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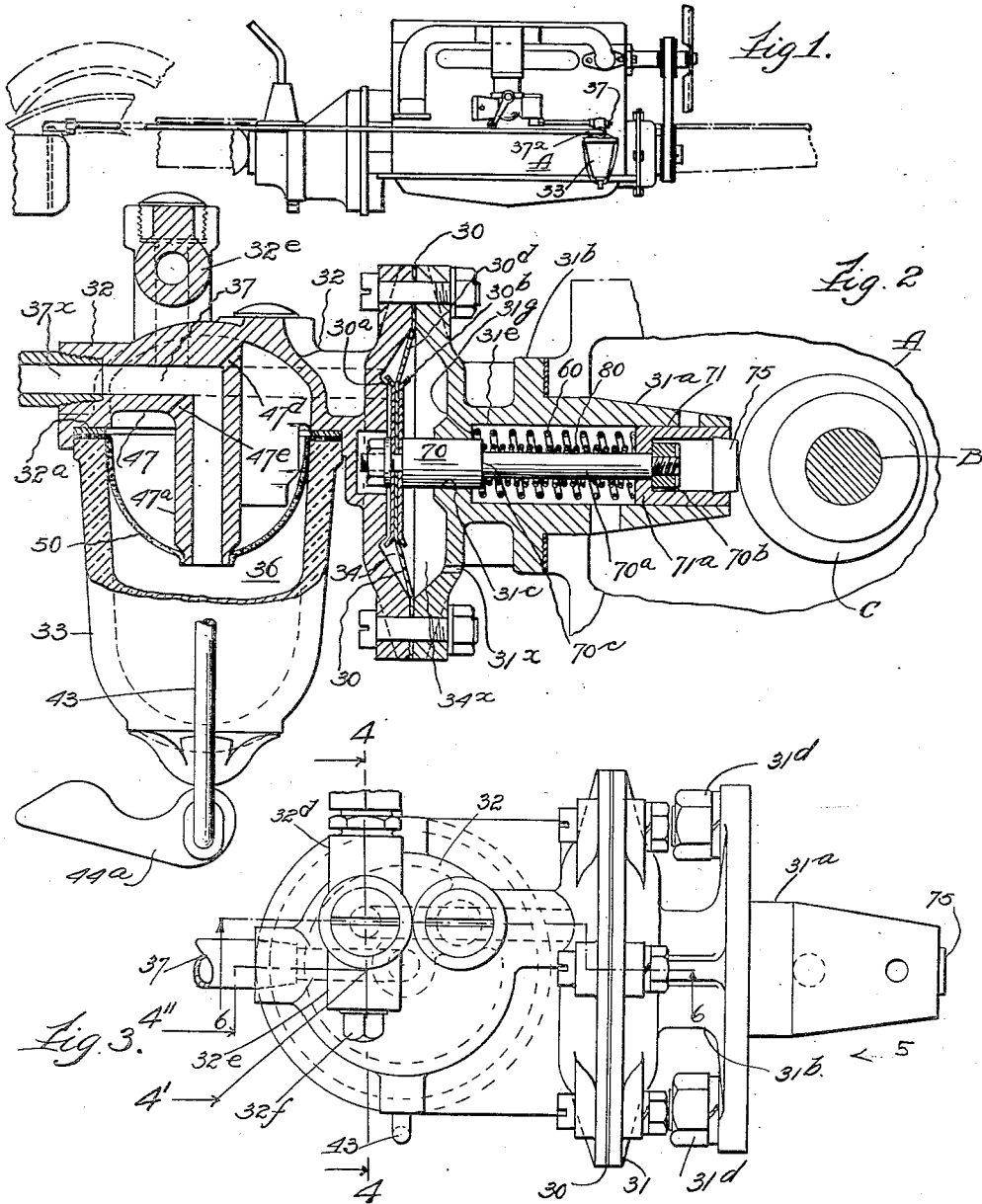
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1,932,676

CARBURETOR SUPPLYING FUEL PUMP

Filed April 2, 1928

3 Sheets-Sheet 1



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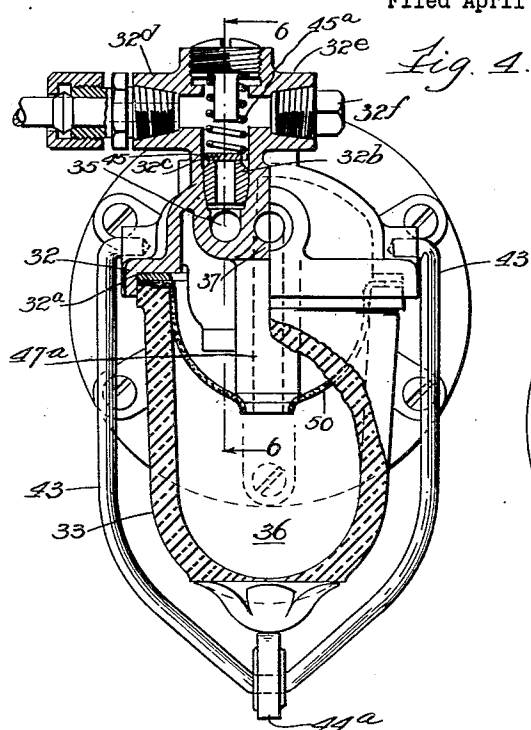
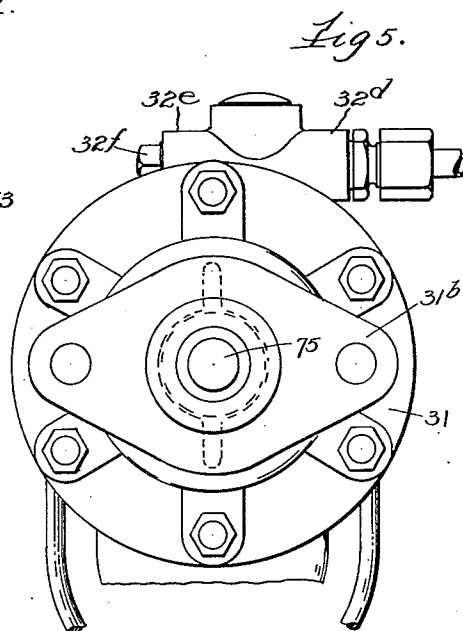
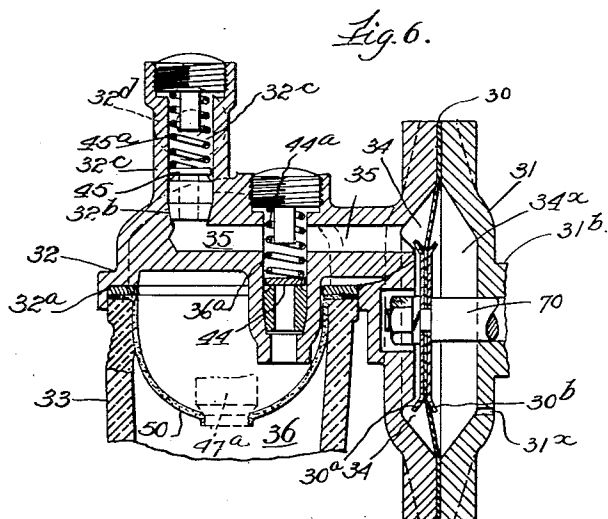
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Filed April 2, 1928

3 Sheets-Sheet 2



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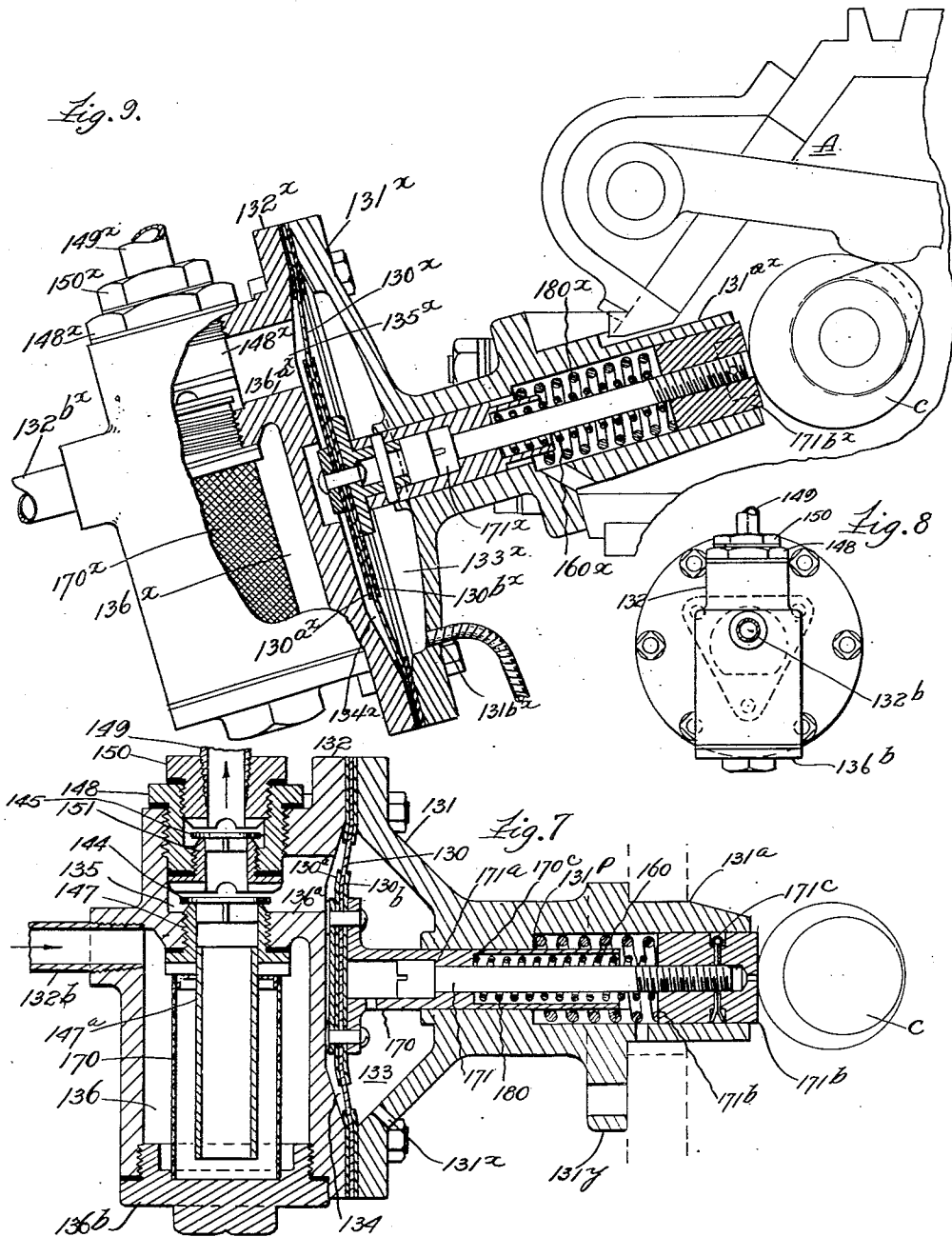
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CARBURETOR SUPPLYING FUEL PUMP

Filed April 2, 1928

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

1,932,676

CARBURETOR SUPPLYING FUEL PUMP

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Application April 2, 1928. Serial No. 266,598

6 Claims. (Cl. 210—165)

The purpose of this invention is to provide an improved construction of a pumping device for supplying fuel to the carburetor of an internal combustion engine from a low level of the carburetor, such pump being mechanically operated by a moving part of the engine. It consists in the elements and features of construction shown and described as indicated in the claims.

In the drawings:

10 Figure 1 is a diagrammatic view for showing the location of the pumping device embodying the invention with respect to the carburetor and the engine body.

15 Figure 2 is a vertical section with respect to the pumping member of the pumping device and the fuel receiving chamber.

Figure 3 is a top plan view of the pumping device disconnected from the engine.

20 4—4' on Figure 3.

Figure 5 is an end elevation looking in the direction of the arrow 5 on Figure 3.

Figure 6 is a staggered section at the planes indicated by the staggered line 6—6 on Figure 3.

25 Figure 7 is a view similar to Figure 2 showing a modification of the invention.

Figure 8 is a front element of the pump shown in section in Figure 7.

30 Figure 9 is a view similar to Figure 7 showing substantially the same form as Figure 6, but adapted for mounting on the engine in a slightly different relation to the element of the engine utilized for actuating the pump.

In the construction shown in the drawings, the 35 engine body is indicated at A showing a portion of the engine casing wall at which the pumping device is inserted for obtaining co-operative relation to a cam indicated at C, on a shaft, B, of the engine, the timing shaft being usually most 40 available for this purpose and such shaft may be understood as indicated at B. Referring to the form shown in Figures 1 to 6, the pumping device comprises a casing consisting of three 45 members, 31, 32 and 33. The members, 31 and 32, are formed for clamping between them a flexible diaphragm, 30, which is hereinafter referred to as the pumping member, this diaphragm serving to partition a portion of the cavity of the casing into two members, 34^x and 34, the 50 chamber, 34^x, having an atmosphere vent or breather hole shown at 31^x, and the chamber, 34, being connected by a passage leading to the fuel receiving chamber, 36, which is formed partly in the casing member, 32, and completed by 55 the casing member, 33, which is an upwardly

open cup, applied to the under side of the casing member, 32, at an annular seat, 32^a, provided for seating the upper end of the cup, said cup constituting a fuel trap sediment chamber and priming trap, a filter member or screen, 50, being interposed in the fuel receiving chamber having its margin clamped between the upper end of the cup member, 33, and its seat, 32^a, on the under side of the casing member, 32, said screen or filter member being formed depending from 65 its clamped margin in the fuel chamber for about half the depth of the latter. The communication of the chamber, 34, with the fuel chamber, 36, is by a passage, 35, which leading into the fuel chamber, has a downwardly extending branch, 70 36^a, open at its lower end above the filter member, 50, an upwardly open check valve, 44, being located in said downwardly extending portion and provided with a spring, 44^a, ensuring its seating against downward flow. Above the check 75 valve, the passage, 35, is continued horizontally somewhat past the vertical axis of the fuel chamber and then extends upwardly, as seen at 32^a, in an upwardly protruding boss, 32^c, to a point at which said boss is T-shaped having oppositely 80 protruding nipples, 32^d, 32^e, through which the passage is continued for pipe connection, afforded by either one of the nipples, with the carburetor, the unused nipple being closed by a plug, 32^f. In the upwardly extending portion, 32^c of the pas- 85 sage there is located an upwardly opening check valve, 45, provided with a spring, 45^a, to ensure its seating against back flow from the carburetor. The fuel chamber is connected for receiving fuel from the low level source by a pipe indicated at 90 37^x connected to an intake passage, 37, which is formed in an interiorly protruding boss, 47, of the casing member, 32, which comprises a downwardly extending portion, 47^a, which protrudes at its lower end through the center of the filter 95 or screen member, 50; and the fuel intake passage 37 which extends through said downwardly extending portion of the boss discharges in the fuel chamber below the screen filter member; so that the fuel thus delivered to the receiving 100 chamber can obtain access to the passage by which it is led to the carburetor only after having passed through the screen or filter member. The cup member, 33, of the casing is clamped to the member, 32, as mentioned, by means of a 105 clamping yoke, 43, of which the loop at the lower end is provided with an eccentric clamping cam lever, 44^a, the operation of which will be understood without further detail description.

The casing member, 31, comprises a horizontal 110

extension, 31^a, constituting a stem of the casing for protruding into the engine casing, said extension having a flange, 31^b, stopping against the engine casing and affording means for securing the pump casing to the engine by bolts as indicated at 31^d. The casing stem, 31^a, is axially bored for affording slide bearing at 31^c, for a stem hereinafter described of the diaphragm, 30, and counterbored for the greater portion of its length, as seen at 31^e, forming a shoulder at 31^f, for stopping a spring, 60, accommodated in the counterbore for a purpose hereinafter mentioned. The stem of the diaphragm, 30, comprises two non-resilient members, 70 and 71, the former being secured to the diaphragm at the center of the latter, and obtaining slide bearing at 31^c, as mentioned, the member, 71, being mounted slidably in the end portion of the casing stem, 31^a, at the portion thereof which protrudes into the engine casing. The diaphragm stem member, 70, is telescopically engaged with the member, 71, said member, 71, having at its inner end an interiorly projecting annular flange, 71^a, and the stem member, 70, reduced in diameter over the greater part of its length from the end back to the portion which obtains slide bearing at 31^c is protruded through the flange, 71^a, and being further reduced and threaded at its extremity, is provided with a nut, 70^b, of suitable diameter to constitute a stop co-operating with the flange, 71^a, for engaging the two stem members with each other against longitudinal extension, but permitting the member, 70, to telescope within the member, 71, for a short distance. Said member, 71, is provided at the end opposite that which has the flange, 71^a, with a wear piece, 75, which closes the axial cavity of said member, 71, at that end, and is adapted to take the thrust of the cam, C. On the reduced portion, 70^a, of the stem member, 70, there is provided a coil spring, 80, stopped at one end against the shoulder, 70^c, of the stem member, 70, and at the other end against the inturned flange, 71^a, of the stem member, 71, said spring being initially conditioned by compression in the assembling of the parts for reacting between the two stem members, 70 and 71, to hold the stem normally extended to the limit determined by the co-operating stops, viz., the flange, 71^a, and the nut, 70^b. The diaphragm, 30, is provided at opposite sides with rigid disks, 30^a and 30^b, diametered for enclosing a central area of the diaphragm, leaving only an annular portion, 30^d, for flexure in the operation of the diaphragm. The spring, 60, is very much stiffer than the spring, 80, as may be understood from the relative dimensions of these springs shown in the drawings.

Assuming the position of all parts to be such as will result from assembling with the spring, 80, conditioned for reacting to hold the diaphragm stem members extended to the limit at which their co-operating stops, 71^a and 70^b, are in contact, with the chambers empty of fuel and the cam, C, rotated to the position of maximum thrust on the stem member, 71, upon continuing rotation of the cam, the reaction of the spring, 60, retracts the diaphragm stem bodily, that is, as to both members,—and causes it to positively flex the diaphragm in the direction for enlarging the chamber, 34, tending to produce partial vacuum in that chamber and in the passages communicating with the fuel receiving chamber and in the latter chamber; and causing fuel to be drawn into that chamber from the low level fuel source.

Upon the continued rotation of the cam, the diaphragm stem operates as a unit for reflexing the diaphragm in the direction for reducing the pumping chamber, 34, and forcing fluid flow,—first, of air, until the fuel receiving chamber has been filled with fuel from the source,—past the check valve, 45, to the carburetor, and the cycle of operation is repeated, in each revolution of the cam until, first, the fuel receiving chamber becomes filled with fuel, and eventually the carburetor float bowl is filled; and during the operation up to this condition, the diaphragm stem continues to operate as a rigid unit; but upon the carburetor being fully supplied, in the next succeeding feeding stroke, while the stem member, 71, will be positively actuated to the full range of the cam action, the diaphragm being under stress only of the spring, 80, for moving it in the direction for reducing the pumping chamber and moving the fuel onward, will be moved only to the extent sufficient to make good the diminution of supply in the carburetor float bowl which may have occurred by the running of the engine in the interval since the last action of the cam; and thus at all times during the continued running of the engine, the diaphragm will be moved in the direction for feeding fuel to the carburetor only to the extent determined by the fuel consumption by the engine in the interval between the pumping strokes, provided the pumping device is of sufficient capacity to fully supply the carburetor, that is, to fully meet the engine consumption of fuel.

Throughout all the stages of operation as above described it will be recognized that the suction stroke, that is, the movement of the diaphragm in the direction for enlarging the pumping chamber, 34, will be performed under the reaction of the spring, 60; and this spring being sufficiently stiff and having sufficient range of resilient action as the parts are assembled, to lift the fuel from the low level to the receiving chamber, the action is as certain as if it were positive, although it is in reality of yielding character. And it will be observed that at no time and as to no stage and phase of the action and no part of the cycle is either movement of the diaphragm in reality positive, notwithstanding the action of the cam upon the stem member, 71, in the feeding stroke is a positive action.

It will be observed that the construction shown is adapted to accumulate in the trap chamber and retain therein after the engine stops, a quantity of fuel, which, if the trap is sufficiently dimensioned, may be sufficient to operate the engine on restarting for a sufficient time to refill the float bowl of the carburetor, which is liable to become drained while the engine is not running, by reason of the unavoidable leakage of the check valve which might retain it. And this reserve supply of fuel is particularly advantageous by reason of being accumulated and held at a point relatively near the carburetor as compared with the location of the main valve supply tank, so that the reserve is available instantly upon the first stroke of the engine when the latter is operated by the starter, whereas a number of revolutions of the shaft would be necessary to bring the fuel from the relatively remote main supply tank.

It will be observed that the fuel inflow passage, 37, terminating for discharge downwardly through the filtering screen, 35, taken in conjunction with the pipe connection, 37^a, which extends from the connection with the passage, 37, 150

downwardly to reach the fuel source, constitutes a siphonic passage which upon cessation of suction, as when the engine is not running, would be liable in case of leakage of the valves which are never to be relied upon to be perfectly tight to cause drainage back to the fuel source of all fuel accumulated in the chamber above the discharge end of the passage, 37, and to prevent such a result, a vent is provided, as seen at 47^d, leading from such point where the pressure continues when the engine is not running where it will break the siphon at said highest point. This vent is most conveniently made by drilling the boss, 47, diametrically from the inner under cross side of the angular bend of the passage, 37, which produces an aperture, 47^c, opening at a lower point in the fuel chamber than the vent port, 47^d, but which in view of its direction with respect to the fuel flow through the passage, 37, is unobjectionable though having no special function, other than inducing vapor to form due to circulation of the gases from above the liquid through the liquid, and the filling up of the trap chamber after the engine stops due to condensation of the vapor therein.

In the form shown in Figure 7, the casing comprises two members, 131 and 132, between which the flexible diaphragm, 130, provided with rigid clamping disks, 130^a, 130^b, at opposite sides over a limited central portion of the area, is clamped for partitioning the pumping chamber, 134, from the chamber, 133, which latter chamber has a breathing hole, 131^x, in the casing member, 131. The pumping chamber communicates with the fuel receiving chamber, 136, by a passage, 135. Said fuel receiving chamber has a horizontal partition, 136^a, which has a central aperture into which there is screwed a bushing, 147, whose upper edge forms a seat for a check valve, 144, opening upwardly, the lower end of said bushing being connected with a depending duct member 147^a, having its lower end open at the lower part of the fuel receiving chamber, 136, the lower end of said chamber being closed by a screwed-in cap, 136^b. Said fuel receiving chamber is provided at the upper part of the casing member, 132, with a pipe connection seen at 132^b, for fuel intake from the lower level main supply tank; and the passage, 135, entering horizontally, leads upwardly from a point above the check valve, 144, to a bushing, 148, which affords connection for a fuel pipe, 149, leading to the carburetor, the connection being made by means of a coupling bushing, 150, screwed into the bushing, 148, and having the fuel pipe, 149, screwed into it; and into the lower end of the bushing, 148, there is screwed a valve seating bushing, 151, whose upper end constitutes a seat for a check valve, 145, opening for fuel flow toward the carburetor and seating by gravity against back flow.

In the fuel receiving chamber, 136, there is provided a cylindrical filtering screen—encompassing the downwardly extending pipe member, 147^a, said screen member being diametered for spacing it inwardly from the wall of the chamber and outwardly from said pipe member, 147^a.

The pumping action of this construction will be understood to be that upon movement of the diaphragm, 130, alternately in the directions for enlarging and reducing the pumping chamber, 134, the fuel is lifted by suction from the low level supply tank and fed onward toward the carburetor.

This pumping action of the diaphragm is produced by the action of the cam, C, on the dia-

phragm operating connection which consists, as in the earlier figures, of a stem of the diaphragm which comprises two non-resilient parts; 170 and 171, held in co-operative relation to each other by a spring, 180, which reacts between them for extension of the total stem to a limit at which the co-operating shoulders, 171^a and 171^b, on said members respectively are in contact under the reaction of the spring, the member, 171, having screwed onto its outer end and secured thereto by a cotton pin, 171^c, a head and wearing piece, 171^b, which takes the reaction of the spring, 180, at one end, the spring at the other end reacting in the opposite direction against the shoulder, 170^c, of the stem member, 170, said shoulder being provided by counterboring the stem member, 170, to accommodate the spring, 180, which is coiled about the reduced portion of the stem, 171.

The stem, 131^a, of the casing member, 131, having the flange, 131^y, for securement to the engine body and the terminal portion, 171^b, which protrudes into the engine casing for obtaining co-operation with the cam, C, is counterbored to accommodate around the diaphragm stem member, 170, a coil spring, 160, which reacts at one end between the shoulder, 131^p, formed in the casing stem by the counterbore, and at the other end against the head and wearing piece, 171^b, of the stem member, 171, said head and wearing piece being fitted in the counterbore for completing the guidance of the stem member, 171, in the reciprocation which said stem member derives from the action of the cam, C, in one direction and the reaction of the spring, 160, in the opposite direction. Said spring, 160, is very materially heavier and stiffer than the spring, 180, so that as to the reaction of the latter spring the stem member, 171, is positioned as positively as if the stem member, 171, were positively stopped in the casing in the direction in which it is in fact stopped only against said spring, 180; and the latter spring reacts for holding the head and wear piece, 171^b, of the stem member, 171, in contact with the cam as certainly as if the cam were engaged for positive actuation of the stem in both directions.

It will be recognized upon considering the construction of Figure 7 that the operation of the diaphragm connections including the two-membered stem and the two springs reacting upon them respectively, is essentially the same as the operation of the construction shown in the earlier figures.

Figures 8 and 9 show a form slightly modified from that shown in Figure 7 merely for adapting the structure to a particular engine which has the cam available for actuating the pumping mechanism so situated that access to it is most conveniently obtained through an opening in the engine casing so situated that the stem of the pump casing and the diaphragm stem member protruding therefrom are necessarily intruded obliquely into the engine casing, as seen in said Figures 8 and 9. The construction of the pumping mechanism in this modification is substantially the same as that of Figure 7, and the corresponding parts are indicated by the same reference numerals with the addition of an exponent x.

It will be observed that in the forms shown in Figures 7 and 9 by reason of the pumping chamber having its diaphragm in a plane extending up and down,—being in fact as shown in Figure 7 in a true vertical plane,—and the flow connection of said pumping chamber being by a port near the circumference at the upper side, the trapping of 150

air or fuel vapor in the pumping chamber is avoided.

Also it should be noted that the chamber at the opposite side of the diaphragm from the pumping chamber, necessary for permitting the flexure of the diaphragm in the direction for enlarging the pumping chamber, has an atmosphere vent port or "breather" port, 131², in Figure 7, and 131^{2a} in Figure 9 necessary also for permitting free flexure of the diaphragm, and that this port being located at the lower side, serves as an escape port for any fuel which may under any circumstances pass through the diaphragm, as in the case of the diaphragm ceasing to be impervious to the liquid or developing a crack adjacent the clamped margin or at the circumference of the central reinforcing plates.

This "breather" port and escape aperture may be provided with a drain pipe connection, as indicated in Figures 8 and 9, for carrying away any liquid fuel which may escape past the diaphragm.

I claim:

1. In combination with a chamber into and out of which liquid is to be moved, an antecedent liquid receiving chamber having a duct member extending downwardly therein and a horizontal inflow passage connected therewith for receiving liquid from a liquid source, said duct member having its discharge at the lower end in said receiving chamber, said receiving chamber having an outlet at a higher level than said discharge and a passage leading therefrom to the first mentioned chamber, said horizontal passage having at its upper and lower sides air vents opening in said receiving chamber at the upper part thereof.

2. A fuel trapping device comprising a head, an inverted cup-shaped member secured in sealing relation to the underside of said head, said head having inlet and outlet connections and inflow and outflow passages, said inlet connection and said inflow passage being disposed in a vertical plane offset from the vertical plane of said outflow passage and said outlet connection, a pair of check valves in said outflow passage arranged in stepped horizontal relationship and a pumping chamber in communication with said outflow passage at a point intermediate said check valves.

3. A fuel trapping device comprising a head, an inverted circular cup-shaped member secured in sealing relation to the underside of said head, said head having inlet and outlet connections and inflow and outflow passageways, said inlet connection and said inflow passageway being disposed in a vertical plane offset from said outflow passage and said outlet connection, said inflow and outflow passages including portions in vertical communication with the chamber formed by said cup-shaped member, a pair of check valves in said outflow passage disposed in offset stepped relation and disposed within the area defined by the circular cross section of said cup-shaped member, said outflow passage being in communication with a closely adjacent pumping chamber at a point intermediate said check valves.

4. A fuel trapping device comprising a head having a cavity at its underside, an inverted cup-shaped member secured in sealing relation to the underside of said head at a plane below the top of said cavity, said head having an intake pas-

sage in a vertical plane consisting of a horizontal portion at a level below the top of said cavity and a vertical portion axial with respect to said cup-shaped member and delivering downwardly thereinto, an outflow passage disposed in a vertical plane offset from the plane of said intake passage and consisting of a horizontal portion and vertical portions above and below said horizontal portion, one of said vertical outflow portions leading upwardly from said cup-shaped member into said horizontal outflow portion, the other of said vertical outflow portions leading upwardly from said horizontal outflow portion, each of said vertical outflow portions having a check valve therein and said horizontal outflow portion being in communication with a closely adjacent pumping chamber.

5. A fuel trapping device comprising a generally circular head, a horizontally directed passage leading into said head and terminating substantially at the center thereof, a vertically directed passage in said head extending downwardly from communication with the inner end of said horizontal passage, said passages together forming an intake conduit for the fuel, a second horizontally directed passage in said head parallel with said first-mentioned horizontal passage, said second horizontal passage extending in the opposite direction to said first-mentioned horizontal passage, a second vertically-directed passage in said head leading upwardly from communication with the inner end of said second horizontal passage, a removable closure for the top of said last-mentioned vertical passage, a laterally-directed outlet connection to said head in communication with said second vertical passage, a third vertically-directed passage extending through said second horizontal passage and open at its lower end, a removable closure for the top portion of said last-mentioned vertical passage, a removable cup-shaped member secured to the bottom side of said head and enclosing the lower openings of said first and third vertical passages, said second horizontal passage being in communication at one end with a closely adjacent pumping chamber.

6. A fuel trapping device comprising a head, laterally directed inlet and outlet connections thereto, an inverted cup-shaped member removably secured to the lower side of said head in sealing relation therewith forming a fuel-trapping chamber, a filter member held in place by the securement of the cup-shaped member to said head, said head having an inlet duct leading horizontally thereinto and vertically downward substantially on the axes of said cup-shaped member, said head having an outlet duct leading vertically upward from said trap chamber above said filter, then extending horizontally parallel to said first duct and then extending vertically upward into communication with said outlet connection, a check valve adapted to seat in one direction only in each of the vertical portions of said outlet duct and removable closures on the upper side of said head for permitting the assembly of said check valves, said horizontal portion of said outlet duct being between said check valves in communication with a closely adjacent pumping chamber.

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