April 10, 1934. R. W. BOND 1,954,662

VALVE CONTROLLED NOZZLE

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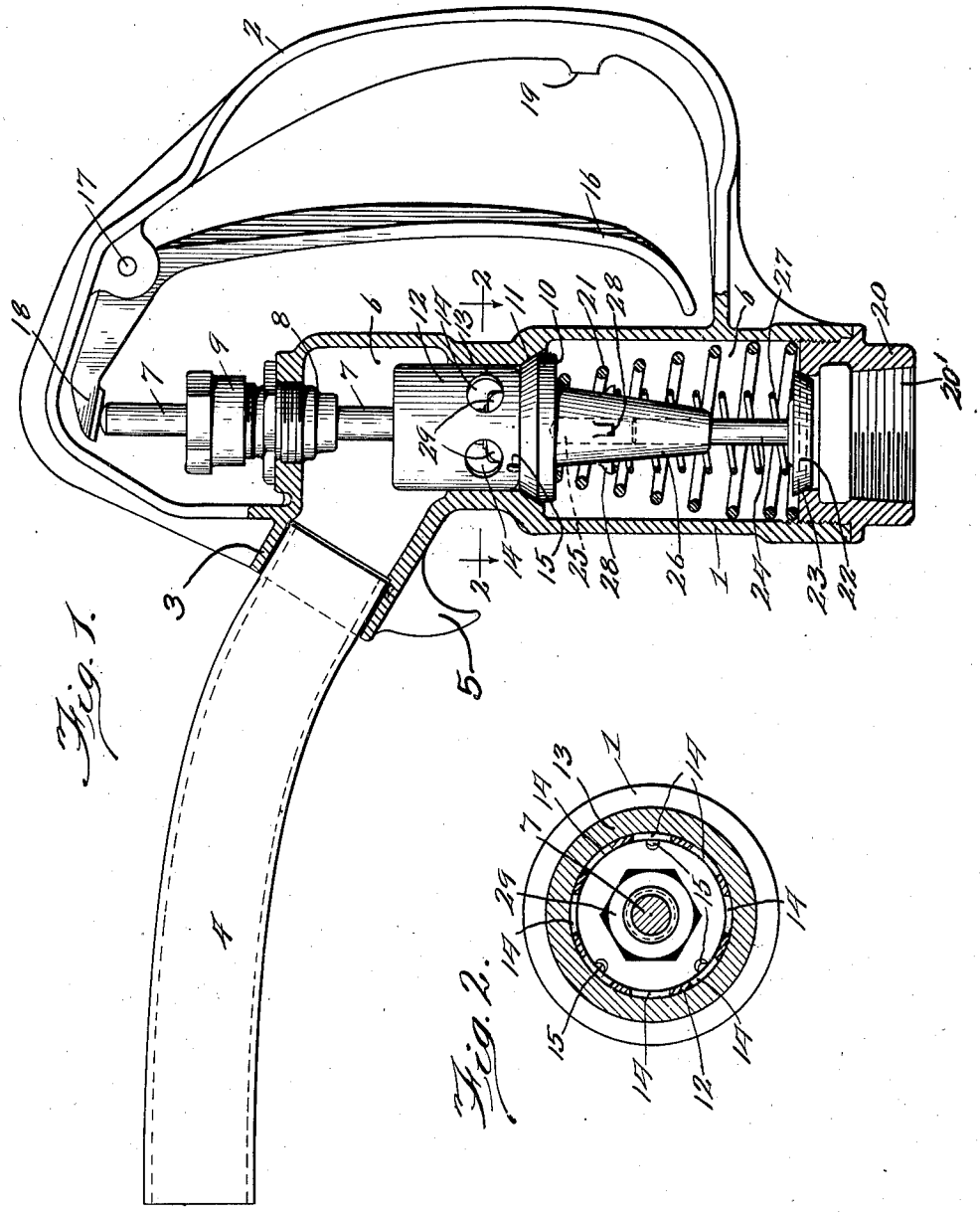


Fig. 1.

Fig. 2.

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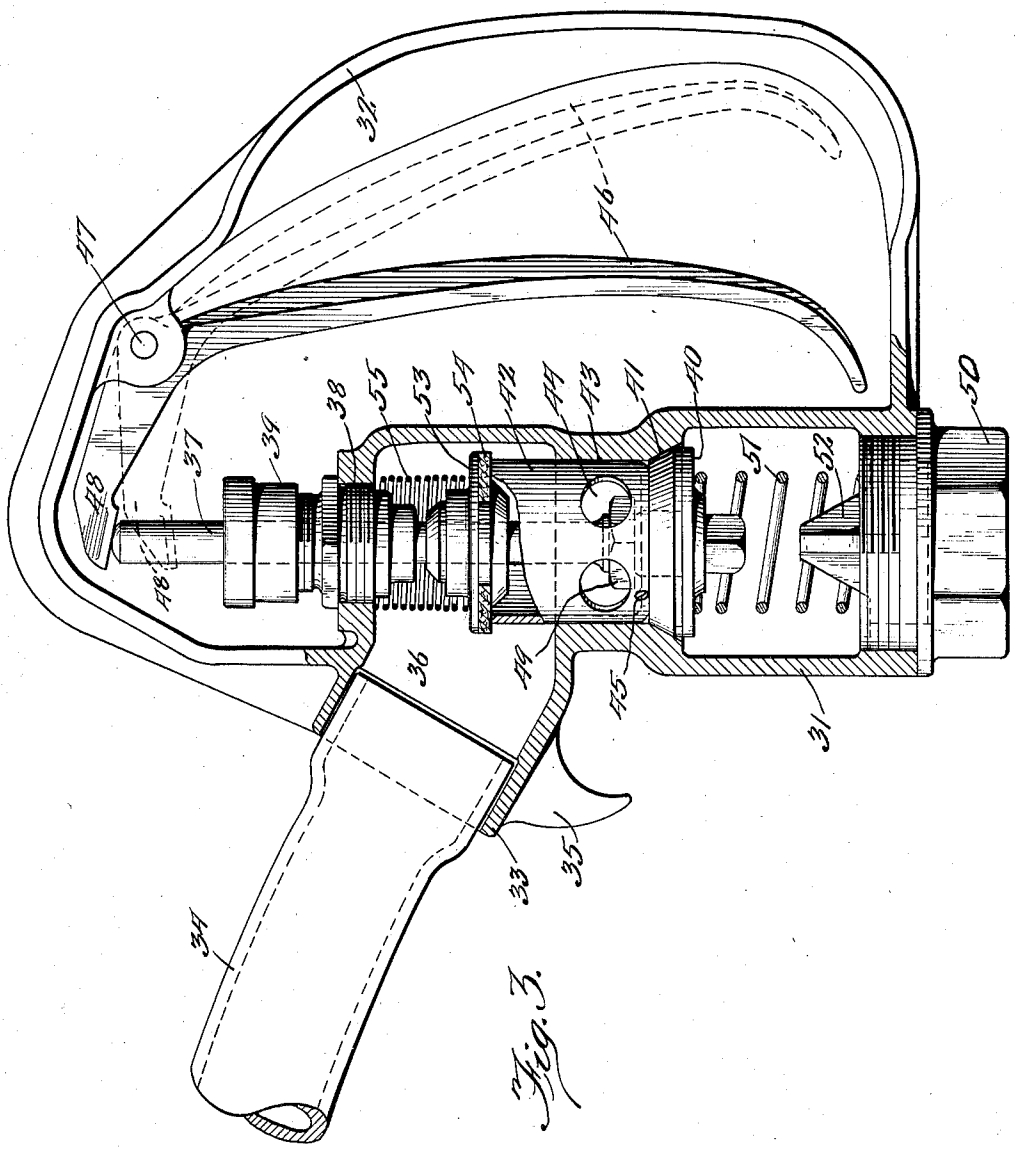
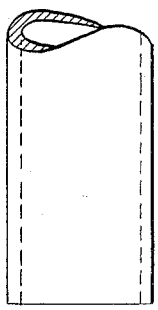


Fig. 3.



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Fig. 4.

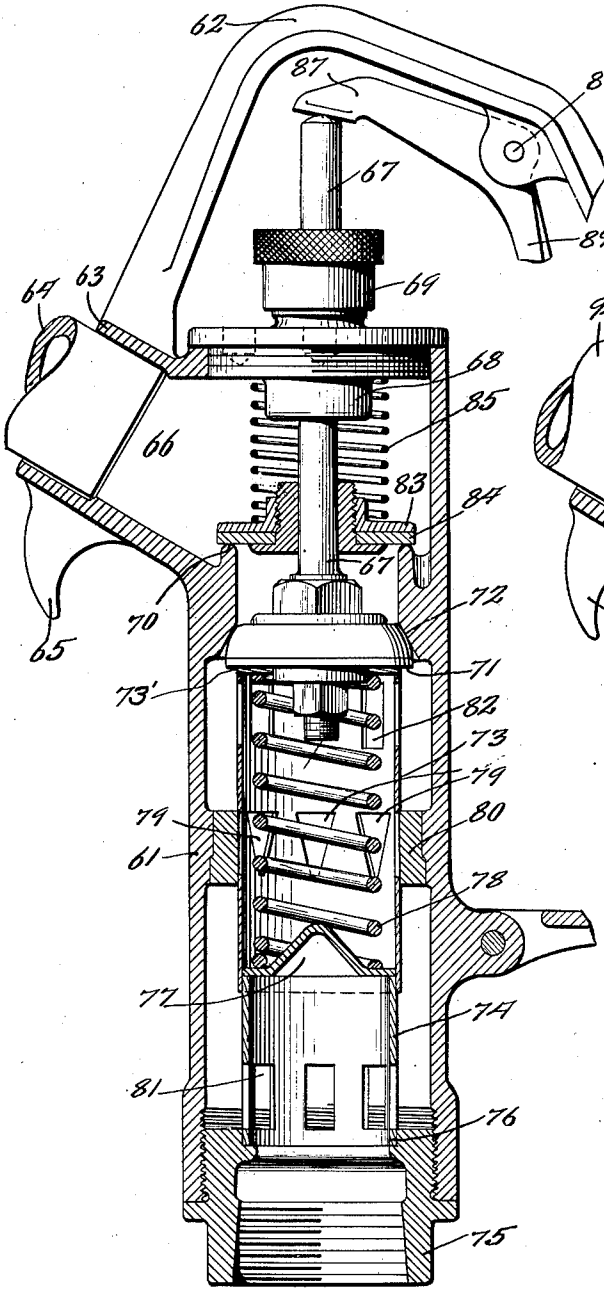
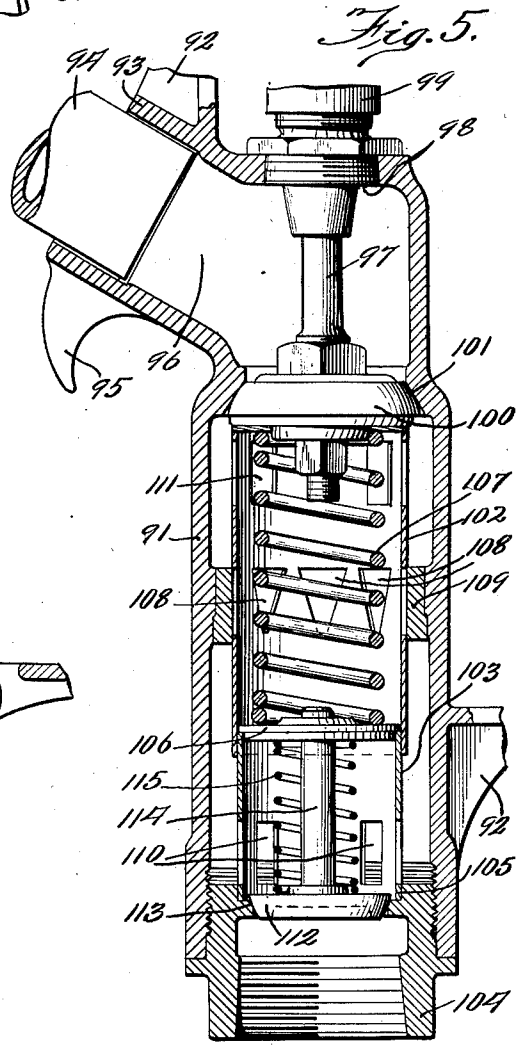


Fig. 5.



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UNITED STATES PATENT OFFICE

1,954,662

VALVE CONTROLLED NOZZLE

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Application November 28, 1928, Serial No. 322,347

15 Claims. (Cl. 277—42)

This invention relates to nozzles such as are applied to the hose of gasoline dispensing apparatus and has for one of its objects to facilitate a more accurate measurement of the liquid due to the fact that the throttling feature allows the operator to slowly approach the exact quantity desired and thus enable him to discontinue the flow more accurately.

Another object of the invention is the provision of means for preventing hammering or chattering of a wet hose nozzle when it is operated to dispense additional small quantities of gasoline or other liquid to complete a tank filling operation, or complete slowly the dispensing of a desired quantity.

Another object of the invention is to provide means to prevent the draining of the wet hose dispensing apparatus after the dispensing operation is discontinued, so that the hose will be kept filled with liquid at all times and particularly so that it will be filled with liquid at the time when the next succeeding dispensing operation is to be begun.

Yet another object of my invention is to provide a valve-controlled nozzle for gasoline dispensing devices wherein by a manually adjustable valve the liquid flow through the nozzle may be throttled down to a minimum without hammering and wherein said nozzle throttling device is provided with an automatic non-drain valve, self-adjusting in response to the adjustment of the throttling valve so that the instantaneous rate of liquid flow through each valve is equal, and which non-drain valve is adapted automatically to close upon the closure of said throttling valve for preventing drainage of liquid through the nozzle when the liquid pressure ceases and if the throttle valve is inadvertently opened.

A further object of the invention is to provide non-draining means for a wet hose of dispensing apparatus to thereby prevent fraud in dispensing the liquid.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claims.

In the drawings:—

Fig. 1 is a vertical sectional view of a nozzle embodying my invention;

Fig. 2 is a cross section on the line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 1 showing a modification of my invention; and

Figs. 4 and 5 are views similar to Fig. 1 showing further modifications of my invention.

In certain types of fluid dispensing pumps, such as gasoline filling station pumps, a hose is provided connected to the pump which has a valve at the delivery end thereof rather than at the end which receives the fluid from the pump. This is to save the attendant at the pump the necessity of draining the hose each time after the fluid has been delivered into a tank or receptacle which is adapted to receive the same. In this type of device, the operator opens the valve in the nozzle until the dial or other means on the pump registers the amount of fluid that has passed through the hose. Obviously, the hose therefor must be always filled with the fluid which is dispensed, or, otherwise, it is very probable that the right amount of fluid will not be delivered, because the fluid indicating means for showing how much fluid has been dispensed is usually located on the pump proper at quite a distance from the delivery end of the hose, and if the hose is not full to begin with, it will not register the correct amount of fluid passing through the nozzle. Also, it is a common occurrence that, when the pressure on the valve due to the hydrostatic head thereagainst, is released, the valve allows the fluid to drain out of the hose because the air can leak past the same from the outer atmosphere.

Considerable hammering or chattering in this type of nozzle is also experienced when it is desired to open the valve just a slight amount or when the valve is almost closed, and it is necessary that this be prevented as far as possible for the reason that it is necessasry for the attendant to reduce the flow of fluid through the nozzle when the pump has delivered almost the required amount of fluid or when he sees that the tank is almost full so that he may cut off the flow of fluid entirely as soon as the indicating means on the pump shows that the proper amount of fluid has been dispensed.

A description of the device embodying my invention will enable one to see how I have managed to attain the desired results by very simple and efficient mechanism which will not readily get out of order and which is composed of very few parts, thus making its cost comparatively small.

In Fig. 1, the nozzle comprises a body portion 1 with a passage 6 therethrough, said body portion having integrally formed therewith a handle 2 for holding the nozzle. The body portion 1 is also provided with an outlet 3 in which a short tubular extension 4 is suitably secured and a hook member 5 is provided by which the nozzle may be hung on some suitable support when

not in use. Slidably mounted in a bearing 8 screw-threaded into one end of the housing 1 is a valve stem 7 and said bearing member has the usual packing nut 9 secured thereto for preventing leakage of fluid between the valve stem 7 and the bearing 8. Secured thereto at the lower end and forming an integral part of the valve stem 7 is a poppet valve 10 having a beveled face engaging a correspondingly beveled seat 11 and this forms a means for entirely closing the passage 6 through which the liquid is adapted to pass.

Mounted within a reduced portion 13 of the nozzle body is a throttling means comprising a sleeve 12 having holes 14 and 15 formed about its periphery, there being eight holes 14 equally spaced about the periphery and only three holes 15 also equally spaced therearound, but it is obvious that the size and number of these openings may be varied to suit the requirements of the particular nozzle to which it is applied. This sleeve 12 is fastened rigidly to the stem 7 by means of the nut 29 engaging a flange forming one end of the sleeve 12 and the sleeve is therefore caused to move longitudinally with the valve 10 and the valve stem 7. To open the nozzle, to allow the fluid to pass therethrough, the stem 7 is moved downwardly carrying with it the valve 10 and sleeve 12. The specific action of this opening movement on the flow of the fluid therethrough will be more fully explained hereinafter.

To open the nozzle, a lever 16 pivoted at 17 is provided and this has an extending portion 18 adapted to engage the upper end of the stem 7. Movement of this handle in a counter-clockwise direction about the pivot 17 moves the extending portion 18, and, consequently, valve stem 7, in a downward direction, thus opening the nozzle. A stop 19 is provided on the handle 2 adapted to be engaged by lever 16 so that the operator is not liable to have his hand pinched between the lever 16 and the handle 2.

Screw-threaded into the lower end of the housing 1 is a coupling member 20 having screw threads 20' adapted to form a means by which the hose from the pump may be connected to the nozzle. A spring 21 is interposed between the coupling member 20 and valve 10 and forms a means to close the valve 10 when the lever 16 has been released.

To prevent the fluid from being drained from the wet hose of the dispensing apparatus, a check valve 22 is provided. This valve 22 has a beveled face engaging a similarly beveled face 23 on the coupling member 20, and has a stem 24 slidably received in a longitudinal bore 25 formed in the boss 26 on the under side of the valve 10. A spring 27 is interposed between lugs 28 on boss 26 and the upper side of the valve 22. The spring 27 is light but is of sufficient strength to hold the valve 22 closed against the hydrostatic head in the hose when the pump is not operating.

The operation of this device is as follows:—

When stem 7 is forced downwardly by operating lever 16, as described, both the sleeve 12 and valve 10 are caused to move therewith. This first allows a space to be formed between the valve 10 and the seat 11 and this space is considerable in cross sectional area although the width of the space between the valve 10 and the seat 11 is only a small amount. A considerable cross sectional area is thus provided through which there is a rush of fluid and due to the fact that this rush of fluid tends to draw the valve 10 closed, there is liable to be what is known as hammering of the valve 10 against the seat 11, but if this rush of fluid past the valve 10 is checked during the first opening or last closing movement, this hammering will be considerably reduced, if not altogether eliminated.

Since the throttling sleeve 12 has a relatively close fit within the portion 13 of the body, the fluid must necessarily first pass through the openings 15 when the valve is first opened, into the interior of the sleeve 12 and out through the tubular extension 4 on the nozzle. The openings 15, being relatively small, only a relatively small area is opened up when the valve 10 is moved downwardly a small amount and the hammering effect is reduced to a minimum, or entirely eliminated, because there is very little movement of liquid through the valve and there is very little tendency to have the fluid rush by the valve 10 to cause it to close.

When the valve has been opened so that the entire area of the holes 15 is uncovered, substantially all of the tendency to cause hammering has been eliminated from the valve and the valve can now be opened wide to allow the fluid to pass therethrough. This is done by moving the stem 7 downwardly until the openings 14 are uncovered which allows the fluid to pass around the valve 10 into the sleeve 12 by means of openings 14 and 15, and thence out of the valve through the tubular nozzle 4. Whenever the valve 10 is in closed position, the movement of the fluid through the valve is stopped and draining of the hose is prevented by the fact that the non-hose-draining valve 22 is kept closed by the spring 27. This valve 22, therefore, prevents the fluid from being drained out of the hose by way of the nozzle whenever the valve 10 is open and the dispensing apparatus is not operating.

It should be understood that when the valve 10 is fully open and the holes 14 are uncovered, liquid can flow to the full capacity of the nozzle due to the fact that the combined area of the holes 14 and 15 is greater than the annular cross sectional area between the periphery of the valve 10 and the cylindrical wall of the housing 1 through which annular area the liquid flows before it passes through the openings 14 and 15.

While Fig. 1 shows the preferred embodiment of the invention, due to its ruggedness and simplicity, the invention is capable of various modifications and in Figs. 3, 4 and 5 are shown three such modifications.

In Fig. 3, the body 31, handle 32, and members 33, 34 and 35 are similar to the corresponding parts 1 to 5, inclusive shown in Fig. 1. In this form of the invention, a stem 37 similar to the stem 7 of Fig. 1, is slidably mounted in a bearing 38 having a packing nut 39 screw-threaded thereon. On the lower end thereof is a poppet valve 40 integrally fastened thereto and having a beveled face co-operating with the beveled face 41 on the reduced portion 43 of the body to stop the flow of fluid through passage 36. A throttling sleeve 42 similar in all respects to sleeve 12 of Fig. 1, is slidably received within the reduced portion 43 and fastened by means of a nut 49 to the stem 37 to move therewith and is provided with openings 44 and 45, similar to openings 14 and 15 in Fig. 1.

A handle 46, pivoted at 47 and having an extension 48, is used to shift the stem 37 longitudinally to open and close the valve. A coupling member 50 screw-threaded into the lower end of the body portion 31 has a projection 52 for centering a spring 51 interposed between the mem-

ber 50 and valve 40 to provide a means for keeping the valve 40 in closed position. The operation of the parts so far described is the same as that of the corresponding parts shown in Fig. 1.

In the embodiment shown in Fig. 3, however, the non-hose-draining valve 53 slidably mounted on stem 37 has a face 54 engaging the upper open end of the sleeve 42 and provides a means for closing the upper opening in the sleeve to prevent draining of the hose by way of the nozzle. A spring 55 holds the valve 53 normally against the upper end of the sleeve 42 to hold the valve 53 closed against static head in the hose, but is sufficiently light so that when the valve 40 is opened it will yield and allow valve 53 to open for the passage of the fluid through the passageway 36 during pumping operations.

In Fig. 4 is shown a still further modification of the device, in which the body 61 is provided with a handle 62, an extension 63 for receiving the short tubular extension 64, and a hook 65, similar to the corresponding parts shown in Figs. 1 and 3. The stem 67 is mounted in a bearing 68 having a packing nut 69 and carries on its lower end a poppet valve 71 having a curved face engaging a beveled seat 72 for closing the passage 66 through the body portion. The structure of the throttling means in this instance is somewhat different from that in Figs. 1 and 3. It performs the same function, however, of checking the flow of fluid through the nozzle and accomplishes the same purpose as do the sleeves 12 and 42 in Figs. 1 and 3. It is located on the under side of the valve seat 72, which is adapted to entirely close the passage through the nozzle and is composed of two sleeves 73 and 74, the latter being set in a recessed portion 76 of a coupling member 75 screw-threaded in the lower end of the body 61. The sleeve 74 has a centering means 77 mounted loosely on top thereof for centering a spring 78 adapted to be interposed between said member 77 and the valve 71. The reaction of the spring 78 holds the member 77 tightly against the end of the sleeve 74 and the sleeve 74 within the recess 76 as well as forming a means to hold the valve 71 against the seat 72 when the valve is closed.

The sleeve 73 is slidably mounted in a reduced portion 80 of the body and to the upper end thereof is secured a flange 73' adapted to be received between the end of spring 78 and the lower face of valve 71, thus causing it to move along with valve 71 when stem 67 is moved up or down. The sleeve 74 is provided with openings 81 in the periphery thereof and sleeve 73 is provided with openings 82 and 79, the latter co-operating with the reduced portion 80 in a manner similar to the way openings 14 and 15 co-operate with reduced portion 13 in Fig. 1 to first allow only a small amount of liquid to pass therethrough when the valve 71 is lowered, carrying with it the sleeve 73.

A non-hose-draining valve 83 slidably mounted on stem 67 and having a face 84 thereof normally spring-pressed into engagement with seat 70 by spring 85 is adapted to prevent draining of the hose by way of the nozzle in the same manner as do valves 42 and 53 respectively of Figs. 1 and 3.

The passage of the fluid through the nozzle when it has been opened is through the opening in the member 75 into the interior of the sleeve 74, then outwardly through openings 81, inwardly through openings 79 into the sleeve 73, outwardly through openings 82, and, from there, past the valves 71 and 83 into the passage 66 and tubular extension 64. A lever 89 pivoted at 88 has an extension 87 adapted to move the valve 71 downwardly when rocked in a counter-clockwise direction.

The operation of this device is similar to that of Figs. 1 and 3 in that the V-shaped or triangular openings 79 afford a means of enabling the operator to slowly approach the exact quantity desired and thus enable him to discontinue the flow more accurately. It can readily be seen, by referring to Fig. 4, that when the operator partially releases the handle 89 so as to effect partial throttling of the flow through the spout and thus restrict the flow, enabling a reduced flow through the spout to be obtained and at the same time hammering or chattering of the valve 71 will be prevented.

In Fig. 5 is shown a modification of my device similar to that shown in Fig. 4, the only substantial difference being in the location of the non-draining valve. In this embodiment, the nozzle is formed with a body 91, a handle 92, an extension 93 for receiving the tubular extension 94, and is provided with a hook member 95 for the same purpose as in Figs. 1 to 4, inclusive. The valve stem 97 passes through a bearing 98 having a packing nut 99 and carries a valve 100 having a curved face portion engaging the beveled seat 101 formed in the body portion 91 for closing the passage 96 and the nozzle is provided with sleeves 102 and 103, similar to sleeves 73 and 74 in Fig. 4, telescoping within each other. The sleeve 103 rests in a recess 105 in the coupling member 104 which is screw-threaded in the lower end of housing 91. Resting on top of the sleeve 103 is a member 106 providing a bearing for the stem 114 of the non-draining valve 112 which is adapted to co-operate with the seat 113 to prevent draining of the fluid from the hose through the nozzle and which is held normally closed by spring 115. The member 106 is held in place against the end of the sleeve 103 by means of spring 107 interposed between the member 106 and valve 100. This spring also holds the sleeve 103 in the recess 105 of the member 104. The sleeve 103 is provided with openings 110, similar to openings 81 of Fig. 4, and the sleeve 102 is provided with V-shaped openings 108 which co-operate with the reduced portion 109 similar to the manner in which openings 79 co-operate with reduced portion 80 in Fig. 4. This sleeve also has openings 111 similar to those 82 of Fig. 4 and for the same purpose.

The operation of this device is very similar to that in Fig. 4, except that the non-draining valve 112 is on the opposite side of the valve seat 101 and co-operates with the valve seat 113 to prevent draining of the liquid from the hose by the static head when the dispensing apparatus is not operating.

Thus it will be seen that with my improved device the valve operating lever may be partially released when it is desired to partially throttle the flow of the liquid from the hose to the spout of the nozzle without causing any chattering or hammering of the main valve. For instance, without the sleeve 12 and the ports therein the valve 10 would be carried to closed position very suddenly whenever an attempt is made by the operator to partially release the handle 16 so as to secure a reduced flow of liquid to the spout 4. The attempt of the operator to secure a reduced flow would cause hammering or chattering at such times as when it is desired to open the valve several times in succession until the tank of an automobile is entirely filled. With my improved

construction, however, the operator may partially release the handle 16 with the assurance that the ports 14 may be closed while the restricted ports 15 are left open without any tendency of the flowing liquid to cause chattering or hammering and with the assurance that the flow will be continuous through the restricted ports 15 and sufficiently slow to secure the desired reduced flow while the operator is waiting for the automobile tank to be entirely filled, or while he is waiting until the desired quantity indication on the dial is reached. The restricted ports 15 therefore serve the double function of enabling the operator to secure accurate measure and also preventing hammering or chattering when the operating handle 16 is partially released to secure such reduced flow.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and I therefore do not wish to be restricted to the precise construction herein disclosed.

Having thus fully disclosed an embodiment of my invention, what I claim and desire to secure by Letters Patent of the United States is:

1. In dispensing apparatus, the combination with a member having a passage through which a fluid is adapted to flow in one direction, of a member adapted to close said passage, means for throttling the flow of fluid through said passage prior to the closing thereof, and a spring-pressed member for preventing draining of the fluid, said spring-pressed member having a stem slidably mounted in an integral part of the closing means.

2. In dispensing apparatus, the combination with a member having a passage through which a fluid is adapted to flow in one direction, of a member adapted to close said passage, a sleeve for throttling the flow of fluid through said passage prior to the closing thereof, and a spring-pressed member engaging said sleeve to prevent draining of the fluid.

3. In dispensing apparatus, in combination with a nozzle adapted to be connected to the end of a delivery hose of dispensing mechanism, said nozzle including a casing providing upper and lower valve seats, the wall of said casing forming the upper valve seat providing an orifice of smaller diameter thereabove, valve mechanism providing a cylinder adapted to fit snugly in that portion of a casing which is of smaller diameter above the upper valve seat, and comprising a valve portion rigid therewith and adapted to seat on the upper valve seat and comprising a depending guide, a valve stem for said cylindrical portion, said valve stem passing through the casing, and means exterior of the casing for operating the valve stem, a second valve stem slidably mounted in said depending guide and terminating in the valve head adapted to seat on said lower valve seat, and two concentrically arranged coiled springs disposed in said casing between said upper and lower valve seats, one of said springs being arranged to seat said upper valve and the other of said springs being arranged to seat the lower valve, said cylindrical sleeve having a restricted liquid passage therethrough.

4. In dispensing apparatus, in combination with a nozzle adapted to be connected to the end of a delivery hose of dispensing mechanism, a casing providing two spaced-apart valve seats, a valve mechanism comprising a valve stem projecting through the casing, and operating means exterior of said casing for operating said valve stem, said stem terminating in a valve adapted to fit on one of said seats, and provided with a hollow extension, a second valve adapted to seat on said second seat and having a stem adapted to slide in said hollow extension, and spring means surrounding said second stem and associated with said valves for normally holding the same on their seats.

5. In dispensing apparatus, in combination with a nozzle adapted to be connected to the delivery end of a hose of dispensing mechanism, said nozzle comprising a valve casing formed to provide a valve seat, a valve stem projecting through said casing, operating means exterior of said casing for operating said stem, a sleeve rigidly mounted with said stem and terminating in a valve adapted to seat on said seat, the wall of said casing adjacent said seat being provided with a cylindrical bore of less diameter than said seat, said sleeve being adapted to slide in said bore, said sleeve having one or more restricted openings therethrough, and a second valve slidable on said valve stem and adapted to fit on that end of the sleeve that is remote from the said first-mentioned valve, and spring means for holding said first and second valves on their seats.

6. In dispensing apparatus, in combination with a nozzle adapted to be connected to a wet hose, said nozzle comprising a casing, provided with a first valve seat, a portion providing a cylindrical bore, and a second valve seat, a valve stem passing through said casing, mechanism exterior of said casing for operating the valve stem, said valve stem terminating in a valve adapted to seat on said first-mentioned seat, and said valve having a sleeve-like extension sliding within the bore of said cylindrical portion, said sleeve-like extension having a plurality of openings therethrough, which openings increase gradually in size longitudinally of the sleeve, a second sleeve mounted in said casing and telescopiing within said first-mentioned sleeve, said second mentioned sleeve having a plurality of openings in the side wall, a second valve mounted on said second valve seat, and spring means within said sleeves for holding the said valves on their seats, said first-mentioned sleeve having openings at its side wall adjacent said first-mentioned valve seat.

7. In a dispensing apparatus the combination of a nozzle having a liquid inlet and a liquid outlet and providing a valve seat and an adjacent cylindrical bore, a valve adapted normally to close on said seat, said valve having a cylindrical extension fitting said bore, and means outside of said nozzle for operating said valve and extension simultaneously, said extension having a plurality of small openings in its peripheral walls, said openings being located closely adjacent to said valve and said extension having a plurality of relatively larger peripheral openings spaced apart and longitudinally of said extension in a direction away from said valve, said openings being of such dimensions and location that the combined area therethrough reduces faster than the area of the valve opening as the valve is permitted to close on its seat.

8. In a dispensing apparatus, the combination with a nozzle adapted to be connected to a hose, a valve controlling the flow of liquid through said nozzle, means for controlling said valve, and a non-drain valve mounted in said nozzle, said non-drain valve having a portion shiftably telescoping relatively to said first-named valve, and spring

means for maintaining said non-drain valve normally on the seat.

9. In a dispensing apparatus, the combination with a nozzle adapted to be connected to a wet hose, a valve for controlling the flow of liquid through said nozzle, means for manually opening said valve, a non-drain valve mounted in said nozzle, said non-drain valve having a stem located co-axially with the stem of the first-named valve, and two concentrically arranged springs in said nozzle, each one of said springs being arranged normally to close a valve and one of said springs cooperating to close a valve when the other valve closes.

10. In a dispensing apparatus, the combination with a nozzle adapted to be connected to the delivery end of a hose of dispensing mechanism, said nozzle comprising a valve casing forming a valve seat and an adjacently associated bore, a sleeve having one end open and having the other end closed, said closed end forming a valve adapted to rest on said seat, said sleeve having openings adapted to connect one side of said valve seat with the interior of said sleeve, and a non-drain valve adapted to close the open end of said sleeve, and a spring to maintain said non-drain valve in closed position.

11. A nozzle for gasoline dispensing systems comprising a casing having an inlet adapted to be connected to a conduit through which gasoline is adapted to be forced under pressure and having a nozzle outlet, said casing having a first valve seat, a second valve seat, and a third valve seat, a first valve mounted in said casing adapted to seat on said first seat, a second valve mounted in said casing adapted to be shiftably associated with said second valve seat, and a third valve in said casing adapted to be associated with said third valve seat, means exteriorally of the valve casing for operating said first and third valves together, and spring means in said casing for normally closing said first and third valves, and spring means in said casing normally closing said second valve, said second mentioned spring means being of such strength as to yield under the pressure of said liquid upon opening of said first and second valves.

12. A liquid dispensing nozzle comprising means forming a conduit adapted for connection to a source of liquid under pressure to effect the control of discharge of liquid from the source through the conduit, means providing a flow-controlling valve for regulating the rate of flow in said conduit, means forming a non-drain valve for said conduit, said non-drain valve having means whereby said valve is automatically self-adjusting in response to the adjustments of the flow controlling valve so that the instantaneous rate of liquid flow through each is equal, and a shut-off valve associated with said control valve and said non-drain valve for controlling the flow of liquid in the conduit, said shut-off valve, when closed, causing the automatic closure of said non-drain valve.

13. A liquid dispensing nozzle for gasoline dispensing, said nozzle having an inlet adapted for connection to a source of liquid under pressure and having a discharge, and a valve mounted in and shiftable relative to said nozzle, spring means normally urging said valve to closed position, and a manual control for opening said valve, a non-drain valve mounted in said nozzle and associated with said first mentioned valve to move bodily therewith and to move bodily relative thereto, said non-drain valve having spring means for normally closing said valve to prevent passage of liquid through said nozzle, said second-mentioned spring means being constructed and arranged to yield to the liquid pressure upon the opening of said first-named valve.

14. A liquid dispensing nozzle comprising means forming a conduit adapted to be connected to a source of fluid under pressure for discharging fluid from said source through said conduit, means in said conduit forming a series of valves therein, said series including a non-drain valve normally urged to close in a direction opposite to the flow of fluid in the conduit, but automatically yielding to permit fluid to flow through the conduit from said source, a shut-off valve operable at certain times to control the opening and closing of the non-drain valve, and a spring-controlled throttling valve manually adjustable for controlling the rate of fluid flow through the non-drain valve.

15. In a dispensing apparatus, the combination of a nozzle having an inlet adapted to be connected to a source of liquid under pressure and having an outlet adapted to discharge the liquid, said nozzle providing a first valve seat and a second valve seat spaced therefrom, a first valve, means for manually opening said first valve, a spring for normally closing said first valve on its seat, a second valve, a spring for normally closing said second valve on its seat, and means for restricting the flow past the first valve to a lesser volume than the circumferential cross sectional area caused by the opening of said first valve away from its seat, said second spring being of requisite tension to yield under the pressure of the liquid upon the manual opening of said first valve and whereby the instantaneous rate of flow through each of said valves is equal.

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