

E. J. WIGGINS.  
 FLUID CONTROLLING APPARATUS.  
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1,397,190.

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Fig. 1.

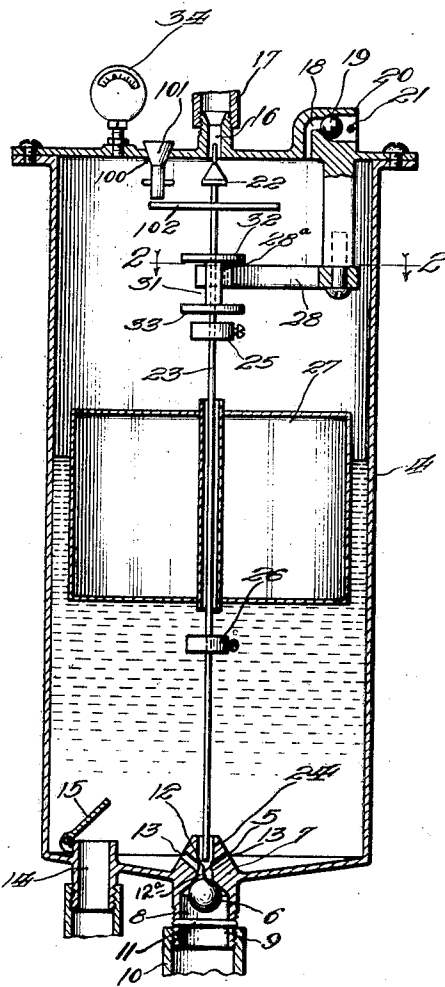
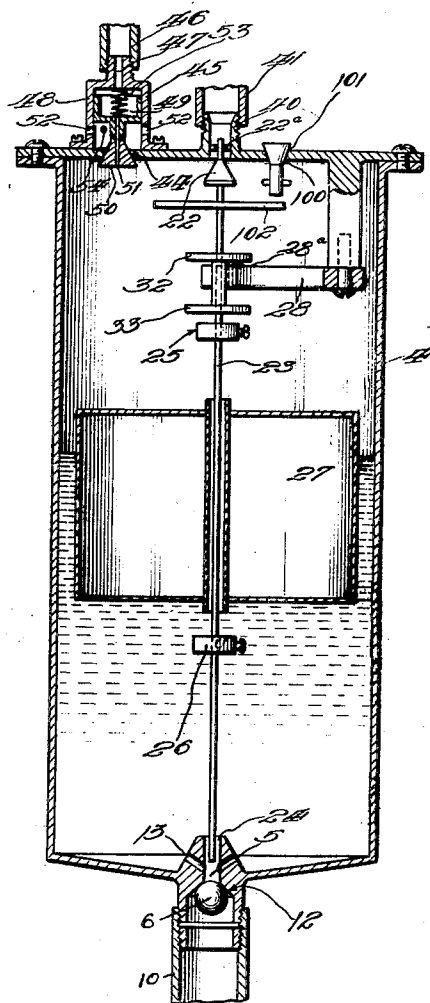
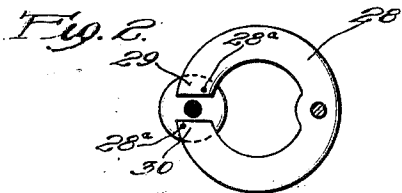


Fig. 3.



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# UNITED STATES PATENT OFFICE.

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## FLUID-CONTROLLING APPARATUS.

1,397,190.

Specification of Letters Patent.

Patented Nov. 15, 1921.

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*To all whom it may concern:*

Be it known that I, EDWARD J. WIGGINS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Fluid-Controlling Apparatus, of which the following is a specification.

I have devised my invention for embodiment more particularly in apparatus for lifting liquid from one level to another through the medium of suction action, and more especially for embodiment in apparatus employed in connection with internal combustion engines for supplying to the carbureter thereof, by the suction action produced by the engine in operating, liquid fuel, as for example, gasoline, located in a tank below the carbureter. However, certain features of my invention may be embodied in other apparatus intended for other uses, as for example, in metering apparatus for registering or otherwise indicating the volume of liquid passed from one point to another, regardless of whether or not the apparatus is used in connection with internal combustion engines.

My primary object, generally stated, is to simplify such structures and reduce the size thereof; render the operation very positive and the production of the apparatus more economical; minimize friction exerted by the moving parts, reduce the number of parts; and avoid the use of springs and levers.

In connection with the use of the invention as a metering device, an object, in addition to those above enumerated, is to provide for the accurate metering of the liquid, and, where suction is employed in the operation of the device, to insure the supplying of the apparatus, upon each operation thereof, to fill the same by suction action with the same amount of liquid, thereby permitting the use of an indicating, or otherwise registering, device, indicating or recording each filling operation produced through the medium of suction action caused to intermittently occur in the apparatus.

In connection with the use of the invention for lifting liquid fuel by suction action of an engine from a level below the carbureter to a level above the latter for supplying the carbureter with fuel, other objects, in addition to those specified, are to

provide a structure which will operate to draw fuel into it from the storage tank below it even when the suction action exerted in the apparatus, by the engine in operating, is very low, compared with the higher degrees of suction commonly required to draw fuel into the apparatus as the latter are commonly provided especially in the case of high-powered cars. In this connection it may be stated that so-called vacuum fuel feeding systems in automobiles are commonly connected at their suction conduit with the engine inlet-manifold, with the result that when the throttle of the engine is open beyond a certain point, as often occurs in the operation of an automobile, especially in ascending hills, the degree of suction in the inlet-manifold, and thus exerted in the vacuum feeding apparatus, is very low and, in fact, so low, especially in the case of high-powered cars, as not to be sufficient for the drawing of the fuel into the vacuum apparatus, and thus it has been found necessary in practice to provide the tanks of the apparatus of such relatively large size as to maintain, during the ordinary running of the engine, a fuel reserve ready for use when the suction falls below a point where it is effective to draw fuel into the apparatus. As to this phase of the conditions presented, it is one of my objects, as above stated, to render the vacuum feed apparatus operable under relatively low degrees of suction, as stated, and thereby reduce to a very material degree the amount of reserve supply required for the continuous operation of the engine. Furthermore, it is a desire to provide an apparatus wherein the vacuum feed feature may be embodied, if desired, as a part of the carbureter and preferably located in the float feed chamber of a carbureter as commonly provided, and thereby dispense with a separate vacuum feed apparatus, and this I am able to accomplish by utilizing my invention particularly because of the fact that by my invention I am enabled to employ a relatively small tank.

Another object in connection with the utilizing of my invention in suction fuel-feeding apparatus for automobiles is to provide a construction the tank of which will fill very rapidly with the liquid fuel under suction action of the engine, as compared with apparatus as hitherto constructed, which is of especial advantage where, as for example

in the prolonged running of the automobile with open, or substantially open, throttle, the vacuum tank becomes exhausted, inas-  
 5 much as the throttle may, by being moved to approach closed position, effect the estab-  
 lishment of suction in the tank, to a degree effective for charging the tank within a few  
 10 seconds of time. Another object in this connection is to provide for the positioning of the liquid outlet from the vacuum tank at a  
 higher level relative to the carbureter than in structures as hitherto provided, thereby  
 15 to cause a faster flow of the liquid to the carbureter due to the increased head, with the advantage of maintaining to a more  
 nearly uniform level, the liquid in the float-chamber of the carbureter.

As vacuum fuel-feeding apparatus for internal combustion engines has been hitherto  
 20 constructed, the fuel-inlet leads into the upper end of the vacuum tank, necessitating each time suction action is exerted in the tank, for the lifting function, the lifting of  
 the liquid from the level in the supply tank below the vacuum tank and which supply  
 25 tank is open to the atmosphere to the height of the liquid-inlet into the vacuum tank. The matter of height to which the liquid is  
 elevated to its point of discharge into the vacuum tank is of considerable importance,  
 30 in such apparatus where the suction is effective in the tank only intermittently, by reason of the cycle of operations involving the  
 lifting of liquid into the tank by suction action, and the flowing of the liquid therefrom,  
 35 as by venting the vacuum tank to the atmosphere, the liquid in the line leading from the storage-tank to the vacuum tank back-  
 flowing toward the storage-tank when the suction action in the vacuum tank discontin-  
 40 ues; and, in this connection, it is one of my objects to reduce to as great a degree as possible the height to which the liquid is  
 drawn for any given height of vacuum tank above the storage tank below it, it being also  
 45 readily apparent that the less the height to which it is necessary to suck the liquid to cause it to enter the vacuum tank, the less  
 degree of vacuum necessary, and, consequently, the less amount of space required to  
 50 be provided for storing, for reserve purposes, quantities of the liquid discharged by suction into the vacuum tank.

A still further object is to provide in apparatus of the characters hereinafter described suitable adjustments for regulating  
 55 the amount of liquid drawn into the tank with each suction operation.

Referring to the accompanying drawings, wherein I have chosen to illustrate my  
 60 invention as embodied in a vacuum fuel-feeding system for an internal combustion engine:

Figure 1 is a view in vertical sectional ele-  
 65 vation of a liquid-controlling device, consti-

tuting one embodiment of my invention. Fig. 2 is a section taken at the line 2 on Fig. 1 and viewed in the direction of the arrow; and Fig. 3, a view like Fig. 1 of another  
 70 embodiment of my invention.

Referring to the construction illustrated in Figs. 1 and 2, a tank, closed except for the openings hereinafter referred to, is represented at 4, this tank in practice being  
 75 positioned at such an elevation relative to the carbureter (not shown) to be supplied with liquid fuel from the tank, as to cause the liquid to run from the tank into the  
 carbureter; the outlet of the tank, and which would be in communication with the fuel-  
 80 inlet of the carbureter, as for example the inlet opening into the float chamber thereof, when the latter forms a part of the carbureter, being represented at 5, there being pro-  
 vided a valve 6 shown as of the outwardly-  
 85 opening ball type, for permitting the liquid to discharge from the tank toward the carbureter, but prevent reverse flow of the liquid in the operation of the suction action  
 hereinafter referred to and which operates  
 90 to charge the tank 4. The valve device referred to may be of any desired construction, that shown involving the casing por-  
 tion 7 having a passage 8 therethrough formed with a chamber 9 at which the cas-  
 95 ing attaches to a pipe 10 which would lead to the carbureter and in which chamber the ball valve 6 is located above a stop-pin 11  
 secured in the casing. The upper end of the chamber is provided with a valve seat 12 for  
 100 coöperation with the ball 6, the upper end of the passage 8 being of reduced diameter as represented at 12<sup>a</sup> and communicating with the interior of the tank 4 through the branch  
 passages 13, the ball 6 under suction action  
 105 exerted in the tank 4 closing the passage 8 as shown.

The tank 4 at its lower end, as shown at the bottom of the tank, is provided with an  
 110 inlet 14 for the liquid fuel, this inlet communicating with a storage tank (not shown) for the fuel, as is commonly the practice, located below the level of the carbureter, the  
 inlet 14 being provided with a check valve, shown as a hinged flap valve 15, opening to-  
 115 ward the interior of the tank.

The upper end of the tank contains an inlet 16 communicating with a pipe 17 which  
 120 would lead to any suitable point where it would be subjected to the suction action produced by the engine (not shown) in operating, it being preferred that this pipe com-  
 municate with the conduit leading from the carbureter to the engine, preferably between  
 125 the throttle of the engine and the inlet-valve, or valves, of the engine. The tank 4 also contains inlets 18 and 100 opening to the atmosphere and controlled by valves 19 and  
 101, respectively. The valve 101 is of taper construction closing the inlet 100, by gravity. 130

The valve 19 provided, more particularly, in connection with the reserve-supply in the tank and hereinafter referred to, is shown as a check valve formed of a ball 19 located in an enlarged portion 20 of the inlet 18 and backed up by a stop-pin 21, the parts just described being so proportioned and arranged that when suction sufficient to draw liquid into the tank 4 is exerted in the upper portion of the tank 4 through the suction opening 16, the ball 19 will become seated and close the inlet 18 to the atmosphere, and when the suction is cut off by closing the valve controlling the suction opening 16 and hereinafter referred to, or drops below that necessary for lifting liquid into the tank, the ball 19 will drop from inlet-closing position, the ball resting against the pin 21, and opening the inlet 18 to the atmosphere.

Coöperating with the suction opening 16 is a valve 22 shown as carried on the upper end of a rod 23, this valve being operated to control the exerting of suction in the tank 4 through the pipe 17. The means shown for controlling the operation of the valve 22 and which also operate to control the valve 101, comprise the rod 23 which is vertically movable in the tank, and carries a disk 102 rigid thereon and through the medium of which the valve 101 is opened, the opposite ends of the rod 23 loosely extending into the inlet 16 and into a vertical guide opening 24 in the bottom of the tank, shown as a continuation of the reduced portion 12 of the passage 8, this rod being provided with tappets represented at 25 and 26 adjustably mounted thereon in vertically spaced relation. A float located in the tank 4 surrounds the rod 23 in the space between the tappets 25 and 26, and is vertically slidable on the rod 23 between the tappets 25 and 26, the height to which the float extends being controlled by the liquid in the tank supplied thereto as hereinafter explained.

Mounted in the tank, as by a depending lug 28<sup>a</sup> on the top of the tank 4, is a magnet, shown as a permanent magnet and represented at 28, its poles 29 and 30 of opposite polarity being spaced apart in a horizontal plane, with the rod 23 extending into the said space, the rod 23 having secured thereto a head 31 of magnetic material preferably iron or soft steel and forming an armature presenting the disk-like portions 32 and 33 vertically spaced apart, the disk 32 extending above the poles 29 and 30 and the disk 33 below said poles. The relative positions of the poles and disks is such that, by preference, when the rod 23 is being raised by the float 27 to seat the valve 22 and open the valve 101, the disk 33 will approach the poles sufficiently close to be attracted by the magnet in the final upward movement of the rod 23 but preferably not come in contact therewith, and when the rod 23 is being lowered

by the float 27 engaging the tappet 26, the disk 32 will approach the poles sufficiently closely to be attracted by the magnet in the final downward movement of the rod, whereby the valve 22 in the rising of the rod 23 is caused to be closed and the valve 101 opened, by a positive action, and the valve 22 to be held closed and the valve 101 open, until the float 27 in its descent exerts a force on the rod 23, through the medium of the tappet 26, to lower this rod, which latter remains in lowered condition until the float 27, in rising, engages the tappet 25 and raises the rod 23 to seat the valve 22 and open valve 101. Means are preferably provided for preventing the disk 32 from contacting with the magnet in the lowering of the rod 23, these means in the construction shown being in the form of pins 28<sup>a</sup> of non-magnetic material, as for example copper or brass, mounted on the upper surface of the magnet and adapted to be contacted by the disk 32.

In this connection it will be noted that upon the movement of the rod 23 in either direction under the action of the float, to a point where the armature has been moved beyond neutral position relative to the magnet, the magnet will operate to accelerate the movement of the rod 23 to a position in which the valves 22 and 101 are opened or closed as the case may be.

A general description of the operation of the device is as follows, assuming the conduit 14 to be in communication with a supply of liquid fuel, the pipe 10 in communication with the float chamber of the carbureter of the engine, the pipe 17 to be connected with the engine as stated for producing suction therein in the operation of the engine, and the engine to be operating, and the parts to be in the position represented in Fig. 1, wherein by reason of the open condition of the valve 22 suction is being exerted in the tank 4 with the result of drawing liquid therein through the inlet 14, the valves 6 and 19, under the suction action referred to being held in closed position and the valve 101 also closed. As the liquid rises in the tank 4 it raises the float 27, the float 27 in rising and engaging the tappet 25 thereby forcing the rod 23 upwardly to a position in which the valve 22 closes the suction opening 16 and opens the valve 101, whereupon the suction in the tank 4 ceases and the latter is opened to the atmosphere, the valve 19 also moving to a position in which the inlet 18 is open to the atmosphere. The initial lifting of the rod 23, by the float 27, as stated, necessitates the lifting of the disk 32, rigid on the rod 23, against the attractive influence of the magnet 28, but as soon as these disks have moved to a position in which the attraction is greater between the magnet and the disk 33 than between the magnet and the disk 32, the mag-

net will operate to accelerate upward movement of the rod 23 thereby positively and effectually closing the valve 22 and opening the valve 101 and maintaining the valve 22 in closed condition and the valve 101 in open condition until the rod 23 has been lowered as hereinafter described. Upon cessation of suction in the tank 4, and the opening of valves 101 and 19, the valve 6 drops to open the inlet 5 to the conduit 10, whereupon the liquid sucked into the tank 4 as hereinbefore described flows therefrom, as to the carbureter hereinbefore referred to. As the liquid runs out of the tank 4, the float 27 lowers correspondingly and in the course of its downward movement strikes the tappet 26 and forces the rod 23 downwardly to a position in which the valve 22 is open and the valve 101 closes, whereupon suction action exerted through the pipe 17, is caused to be exerted in the tank 4 whereupon liquid is drawn into the tank through the inlet 14, the valves 6 and 19 seating under the suction action, until the float by striking the tappet 25 moves the valve 22 in a direction to close it, these intermittent operations continuing so long as effective suction exists in the pipe 17 and the supply of liquid is maintained in the storage tank and with which the inlet 14 communicates.

The valve 15 being an inwardly-opening valve, the flowing of liquid from the tank 4 back to the storage tank, when the valve 22 is closed, is prevented.

The magnet 28 by reason of the close proximity thereto, of the disk 32, in the lowered position of the rod 23, serves to releasably hold the rod against upward movement, therefore avoiding the possibility of the float 27 lifting the rod 23 until the float engages the tappet 25.

It will be readily understood from the foregoing description that by reason of the provision of the parts, and the arrangement thereof, as described, the device is very positive in action, and may be operated, even when the suction in the pipe 17 is very low. Furthermore, the same amount of liquid is drawn into the tank 4 in each period of suction in the tank. The various features above referred to afford great advantages in a device of this character inasmuch as, considering the device from the standpoint of a measuring device, the accurate indication or registry of the amount of liquid delivered through the tank, may be effected, as for example by an indicator which may be operated by the suction produced in the tank 4 through the pipe 17, to move an indicating hand a certain distance each time suction is established in the tank. In the drawings I have indicated such a registering device at 34 which opens into the tank 4 and may be of any suitable construction. In-

asmuch as the same quantity of liquid enters the tank 4 with each period of suction, by providing a device which is operated once each time suction is established, accurate indication of the liquid flowing through the tank may be effected, the scale of the gage being calibrated, if desired, in gallons and fractions thereof, thereby indicating to the user the number of gallons of liquid flowing through the tank 4.

A device constructed in accordance with my invention also presents a great advantage as regards the matter of maintaining, at a level above the carbureter, a reserve liquid fuel supply to meet a condition wherein the suction produced in the conduit 17 is insufficient to draw the liquid into the tank 4, as for example when the engine is run under wide-open throttle. Inasmuch as a device constructed in accordance with my invention may operate to draw liquid into the tank 4 when the suction in the conduit 17 is very low compared with the suction required to operate liquid-lifting devices, as hitherto provided, it is not necessary to provide as large a reserve storage space as in such prior constructions.

As regards the operation of the device, when the suction action in the conduit 17 becomes decreased to such a degree that it is not effective for raising liquid into the tank 4, it will be noted that unless the necessary suction for lifting the liquid into the tank, 4, is exerted, the liquid in the tank will continue to flow therethrough until the tank empties, as the valve 19, as soon as the suction becomes decreased as stated, automatically opens and supplies the necessary communication between the tank and the atmosphere to permit the liquid to drain therefrom, the amount of the reserve liquid maintained during the normal operation of the device, being determined by the height of the tappet 26 relative to the bottom of the tank.

The feature of having the inlet 14 open through the lower end of the tank, as shown through the bottom of the tank, is of considerable advantage as compared with having this opening at the upper portion of the tank, as by the arrangement first-referred-to, the liquid to be drawn into the tank 4 is not required to be lifted to as great a height as when the inlet is near the top of the tank, and consequently the amount of suction required to draw liquid into the tank 4 is not as great as in those cases where the liquid must be drawn into the top of a tank, and furthermore a quicker charging of the tank 4 may be effected which is a feature forming a factor in the amount of reserve supply required to be maintained.

A further advantage of a construction embodying my invention, and constituting

a vacuum fuel-feeding system, is that the tank 4 may be made relatively small and thus may be filled very quickly.

The valve 19 in the particular illustrated embodiment of my invention, is intended merely to provide for the venting of the tank 4 when the reserve therein is to be drawn on, and when no reserve is to be afforded this valve may be omitted. A valve opened by the rod 23 is preferred as thereby the opening of the valve is rendered positive, and where a reserve is to be maintained an additional valve, such as valve 19, may be employed. However, a valve not operated by the rod 23 may be employed, as for example valve 19, which will operate not only in connection with the reserve when provided for, but also in the normal operation of the apparatus, but which would not be as desirable as a valve like 101 because not positively operated.

The construction shown in Fig. 3 is the same as that of Fig. 1 except in the following particulars: Instead of providing for the inlet of the liquid at the bottom of the tank, it is provided at the upper end thereof, as indicated at 40, and communicates with a pipe 41 which would lead to the source of liquid fuel supply located below the tank 4, the valve 22 in its operations controlling the opening and closing of the inlet 40, the valve 22 for the inlet 40, in this case being shown as provided with a guiding spider-disk 22<sup>a</sup> movable in the inlet 40. The manner of intermittently producing suction in the tank 4, effective for drawing liquid into the tank, instead of being in accordance with Fig. 1, involves the provision of an opening 44 in the top of the tank 4 which opens into a housing 45 mounted on the top of the tank and adapted for connection with a pipe 46 corresponding with the pipe 17 of Fig. 1, the upper end of the housing 45 containing a passage 47 opening at one end into the pipe 46 and at its opposite end into the chamber 48 provided in the housing. The housing 48 contains a sliding piston 49 carrying a valve 50 cooperating with the inlet 44 and adapted when the piston 49 is raised to close said inlet, there being a passage 51 provided through the valve 50 and the piston 49 and opening into the upper end of the housing 48 which latter contains ports 52 in its side wall for causing the housing 48 beneath the piston 49 to be in communication with the atmosphere. A coil compression spring 53 serves to yieldingly force the piston 9 downwardly to a position wherein the valve 50 is open in which position it engages a stop-pin represented at 54.

The operation of the device of Fig. 3 is as follows:

The parts of the device are shown in the positions they occupy while the tank 4 is

being charged with liquid from the pipe 41, 65 wherein the valve 22 is open, the valve 101 closes the opening 100 and, suction being exerted in the pipe 46, holds the piston 49 in the raised position in which the inlet 44 is closed and the suction in the tank pro- 70 duced by the communication of the latter with the pipe 46, through the passage 47, upper portion of the housing 48 and passage 51, causes the liquid to be drawn from the supply tank (not shown but hereinbefore 75 referred to) into the pipe 41 from which it discharges into the tank 4. As soon as the liquid in the tank 4 has reached such a level as to cause the float 27 to shift the rod 23 upwardly, by engaging the tappet 25, as ex- 80 plained of the construction shown in Fig. 1, the valve 22 closes and the valve 101 is automatically lifted by the disk 102 to open condition in which the tank 4 is caused to be in communication with the atmosphere through 85 the port 100. In this case the tank 4 is open to the pipe 46 at all times, and the requisite air-vent for the tank 4, to permit the liquid charged into this tank to flow therefrom periodically, is accomplished through the 90 valve inlet 100 which is of such dimensions that when the valve 101 is in open condition the suction exerted through the pipe 46 is relieved by the incoming atmosphere, to such an extent that the liquid may flow from 95 the tank 4; it being understood that the valve 101 will remain open and the valve 22 closed, until the float 27 has lowered to a position in which it shifts the rod 23 downwardly to the position shown in Fig. 3 by 100 engaging with the tappet 26.

In the event that the suction exerted in the pipe 46 drops to such a degree that it is not effective for drawing liquid into the tank 4, and requires drawing upon the re- 105 serve supply in the tank, determined by the elevation in which the tappet 26 extends, this is automatically effected by the establishment of communication between the tank 4 and the atmosphere through the inlet 110 44, housing 48 and openings 52, which is brought about by the action of the spring 53 forcing the piston 49 into a position in which it engages the pin 54, in which position the valve 50 is open, it being under- 115 stood that the valve 101 would be in the closed position shown following the lowering of the rod 23 by the action of the float 27 striking the tappet 26.

As bearing on the functioning of the de- 120 vice as a meter for measuring the flow of liquids, the device of this Fig. 3 being adapted for the indication or registering of the flow of liquid as explained of the construction shown in Fig. 1, it may be stated that 125 the device of this Fig. 3 may not only meter liquid which is drawn into it from the lower elevation by suction as explained, but it

may be used where the liquid to be metered is maintained at a point above the tank 4 and flows thereto by gravity or force feed, in which case the air controlling the suction valve mechanism involving the inlet 44 and the conduit 46 with the ports directly cooperating therewith, may be omitted and any suitable means provided for registering the tank-filling operations as through the medium of any suitable electrical registering device controlled by a contact operated by the reciprocating of the valve 101.

When the magnet 28 is a permanent magnet it is desirable to provide therefor a keeper to prevent leakage and consequent demagnetization of the magnet, this being accomplished in the construction described by the disks 32 and 33 which in alternation extend so closely to the magnet poles that leakage to a substantial degree is eliminated.

The provision of the tappets as adjustable on rod 23, permits of the desirable adjustments thereof being made, as for example to regulate the amount of liquid entering the tank 4 with each operation of the mechanism in the tank and controlling the inlet of fluid thereto.

The embodiment of my invention in fuel-feeding apparatus permits of the use of a small tank, which fills very quickly and in response to relatively low suction, the provision of a small tank permitting of the location of the liquid outlet thereof at a relatively high level above the carbureter fuel-intake, thereby augmenting the head under which the liquid flows from the tank 4.

While I have illustrated and described certain particular constructions constituting the embodiment of my invention, I do not wish to be understood as intending to limit it thereto as the invention may be otherwise embodied and furthermore various modifications and alterations may be made in the structure shown, all without departing from the spirit of my invention.

What I claim as new, and desire to secure by Letters Patent, is:

1. In a liquid controlling device, the combination of a tank containing an inlet and an outlet and provided with a valve, a float in said tank controlled by the height of the liquid in said tank, a magnet, and a movable member movable by engagement therewith of said float and controlling said valve and releasably held by said magnet in the position to which it is moved in the movement of said float.

2. In a liquid controlling device, the combination of a tank containing an inlet and an outlet and provided with a valve, a float in said tank controlled by the height of the liquid in said tank, a magnet, and a movable member movable by engagement therewith

of said float and controlling said valve, said magnet operating to accelerate the movement of said member following the movement of the latter by said float.

3. In a liquid controlling device, the combination of a tank containing an inlet and an outlet and provided with a valve, a float in said tank controlled by the height of the liquid in said tank, a magnet, and a movable member movable by engagement therewith of said float and controlling said valve, said magnet operating to accelerate the movement of said member following the movement of the latter by said float and releasably hold said member in a position to which it is moved.

4. In a liquid controlling device, the combination of a tank containing an inlet and an outlet and provided with a valve, a float in said tank controlled by the height of the liquid in said tank, a magnet, and a movable member movable by engagement therewith of said float and controlling said valve, said magnet operating to accelerate the movement of said member following the movement of the latter in both directions by said float.

5. In a liquid controlling device, the combination of a tank containing an inlet and an outlet and provided with a valve, a float in said tank controlled by the height of the liquid in said tank, a magnet, and a movable member movable by engagement therewith of said float and controlling said valve, said magnet operating to accelerate the movement of said member following the movement of the latter in both directions by said float and releasably hold said member in the position to which it is moved.

6. In a liquid controlling device, the combination of a tank containing an inlet and an outlet and provided with a valve, a float in said tank controlled by the height of the liquid in said tank, a magnet having poles of opposite polarity extending adjacent each other, and a movable member movable by said float and controlling said valve, said member being provided of magnetic material so disposed relative to said poles as to be attracted thereby and produce accelerated movement of said member in opposite directions, respectively, following the initial actuation thereof by said float.

7. In a liquid controlling device, the combination of a tank containing an inlet and an outlet and provided with a valve, a float in said tank controlled by the height of the liquid in said tank, a magnet having poles of opposite polarity extending adjacent each other, and a movable member movable by said float and controlling said valve, said member being provided of magnetic material so disposed relative to said poles as to be attracted thereby and releasably hold

said member against movement when in either of the positions to which it moves under the control of said float.

8. In a liquid controlling device, the combination of a tank containing an inlet and an outlet and provided with a valve at said inlet, a float in said tank controlled by the height of the liquid in said tank, a magnet and a movable member movable by engagement therewith of said float and controlling said valve, and releasably held by said magnet in the position to which it is moved in the movement of said float.

9. In a liquid controlling device, the combination of a tank containing an inlet and an outlet and provided with a valve at said inlet, a float in said tank controlled by the height of the liquid in said tank, a magnet, and a movable member movable by engagement therewith of said float and controlling said valve, said magnet operating to accelerate the movement of said member following the movement of the latter by said float.

10. In a liquid-controlling device, the combination of a tank containing an inlet and an outlet, said outlet being provided with an outwardly-opening valve, a valve controlling said inlet, a float in said tank controlled by the height of the liquid in said tank, a magnet, and a movable member movable by engagement therewith of said float and controlling said second-referred-to valve and releasably held by said magnet in the position to which it is moved in the movement of said float.

11. In a liquid controlling device, the combination of a tank containing an inlet and an outlet, said outlet being provided with an outwardly-opening gravity-controlled valve, a valve controlling said inlet, a float in said tank controlled by the height of the liquid in said tank, a magnet, and a movable member movable by engagement therewith of said float and controlling said second-referred-to valve and releasably held by said magnet in the position to which it is moved in the movement of said float.

12. In a liquid-controlling device, the combination of a tank containing an inlet and an outlet and provided with a valve, a float in said tank controlled by the height of the liquid in the tank, a permanent magnet, and a movable member movable by engagement therewith of said float and controlling said valve and releasably held by said magnet in a position to which it is moved in the movement of said float.

13. In a liquid-controlling device, the combination of a tank containing an inlet and an outlet and provided with a valve, a float in said tank controlled by the height of the liquid in said tank, a permanent magnet, and a movable member movable by engagement therewith of said float and controlling said valve, said magnet operating to acceler-

ate the movement of said member following the movement of the latter by said float.

14. In a liquid-controlling device, the combination of a tank containing an inlet and an outlet and provided with a valve, a float in said tank controlled by the height of the liquid in said tank, a permanent magnet having poles of opposite polarity extending adjacent each other, and a movable member movable by said float and controlling said valve, said member being provided of magnetic material so disposed relative to said poles as to be attracted thereby and produce accelerated movement of said member in opposite directions respectively following the initial actuation thereof by said float.

15. In a liquid-controlling device, the combination of a tank containing an inlet and outlet and provided with a valve, a float in said tank, controlled by the height of the liquid in said tank, a magnet, and a longitudinally movable rod provided with tappets adapted to be engaged, respectively, by the movement of the float in opposite directions, said rod controlling said valve and cooperating with said magnet, for the purpose set forth.

16. In a liquid-controlling device, the combination of a tank containing an inlet and an outlet, an outwardly-opening valve controlling said outlet, a valve controlling said inlet, a float in said tank controlled by the height of the liquid in said tank, a magnet, and a longitudinally movable rod provided with tappets adapted to be engaged, respectively, by the movement of the float in opposite directions, said rod controlling said valve and cooperating with said magnet, for the purpose set forth.

17. In a liquid-controlling device, the combination of a tank containing an inlet and an outlet and provided with a valve, a float in said tank controlled by the height of the liquid in said tank, a movable member movable by engagement therewith of said float and controlling said valve, and a holding magnet for said member.

18. In a liquid-controlling device, the combination of a tank containing an inlet and an outlet for liquid, an inlet for air, and an opening for connection with a source of suction, a valve controlling said suction opening, a float in said tank controlled by the height of the liquid in said tank, a magnet, and a movable member movable by engagement therewith of said float and controlling said valve and attractable by said magnet for the purpose set forth.

19. In a liquid-controlling device, the combination of a tank containing an inlet and an outlet for the liquid, an inlet for air, and an opening for communication with a source of vacuum, an outwardly-opening valve for said outlet, an inwardly-opening valve for the said inlet for the liquid, an outwardly-

opening valve for said air inlet, and a valve for said suction-opening, a float in said tank controlled by the height of the liquid in said tank, a magnet, and a movable member movable by engagement therewith of said float and controlling said valve and attractable by said magnet, for the purpose set forth.

20. In a liquid controlling device, the combination of a tank, a float in said tank controlled by the height of the liquid in said tank, a magnet, and a movable member engageable by said float and moved by the latter and said magnet.

21. In a liquid controlling device, the combination of a tank containing openings provided with valves, a float in said tank controlled by the height of the liquid in said

tank, a magnet, and a movable member engageable by said float and moved by the latter and said magnet, for controlling the operation of certain of said valves.

22. In a liquid controlling device, the combination of a tank containing an inlet and an outlet for liquid, an air-vent, and an opening for connection with a source of suction, valves controlling said suction opening and said air-vent, a float in said tank controlled by the height of the liquid in said tank, a magnet, and a movable member for controlling the operation of said valves, engageable by said float and moved by the latter and said magnet.

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