the vehicle on which the system is mounted.

10. In apparatus of the class described in combination with a carbureting chamber, a fuel

nozzle adapted to discharge into said carbureting chamber, a fuel well connected to said nozzle, a source of fuel supply, means for supplying fuel above the outlet of said nozzle while said pump and an inclined fuel passageway extending from said pump to said well, and means interposed in said passageway for maintaining the level of the fuel in said well at a substantially constant height above the outlet of said nozzle while said pump is running, the said last named means comprising a casing, a valve in said casing adapted to control the supply of fuel from said source to said well, means tending to maintain said valve in closed position, a diaphragm in said casing subject on one side to the pressure exerted by the weight of the column of fuel between said valve and the fuel well, and means including a weighted member so mounted that, due to its inertia, it will exert a force on the other side of said diaphragm equal and opposite to the inertia force of said column of fuel.

11. In a pump structure including a single casing, a diaphragm within said casing forming an upper and a lower chamber therein, an actuator operatively connected to said diaphragm mounted in one of said chambers, a fuel supply connected with the other said chamber for supplying fuel thereto, and means disposed in the last said chamber including a thermostat operatively connected to and for controlling the effective operation of said diaphragm in accordance with the temperature of the fuel.

FRANK C. MOCK.

CERTIFICATE OF CORRECTION.

Patent No. 1,933,379.

October 31, 1933.

FRANK C. MOCK.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, line 13, for the syllable "jest" read ject; page 6, line 79, claim 10, strike out the words "above the outlet of said nozzle while said" and insert instead from said source to said well including a; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 9th day of January, A. D. 1934.

(Seal)

Acting Commissioner of Patents.