

Oct. 20, 1936.

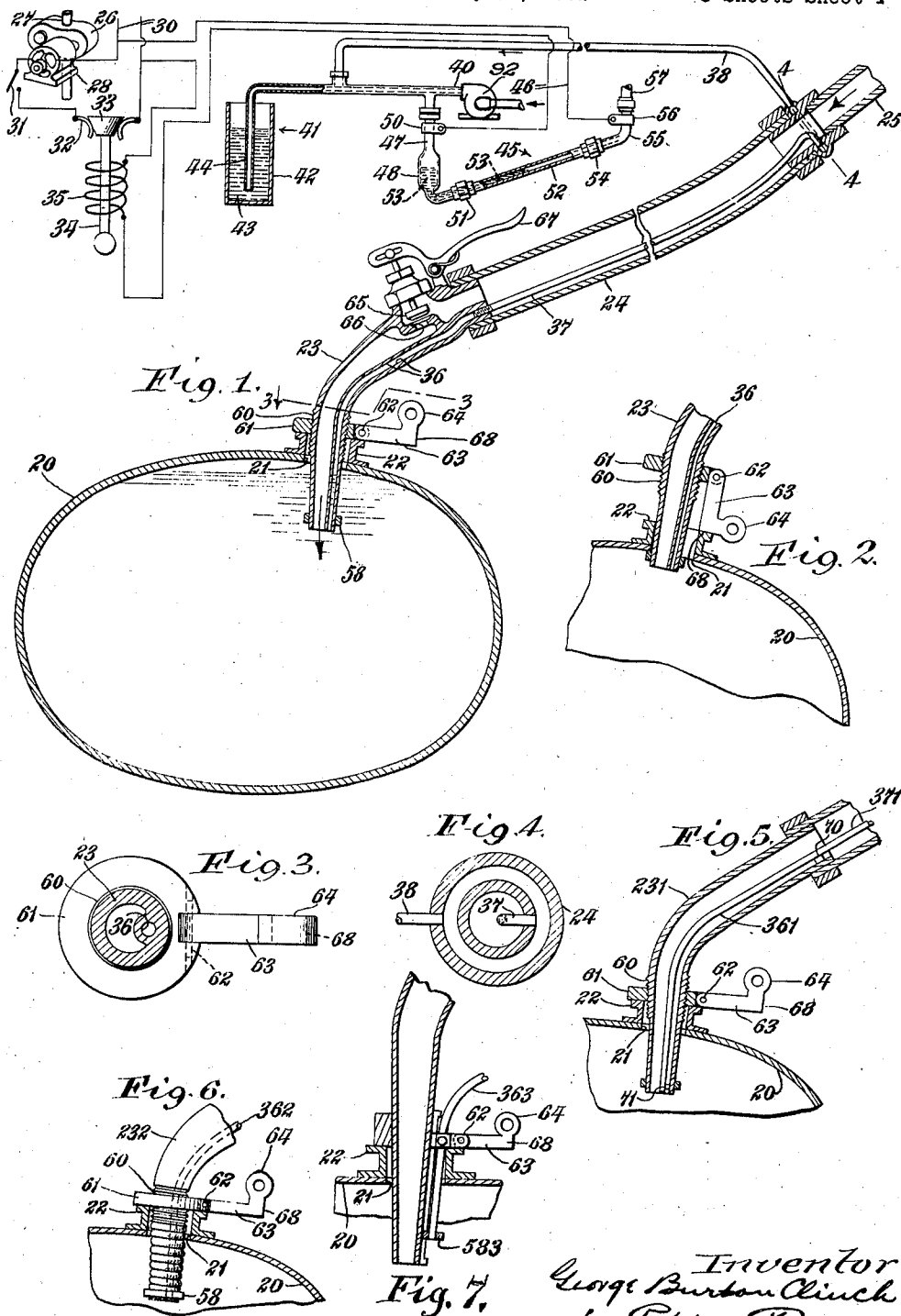
G. B. CLINCH

2,058,061

FLUID CONTROLLING APPARATUS

Filed May 29, 1931

3 Sheets-Sheet 1



Inventor
George Burton Clinch
by Popp & Powers
Attorneys.

Oct. 20, 1936.

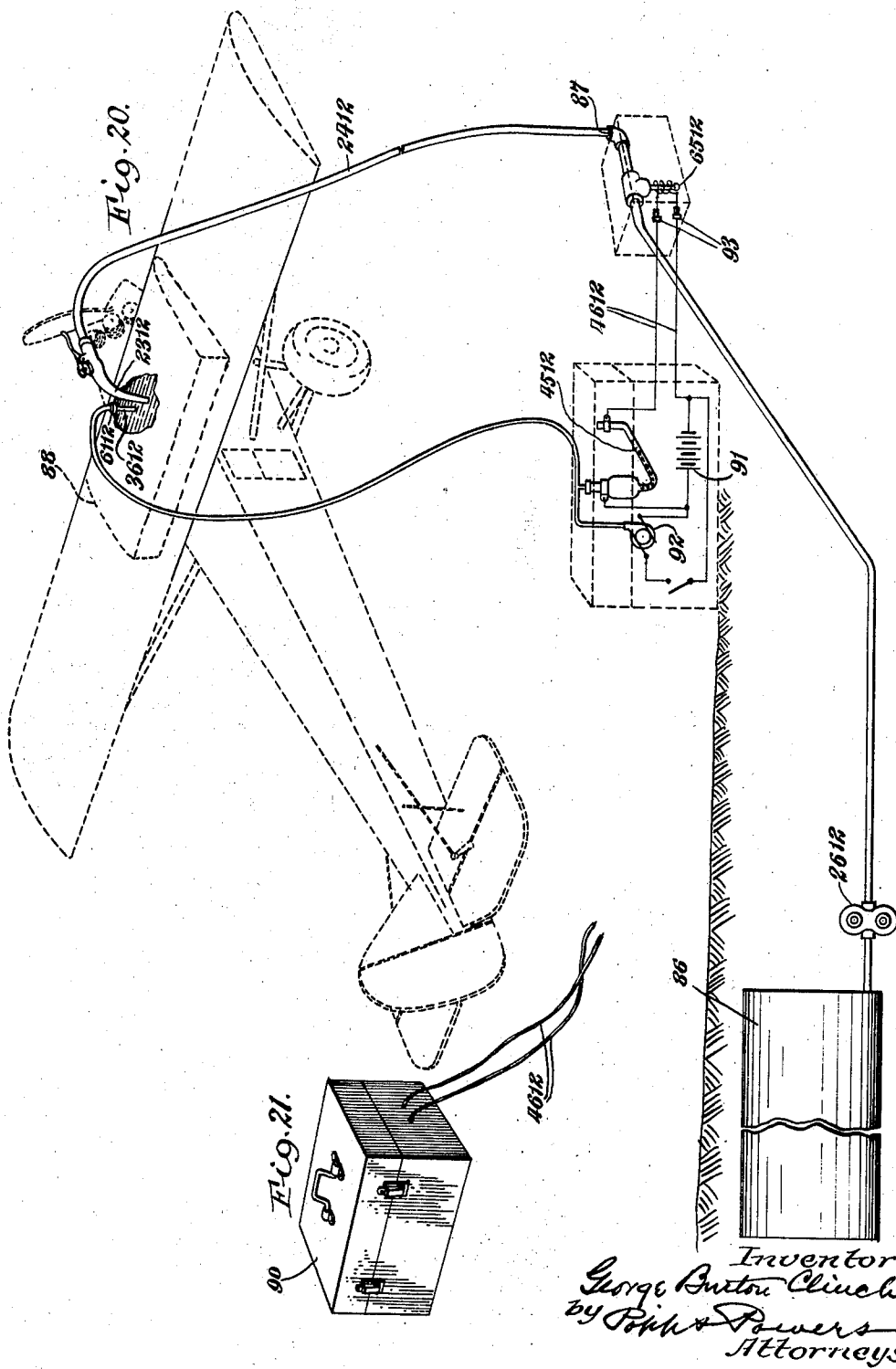
G. B. CLINCH

2,058,061

FLUID CONTROLLING APPARATUS

Filed May 29, 1931

3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,058,061

FLUID CONTROLLING APPARATUS

George Burton Clinch, Tampa, Fla., assignor of
one-half to Theodore L. Popp, Buffalo, N. Y.

Application May 29, 1931, Serial No. 540,912

9 Claims. (Cl. 226—127)

This invention relates to a dispensing device or receptacle filling apparatus and relates more particularly to an apparatus for filling the gasoline tanks of automobiles or other vehicles.

The object in general of the invention is to permit of completely filling a receptacle with whatever fluid is to be supplied and to then cut off the flow of said fluid automatically, thereby eliminating any need of gauging the capacity of the vacant volume of said receptacle and, at the same time, to prevent any liability of having said fuel continue to flow after the receptacle has been completely filled. Numerous other objects of the invention and practical solutions thereof are disclosed in detail in the herein patent specification, wherein,

In the accompanying drawings:

Figure 1 is a vertical, transverse section through an automobile fuel tank showing the same being filled by a form of filling apparatus constructed in accordance with the present invention, some of the elements thereof being shown in diagrammatic fashion.

Figure 2 is a fragmentary, vertical, transverse section through the gasoline tank and filling tube nozzle of Fig. 1 showing said parts in a different position from that illustrated in Fig. 1.

Figures 3 and 4 are transverse sections on an enlarged scale through the nozzle and filling tube and are taken on lines 3—3 and 4—4 of Fig. 1.

Figures 5, 6 and 7 are fragmentary, vertical sections similar to Fig. 2 but showing variously modified nozzles as used when filling a receptacle.

Figure 8 is a schematic diagram showing a modified form of the invention in which the cut-off switch is directly actuated by air pressure.

Figure 9 is a schematic diagram of another modified form of the invention showing the flow of fuel directly controlled by air pressure.

Figure 10 is a schematic diagram similar to Fig. 1 but showing a form of the invention adapted to be used with air pressures which are less than atmospheric pressure.

Figure 11 is a fragmentary, schematic diagram showing the invention used with a signal device.

Figures 12 and 13 are longitudinal sections through the vacuum type of hose nozzle and taken on correspondingly numbered lines of Fig. 10.

Figures 14 and 15 are similar respectively to Figs. 12 and 13 but show the vacuum type of shut-off valve in its closed position.

Figures 16, 17 and 18 are fragmentary, diagrammatic, sectional views showing variously modified forms of the invention in which the flow of fluid supplied to the receptacle is directly con-

trolled by air pressure in a manner analogous to that shown in Fig. 9.

Figure 19 is a fragmentary, perspective view of a modified form of filling tube.

Figures 20 and 21 are perspective views of a portable modification of the invention.

In the following description similar characters of reference indicate like parts in the several figures of the drawings.

My invention may be embodied in various forms and in receptacle filling apparatuses of different constructions, and the present applications are therefore to be regarded merely as some of the possible organizations which come within the scope of my invention and satisfactorily carry out the function of same in practice. As here shown (referring for the present to only Figs. 1—4) the same is constructed as follows:

The numeral 20 conventionally represents a fuel tank or other fluid receptacle such as that of an automobile, tractor, aeroplane or other vehicle, said fuel tank being provided at its upper part with an opening 21 from which concentrically arises a tubular filling head 22 that is secured by brazing or otherwise to the upper face of said tank.

Said tank is adapted to be supplied with fluid from a nozzle 23 which is tubularly connected through the intermediary of a flexible filling tube 24 with a fluid supply pipe 25. The latter is supplied with fluid under pressure from any suitable source, the pressure being obtained, for instance, from the fluid pump 26, the discharge pipe 27 of which is tubularly connected with aforesaid supply pipe 25. This fluid pump 26 is driven by any suitable prime mover such as the electric motor 28. By this arrangement the control of the electric current passing to said motor 28 concomitantly controls the flow of fluid from the nozzle 23 into the receptacle 20. The electric current for the driving of said motor 28 is supplied from a feed line 30, the flow of electric current being controlled by a manual, main switch 31 and also by an automatic cut-off switch 32. The latter is provided with a contact head 33 arranged at the upper end of a solenoid plunger 34 which is actuated by and is situated concentrically within the bore of a helical electric coil or solenoid 35. This solenoid is also adapted to be connected with and to derive its electric current from the main electric feed line 30, and its actuation (by reason of its electrical connection with the motor 28) controls the flow of fluid from the nozzle 23 into the receptacle 20.

Said nozzle 23 is suitably cored longitudinally

or is otherwise provided with an air duct 36 which is tubularly connected to a flexible metallic or other air conveying tube 37, the lower end of which is threaded into or otherwise connected with the nozzle 23 and the upper end of which is tubularly connected, in any suitable manner, with an air pressure conveying pipe 38. The latter is tubularly connected with an air supply pipe 40 which receives a flow of air under pressure from any suitable source such as from an air pump 92. This air supply pipe 40 is preferably connected to a relief valve or overload valve 41 to prevent excessive air pressures from being built up in said air supply pipe 40 and in the parts which are tubularly connected therewith. The particular type of overload valve 41 illustrated comprises an open vessel 42 containing any suitable liquid 43 (preferably nonvolatile) into which projects an exhaust tube 44, the latter being tubularly connected with the air supply pipe 40. This construction is such that when the air pressure in said air pipe 40 becomes greater than that which can be sustained by the static head caused by the height of the liquid 43 in said open vessel 42, then a sufficient amount of air is caused to bubble out of said exhaust tube 44 through said liquid 43 and thereby prevents the air pressure from rising beyond a definite maximum. This maximum may be adjusted by merely adding to or subtracting from the liquid 43 a sufficient amount thereof to obtain the desired liquid pressure head in the vessel 42.

Tubularly connected with the air supply pipe 40 is a control electric switch 45 which operates to close the electric circuit through the electric line 46 when the pressure in the air supply pipe 40 rises above a certain definite amount. Said control switch 45 is of the mercury U-tube type, the pressure leg 47 of which is tubularly connected with the air supply pipe 40 and is preferably provided with a small mercury reservoir 48 and is constructed of an electrically conductive material which is electrically connected to one side of the electric line 46 by means of a clip 50. Tubularly connected by a packing gland 51 to said pressure leg 47 is an inclined riser tube 52 which is constructed of glass, porcelain or other similar non-electric conducting material. This riser tube 52 is disposed at an incline for the reason that the displacement of the mercury 53 longitudinally of said riser tube is greater for a given pressure differential than would be the case if this riser tube 52 were disposed vertically. Tubularly connected by a packing gland 54 to the upper end of said riser tube 52 is an atmospheric leg 55 which is electrically connected to the other side of the electric line 46 by means of a clip 56. Said atmospheric leg 55 communicates with the atmosphere through an atmospheric pipe 57, so that the pressure exerted on the leg 55 of the control electric switch 45 is also atmospheric pressure.

The electric line 46 is connected across and thereby derives electric power from the electric feed line 30, and is connected electrically in series with aforesaid solenoid 35 which is adapted, when energized, to actuate the cut off switch 32.

Secured to the lowermost end of the nozzle 23 is a limiting ring 58. The central part of said nozzle 23 is provided with an external screw thread 60 upon which is threaded a stop collar 61 on one side of which is pivoted, at 62, a distancing arm 63 preferably provided with a suitable handle 64 to facilitate its manual manipula-

tion. Arranged in the nozzle 23 is also a positive fluid control valve 65 provided with a valve seat 66 and pivoted handle 67 whereby the said valve is adapted to be manually actuated so as to be moved to and remain in either its wide open or its completely closed position.

Operation

The nozzle 23 is first pushed through the bore of the tubular filling head 22 and through the opening 21 into the interior of the tank 20. Said nozzle 23 is then pressed laterally in any desired direction (for instance to the left in Fig. 2) and then moved longitudinally outwardly until its limiting ring 58 bears against the inner face of the tank 20 adjacent its opening 21. The distancing arm 63 is then swung down about its pivot 62 by means of its handle 64. The stop collar 61 (to which said distancing arm 63 is pivoted) is then screwed either up or down, as conditions may warrant, until its gauging face 68 is in light contact with the top of the filling head 22 while the limiting ring 58 is in abutting contact with the inner face of the tank 20. The distancing arm 63 is then thrown upwardly and the nozzle 23 pushed down into the tank 20 until the stop collar 61 bears against the outer face of the filling head 22.

The whole effect of the foregoing operations is to locate the tip of the air duct 36 a fixed distance below the top of the tank 20. It is obvious that when the herein invention is used with standardized tanks 20, these foregoing operations may be eliminated as well as the distancing arm 63 and limiting ring 58, the stop collar 61 in such case being permanently secured to the nozzle 23. In either case, however, said nozzle 23 may now be assumed to be in proper position relatively to the top of the tank 20.

The positive fluid control valve 65 is now opened to allow fluid to flow from the discharge pipe 27 of the pump 26, through the fluid supply pipe 25, flexible filling tube 24 and nozzle 23 into the tank 20. At this time (or at any convenient previous time) the manual, main, electric switch 31 is closed to start the operation of said fluid pump 26 and in addition to this the necessary valves are opened to admit air into the air supply pipe 40. These latter two operations are preferably effected automatically in a manner which does not constitute a necessary part of the herein invention and has therefore not been here illustrated.

Under this condition of affairs, fluid is being discharged into said tank 20 from the nozzle 23 and also a steady stream of air is being discharged from the air duct 36, this stream of air at this time having no effect upon the apparatus.

The fluid in tank 20 now continues to rise until the level of said liquid rises above the outlet of the air supply pipe 36 (see Fig. 1). As the level of said fluid in the tank 20 continues to rise the back pressure in the air supply pipe 40 is gradually increased, causing the mercury 53 to gradually ascend in the riser tube 52 until finally when the fluid has completely filled the tank 20, this air back pressure has become so great as to have raised the mercury 53 up to the lower part of the atmospheric U-tube leg 55, whereupon the current through the electric line 46 is closed. This flow of current energizes the solenoid 35 which causes the solenoid plunger 34 to be elevated and the cut-off switch 32 to be opened, thereby shutting off the motor 28 and fluid pump 26 and thereby also the flow of fluid into tank 20.

By this arrangement, said tank 20 is either completely or sufficiently filled and the filling operation then terminated automatically so that there is no danger of over-filling which otherwise would result in slopping over and consequently an unnecessary fire hazard, messiness, injury to the enamel finish, etc.

When the flow of fluid is thus automatically stopped by shutting off the motor 28 this fact is made apparent to the operator, who is under no necessity of giving the apparatus immediate attention but is thus notified when the filling operation has been completed. Thereafter, when convenient, the operator opens the manual, main electric switch 31 and preferably (though not necessarily) closes the positive fluid control valve 65. He then removes the nozzle 23 from the tank 20 and shuts off the flow of air to the air supply pipe 40 in any suitable manner, this operation being preferably accomplished automatically (together with the opening of the main electric switch 31) in a manner hereinbefore indicated. This cycle of operations may then be repeated indefinitely.

In Fig. 5 is shown a modified form of nozzle 231 in which the same, instead of being cored to form an air duct 36, is provided with an air duct pipe 361 which is merely a continuation of the flexible air conveying tube 371 and is secured by soldering or otherwise at 70 and 71 to the upper and lower bore faces of said nozzle 231.

In Fig. 6 is shown another modified nozzle 232 which is similar to the one shown in Fig. 5 but is so constructed as to be flexible in a manner analogous to ordinary spiral wound tubing.

In Fig. 7 is shown still another modified nozzle 233 in which the amount of submergence of the air duct 363 is independent of the amount of submergence of the nozzle 232 itself.

Figure 8 illustrates a modified method of automatically controlling the motor 28. In this case the increase of air pressure in the air supply pipe 40, instead of actuating a control electric switch which in turn actuates the cut-off switch 32, actuates said cut-off switch 32 directly through a diaphragm 72 which is responsive to the air pressure in said air supply pipe 40 and is directly connected with the plunger 344 whose contact head 33 is adapted to close the circuit through the motor 28 similarly to the arrangement shown in Fig. 1.

In Fig. 9 this direct control is carried still further. In this case also a diaphragm 725 is employed which, as in Fig. 8, is responsive to air pressure in the air supply pipe 40 but, instead of indirectly controlling the electrical energy supplied to the motor 28 is so arranged as to directly control the flow of fluid from the pump 26, a suitable valve 73 being directly connected with said diaphragm 725 for this purpose. This valve 73 controls the flow of fluid flowing from the pump 26 to the fluid supply pipe 25, filling tube 24 and nozzle 23 and hence directly controls the flow of fluid to the tank or receptacle 20.

In Fig. 10 is shown still another modified form of the invention in which a vacuum instead of a pressure is used to control the flow of fluid to the tank 20. In this case a suitable steady source of sub-atmospheric (vacuum) pressure is tubularly connected with the air suction pipe 406 which pipe is in turn tubularly connected with the low pressure leg of a control electric switch 456. The construction of this form of the invention is analogous to that shown in Fig. 1 except that in this

case, with a vacuum in the air pipe 366 a small quantity of fluid is drawn a short distance up from the lower end of said air pipe 366. To allow this small quantity of fluid to run back into the tank when the main supply of fuel is shut off, a special or compound positive control valve 656 is arranged in the nozzle 236. This valve is a rotary plug valve and is adapted to not only control the flow of fluid through said nozzle 236 but to also and simultaneously control the flow of air through said air pipe 366. In the position of this compound valve 656 shown in Figs. 12 and 13 both the fluid line and the air line are open. When, however, the fluid line is closed (as in Fig. 14) it is desirable that not only the air line be closed against further vacuum pressure but that any fluid which may have been drawn up the air line 366 be vented. To accomplish this end this compound valve 656 is provided with an atmospheric vent 74 which, as shown in Fig. 14, is tubularly connected with the lower end of said air tube 336 when said compound valve 656 is closed, thus allowing any fluid which may have been sucked up said air pipe 366 to be drained out therefrom when said compound valve 656 is closed.

In Fig. 11 is shown a modified form of the invention, as applied to vacuum pressures, in which the flow of fluid is not cut off when the tank 20 becomes completely filled but instead a signal is given the operator of the apparatus. For instance, a bell or other audible signal device 76 is connected in series with a battery or other source of electric power 307 and with the control electric switch 457. Thus when said switch is closed due to an excessive amount of vacuum in the vacuum supply pipe 407 the electric current from the battery 307 is connected through said bell 76 and causes the latter to ring.

In Fig. 16 is shown another modified form of the invention which is analogous to that shown in Fig. 9 in that the change in air pressure in air pressure pipe 408 directly controls the flow of fluid through the fluid supply pipe 258. In this case, however, the difference in pressure is exerted against and thereby actuates a piston 77 which is directly attached to a fluid control valve 738.

In Fig. 17 is shown an arrangement similar to that of Fig. 16 in that the flow of fluid is directly controlled by the air pressure in air supply pipe 409. In this case not only is a piston used to receive the pressure from said air supply pipe 409 but in addition to this a ball check valve 78 is employed to prevent any possibility of fluid from the fluid line backing up into said air supply pipe line 409.

Fig. 18 is also analogous to the constructions of Figs. 16 and 17 in that the air pressure in air supply pipe 4010 directly controls the flow of fluid. In this case the air actuating piston is connected to the fluid control valve through a rocking lever 80 pivoted at 81 and operating to transmit the power from said air actuating piston to said fluid valve.

Fig. 19 illustrates a form of flexible fluid supply pipe 2411 in which the same is made integral by means of coring, cementing or otherwise, with the air supply pipe 3711, such an arrangement being somewhat more difficult to manufacture but being more uniformly flexible and much less likely to be disarranged by reason of any otherwise difference in flexibility between said air conducting tube and said fluid conducting tube, the

same being made integral and therefore forced to flex with each other.

In Fig. 20 is shown still another modification of the invention. In this case the liquid fuel pump 2612 is stationary, and receives its supply of fluid from a stationary (underground) fluid reservoir 86 and delivers the same to a main flexible fluid-supply pipe 2412 which is permanently connected at 87 to the stationary pumping apparatus. The flow of fluid into said fluid supply pipe 2412 is controlled by a solenoid valve 6512. It is obvious that the level to which the fluid will be filled in the vehicle supply tank 88 will be determined by the control of said solenoid valve 6512. The control of this valve is of a portable character in this particular modification of the invention—such an arrangement being commercially advantageous in certain installations which need not here be discussed in detail. Suffice to say that the entire liquid level control apparatus may be conveniently housed in a portable case 90. The latter is equipped with a suitable battery 91 (or is provided with an electric plug socket to enable the same to be plugged into an ordinary electric power line), said battery being adapted to drive an air fan 92 and to also actuate the aforesaid solenoid fluid valve 6512 through the usual type of (mercury) control electric switch 4512, the electric wires 4612 leading from said electric switch (and portable case 90) being detachably connected to the binding posts 93 of said solenoid valve. In this modification of the invention, just as in the modification of Fig. 7, the final level of fluid in the supply tank 88 is not affected by the amount of submergence of the nozzle 2312 but only by the amount of submergence of the air tube or level controlling "pilot" tube 3612.

This amount of submergence of said air tube is adjustably regulated by an adjustment collar 6112 which is vertically adjustable relatively to its air or "pilot" tube 3612. It has been also assumed in this modification of the invention that the various fluid supply tanks supplied with fluid by this form of the invention are sufficiently standard as to their filling heads that no distancing arm (63 or the like) is necessary to enable the air tube to be variably adjusted for different tanks.

It will be seen from all of the foregoing that the herein invention fulfills a very desirable need at automobile filling stations or at any other places where receptacles are to be filled to a certain definite level irrespective of the quantity of fluid in each of said receptacles prior to the filling operation. At the present time the filling of automobile fuel tanks, for instance, requires not only the constant attention of the attendant during the filling operation but, even with such attention, the tank being filled is very frequently overfilled due to the discrepancy which usually exists between the volume measuring meter or indicator upon the automobile dash-board and the actual vacant capacity of the automobile fuel tank, such a discrepancy naturally resulting in a condition of affairs which inevitably results in overfilling irrespective of whether this discrepancy is over or under the actual volume. This is due to the fact that the average filling station attendant is very eager to sell as much gasoline or other fuel as possible and invariably, in actual practice, continues to fill each tank until he is sure that said tank is filled practically full and if a visual examination of any tank seems to indicate a considerable discrepancy in the gauge, he will in his own interest continue to fill such a tank.

When any receptacle is overfilled there results either a dangerous fire hazard, if the fluid being filled is volatile, or in any case a waste of fluid and a messiness and usually also a destruction of the finished parts adjacent the tank. It should be noted in this regard that the herein invention is not at all confined to automobiles, but includes the filling of any fluid into any receptacle. For instance, in the filling of the fuel tanks of aeroplanes not only is the fire hazard of extremely vital importance due to the flammability of the usual aeroplane construction, but in addition to this the fuel tank is customarily located in an extremely awkward position, either in the wings or up in the nose of the fuselage where visual inspection is awkward. In such case, as in the cases previously noted, no great dependence is ever, in actual practice, placed upon the dashboard gauges so that the accurate filling completely full of aeroplane fuel tanks has in the past always meant more or less slopping over of the fuel. It is obvious that such a condition is obviated by the use of the herein invention, its use in regard to aeroplanes being more than usually important due to the fact that the amount of weight which can be carried for any given ceiling is very definite and any quantity of fuel less than a certain definite known quantity in the fuel tank before starting the flight is very likely to lead to disaster. It is to be remembered in this regard that it is only the total quantity of fluid in the tank which is of any concern to the pilot, this being the factor which determines the possible duration of his flight.

The invention may be used for filling definite quantities of fluid into containers such as milk bottles, cans of maple syrup, etc., but the invention is more particularly adapted to fill containers up to a definite level rather than with a definite quantity. Such a condition occurs in filling tank cars, oil tanks on locomotive tenders, fuel tanks in boats, etc.

The invention is, of course, particularly adapted to the kind of labor which is the lowest in cost, and hence which is the least intelligent, the point at which the filling of any receptacle is to be stopped being automatically controlled and not dependent in any degree upon the judgment of the operator. Being automatic, such an automatic functioning of the invention permits of other tasks being carried out during the filling operation.

I claim as my invention:

1. A receptacle filling apparatus comprising a filling tube adapted to supply fluid to a receptacle having a filling head; a nozzle tubularly connected therewith; an air duct connected with said nozzle; an air pump adapted to force air into said air duct; a stop collar adjustably arranged on said nozzle and adapted to rest upon the filling head of said receptacle; a distancing arm connected with said stop collar and also adapted to rest upon said filling head and adapted to position said collar a fixed distance from said filling head; and means for controlling the flow of fluid through said filling head, said flow being responsive to the air pressure in said air duct and said pressure being, in turn, responsive to the depth of immergence of said nozzle in the fluid in said receptacle.

2. A receptacle filling apparatus comprising a filling tube adapted to supply fluid to a receptacle having a filling head; a nozzle tubularly connected therewith; an air duct connected with said nozzle; an air pump adapted to force air

into said air duct; a stop collar threaded upon said nozzle; a distancing arm pivoted on said collar; and means for controlling the flow of fluid through said filling tube, said flow being responsive to the air pressure in said air duct and said pressure being, in turn, responsive to the depth of immergence of said nozzle in the fluid in said receptacle.

3. A receptacle filling apparatus comprising a filling tube adapted to supply fluid to a receptacle having a filling head; a nozzle tubularly connected therewith; an air duct connected with said nozzle; an air pump adapted to force air into said air duct; a stop collar threaded upon said nozzle; a distancing arm pivoted on said collar; a limiting ring secured to said nozzle; and means for controlling the flow of fluid through said filling tube, said flow being responsive to the air pressure in said air duct and said pressure being, in turn, responsive to the depth of immergence of said nozzle in the fluid in said receptacle.

4. A receptacle filling apparatus comprising a filling tube adapted to supply fluid to a receptacle and having a nozzle; an air duct secured to said nozzle; means for maintaining an above atmospheric air pressure in said air duct; and diaphragm means responsive to changes in air pressure in said air duct; and a switch connected with said diaphragm means and adapted to control the flow of fluid through said filling tube.

5. A receptacle filling apparatus comprising a filling tube adapted to supply fluid to a receptacle and having a nozzle; an air duct secured thereto; a control electric switch responsive to changes in pressure in said air duct and adapted to control the flow of fluid through said filling tube; and an overload valve tubularly connected with said air duct and adapted to release air therefrom when the air pressure reaches a definite limit.

6. A receptacle filling apparatus comprising a

filling tube adapted to supply fluid to a receptacle and having a nozzle; an air duct secured thereto; a control electric switch responsive to changes in pressure in said air duct and adapted to control the flow of fluid through said filling tube; and an adjustable overload valve tubularly connected with said air duct and adapted to release air therefrom when the air pressure reaches a definite limit.

7. In filling apparatus for containers, a fluid outlet, a valve for controlling discharge from said outlet, a tube adjacent said outlet and adapted to project into the filling opening in said container, means for supplying air under pressure to said tube and means operated by the pressure of the air for closing said valve when the end of said tube is sealed by the fluid in the container.

8. In filling apparatus for containers, a material delivery valve, means for automatically closing said valve when the delivered material has reached a predetermined level, and means, including a compressed air supply, for positively excluding delivered material from a part of the said automatic valve closing means, said compressed air supply being in communication with said automatic valve closing means and also with an air vent adapted to be sealed by delivered material when the latter has reached the said predetermined level.

9. In filling apparatus for containers, a material delivery valve, pressure-responsive means for automatically closing said valve when the delivered material has reached a predetermined level, and means, including a compressed air supply for flowing air through the apparatus, for operating the pressure-responsive means and for positively excluding delivered material from a part of said pressure-responsive automatic valve closing means.

GEORGE BURTON CLINCH.