Feb. 13, 1951 E. B. WHITE 2,541,798

CHEMICAL FEEDER

Filed May 22, 1947 2 Sheets-Sheet 1

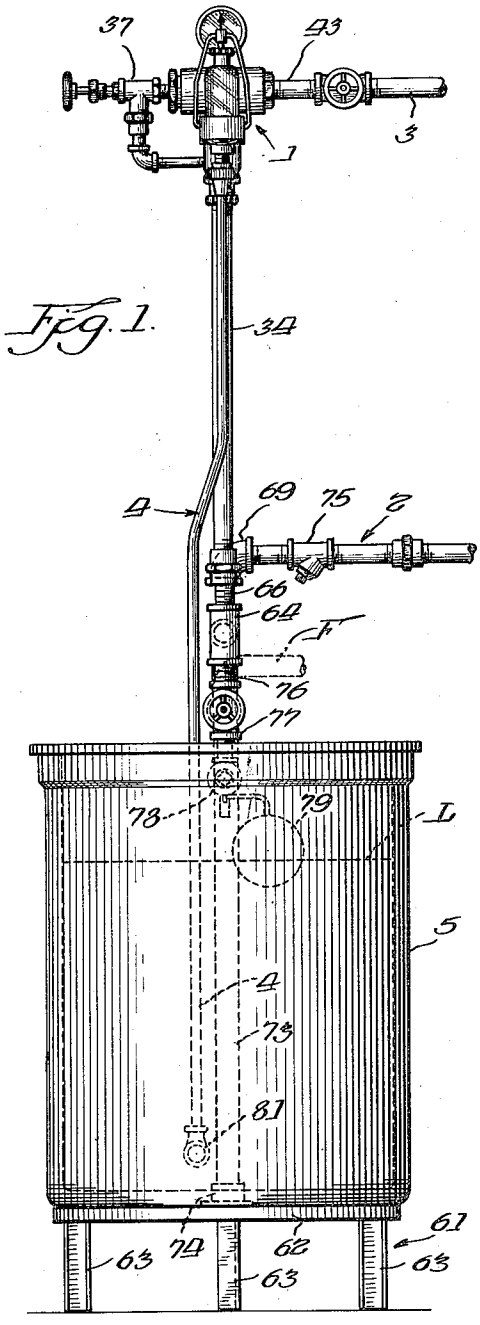


Fig. 1.

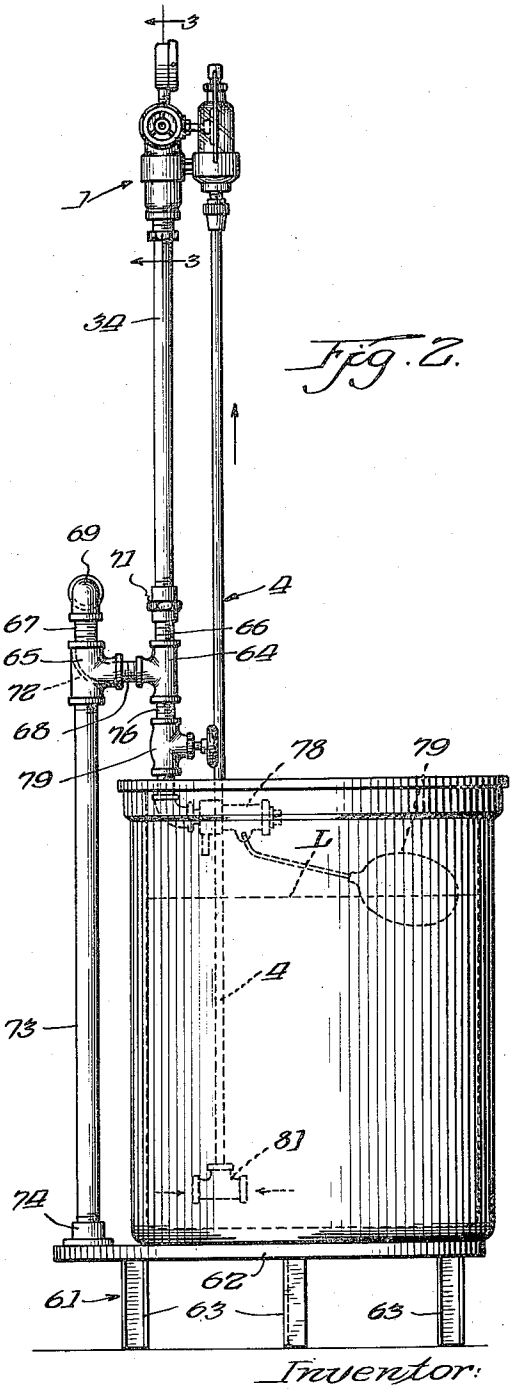


Fig. 2.

Inventor:
Eugene B. White.

By: Lee & Lee

Attys.

Feb. 13, 1951 E. B. WHITE 2,541,798

CHEMICAL FEEDER

Filed May 22, 1947 2 Sheets-Sheet 2

Fig. 3.

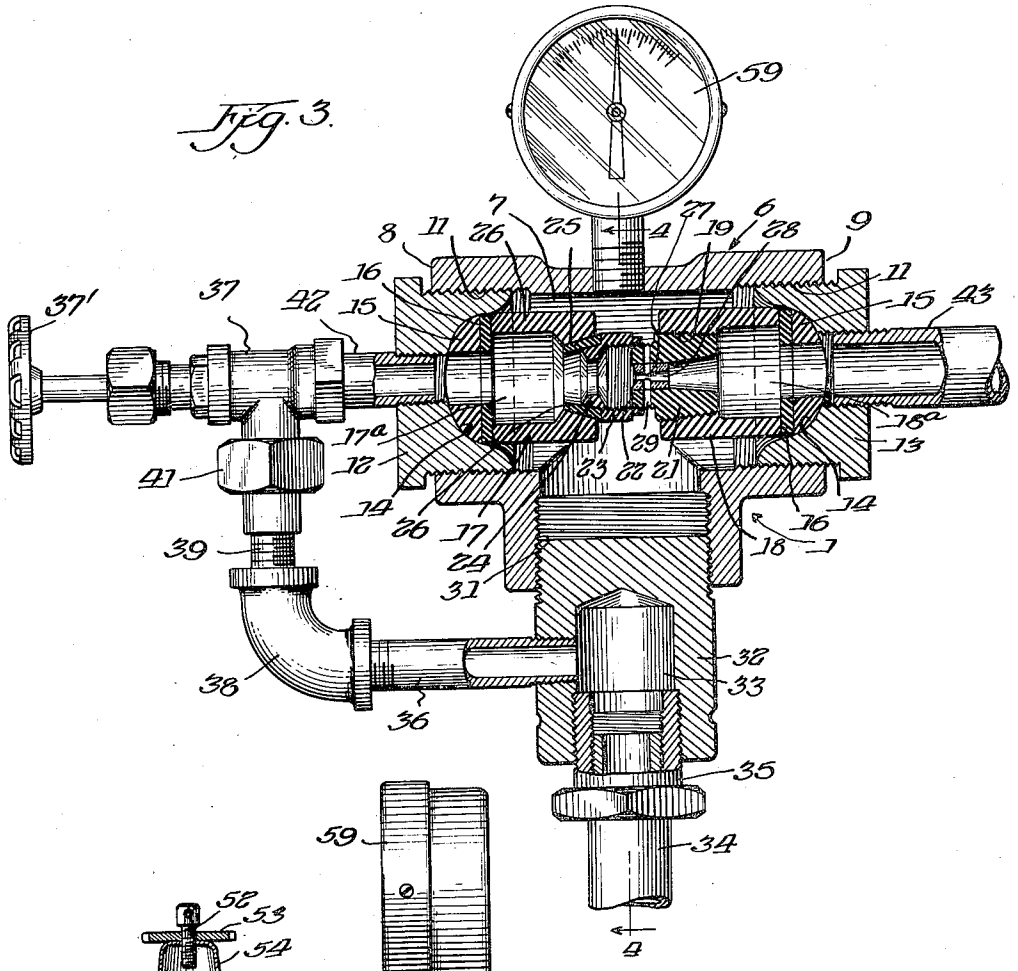
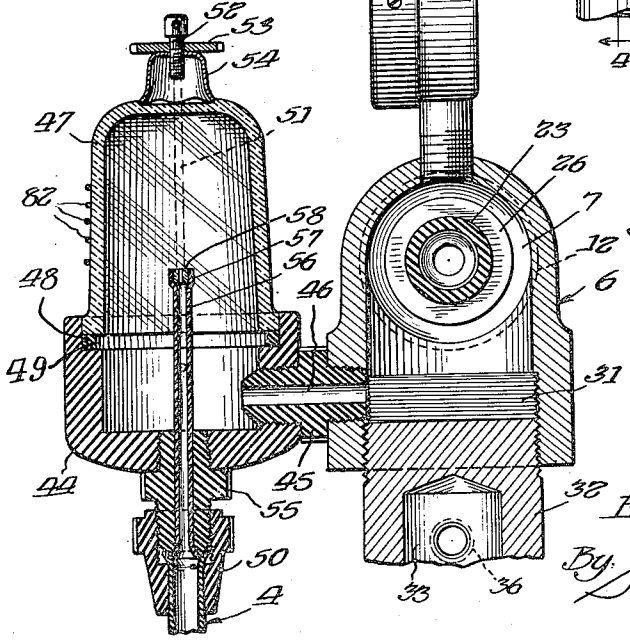


Fig. 4.



Inventor:
Eugene B. White.
By: Lee & Lee
Attys.

Patented Feb. 13, 1951 2,541,798

UNITED STATES PATENT OFFICE

2,541,798

CHEMICAL FEEDER

Eugene B. White, Oak Park, Ill.

Application May 22, 1947, Serial No. 749,691

4 Claims. (Cl. 210—40)

1

The invention relates generally to a feeding or injection device, and more particularly to a device for automatically feeding chemicals or the like into a fluid system.

The invention is particularly adapted for use in feeding a chemical solution into a fluid system, wherein the chemical concentration of the solution being fed may be automatically and continuously varied to provide a desired control of the chemicals being fed into the system. A typical example of a situation wherein such type of apparatus may be readily utilized is in the antisepticizing of water in swimming pools, wherein it is desirable to maintain a residual of the antisepticizing material in the water during the period of pool use.

The invention has among its objects the production of a feeding or injecting device, which will automatically vary the characteristics or chemical concentration of the solution being fed to provide desired feeding characteristics, which apparatus is simple in construction, very inexpensive to manufacture and efficient in operation.

Another object of the invention is the production of such an apparatus, the feeding mechanism of which embodies no moving parts and is so constructed that the elements thereof may be readily manufactured from suitable materials that will not deteriorate under the action of chemicals being fed, and in which the operating elements may be readily replaced if necessary.

A further object of the invention is the construction of such a device which is relatively free from clogging and which is so constructed that the operation of the device may be visually ascertained.

A further object of the invention is the production of such a device which utilizes a pressure differential in the fluid line, which is to receive the material being fed for actuation of the device whereby a pressure failure in such fluid line will automatically render the device inoperative and stop the feeding action thereof.

Many other objects and advantages of the construction herein shown and described will be obvious to those skilled in the art from the disclosure herein given.

To this end my invention consists in the novel construction, arrangement and combination of parts herein shown and described and more particularly pointed out in the appended claims.

In the drawings wherein like reference characters indicate like or corresponding parts:

Fig. 1 is a front elevational view of a device embodying the present invention;

2

Fig. 2 is a side elevational view of the device illustrated in Fig. 1;

Fig. 3 is a sectional view taken approximately on the line 3—3 of Fig. 2; and

Fig. 4 is a sectional view taken approximately on the line 4—4 of Fig. 3.

Referring to the drawings and more particularly to Figs. 1 and 2, the embodiment of the invention illustrated comprises a hydraulic fluid injector mechanism, indicated generally by the numeral 1, adapted to be operatively connected to a fluid line 2, having a relatively high fluid pressure and to a line 3, having a relatively lower fluid pressure existing therein. Also connected to the injector mechanism 1 is a feed line 4 communicating with a suitable tank or container 5, adapted to hold the supply of fluid being injected into the line 3.

Referring to Figs. 3 and 4, 6 indicates generally a housing similar in shape to a standard pipe T, having a bore 7 extending through the housing 6 and threaded at the respective ends 8 and 9 as indicated at 11, for receiving closure members 12 and 13 respectively, the inner ends of which are cup-shaped as indicated at 14.

Positioned in the cup-shaped portions of the closure members 12 and 13 are resilient rings 15 and 16, the rings 16 being seated on their respective rings 15 as illustrated in Fig. 3. Positioned in the bore 7 and seated upon the rings 16 are a pair of tubular members 17 and 18 positioned adjacent the closure members 12 and 13 respectively. The member 18 is internally threaded adjacent its free end as indicated at 19, to receive a hollow nipple 21 the free end 22 of which is externally threaded and carries an internally threaded sleeve 23, having a tapered shoulder 24 adapted to cooperate with the tapered portion 25 of the tubular member 17, a suitable gasket ring 26 being interposed between the respective tapered surfaces. Positioned in the nipple 21 is an insert 27 having a slightly flaring aperture 28 therein communicating at its respective ends with the interior of the members 17 and 18 respectively. The threaded end 22 of the nipple 21 is also provided with an aperture 29 extending transversely therethrough and intersecting the aperture 28 in the insert 27, thus forming a pair of orifices connecting the bore 7 of the housing 6 with the aperture 28.

The lower portion of the housing 6, in the construction illustrated, is internally threaded as indicated at 31 into which is threaded a block 32, thereby sealing the lower portion of the bore 7, the block 32 having a chamber 33 therein com-

municating with an inlet pipe 34 connected to the block through a bushing 35. Also threaded into the block 32 and communicating with the chamber 33 is a pipe 36 operatively connected to a valve 37 through the L 38, nipple 39 and union 41, the valve 37 being operatively connected to the chamber 17a, formed by the member 17, by the pipe 42 threaded into the closure member 12. An outlet pipe 43 threaded into the closure member 13 connects the chamber 18a formed by the tubular member 18, with the low pressure line 3. It will be apparent that while the housing 6 and block 32 are illustrated as being formed of two separate pieces threaded together, if desired, the two could be integrally constructed, the construction illustrated being utilized merely for ease of manufacture and assembly.

Carried by the housing 6 is a bowl-shaped member 44 connected to the housing 6 by a nipple 45 threaded into the respective elements and having a bore 46 therein operatively connecting the interior of the member 44 with the bore 7 of the housing 6. A dome-shaped member 47 of glass or other transparent material is seated on a sealing gasket member 48 which in turn is seated on the shoulder 49 of the member 44, the dome being securely held in place by a U-shaped bale 51, pivotally connected at its lower ends to the member 44 and provided at its upper end with a threaded stem 52 upon which is threaded a thumb wheel 53 adapted to urge the dome 47 into sealing engagement with the gasket 48 and member 44 through a bell-shaped washer 54. Thus, by screwing the thumb wheel 53 downward towards the member 44 the dome 47 and washer 48 will be securely clamped between the shoulder 49 and washer 54, thus providing a fluid tight connection. Threaded into the bottom of the member 44 is a nipple 55, providing a support for a vertically extending tube or stem 56, the tube 56 being operatively connected to the feed line 4 by a collar 58 threaded on the free end of the nipple 55. The free upper end of the tube 56 is provided with an insert 57 having a metering orifice 58 therein.

Positioned at the top of the housing 6 is a suitable vacuum gage 59 operatively communicating with the bore 7 of the housing.

Referring to Figs. 1 and 2, the tank or container 5 is supported on a stand indicated generally by the numeral 61, having a platform 62 on which the tank 5 is positioned, the platform 62 being raised from the floor by legs 63. The pipe 34 is connected to the fluid inlet line 2 by means of the T's 64 and 65, nipples 66, 67 and 68 and L 69, the pipe being connected to the nipple 66 by a union 71 so that the entire injector mechanism 1 may be disconnected from the piping when desired by breaking the union 71. The T 65 is provided with a partition 72 which seals the lower end of the T from the nipples 67 and 68 so that the T 65 functionally serves as an L. A supporting pipe 73 is threaded into the lower end of the T 65 and is seated in a pipe flange 74 mounted on the platform 62, thus the pipe 73 will support the injector 1 and the rest of the piping, no fluid, however, entering the pipe 73. If desired, a suitable strainer 75 may be inserted in the line 2 to remove any material in the line. Connected to the lower end of the T 64 by means of a pipe nipple 76 is a gate valve 77 operatively connected to a float valve 78 of common construction and actuated by a float 79. The feed line 4 extends downwardly into the tank 5, terminating adjacent the bottom thereof in a T 81. It will be apparent that the tubular members 17 and 18, washers 15 and 16, nipples 21 and sleeve 23, as well as the other elements of the device may be readily formed from suitable materials to minimize deterioration.

In the operation of the device the lines 2 and 3 are operatively connected in the fluid line, into which the solution is to be fed, the line 2 being connected to a high pressure side and the line 3 to a relatively low pressure side of the system in which the receiving fluid flows. The tank 5 is then filled with the solution to be injected and the valve 37 opened to permit fluid to flow from the line 2 into the line 3. As this operation takes place the passage of fluid through the aperture 28 in the insert 27 will result in a withdrawal of air from the bore 7 into the pipe 43 of the line 3, thus creating a vacuum in the bore 7 and communicating chambers and passages, such as the member 44 and line 4, causing liquid to be drawn from the tank 5 through the member 44, into the bore 7 and through the orifices formed by the aperture 29, into the line 3. The amount of the solution entering the line 3 will be dependent upon the rate of flow from the chamber 17a to the chamber 18a through the aperture 28, and the degree of vacuum existing in the bore 7, so that by rotating the handle 37' of the valve 37 to increase or reduce the flow from the line 2 to the line 3, the amount of solution fed into the line 2 may be readily and accurately controlled, as the amount of solution withdrawn into the line will be more or less proportional to the degree of vacuum in the chamber 17a.

The gage 59 provides a means for determining the correct position of the valve 37 to produce the desired amount of feeding action. A further visual indication of the satisfactory operation of the device and the amount of solution being injected, may be obtained by observing the height of the column of solution being ejected from the mouth of the tube 56 into the dome 47, and if desired the side wall of the latter may be provided with a series of graduations 82 thereby providing a means for obtaining comparison readings of the height of the fluid column. Likewise, as the gage 59 would indicate a vacuum in the bore 7 even though solution were not being withdrawn in the line, as for example, if an obstruction existed in the line 4 or T 81, observation through the dome 47 of the mouth of the tube 56 would readily disclose the fact that no solution was entering the housing 1. Similarly a comparison of the height of the fluid column flowing from the mouth of the tube 56 with the degree of vacuum in the bore 7 as indicated by the gage 59 would readily disclose whether or not the device was operating properly. For example, if the desired amount of vacuum were indicated by the gage 59, but the column of solution flowing from the tube 56 did not rise to as great a height as it normally would with the same amount of vacuum present, it would indicate an obstruction between the bore 7 and tank 5, or an air leak directly or indirectly into the vacuum chamber.

As the level of the solution in the tank 5, indicated by the letter L, drops thereby lowering the float 79, fluid will be admitted from the line 2 through the valve 77 and valve 78 into the tank until the rising fluid level sufficiently raises the float to shut off the valve 78. The volume of fluid in the tank 5 will, therefore, remain substantially constant throughout the operation of the device although the concentration or strength of the fluid therein will be substantially continuously reduced as fluid is withdrawn from the tank into

the line 3. It will thus be apparent that during such operation a relatively strong solution will be initially injected into the line, gradually becoming weaker as the injecting process continues.

In certain applications of the device, it may sometimes be desirable to inject solution of uniform concentration in which case it is merely necessary to close the valve 77 to shut off the supply of fluid into the tank 5, whereby dilution of the solution in the tank will cease. Likewise, in certain applications it may be desirable to dilute the solution in the tank with fluid other than that flowing in the lines 2 and 3 in which case the valve 77 may be disconnected from the T 64 and line 2, and connected to a separate fluid line, indicated in Fig. 1 in dotted lines and designated by the letter F. Obviously, in this case the T 64 would be replaced by an L or the lower end of the T may be closed by a suitable pipe plug.

A further adjustment of the injector 1 is provided by the nipple 21 and the sleeve 23 threaded on the latter, as it will be apparent that the effective size of the orifices formed by the aperture 29 may be varied by screwing the sleeve 23 farther on the threaded portion 22 of the nipple 21 thereby partially covering the aperture 29 to restrict the flow of fluid through the latter. The resiliency of the rings 15 and 16 is sufficient to compensate for any minor variations in distance between the outer edges of the members 17 and 18 due to the relative position of the sleeve 23, with respect to the nipple 21, as well as compensate for any minor variations in assembly between the various elements to efficiently seal the chambers 17*a* and 18*a* from the bore 7, at all times.

It will be apparent that the construction of the various elements of the device is such that such elements may be made out of suitable material to handle the desired chemicals being fed with minimum deterioration. Likewise, the device may be readily cleaned or the members 17 and 18 and associated elements readily replaced with a minimum amount of effort.

It will be noted from the above description that I have provided a very simple and inexpensive feeding apparatus by means of which one fluid may be injected into another fluid, wherein the concentration of the fluid being fed may be automatically varied to meet particular requirements, and in which the apparatus may be readily and accurately adjusted to the desired operating conditions.

Having thus described my invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of my invention; hence, I do not wish to be understood as limiting myself to the exact form, construction, arrangement and combination of parts herein shown and described or uses mentioned.

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

1. In a hydraulic injector, the combination of a housing having a bore therein extending therethrough, a closure member threaded into each end of said bore, each of said members having a hole therein communicating with said bore and adapted to connect the respective opposite ends of the latter with a relatively high pressure fluid line and a relatively low pressure fluid line, a tubular member positioned adjacent each closure member to form a pair of spaced chambers, resilient gasket means interposed between said tubular members and their respective closure members to provide fluid tight joints therebetween, a hollow nipple, one end of which is threaded into the free end of one of said tubular members, a sleeve threaded on the other end of said nipple and having a tapered shoulder cooperable with the free end of the other tubular member, a gasket member interposed between the cooperating surfaces of said sleeve and tubular member to provide a fluid tight joint therebetween, and an apertured insert positioned in said nipple with the aperture defining a passage between the chambers formed by the two tubular members, said nipple and insert having an orifice therein extending transversely to the aperture in said insert and communicating with said aperture and opening in said bore, said sleeve being adapted to partially overlie said orifice and provide an adjustment for varying the amount of fluid passing therethrough, said housing having a fluid inlet therein communicating with said bore and said orifice.

2. In a feeding and mixing device, the combination of a housing having a bore therein extending therethrough, a closure member threaded into each end of said bore, each of said members having a hole therein communicating with said bore and adapted to connect the respective opposite ends of the latter with a relatively high pressure fluid line and a relatively low pressure fluid line, a tubular member positioned adjacent each closure member to form a pair of spaced chambers, resilient gasket means interposed between said tubular members and their respective closure members to provide fluid tight joints therebetween, a hollow nipple, one end of which is threaded into the free end of one of said tubular members, a sleeve threaded on the other end of said nipple and having a tapered shoulder cooperable with the free end of the other tubular member, a gasket member interposed between the cooperating surfaces of said sleeve and tubular member to provide a fluid tight joint therebetween, an apertured insert positioned in said nipple with the aperture defining a passage between the chambers formed by the two tubular members, said nipple and insert having an orifice therein extending transversely to the aperture in said insert and communicating with said aperture and opening in said bore, said sleeve being adapted to partially overlie said orifice and provide an adjustment for varying the amount of fluid for passing therethrough, said housing having a fluid inlet therein communicating with said bore and said orifice, a fluid container, conduit means operatively connecting said container and said fluid inlet, conduit means adapted to be connected to a source of fluid, operatively related to said container for supplying fluid thereto, and a float actuated valve connected to said conduit means for controlling the admission of all fluid to said container to maintain the fluid volume therein substantially constant.

3. In a hydraulic injector, the combination of a housing having a bore therein extending therethrough, a closure member threaded into each end of said bore, each of said members having a hole therein communicating with said bore and adapted to connect the respective opposite ends of the latter with a relatively high pressure fluid line and a relatively low pressure fluid line, a tubular member positioned adjacent to and in fluid tight relation with each closure member to form a pair of spaced chambers, a hollow nipple extending axially from the free end of one of said tubular members, and a sleeve member ex-

tending axially from the free end of the other tubular member, said nipple and sleeve member forming a passage between the chambers formed by the two tubular members, said nipple and sleeve member being axially adjustable relative to each other and co-operating to define a transverse passage communicating with said first passage and opening in said bore, with the effective size of said second passage being variable by relative axial adjustment of said nipple and sleeve member for varying the amount of fluid passing through said passage, said housing having a fluid inlet therein communicating with said bore and said second passage.

4. In a hydraulic injector, the combination of a housing having a bore therein extending therethrough, a closure member threaded into each end of said bore, each of said members having a hole therein communicating with said bore and adapted to connect the respective opposite ends of the latter with a relatively high pressure fluid line and a relatively low pressure fluid line, a tubular member positioned adjacent to and in fluid tight relation with each closure member to form a pair of spaced chambers, a hollow nipple extending axially from the free end of one of said tubular members, a sleeve member extending axially from the free end of the other tubular member, said nipple and sleeve member forming a passage between the chambers formed by the two tubular members, said nipple and sleeve member being axially adjustable relative to each other and co-operating to define a transverse passage communicating with said first passage

and opening in said bore, with the effective size of said second passage being variable by relative axial adjustment of said nipple and sleeve member for varying the amount of fluid passing through said second passage, said housing having a fluid inlet therein communicating with said bore and said second passage, a fluid container, conduit means operatively connecting said container and said fluid inlet, conduit means adapted to be connected to a source of fluid, operatively related to said container for supplying fluid thereto, and a float actuated valve connected to said conduit means for controlling the admission of all fluid to said container to maintain the fluid volume therein substantially constant.

EUGENE B. WHITE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
445,909	Shontz	Feb. 3, 1891
1,905,244	Rohlin	Apr. 25, 1933
1,922,920	Aherne	Aug. 15, 1933
1,946,474	Banks et al.	Feb. 13, 1934
1,963,522	Gavaza	June 19, 1934
2,009,306	Ware	July 23, 1935
2,065,583	Heitzmann	Dec. 29, 1936
2,260,936	Everson	Oct. 28, 1941
2,381,589	Hayes	Aug. 7, 1945
2,461,334	Major	Feb. 8, 1949