

Sept. 18, 1934.

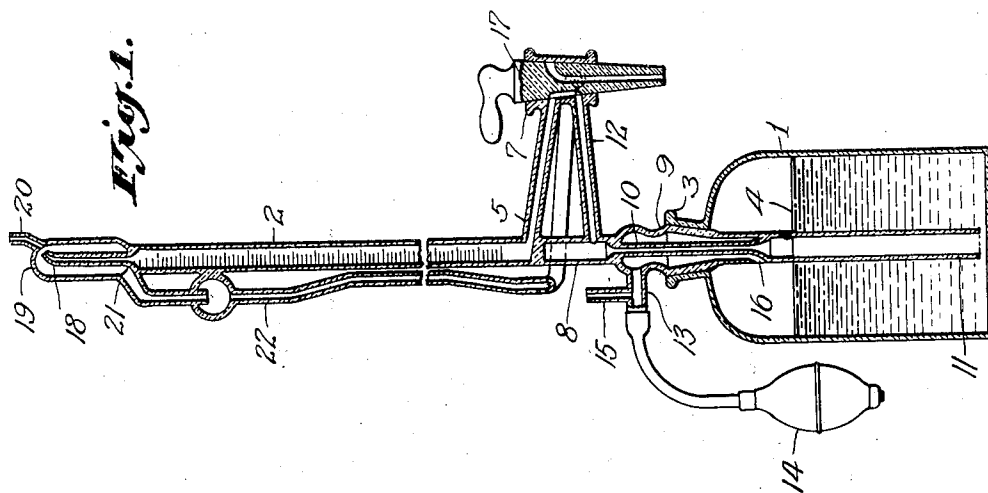
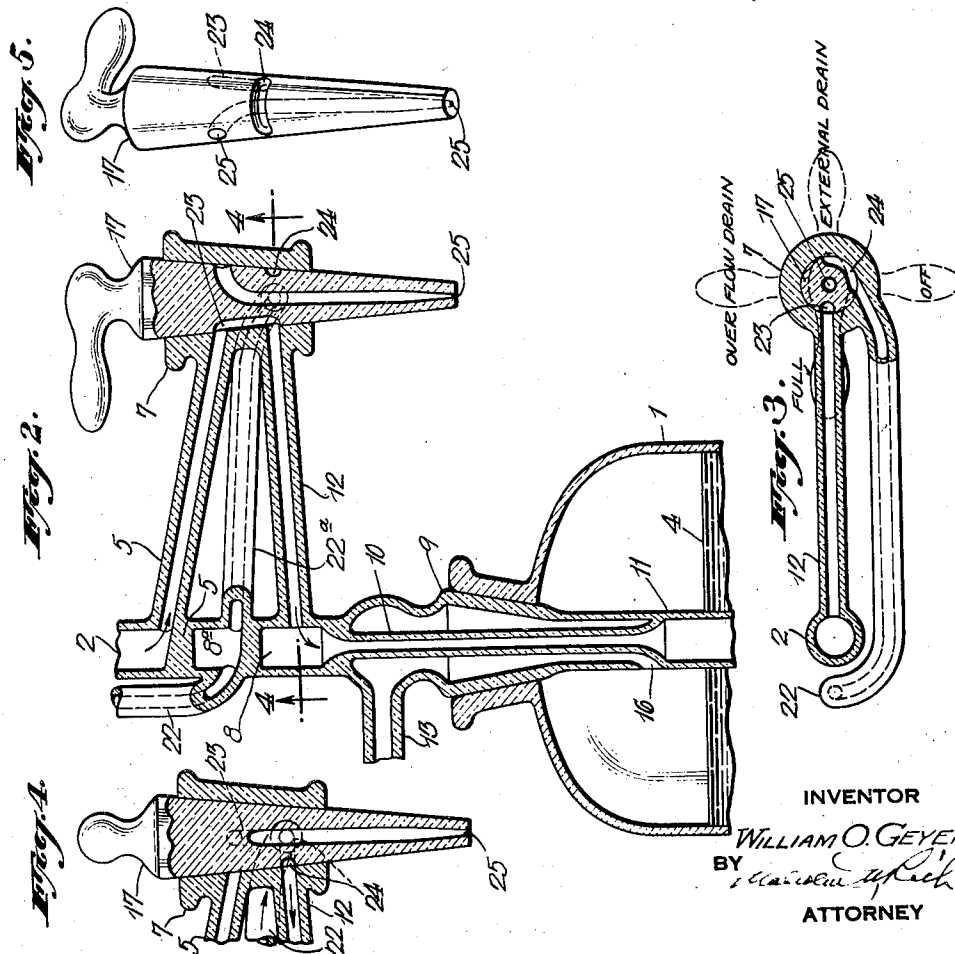
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CHEMICAL LABORATORY APPARATUS

Filed July 13, 1933

2 Sheets-Sheet 1



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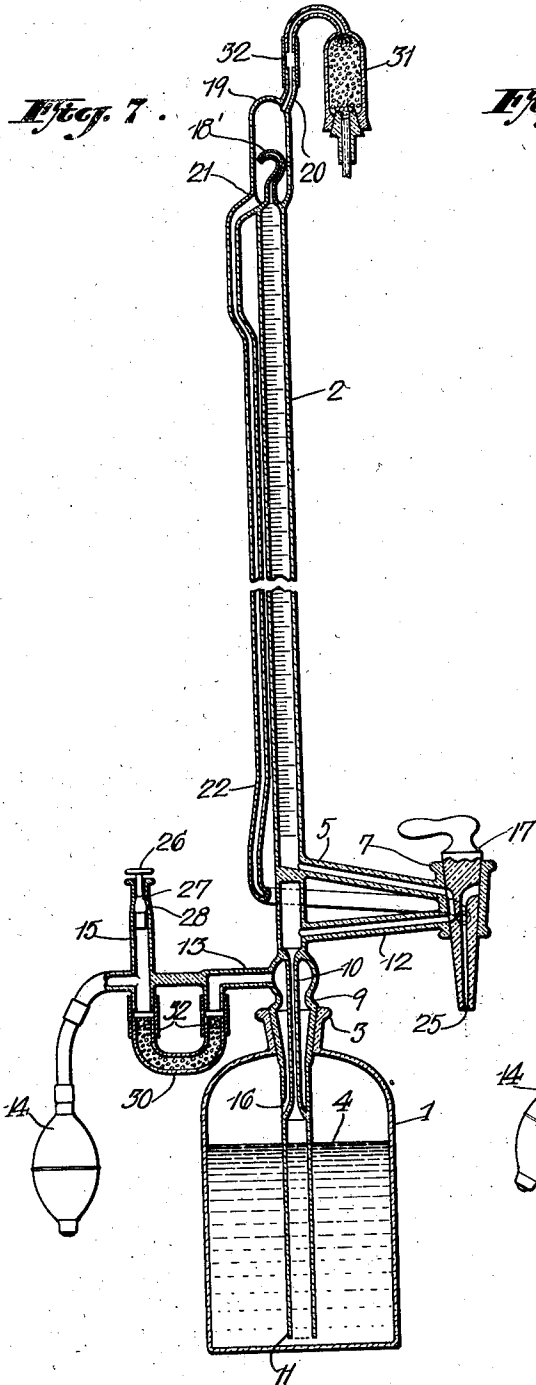
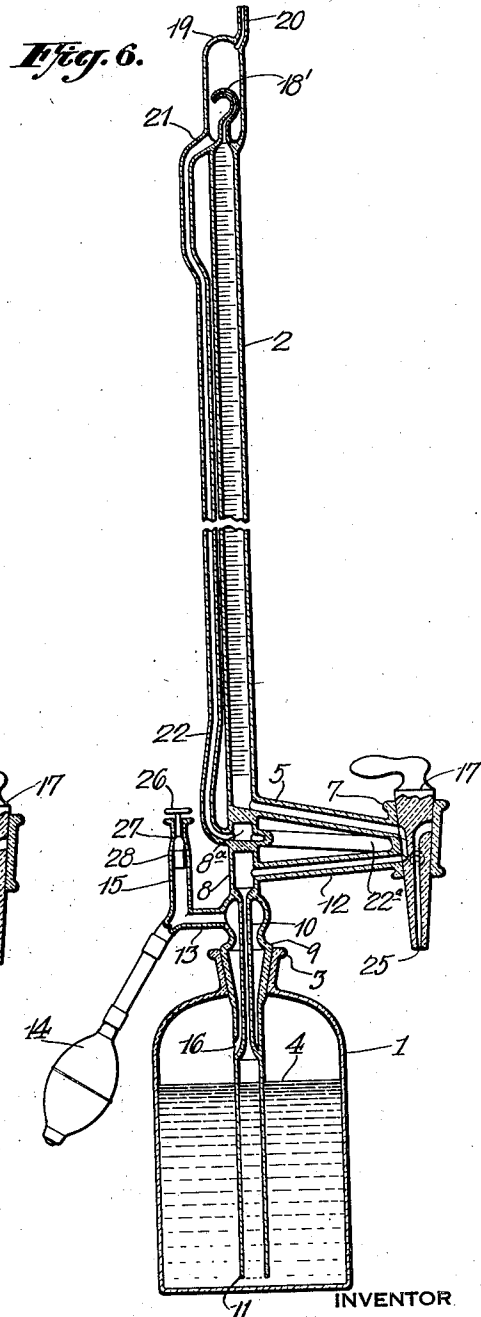
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CHEMICAL LABORATORY APPARATUS

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2 Sheets-Sheet 2



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CHEMICAL LABORATORY APPARATUS

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Application July 13, 1933, Serial No. 680,196

9 Claims. (Cl. 23—259)

This invention relates to chemical apparatus and more particularly to chemical apparatus of the type known in the art as burettes. Still more particularly the present invention relates to burettes known in the art as self or pressure filling burettes.

One of the objects of the present invention is to provide an improved self or pressure filling burette.

Another object of the present invention is to provide a self or pressure filling burette in which all the operations of filling and draining the burette, and the return of overflow from the burette to the fluid source, are controlled through a single stop-cock.

Still another object of the present invention is to provide a novel stop-cock for use in combination with a burette of the self or pressure filling type.

Other objects and advantages will be apparent as the invention is more fully disclosed.

In accordance with the objects of the present invention I have devised a burette of the type defined in which in addition to pressure filling means, liquid leveling means, and means to drain the said burette, I have provided means to return both the liquid overflow from the liquid leveling means and the unused liquid remaining in the burette after the desired or measured portion thereof has been removed therefrom through the draining means to the supply source, all of said means being controlled by the manipulation of a single stop-cock of special and novel design.

Before further disclosing the nature and scope of the present invention reference should be made to the accompanying drawings, wherein

Fig. 1 is a side elevational view in section of one modification of the present invention;

Fig. 2 is an enlarged section of Fig. 8;

Fig. 3 is an enlarged section taken along plane 4—4 of Fig. 2;

Fig. 4 is an enlarged section taken along the same plane as in Fig. 2 with the stop-cock plug in a second position of rotation;

Fig. 5 is a perspective view of the stop-cock plug of the present invention;

Fig. 6 is a side elevational view in section of a modification of the present invention; and

Fig. 7 is a side elevational view in section of another modification of the present invention.

Referring to the drawings the modifications illustrated in Figs. 1, 6 and 7 show the various combinations of elements that may be utilized in comprising the self or pressure filling burette of the present invention. The stop-cock structure

illustrated in Figs. 2 to 5, inclusive, may be utilized in either modification of the self or pressure filling burette of the present invention.

In a burette of the self or pressure filling type it is highly essential that the elements comprising the same be assembled together in a compact unit that may be readily moved about from place to place, and easily taken apart to be cleaned and refilled. Moreover the liquid utilized therein must be stored in a container adapted to be assembled therewith and means must be provided to prevent access thereto of deleterious atmospheric gases and the liquid must also be protected from changes in volume incident to vaporization or absorption of moisture from the atmosphere. In the burette assemblies illustrated in Figs. 1, 6 and 7, I have provided for these features in addition to the means features hereinbefore described.

Referring to the modification illustrated in Fig. 1 the burette assembly therein disclosed is comprised essentially of two separable parts, a bottom container part 1 retaining the supply of liquid to be utilized in the upper or burette part 2, supported by and engaging the said bottom part in a substantially hermetic seal.

The bottom container 1 is preferably comprised of glass and is flat-bottomed and bottle-shaped. The neck opening of the bottle container 1 is provided with a ground and tapered stopped opening 3. Liquid 4 to be used in the burette is contained therein. The container 1 with fluid 4 may be hereinafter identified as the fluid or liquid supply source 1.

The burette assembly of elements 2 is provided with a hollow stopper 9 provided with an outer ground and tapered surface adapting the stopper 9 to be engaged in opening 3 of container 1 to form a hermetic seal therewith.

Extending through the hollow stopper 9 is tube 10 which is spaced from the inner face of the hollow stopper 9 a sufficient distance to provide passageway 16 through the stopper 9 into the top of container 1 above the fluid level of liquid 4. The bottom of tube 9 opens into tube 11 extending downwardly a distance adapted to bring the end thereof adjacent the bottom of container 1. The top of tube 9 is sealed through hollow stopper 9 and opens into tube 8. The top of tube 8 is sealed to the bottom of graduated tube 2 with a hermetic joint therebetween. The entire burette assembly of the present invention thereby is carried by stopper 9 engaging in stopper opening 3 of container 1.

To provide for the self or pressure filling of the graduated tube 2, I connect the bottom of the

graduated tube 2 to tube 8 through a stop-cock comprising barrel 7 and plug 17 by means of conduit tubes 5 and 12 extending horizontally from the bottom of said tube 2 and from adjacent the bottom of tube 8, which conduit tubes are sealed to the barrel 7 and opening therethrough to the inner tapered seat thereof in spaced relationship in the same vertical plane longitudinal of the barrel 7. Preferably conduit 5 opens into the bottom of tube 2 in substantially the manner shown and is pitched at a slight angle from the horizontal to obtain complete and ready drainage of the tube 2. Stopper 17 is provided with a longitudinally extending groove 23 as will be more fully herein-
after described adapted to bridge the spacing between the openings of tubes 5 and 12 through barrel 7. The interior of hollow stopper 9 is provided with a tube 13 opening therethrough to the atmosphere, on the end of which tube is attached the pressure applying means comprising compressible bulb 14. On tube 13 I provide a pressure release means which comprises a capillary tube 15 opening from the atmosphere to the interior of tube 13, which may be closed, as by the application thereto of a finger tip while pressure is applied by means 14 and opened by the removal of the finger tip when it is desired to release the pressure.

Upon the application of pressure from means 14 through tube 13, hollow stopper 9, passageway 16 into container 1, upon the liquid level of fluid 4, fluid 4 will be forced upward in tube 11, through tube 10 into tube 8 and thence through conduit 12 through grooved opening 23 into conduit 5 and into graduated tube 2, thereby filling the tube 2.

At the top of tube 2, I provide means to automatically adjust the liquid level in the burette, the said means comprising a capillary tip 18 which tip is sealed to the top of graduated tube 2 or is formed from the top thereof and is enclosed by a chamber 19 which is provided with an air outlet opening 20 and a fluid over-flow drainage opening 21.

It is exceedingly difficult to so control the pressure from source 14 that the fluid forced from container 1 into graduated tube 2 will precisely fill the same. It is therefore necessary to provide chamber 19 and drainage opening 21 with such a capacity as will normally take care of ordinary excesses of such fluid. Heretofore in the art it has been customary to permit the excess or over-flow fluid from chamber 19 to drain from opening 21 into a waste bottle from which it is discarded. In accordance with one of the objects of the present invention I provide means to return this over-flow fluid to the container 1, which means comprises a return conduit 22 which is carried back to and opens into stop-cock barrel 7. I then provide stop-cock plug 17 with a suitable passageway groove 24 which upon proper manipulation of the plug 17 bridges the spaced openings between conduit tubes 22 and 12, thereby permitting the flow of the over-flow liquid by gravity into tube 8 and thence through tubes 10 and 11 back into the container 1.

Preferably, I seal the over-flow conduit tube 22 through barrel 3 in such a position as to position the opening thereof in the interior seat of barrel 7 in the same horizontal plane as the opening of conduit 12 but at a substantial diametric right angle thereto. Groove 24 therefore lies in a horizontal plane at right angles to groove 23 and extends from the bottom of groove 23.

The means to drain liquid from graduated tube

2 into an exteriorly positioned container (not shown) substantially comprises an axial passageway 25 in stop-cock plug 17 extending from the bottom of the plug 17 upwardly therethrough to a point adjacent the top of groove 23 and from thence curving outwardly to the plug surface and opening therethrough diametrically opposite to the top of said groove 23 and in a horizontal plane adapting it to coincide with the opening of conduit 5 on the inner tapered face of barrel 7. When the plug 17 is rotated to bring this upper opening of axial passage 25 to coincide with the opening of conduit 5 on the inner tapered face of barrel 7, the liquid in graduated tube 2 flows by gravity therethrough into a container positioned under the lower opening of the passageway 25. Preferably the lower opening of axial passageway 25 is made capillary or restricted in size to provide for the more accurate control over the drainage of measured volumes of fluid from the graduated tube 2.

Referring to Figs. 3 to 6 inclusive, the specific four-way stop-cock design of the present invention may be noted. The periphery of the plug 17 is substantially divided into quadrants, in the center of one quadrant is positioned groove 23 which is utilized in the dual capacity of pressure filling and gravity drainage of graduated tube 2. In the next succeeding quadrant (which may be to either left or right but preferably to the right) is positioned groove 24. In the third quadrant is positioned the upper opening of axial passageway 25; and the fourth quadrant is blank to provide for a shut-off position.

Fig. 3 illustrates the position of stop-cock plug 17 in the first quadrant. Fig. 5 illustrates the position of stop-cock plug 17 in the second position. Fig. 4 is a top plan view partly in section illustrating the successive positions of plug 17 to perform the desired functions. Fig. 6 is a perspective view illustrating the relative positioning of grooves 23 and 24 and passageway 25 in plug 17.

In the modification shown in Fig. 1 the pressure control means is illustrated as a vertically extending tube 15 open to the atmosphere, over which when pressure from means 14 is desired the operator or manipulator of the device may press a finger tip during the application of pressure from means 14. Upon a removal of the finger tip the pressure is released. On Figs. 6 and 7, I have shown as a modification the adaptation of a pressure valve 26 which has a conical shaped shoulder 27 which seats in conical tapered opening 28 when pressure is applied by means 14. To release the pressure the operator or manipulator presses top 26 of the valve downwardly breaking the seal between shoulder 27 and opening 28. This valve is carried in place of or by tube 15 of Fig. 1.

In the modification illustrated in Fig. 6, the combination of elements heretofore described with respect to Fig. 1 plus the automatic valve 26 and a modified fluid leveling means 18' is made hook-shaped as shown with the hook end pointed towards tube drainage opening 21 to prevent, when undue pressure is applied on fluid 4, the inadvertent discharge of fluid 4 through vent opening 20. As an alternative arrangement I have shown conduit 22 sealed into chamber 8a which is formed by partitioning tube 8 from which chamber 8a conduit 22a, which is substantially a continuation of conduit 22, opens to stop-cock barrel 7 in identically the same manner and position as has heretofore been described, with respect to conduit 22 in Fig. 1. This arrangement

is preferred to that illustrated in Fig. 1 for rigidity of structure.

In the modification illustrated in Fig. 7 the combination of elements of the structure of Fig. 6 is shown in combination with means to prevent contacting of fluid 4 with deleterious atmospheric gases. This means substantially comprises a U-tube 30 filled with soda-lime or other solid absorption materials through which air under pressure from means 14 must pass before entering container 1. It is preferable to position the pressure release valve 26 ahead of tube 30 substantially as indicated as the maximum pressure will be present at this point. Vent opening 20 also is provided with a tube 31 filled with similar absorption material as tube 30 through which air expelled through or drawn into vent opening 20 must pass. Tubes 30 and 31 are most conveniently attached to tubes 13 and vent opening 20 substantially as in the manner indicated by means of rubber tubing connections 32.

From the above description and drawings it is apparent that the burette structure and the specific stop-cock structure is adapted to modification without departing from the nature and scope thereof, and that various combinations of elements may be utilized in comprising the same. All such modifications and adaptations thereof are contemplated however as may fall within the scope of the following claims.

What is claimed is:

1. A pressure filling burette including in combination, a container for fluid to be used in said burette, said container being provided with means to apply pressure upon the surface of fluid in said container, a vertically supported graduated tube, a four-way stop-cock, and conduit means connecting said container, tube and stop-cock to provide means to conduct fluid under pressure from the container through the said stop-cock into said tube, means to return fluid overflowing from said tube through the said stop-cock back to the said container, means to drain fluid from the said tube into an outside container, means to drain fluid from the said tube back to the said container and means rendering inoperative each of these said means.

2. A pressure filling burette including in combination a container for fluid to be used in said burette, said container being provided with means to apply pressure upon the surface of said fluid, a graduated tube, means to vertically support said tube above said container, a four-way stop-cock and conduit means connecting the said container, tube and stop-cock into a unit structure and providing means to conduct fluid under pressure from the container through the said stop-cock into said tube, means to return fluid overflowing from said tube through the said stop-cock back to the said container, means to drain fluid from the said tube into an outside container, means to drain fluid from the said tube back to the said container and means rendering inoperative each of these said means.

3. A pressure filling burette including in combination a container for fluid to be used in said burette, said container being provided with a stopper opening in the top thereof, a stopper for said opening, a conduit sealed through said stopper and extending to adjacent the bottom of said container, an opening through said stopper into the top of said container, means to apply pressure through said opening upon the surface of fluid in said container, a graduated burette tube, the top of said tube being enclosed and provided

with automatic liquid leveling means and an overflow conduit means and the bottom of said tube being sealed to the top of said stopper and conduit sealed therethrough, a four-way stop-cock and conduit means connecting the said stop-cock to the said container and tube to provide means to conduct fluid under pressure from the container through the said stop-cock into said tube, means to return fluid overflowing from said tube through the said stop-cock back to the said container, means to drain fluid from the said tube into an outside container, means to drain fluid from the said tube back to the said container and means rendering inoperative each of these said means.

4. A pressure filling burette including in combination, a fluid container, a tapered opening in said container, a stopper sealing said opening, a conduit sealed through said stopper and extending to adjacent the bottom of said container, a graduated tube sealed at its bottom to the top of said conduit and stopper and supported vertically thereby above said container, means to apply pressure on the surface of fluid in said container and a four-way stop-cock provided with means to pass fluid forced by said pressure from the container into said conduit into said tube, means to return fluid overflowing from the top of said tube back to the container, means to drain off fluid from the said tube into an outside container and means to close off each of the other three means.

5. A burette assembly of the pressure filling type including in combination a fluid container, having a tapered opening in the top thereof, a hollow stopper adapted to hermetically seal said opening, means to apply pressure through said stopper upon the surface of fluid in said container, a conduit sealed through said stopper and extending downwardly to adjacent the bottom of said container, a graduated tube sealed to the top of said stopper and supported vertically thereby, and a stop-cock provided with means in one position to pass fluid under pressure from said container in said conduit into the said graduated tube, means in a second position to return fluid overflowing from the top of said tube to the said container, means in a third position to drain fluid from the said tube into an outside container and means in a fourth position to close off each of the other three means.

6. In a pressure filling burette, in combination, a closed container for fluid, means to apply pressure upon the surface of fluid in said container, conduit means to conduct fluid under pressure from said container, a graduated tube, means to vertically support said tube by and upon said conduit means, and a single stop-cock means with associated conduits to control the flow of fluid into said tube from said container, to control the return of fluid from the tube back to the container, to control the draining of fluid from the said tube into an outside container and to return overflow fluid from the top of the tube back to the said container.

7. A four-way stop-cock comprising a barrel and a tapered plug member seated therein, said barrel being provided with a pair of conduits sealed therethrough in spaced relationship longitudinally of said barrel in one quadrant of plug rotation and a single conduit sealed therethrough in a next adjacent quadrant in substantial alignment with the lower of said pair of conduits, and said plug member being provided in one quadrant of rotation with a surface groove in a position

to bridge the said pair of conduits and with a second groove in a next adjacent quadrant adapted to bridge the said single conduit with the lower of said pair of conduits, and with a longitudinal bore extending axially from the bottom of said plug member towards the top thereof and angularly bent to the plug surface to an opening in a third quadrant of rotation in a position to communicate with the upper of said pair of conduits.

8. In a stop-cock, a rotatable plug member having a longitudinal groove disposed in the surface thereof in one quadrant of rotation thereof, a second groove disposed in the surface thereof in a next adjacent quadrant said second groove being angularly disposed with respect to the said first groove and terminating at one end adjacent the bottom of said first groove, and a longitudinal bore extending axially from the bottom of said plug member towards the top thereof and angularly bending to an opening in the surface of said plug member in a third quadrant, said opening being approximately in cross-sectional alignment with the top of said first groove.

9. In combination, a bottle container, a hollow stopper hermetically sealing said container, a tube sealed through said stopper to adjacent the bottom of said container, a passageway opening through said stopper into the top of said container, means to apply air pressure through said passageway, a graduated tube vertically supported on said tube and stopper, automatic liquid leveling means closing the top of said graduated tube, a chamber enclosing the top of said tube and said liquid leveling means, a fluid draining opening in said chamber, an air venting opening in said chamber, a four-way stop-cock, the barrel of said stop-cock having a pair of longitudinally spaced tubes sealed therethrough in one quadrant of rotation of the stop-cock plug therein, said tubes being sealed to and opening into the tube sealed through the said hollow stopper and the bottom of the said graduated tube respectively, and a single tube sealed through said barrel in a next adjacent quadrant of rotation, said single tube extending to and opening into the fluid drain opening of said chamber enclosing the top of said graduated tube, the stop-cock plug having a longitudinal groove in the surface thereof adapted to bridge the openings of said pair of conduits in the said barrel and a second groove angularly disposed to said first groove and communicating adjacent the bottom end thereof adapted to bridge the opening of the lower of said pair of tubes with the opening of said single tube, and an axial bore passageway opening from the bottom of said plug and extending towards the top thereof and angularly bending to an opening in the plug surface diametrically opposite the top of said longitudinal groove in a position adapted to coincide with the opening of the upper of said pair of tubes upon the rotation of the said plug.

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