June 13, 1939. C. E. KERR 2,162,404

FILLING VALVE

Filed Nov. 18, 1936 2 Sheets-Sheet 1

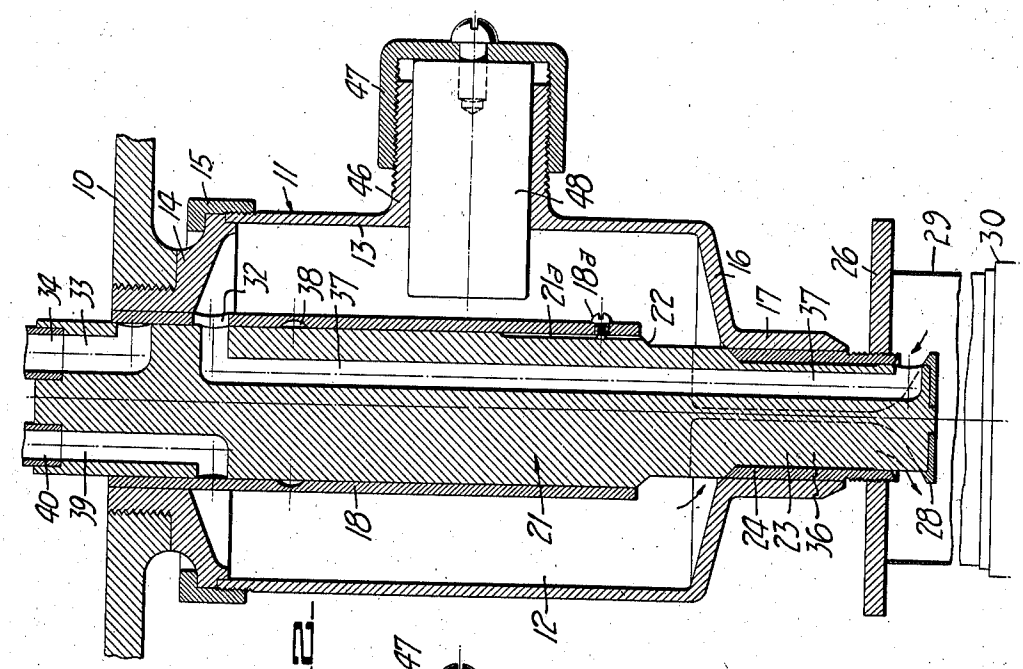

FIG. 2.

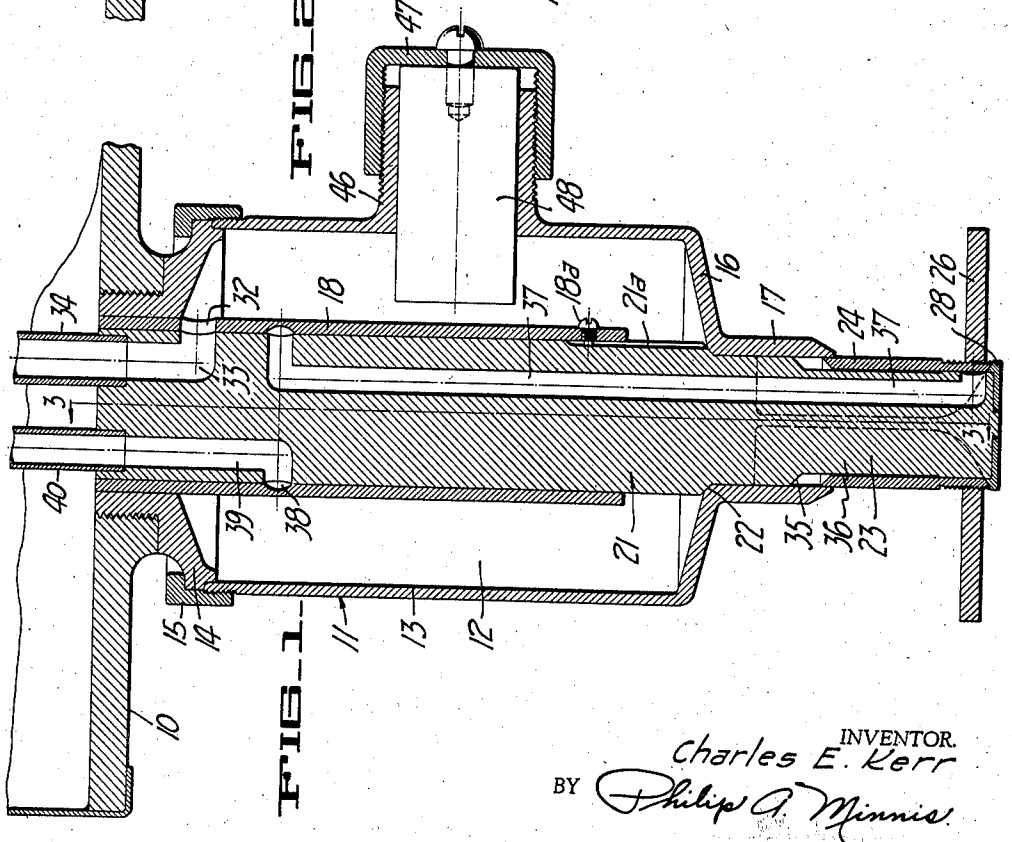

FIG. 1.

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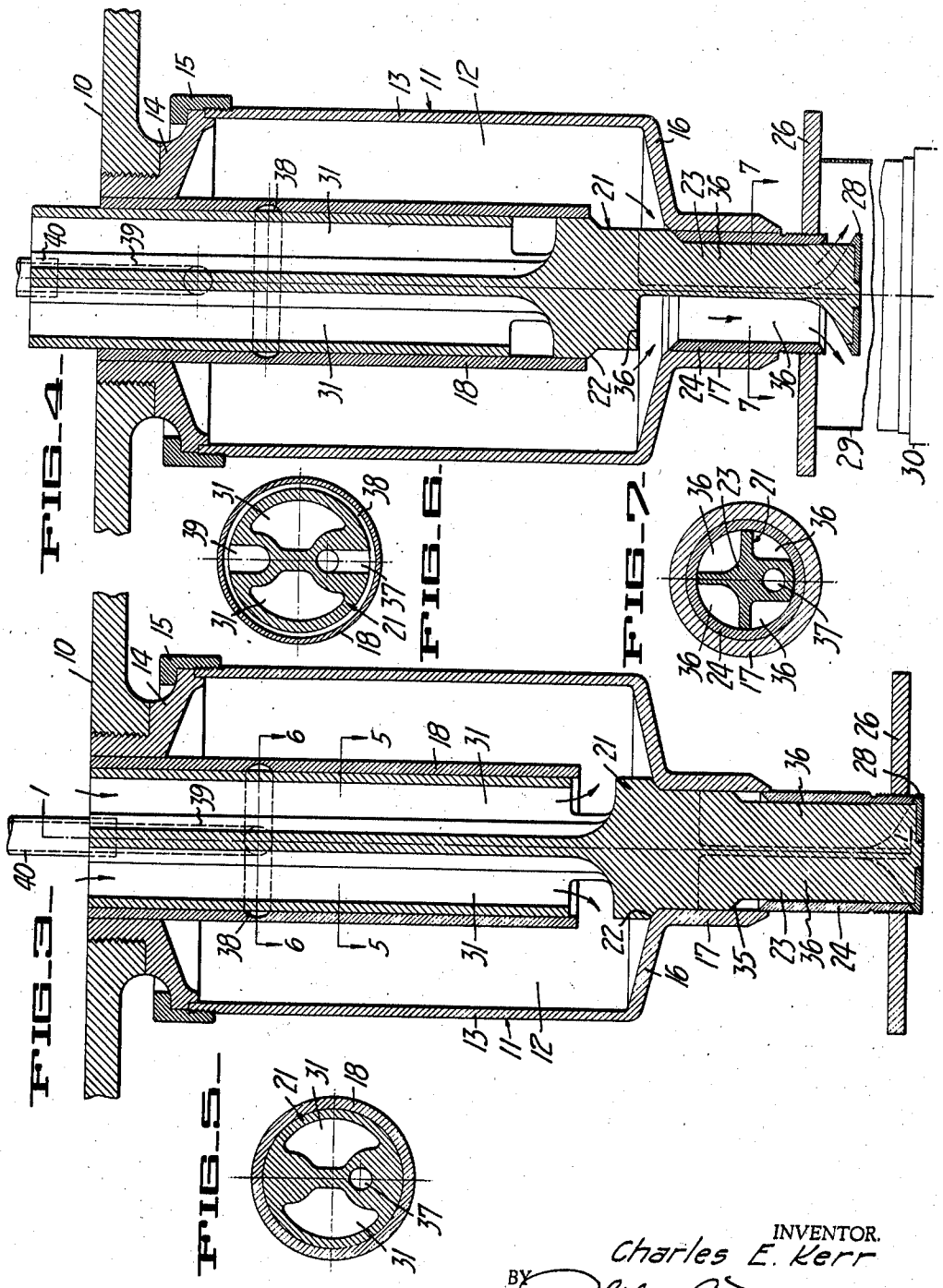

FIG. 4

FIG. 6

FIG. 7

FIG. 3

FIG. 5

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FILLING VALVE

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Application November 18, 1936, Serial No. 111,356

20 Claims. (Cl. 226—108)

The present invention relates to filling machines, and more particularly to the provision of an improved liquid filling valve for dispensing of liquid into a can.

It is a general object of the invention to provide a liquid filling valve, which will accurately dispense measured amounts of liquid and is capable of efficient operation over a long period of time.

Another object of the invention is to provide a liquid filling valve of improved construction, in which the control for measured amounts of liquid is effected in a simple efficient manner.

Another object of the invention is to provide a valve of the character described, which can be operated on the air cut-off principle if desired for use in filling containers to a desired level.

Another object of the invention is to provide a valve of the character described, which fills cans without any dripping of liquid after the filling operation.

Another object of the invention is to provide a liquid filling valve constructed for economical manufacture and assembly.

Other objects will be apparent from the following description with reference to the drawings illustrating a preferred embodiment of my invention.

In the drawings:

Fig. 1 is a vertical section through a liquid filling valve constructed in accordance with my invention, the view being indicated by the line 1—1 in Fig. 3.

Fig. 2 is a view similar to Fig. 1, but illustrates the valve in can filling position with the can engaged therewith.

Fig. 3 is a vertical sectional view of the liquid filling valve which is taken at right angles to the section shown in Fig. 1 as indicated by the line 3—3 in Fig. 1.

Fig. 4 is a section similar to Fig. 3 with the valve shown in can filling position, a portion of the valve slide being broken away to show one of the passages leading from the valve to the can.

Fig. 5 is a horizontal sectional view taken in a plane indicated by the line 5—5 in Fig. 3.

Fig. 6 is a horizontal sectional view taken in a plane indicated by the line 6—6 in Fig. 3.

Fig. 7 is a horizontal sectional view taken in a plane indicated by the line 7—7 in Fig. 4.

The present invention is concerned with filling machines of the type in which a liquid filling valve receives liquid from a source of supply, such as a tank, and dispenses such liquid into a can which is lifted into filling position by the can lift mechanism of the filling machine. Preferably, the operation of the liquid filling valve is made responsive to the lifting of the can so that it is an automatic no-can-no-fill valve.

The filling machine includes tank 10, only a portion of which is seen in Fig. 1, in the bottom of which one or more similar valves 11 are mounted. Only one such valve is shown and described in this application, but it will be understood that if desired, a series of such valves may be mounted around the periphery of the tank as is conventional in filling machines of this character.

The liquid filling valve includes a measuring chamber and a valve slide movable relative thereto, to control the flow of air and liquid into and out of the measuring chamber, both from the tank and to the can.

The valve includes measuring chamber 12 which is formed by cylindrical shell 13 (Fig. 1) having cover 14 seated thereon and detachably secured thereto by ring 15. Cover 14 has threaded engagement within the bottom wall of tank 10 to secure the valve in assembled position on the tank.

At its lower end, shell 13 is provided with apertured bottom wall 16, the aperture being defined by sleeve extension 17 of wall 16. Cover 14 is also provided with a central aperture, within which the upper end of sleeve 18 is pressed, so that the sleeve extends downwardly within shell 13 and into chamber 12 in alignment with sleeve extension 17. Sleeve 18 and sleeve extension 17 are slidably engaged by valve slide 21 which fits closely therein. To guide valve slide 21 for vertical sliding movement only, sleeve 18 has cap screw 18a threaded therein and having its reduced inner end engaged with vertical groove 21a in slide 21. The lower position of valve 21 when the valve is closed, as illustrated in Fig. 1, is determined by the engagement of annular shoulder 22 thereon with a seat at the top of sleeve extension 17.

Valve slide 21 extends through sleeve extension 17 and has reduced end 23 on which actuating sleeve 24 is mounted for engagement within sleeve extension 17 of the shell. In the closed position of the valve, actuating sleeve 24 seats against end plate 28 threaded on an end extension of the valve slide. Actuating sleeve 24 has a lost motion connection with the valve slide, being mounted for free movement between plate 28 and shoulder 35 at the upper end of reduced end portion 23 of the valve slide. At its lower end

actuating sleeve 24 carries lift plate 26 threaded thereon for vertical adjustment.

As is common in this type of valve, the can 29 is carried by lifting mechanism 30 of conventional construction and the engagement of a can with can lift plate 26, illustrated in Fig. 2, serves to move the valve from closed to can filling position. By virtue of the improved construction of my invention, such movement is utilized to effect accurate filling of each can with a desired amount of liquid without after-dripping, the return of the valve slide to normal position being effected by the release of the can lift plate by the can.

In the lowered position of the valve slide, the valve is in communication with the tank and is filled with liquid which preferably is introduced into the bottom of the measuring chamber while the air in the chamber is vented from the top thereof.

As seen in Fig. 3, the upper part of valve slide 21 is provided with longitudinally extending passages 31 by means of which the liquid in tank 10 can flow down through sleeve 18 and into the bottom of chamber 12. At the same time, the air is vented from the top of the chamber through aperture 32 in sleeve 18 and vent passage 33 of slide 21 which registers with aperture 32 in the lowered position of the valve slide. Passage 33 communicates at its upper end with vent pipe 34 which extends upwardly above the level of the liquid in the tank. From the above description, it will be noted that each time the valve slide is in its lowered position, the tank is placed in communication with the measuring chamber to permit flow of liquid from the tank to the lower end of the chamber. Also, the chamber is placed in communication with the atmosphere by a vent passage leading from the upper end thereof to vent air from the chamber as it is being filled by the flow of liquid from the tank.

In the lifted position of the valve slide, the tank and the atmosphere are cut off from the measuring chamber, which is connected directly to the can so that the measured charge is dispensed into the can and the air from the can is vented into the measuring chamber. When the can is raised to engage and lift the plate 26, actuating sleeve 24 is moved up on the valve slide with the lift plate until the frusto-conical upper end of the actuating sleeve engages a complementary shoulder 35 on the slide, which is then lifted during the further movement of the sleeve.

As seen in Figs. 3 and 4, the valve slide is provided at its lower end with passages 36 of which there are four in the illustrated embodiment as seen in Fig. 7. In the lowered position of the valve slide illustrated in Fig. 3, i. e., during filling of the chamber from the tank, passages 36 are closed at the top by sleeve extension 17 and are closed at the bottom by actuating sleeve 24 which is engaged with its seat on end plate 28.

In the raised position of the valve slide as seen in Fig. 4, the valve slide is withdrawn into sleeve 18 to close passages 31, such closing being effected slightly before the upper edges of passages 36 communicate with the chamber 12. The closing of passages 31 serves to cut off the supply of liquid from the tank to the chamber. In the raised position of the slide, actuating sleeve 24 has been lifted relatively to the valve slide to open the lower ends of passages 36 and permit the flow of liquid from chamber 12 into the can, as indicated by the arrows in Fig. 4.

As seen more clearly in Figs. 1 and 2, the valve slide is provided with vent passage 37 which extends from the lower end thereof to adjacent the top of sleeve 18. In the raised position of the valve slide, as shown in Fig. 2, vent passage 37 communicates with aperture 32 of sleeve 18, so that the air from the can is vented into the top of the measuring chamber as the liquid flows therefrom into the can. In the lowered position of the valve slide, the upper end of passage 37 registers with annular vent passage 38 in sleeve 18 which establishes communication between vent passage 37 and air vent passage 39 of the valve slide. Vent passage 39 communicates at its upper end with vent pipe 40 extending above the level of the liquid in tank 10. In this connection, it is to be noted that, as the can withdraws, valve slide 21 and actuating sleeve 24 will move downwardly as a unit with the can so that shoulder 21 of the valve slide will engage its seat before the actuating sleeve completes its movement and closes the lower ends of filling passages 36 and vent passage 37. Thus, the upper end of vent passage 37 will become operatively associated with annular vent passage 38 before sleeve 24 closes the lower end of vent passage 37. This occurs before the can is withdrawn from beneath the valve and by this means, any liquid which may have been drawn up into passage 37 is drained back out into the can so that passage 37 is open and free for the next filling operation. Also, filling passages 36 are allowed to drain, before the actuating sleeve engages its seat to close the passages and effectively prevent any after dripping.

It is believed that the operation of the valve will now be apparent from the above description thereof. Thus, when the valve slide is in its lowered position, the lower ends of passages 31 therein are open, whereby liquid can flow from the tank into the chamber, displacing the air therein. The displaced air flows out from the top of the chamber through passage 33 and vent pipe 34 which opens into the atmosphere. When a can engages the can lift plate to raise actuating sleeve 24 on the valve slide the lower ends of filling passages 36 and vent passage 37 are opened, and the actuating sleeve engages shoulder 35 on the valve slide which then moves upwardly with the sleeve. During the lifting of the valve slide, the chamber filling passages 31 and vent passage 33 are first closed by the valve slide as it moves upwardly within sleeve 18. Subsequently, the upward movement of the valve slide serves to move the upper ends of passages 31 out of sleeve extension 17 into communication with the chamber, so that the liquid can flow from the chamber into the can. At the same time, the upper end of vent passage 37 is placed in communication with the upper end of the chamber, whereby the air from the can is vented into the chamber. As the can moves away from the valve and the valve slide falls to its lowered position, the delayed closing of the lower ends of filling passages 36 and vent passage 37 by the actuating sleeve permits complete draining of the passages, which are subsequently closed by the sleeve which engages its seat to prevent after dripping.

In order to provide for the filling of various size cans or for the filling of various amounts of liquid into the same can, an adjustment is provided for varying the capacity of the measuring chamber. For this purpose, shell 13 is provided with lateral sleeve extension 46 which is threaded to receive cup-shaped cap 47 carrying plug 48 slidable within sleeve 46. By adjusting cap 47, plug

48 can be moved in or out of chamber 12 to vary the capacity thereof.

If desired, the liquid filling valve can be used as an air cut-off valve for filling cans to a desired level and in this connection it will be noted that liquid will cease to flow from the measuring chamber into the can when the liquid in the can covers the lower end of vent passage 37 seen in the position shown in Fig. 2. This level can be varied by screwing lift plate 26 up or down along sleeve 24. In connection with this type of operation, the operation of the valve slide and the actuating sleeve in providing for draining of vent passage 37 by establishing communication between the upper end thereof with annular passage 38 before the lower end thereof is closed is particularly advantageous, because it is desirable that passage 37 be entirely free of liquid at the beginning of each filling operation.

While I have shown and described a preferred embodiment of my invention, it is to be understood that such invention can be embodied in other forms. The scope of my invention, therefore, should be limited only by the scope of the appended claims.

I claim:

1. In a valve for filling containers with liquid from a tank, a measuring chamber, and a valve member movable relative to said chamber having passage means for controlling the flow of liquid and air to and from said chamber; said passage means incuding a chamber filling passage for admitting liquid from the tank to the chamber in a lowered position of said valve member, a chamber vent passage for venting air from said chamber in said lowered position of said valve member, a container filling passage for flow of liquid from the chamber to a container in a raised position of said valve member, and a container vent passage for flow of air from a container into the chamber in said raised position of the valve member.

2. In a valve for filling containers with liquid from a tank, a measuring chamber, a valve member movable relative to said chamber having passage means for controlling the flow of liquid and air to and from said chamber; said passage means including a chamber filling passage for admitting liquid from the tank to the chamber in a lowered position of said valve member, and a passage for venting air from said chamber in said lowered position of said valve member with said chamber otherwise closed; and lift means carried by said valve member to provide for upward movement thereof in response to engagement of a container with said lift means, whereby to move said valve member to container filling position.

3. In a valve for filling containers with liquid from a tank, a measuring chamber, means for varying the capacity of said chamber, a valve member movable relative to said chamber having passage means for controlling the flow of liquid and air to and from said chamber; said passage means including a chamber filling passage for admitting liquid from the tank to the chamber in a lowered position of said valve member, and a passage for venting air from said chamber in said lowered position of said valve member with said chamber otherwise closed; and lift means carried by said valve member to provide for upward movement thereof in response to engagement of a container with said lift means, whereby to move said valve member to container filling position.

4. In a valve for filling containers with liquid from a tank, a measuring chamber, means for varying the capacity of said chamber, and a valve member movable relative to said chamber having passage means for controlling the flow of liquid and air to and from said chamber; said passage means including a chamber filling passage for admitting liquid from the tank to the chamber in a lowered position of said valve member, a chamber vent passage for venting air from said chamber in said lowered position of said valve member, a container filling passage for flow of liquid from the chamber to a container in a raised position of said valve member, and a container vent passage for flow of air from a container into the chamber in said raised position of the valve member.

5. In a valve for filling containers with liquid from a tank, a measuring chamber having an apertured bottom wall, a sleeve extending into said chamber from the upper end thereof and having its lower end spaced from said bottom wall, and a valve member slidably received in said sleeve and in said aperture and having passage means cooperating with said sleeve and said chamber to form the sole means for controlling the flow of air and liquid in and out of said chamber, said passage means including a container vent passage for flow of air from a container to said chamber during the filling of the container.

6. In a valve for filling containers with liquid from a tank, a measuring chamber having an apertured bottom wall, a sleeve extending into said chamber from the upper end thereof, a valve member slidably received in said sleeve and said aperture, said valve member having passage means operative in a lowered position of said valve member to introduce liquid into the bottom of said chamber and to vent air from the top of said chamber, and operative in a raised position of said valve member to control flow of liquid therefrom and flow of air thereto, and lift means carried by said valve member to provide for upward movement thereof in response to engagement of a container with said lift means, whereby to move said valve member to container filling position.

7. In a valve for filling containers with liquid from a tank, a measuring chamber having an apertured bottom wall, a sleeve extending into said chamber from the upper end thereof, and a valve member slidably received in said sleeve and said aperture, said valve member having a set of passage means operative in a lowered position of said valve member to introduce liquid into the bottom of said chamber and to vent air from the top of said chamber, and having another set of passage means operative in a raised position of said valve member to conduct liquid from said chamber to a container and to vent air from said container to the top of said chamber.

8. In a valve for filling containers with liquid from a tank, a measuring chamber, and a valve member movable relative to said chamber having passage means for controlling the flow of liquid and air to and from said chamber; said passage means including a chamber filling passage in communication with the tank and opening into the bottom of said chamber in a lowered position of said valve member, a container filling passage for flow of liquid from the chamber to a container in a raised position of said valve member and a container vent passage for flow of air from a container into the top of the chamber in said raised position of the valve member.

9. In a valve for filling containers with liquid

from a tank, a measuring chamber having an apertured bottom wall, a sleeve extending into said chamber from the upper end thereof and spaced from said bottom wall, a valve member slidably received in said sleeve and in said aperture, said valve member in a lowered position thereof closing said aperture and establishing communication from the tank through said sleeve to said chamber, and in a raised position thereof closing said sleeve and establishing two paths of communication from said chamber through said valve member to a container, one of said paths providing for flow of liquid from said chamber to the container and the other of the paths providing for flow of air from the container to the chamber, and lift means carried by said valve member to provide for upward movement thereof in response to engagement of a container with said lift means, whereby to move said valve member to container filling position.

10. In a valve for filling containers with liquid from a tank, a measuring chamber having an apertured bottom wall, a sleeve extending into said chamber from the upper end thereof and spaced from said bottom wall, a valve member slidably received in said sleeve and in said aperture and having a shoulder seating on said bottom wall in a lowered position of said valve member, said valve member in a lowered position thereof closing said aperture and establishing communication from the tank through said sleeve to said chamber, and in a raised position thereof closing said sleeve and establishing two paths of communication from said chamber through said valve member to a container, one of said paths providing for flow of liquid from said chamber to the container and the other of the paths providing for flow of air from the container to the chamber, and lift means carried by said valve member to provide for upward movement thereof in response to engagement of a container with said lift means, whereby to move said valve member to container filling position.

11. In a filling valve, a measuring chamber, and a valve member movable relative to said chamber to control dispensing of liquid therefrom, said valve member in the dispensing position thereof providing separate passages for flow of liquid from said chamber to a container and flow of air from the container to said chamber with said chamber otherwise closed, and means for connecting the upper end of said air-flow passage with the atmosphere in the non-dispensing position of said valve member.

12. A filling valve comprising a cylindrical shell providing a liquid chamber and having a sleeve extension formed in the bottom wall thereof, a valve sleeve mounted in the other end of said shell extending into said chamber in axial alignment with said sleeve extension, a valve slide mounted for movement in said valve sleeve and said sleeve extension, and having a shoulder seating on said bottom wall, the lower end portion of said slide cooperating with said sleeve extension having a reduced diameter forming a shoulder at the upper end thereof, an actuating sleeve slidably mounted on said valve slide end and within said sleeve extension, and an end plate mounted at the extremity of said slide end portion, and forming a seat for said actuating sleeve spaced from said end portion shoulder a greater distance than the length of said actuating sleeve to provide a lost motion connection between said valve slide and said actuating sleeve.

13. A filling valve comprising a cylindrical shell providing a liquid chamber and having a sleeve extension formed in the bottom wall thereof, a valve slide extending through said shell and mounted for movement in said sleeve extension, and having a shoulder seating on said bottom wall, said valve slide including means for controlling the flow of liquid to and from said chamber, the lower end portion of said slide cooperating with said sleeve extension having a reduced diameter forming a shoulder at the upper end thereof, an actuating sleeve slidably mounted on said valve slide end and within said sleeve extension, and an end plate mounted at the extremity of said slide end portion and forming a seat for said actuating sleeve spaced from said end portion shoulder a greater distance than the length of said actuating sleeve to provide a lost motion connection between said valve slide and said actuating sleeve..

14. In a valve for filling containers with liquid from a tank, a measuring chamber, and a valve member slidably passing entirely through said measuring chamber and having isolated ports for controlling the passage of liquid and air into and from said chamber in response to reciprocation of said valve member by an associated container, one of said ports providing for venting of air from a container into said measuring chamber during the filling of the container.

15. In a valve for filling containers with liquid from a tank, a measuring chamber, and a valve member mounted for sliding movement in said chamber and extending therethrough, said valve member having separate passages for the flow of liquid and air into said chamber and other separate passages for the flow of liquid and air from said chamber, one of said ports providing for venting of air from a container into said measuring chamber during the filling of the container.

16. In a valve for filling containers by a gravity flow of liquid from an open tank, a measuring chamber having an apertured bottom wall, a sleeve extending into said chamber from the upper end thereof, a valve member slidably received in said sleeve and in said aperture and cooperating with said sleeve and said chamber to control the flow of air and liquid in and out of said chamber, said valve member including passage means communicating with said chamber and the atmosphere in the chamber filling position of said valve member, and lift means carried by said valve member to provide for upward movement thereof in response to engagement of a container with said lift means, whereby to move said valve member to container filling position.

17. In a valve for filling containers with liquid from a tank, a cylindrical shell providing a measuring chamber and having an opening in the bottom wall thereof, a valve slide extending through said shell and said opening for sliding movement relative thereto, said valve slide including means for controlling the flow of liquid to and from said chamber, a shoulder on said valve slide for engagement with said bottom wall, an actuating sleeve slidably mounted on the lower end of said valve slide, and a pair of opposed seats on said valve slide for cooperation with the respective ends of said actuating sleeve, said seats being spaced apart to provide a lost motion connection between said sleeve and said slide.

18. In a valve for filling containers with liquid from a tank by a gravity flow of liquid in response to engagement of the container with the valve, a measuring chamber, a valve member slidably passing entirely through said measuring

chamber and having isolated ports for controlling the passage of liquid and air into and from said chamber in response to reciprocation of said valve member by an associated container, and a ring mounted on said valve member for engagement with a container during the filling operation.

19. In a valve for filling containers with liquid from a tank, a shell providing a measuring chamber and having an opening in the bottom wall thereof, a valve slide extending through said shell and said opening for sliding movement relative thereto, said valve slide including means for controlling the flow of liquid from said chamber, means limiting the downward movement of said valve slide, and actuating means slidably mounted on and having a lost motion connection with said slide adjacent the lower end thereof.

20. In a valve for filling containers with liquid from a tank, a shell providing a measuring chamber and having an opening in the bottom wall thereof, a valve slide extending through said shell and said opening for sliding movement relative thereto, means limiting the downward movement of said valve slide, passage means in said valve slide for flow of liquid from said measuring chamber into a container, said passage means discharging from the side wall of said slide, and an actuating sleeve slidably engaged with and having a lost motion connection with said slide to control opening and closing of the lower end of said passage means.

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