April 8, 1958 C. D. MATTESON 2,829,645

HYDRAULIC DENTAL SYRINGE

Filed March 21, 1955 3 Sheets-Sheet 1

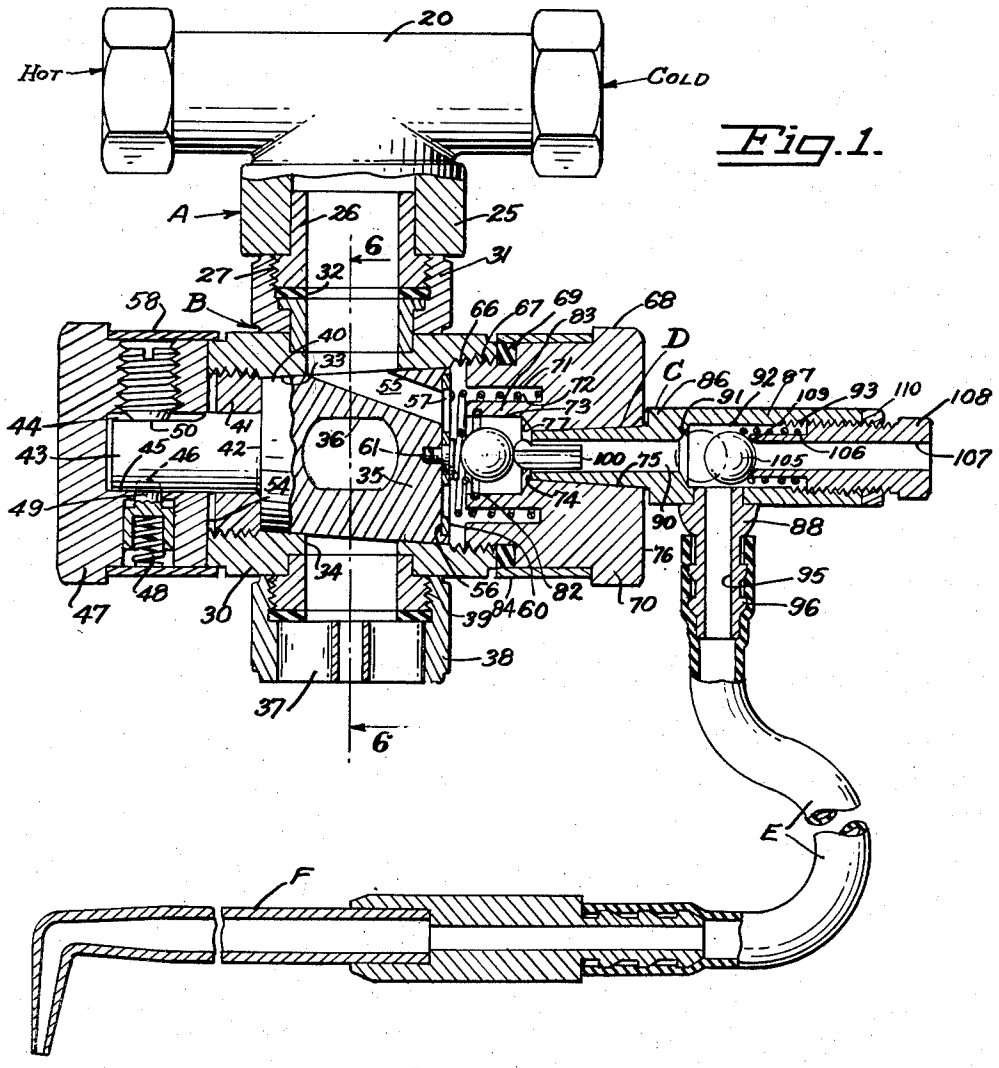

Fig. 1.

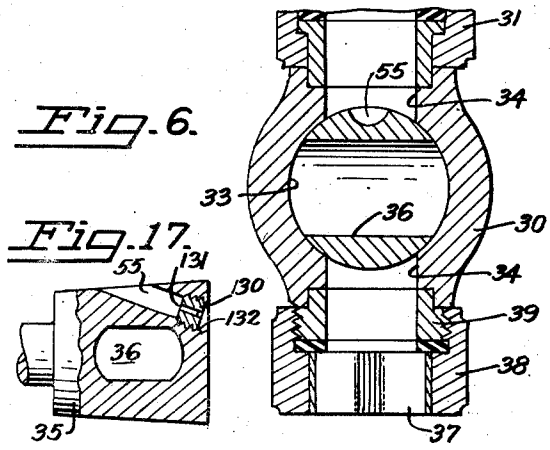

Fig. 6.

Fig. 17.

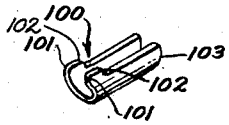

Fig. 11

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HYDRAULIC DENTAL SYRINGE

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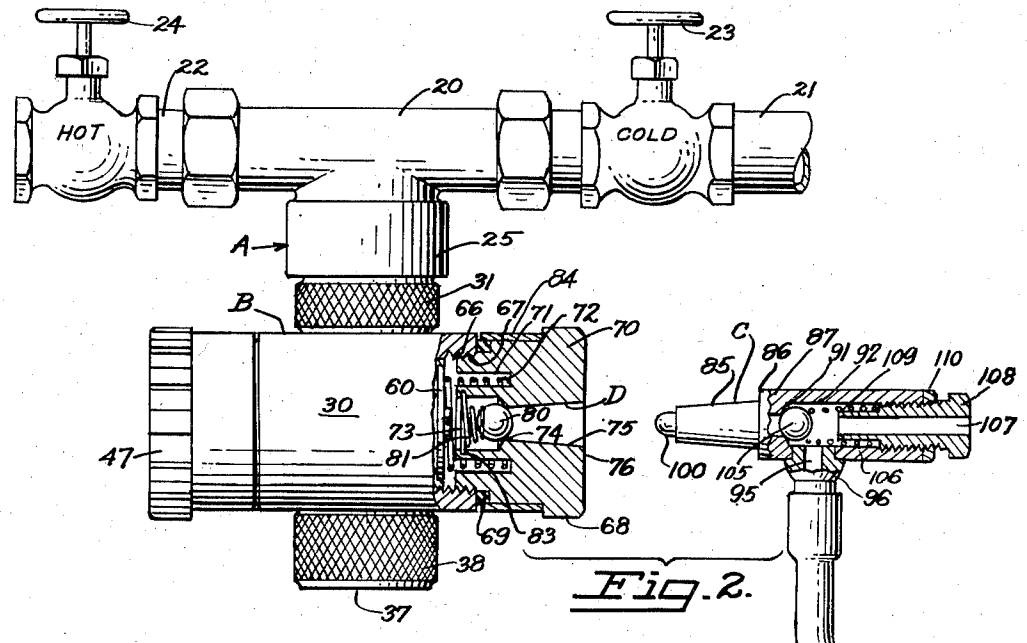

Fig. 2.

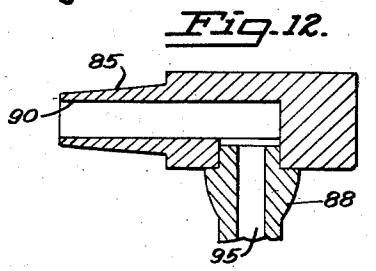

Fig. 12.

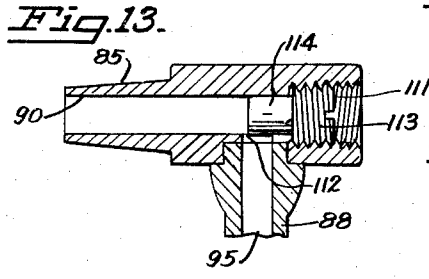

Fig. 13.

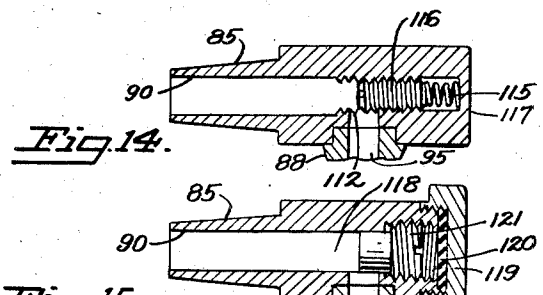

Fig. 14.

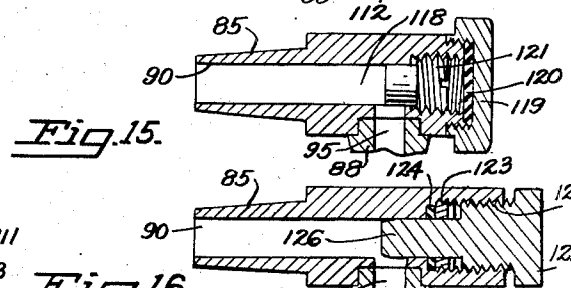

Fig. 15.

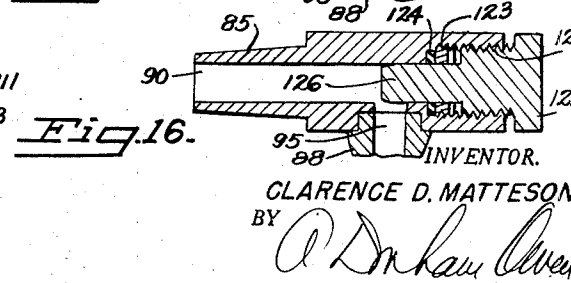

Fig. 16.

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Fig. 3.

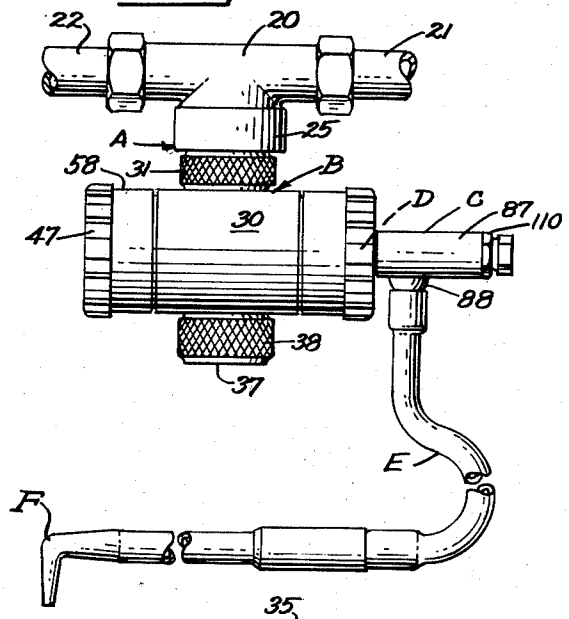


Fig. 7.

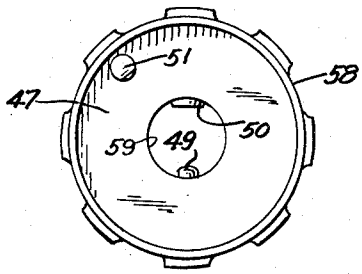


Fig. 8.

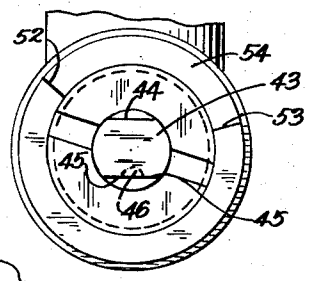


Fig. 9.

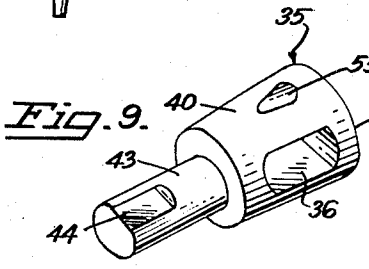


Fig 10

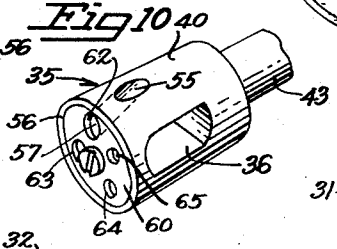
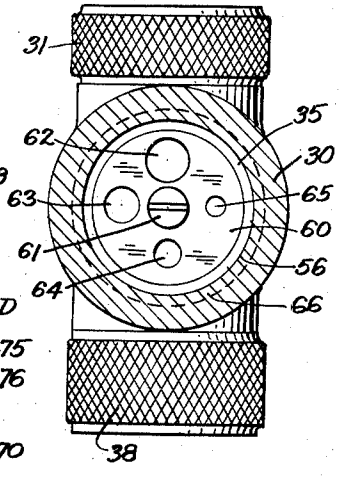


Fig. 5.



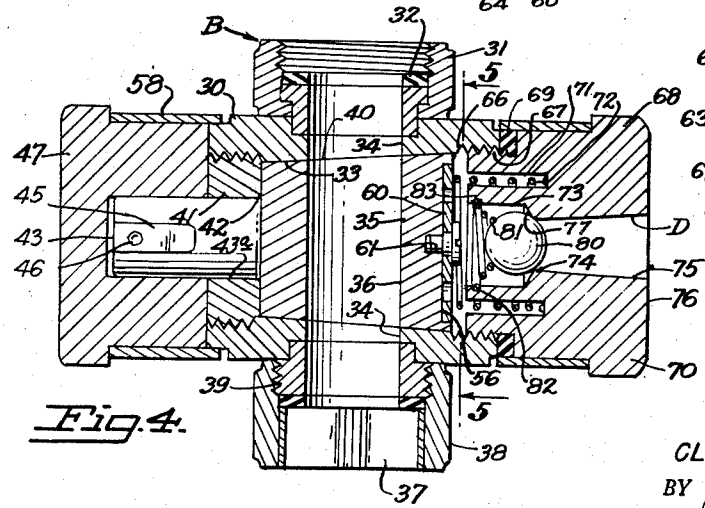


Fig. 4.

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United States Patent Office 2,829,645 Patented Apr. 8, 1958

2,829,645

HYDRAULIC DENTAL SYRINGE

Clarence D. Matteson, Fort Collins, Colo.

Application March 21, 1955, Serial No. 495,675

20 Claims. (Cl. 128—229)

This invention relates to an improved hydraulic dental syringe particularly well adapted for use by patients.

Since food left under the gum and around the teeth is now believed to be the principal cause of pyorrhea and a requisite for the incidence of tooth decay, some dentists have advocated the use of a syringe after meals for the removal of residual food. The hand syringe heretofore in use consists of a rubber bulb fitted with a metal tip having an orifice of a diameter of one and a half millimeters (.0591) inch or even larger. It is operated by squeezing the air from the bulb and placing the tip in water. The pressure on the bulb is then released, and the bulb is allowed to fill with water. The tip is then placed in the mouth and the bulb emptied under hand pressure, while at the same time the column of water is directed along and under the gum. However, it requires approximately eight bulbs full of water to reasonably cleanse a full complement of teeth. The operation takes about two minutes to perform if the operator has a rubber bulb of the right consistency, can produce eight pounds of pressure, and at the same time can accurately direct the water column. Of this time, approximately twenty-four seconds are required for the actual syringing, with the remainder of the two minutes being consumed by filling and re-filling the bulb. The demand for power, dexterity and time is more or less uniform. The ability of a patient to meet these demands is highly variable and uncertain. Few patients possess the power, dexterity and patience to follow this exacting and irksome regimen.

My invention is designed to render the cleansing of the teeth and gums after meals a delightful necessity by making it possible for people of every age to effectively remove the residual food with a minimum of time, effort and skill. This invention provides a reliable aid in the maintenance of a constantly clean mouth and thus supplies a positive curb to dental diseases due to filth, namely, pyorrhea, decay and trench mouth.

This desideratum is made possible by using a syringe tip with an orifice having a diameter of .045 of an inch and a water pressure at the tip as high as fifty pounds per square inch. The pressure is controlled by a special valve and complex. A full complement of teeth can be thus thoroughly cleansed in ten seconds of syringing by the application of these devices and using only forty-five pounds of pressure at the tip. This feat can be accomplished even though deep pyorrhea pockets are present. No discomfort is caused by these high pressures where the gum is normal or has been previously freed of mechanical irritants such as tarter, rough crowns, overhanging fillings, etc. The gum tissue of the novice may not comfortably tolerate the pressure necessary for a thorough cleansing. Children may enjoy greater pressures as they grow older. Tender spots around the gum may require instant reduction in the pressure. The pressure in water systems in tall buildings, in different parts of communities and in different cities may vary considerably. This invention meets all of these requirements for pressure regulation by means incorporated in the special valve and coupling for this purpose.

Three problems must be met where equipment is to be used by a group such as a family, etc. One problem concerns sanitation; another has to do with time; while a third is concerned with the possibility of right and left-handed persons having to use the devices. The first two of these problems are taken care of admirably by the easily attached and detached coupler-tip unit of a design that also solves the sanitary problem. Each person will have his own unit. Right and left-handed individuals my instantly rotate the valve to a position for comfortable operation.

The average lavatory or sink affords little room for equipment other than the faucet. Length and bulk have therefore been considered in the designing of the devices to meet this problem. Size has been kept at a minimum consonant with the needs for a necessary minimum flow of water to the male coupler and for a maximum flow to the basin or sink for ordinary needs. Anticipating the possibility of its use while traveling, the device has been kept purposely small for convenient transport and has been designed for easy and rapid installation.

Syringes are most beneficial when they can be used immediately after each meal, and the best results and the fastest and easiest operation are therefore obtained from a demountable syringe that can be attached to a universal type of fitting on a water faucet. Consequently one of the main problems has been to provide a coupling which is sufficiently simple to connect and disconnect. If this problem could be solved and a universal connection made standard, and public installations provided, everybody could carry a syringe with him and use it after each meal; hence, the solution of this problem is one object of the present invention.

Even before the necessary faucet connections have become universal, it is obviously desirable that each member of a family have his own dental syringe which nobody else uses, and since this means that no syringe can be permanently connected to the faucet, it has been a problem to provide an easily attachable and easily detachable type of coupling that will encourage rather than discourage a frequent use of the syringe. The provision of such a coupling is another object of the invention.

Another problem that has heretofore prevented the wide use of hydraulic dental syringes, stems from the fact that different people require a different water pressure in the stream that issues from the syringe, high pressures being undesirable for small children and for adult beginners and those who have abnormal gum conditions. It is therefore another object of this invention to provide an easily operable, foolproof pressure regulating means in the devices.

As stated before, important sanitary problems must also be met, if wide use of dental syrings is to be achieved. Both the syringe itself and the tube connecting it to the faucet must be easy to keep clean and the faucet itself must not be contaminated by any flow draining back into it from the syringe after use. The present invention includes among its objects the solution to this sanitation problem.

Another problem solved by this invention concerns the provision of automatic stop valves and drainage valves that prevent water from accidentally drenching the user or flowing in the wrong direction. A feature of these valves is their relatively simple construction and foolproof operation.

The present invention has solved these problms and achieved its objects by providing a hydraulic dental syringe having a frictional valve-coupler combination where attachment and detachment are accomplished merely by pushing the coupler elements together by a rotary thrust

motion or taking them apart by a rotary pull motion, without any latch or latch-release mechanisms. The coupler combination comprises mated conical surfaces which require no catches, threads, or other members to insure flow without leakage. The pressure of the fluid passing through the syringe is regulated to a large extent by selecting any one of several orifices available in one of the coupler members. The invention also includes ball stop valves and novel means for unseatnig these valves.

Other objects and advantages of the invention will appear from the following description of some preferred embodiments.

In the drawings:

Fig. 1 is a view in elevation and in section of a hydraulic dental syringe embodying the principles of this invention. The syringe nozzle and the tube connecting the syringe to the male coupler have been broken in order to conserve space.

Fig. 2 is a view generally similar to Fig. 1 on a somewhat reduced scale with some parts shown in round instead of in section and with the apparatus shown in its uncoupled position.

Fig. 3 is a view in elevation on a further reduced scale of the coupled assembly shown in Fig. 1 and also showing the relation to the hot water and cold water pipes. Once again the syringe nozzle and connecting tube have been broken in order to conserve space.

Fig. 4 is a view in elevation and in section of the valve element, shown on the same scale as Fig. 1 with the male coupler disconnected and withdrawn and with the valve rotated into the position it normally is kept when the syringe is not being used, so that the faucet can be used for washing one's hands, etc.

Fig. 5 is a view in section taken along the line 5—5 in Fig. 4.

Fig. 6 is a view in section taken along the line 6—6 in Fig. 1.

Fig. 7 is a view in elevation of the valve handle looking at it from the inside, which would be from the right in Figs. 1–4.

Fig. 8 is a view in elevation of the valve body with the handle removed, looking from the left of Figs. 1 to 4.

Fig. 9 is a view in perspective of the moving valve body looking from the handle end, with the handle detached.

Fig. 10 is a view of the valve element of Fig. 9 looking from the opposite direction from the orifice-plate end, and with a portion of the handle mount broken off to conserve space.

Fig. 11 is an enlarged view in perspective of the ball-valve-unseating member of the male coupler.

Figs. 12–16 are views in elevation and in section of modified forms of male coupler elements.

Fig. 17 is a view in elevation and in section of the moving valve body showing a modified form of orifice-controlling means.

The main elements of the hydraulic dental syringe, as shown in Figs. 1 to 3, comprise the faucet A on which the valve B is installed, a male coupler C fitting into a female coupler D at one end of the valve B, and a rubber tube E connecting the male coupler C to a syringe nozzle F.

The faucet A

The faucet A (see Figs. 2 and 3) is preferably of the type having a union 20 into which the hot water and cold water streams flow through pipes 21 and 22 under control of valves operated by handles 23 and 24. The direct, controlled mixture of hot and cold water makes it possible to obtain the optimum water temperature at the syringe F. Some regulation of the water pressure may also be obtained by manipulation of the hot and cold water faucet handles 23, 24, but additional regulation means are provided in the valve B itself. The union 20 terminates in a spout 25, to which is preferably welded or brazed a permanent insert 26 having exterior threads 27 that receive the valve B (see Fig. 1).

The valve B

The valve member B (see Figs. 1–4) is adapted to fit on the faucet A in a leak-tight connection therewith, determines whether the water flows directly down or to the syringe F, and regulates the pressure of water passing to the syringe F. The valve B may be attached to a faucet by any type of device, such as snap-on, etc. As shown in the drawings, the valve B's hollow housing 30 may be provided at its upper end with a threaded collar 31 (either integral with the housing 30 or a separate member secured thereto), which engages the threads 27 of the faucet A and compresses a gasket 32 against the lower end of the insert 26, so as to prevent leaks between the faucet A and valve B at this point.

The interior of the housing 30 provides a crossing for two perpendicular channels therethrough—a horizontal passage 33 and a vertical passage 34. A valve body 35 fits rotatably in the passage 33 and opens and closes the vertical passage 34, according to its rotational position. When the vertical passage 34 is open, water can pass straight through the housing 30, through a diametric passage 36 through the body 35 and the bottom through the normal outlet 37. An anti-splash attachment or shampoo spray attachment 38 may be threaded on a nipple 39 on the housing 30. The outlet 37 is the one through which the water passes when the faucet is being used for washing one's hands and face, filling a drinking glass, and so on, but it is not used when employing the syringe F.

The horizontal passage 33 is tapered to receive and mate with the frusto-conical periphery 40 of the valve body 35. Its smaller-diameter end is partly closed by an adjustable end-thrust bearing 41, threaded into the housing 30, against which abuts a shoulder 42 of the smaller-diameter end of the body 35. The bearing 41 cooperates with the associated parts to offset the hydraulic pressure on the end when the springe is being used. Otherwise the valve would jam in the taper and be very difficult to turn. If the adjustment is accurate there is little or no leakage of water. A flattened shaft-like handle-receiving portion 43 of the valve body 35 projects out through a small-diameter bore 43*a* in the end-thrust bearing 41. One flat face 44 of the portion 43 may be substantially smooth, while the other flat face 45 is preferably provided with a small depression 46. A handle 47 is provided with a spring 48 pressed locking member 49 that fits in the depression 46, the spring 48 being held in by a collar 58. The handle 47 is also provided with an opening 59 having a flat interior face 50 that engages the flat face 44 and having a projecting stop member 51. The stop member 51 is adapted to limit rotation of the handle 47 between two stops 52, 53 at each end of an annular segmental relief 54 (see Fig. 8) on the housing 30, thereby limiting the movement of the valve 35 to approximately 90°. The valve body 35 can thus readily be turned between the fully "on" position (for straight-through movement of the water through its passage 36 to the normal outlet 37) and the fully "off" position for the normal outlet—which is the "on" position for the syringe F.

In addition to the direct diametric passage 36 which is used when the valve is to send water straight down through the normal faucet outlet 37, the valve body 35 is provided with a bore or passage 55 which enters the body 35 at an angle on the frusto-conical periphery 40, at a position approximately midway between the valve ends 42 and 56 and 90° from the passage 36. The passage 55 terminates in an outlet 57 through the larger face 56 of the valve body 35, in a location about midway between the axial center and the periphery of the rotatable body 35. The water to the syringe F passes through this passage 55.

Pressure regulation is provided by an orifice plate **60** which is secured by a screw **61** to the axial center of the valve face **56** and which carries a plurality of different-sized orifices **62**, **63**, **64**, and **65**. The plate **60** can be rotated by a finger nail or orange wood stick without having to loosen the screw **61**. The larger the orifice used, the greater the pressure will be through the syringe F, the largest orifice **62** being about the same diameter as the passage **55**, while the smallest orifice **65** is considerably smaller and therefore greatly reduces the water pressure beyond it. These openings help to make the pressures in the syringe normal where the pressure in the faucet is usually higher than sixty pounds, at it might be in certain communities or buildings. The higher the pressure above 60 pounds the more difficult it is to turn the valve in the housing if that should be desired, and the more snugly the coupler C must be seated in D to keep it in position.

Thus, when the valve body **35** is turned by the handle **47** against the stop **52**, the diametric passage **55** directly connects the faucet A to the outlet **37**, while rotation of the valve **35** through 90°—when the handle stop **51** strikes the stop **53**—will send a full head of water through the angular bore **55** and out through one selected orifice **62**, **63**, **64**, **65** in the orifice plate **60**.

The end member 70 and female coupler D

Adjacent the orifice plate **60** of the valve body **35**, the housing **30** is provided with interior threads **66** adapted to receive and engage exterior threads **67** on an end member **70** that contains the female coupler D. The member **70** has a knurled outer surface **68** that facilitates removal without tools for adjustment of the orifice plate **60**, and for cleaning, greasing, and other servicing of the interior, while a gasket **69**, retained in position by a collar **84**, prevents leaks when the member **70** is threaded in place.

The end member **70** is provided with an annular cylindrical recess **71** in which is seated a helical spring **72** that bears against the orifice plate **60** and urges the valve **35** against the end-thrust bearing **41** so as to prevent leakages of fluid out through the handle side of the valve **35**. Silicone grease may be used to lubricate the valve body **35** in the housing **30**.

The end member **70** also has a central axial recess **73** which leads via an opening **74** into a conical bore **75** which comes in from the outer end **76** of the member **70**. A conical valve seat **77** is provided at the bottom of the recess **73**, which is of larger diameter than the inner end of the conical bore **75**. A ball valve **80** normally closes off the opening **74**, being urged to this position by a very light conical spring **81**, the small end of which engages the ball **80** while the larger end engages an annular recess **82** in the annular wall **83**. Since the spring **81** is very light, only a slight pressure is required to move the ball valve **80** off its seat **77**, but when that pressure is withdrawn, the spring **81**, together with the water pressure, if any water is passing through the passage **55**, act to close the ball valve **80** immediately. Therefore, no water will pass out through the opening **74** except when the ball valve **80** is purposely pushed away from its seat **77**.

The male coupler C

The male coupler member C (see Figs. 1 and 2) has a conical portion **85** that cooperates with the conical passage **75** which acts as the receptacle of the female coupler D. The conical surfaces **85** and **75** conform exactly, and the metal-to-metal frictional contact over the area and the exact mating of the parts serve to hold the male coupler C in place by a light rotary-thrust movement. Removal is just as simple and is done merely by a rotary-pull movement on the male coupler C. Friction between the parts is easily maintained by occasionally washing the coupler C with detergent and then rinsing it.

The body **86** of the male coupler C is provided with a main hollow portion **87** and a side **T** portion **88**. An axial passage **90** leads through the conical coupler portion **85** to the portion **87**, where it is stepped at **91** into a larger-diameter axial portion **92**, which continues completely through the body portion **87** and is threaded at its end **93**. A transverse passage **95** through the **T** **88** joins the axial passage **92** a short distance away from the step **91** and leads out to the rubber tube E. The outer surface of the **T** **88** is preferably roughened at **96** for securely holding the rubber tube E, as is the end of the syringe F.

At the outer end of the axial passage **90** a ball displacement member **100** is provided. The member **100** preferably comprises a small, thin strip of spring material which gives very little resistance to water flow, formed to shape and inserted in the passage **90**, with a portion projecting from the end of the coupler C. The strip **100** (see Fig. 11) is generally curved to coincide with the arcuate shape of the axial passage **90** in which it extends for about 180°, and is provided with outwardly bent flanges **101** approximately opposite each other whose inner edges **102** engage the outer end of the male coupler C and prevent the member **100** from being pushed inside the axial passage **90**. My invention also takes advantage of sufficient spring tension on the sides of the passage **90** for retention in place of the flanges **101**, even if the device is dropped on the lavatory. The projecting flanges **101** are preferably somewhat rounded at their outer ends to offer less interference with water flow into **90**, the two rounded prongs serving on installation to force the ball valve **80** away from its seat **77** when the two conical sections **75**, **85** mate.

For sanitary reasons it is advisable to prevent water from draining back through the syringe F and rubber tube E into the coupler passage **90** and the valve B. I prefer, therefore, to provide a ball valve **105** in the axial passage **90**. The valve **105** is normally urged against the step **91** by a very light spring **106**, which permits the ball **105** to be pushed away from step **91** by water under pressure entering from the passage **90**. The water pressure, built up by the small opening through the tip, thrusts the ball **105** against the end **109** of a shell **108**, as shown in solid lines in Fig. 1, thus forcing the water through the transverse passage **95**. When the water is turned off at the valves **23** and **24**, or when the valve **35** is rotated to the open position, or when the coupler C is detached from D, the spring **106** urges the ball valve **105** against the step **91** (see the dotted lines in Fig. 1), thus preventing the return flow from entering the passage **90** but the water is then permitted to escape rapidly through a passage **107** of the shell **108**, or more slowly through the syringe tip F.

The same parts that constitute this drain also serve to provide a fine adjustment of the pressure of the water through the syringe F, because the location of the end **109** of the shell **108** determines how much of the transverse passage **95** is closed off by the ball **105** when the device is in use. This closure is varied by how far into the coupler the drain tube **108** is threaded into the threads **93**. Preferably a lock nut **110** is provided to secure the adjustable shell **108** in any position which may be selected.

Alternative forms of male couplers

Several alternative forms of male couplers are shown in Figs. 12 to 16. All of these have the conical coupling portion **85** with an axial passage **90** leading through the conical coupler portion, and a transverse passage **95** that connects with the tube E, of this axial passage. However, none of these modified forms have the drain member **108**.

In Fig. 12 the axial passage **90** connects directly to the transverse passage **95** and there is no adjustment at all.

In the modification shown in Fig. 13 I provide a snugly-

fitted threaded member **111** which regulates the size of the opening **112** connecting the axial and transverse passages **90**, **95** and thereby regulates the pressure therethrough. This adjustment member **111** comprises a threaded and slot-ended nut **113** with a projecting pressure regulating portion **114**.

In the Fig. 14 modification, a spring **115** urges an adjustable threaded pressure-regulating member **116** outwardly and serves as a lock to prevent loss of adjustment. The spring **115** is seated against a closed end **117**. Adjustment of pressure is made with a screwdriver through the passage **90**.

In the modification shown in Fig. 15 the axial passage **90** is connected directly to the transverse passage **95**. Water pressure is regulated by a snugly fitted, threaded, and slot-ended nut **121**. Leakage is prevented by a closure nut **119** and gasket **120**.

In Fig. 16 the modification is comprised of a snugly threaded member **122** with a knurled or octagon head **125** for easy finger manipulation. A threaded and slotted (for screw driver) gasket retainer **123** holds a gasket **124** snugly in place around the end of the projecting regulating portion **126** of the member **122**, to prevent leakage and to assist in preventing loss of adjustment by its friction. If desired, a lock nut may be installed to aid in holding the gasket retainer **123** in place.

In Fig. 17 is illustrated a modified type of orifice controlling means. Instead of employing the orifice plate **60**, the device may be accompanied with the series of threaded slot ended nuts **130**, each of which has a different diameter bore **131**, graduated from fine to coarse. The outlet end of the passage **55** is threaded at **132** to receive any one of these nuts **130**. According to the pressure desired, the proper nut **130** is chosen, and the operation is substantially identical to that where the orifice plate **60** is used.

Operation

In operation, the handle **47** is used to operate the valve member **35** and turn it either to the normal faucet position for straight-through passage of water through the passage **36** or to the syringe position where water will pass through the passage **55** and through one of the selected orifices **62**, **63**, **64**, **65**, into the space between the end member **70** and the valve body **35**. The water will not pass out from there unless the male coupler C has been inserted into the conical passage **75** to push the ball **80** off its seat **77**, because unless this is done, the water pressure augments the pressure of the spring **81** to keep the valve **80** seated. When the coupling C is in place in the coupling D, water will pass around the ball **80**, through the axial passage **90** and will be directed by the ball **105** into the transverse passage **95** of the coupler C, from whence it passes through the rubber hose E into the syringe nozzle F. When the coupler C is disconnected (accidently, or by merely withdrawing it with a rotary motion from the conical passage **75**) the flow of water from the valve B is immediately stopped by the ball valve **80**. At the same time, the syringe nozzle F and its tube E will drain through either the syringe nozzle F or preferably through the larger and therefore faster drain opening **107**, or both, the ball valve **105** closing off the opening leading to the coupler connection.

Should the temperature need adjusting during the act of syringing, the valve **35** is instantly rotated to the open position to allow all of the water to flow through **37**. The water is rapidly tempered by adjusting either one of the valves **23** or **24** and is instantly forced back into the syringe by turning **35** to the closed position.

When the pressure is released on the gasket of the hot water valve **24** by turning the valve on, there is a very marked tendency for the gasket, if made of rubber, to gradually swell and thus restrict the flow of hot water. If the flow is already restricted to control pressure, the expanding gasket will cut the flow of hot water sufficiently to cause the temperature and pressure to drop. By operating on a substantial flow of water the influence of the expanding gasket is not noticeable even to teeth that are very sensitive to heat changes. If there is too much pressure on the syringe when working with a full head of water, this can be instantly released by rotating **35** to allow a sufficient flow of water through **37** to reduce the pressure to the point desired. This arrangement obviates the necessity of going through a complicated time-wasting experimental procedure of adjusting for temperature and pressure by having to manipulate the faucet valves **23** and **24**. This arrangement of control is also useful in syringing over sore spots on the gum.

To those skilled in the art to which this invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. The disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

I claim:

1. A hydraulic dental syringe adapted for attachment to a water faucet or the like, including in combination: a hollow housing adapted to be secured to said faucet; a valve body mounted rotatably in said housing, said body having a generally diametrical passage for utilizing the combination as a faucet, and an isolated second passage extending in from its periphery and out through one end; a closure member for said housing opposite said end, said closure member having an inner face, an outer face, and a conical passage extending through it from its outer face; valve means adjacent said inner face normally adapted to close off said conical passage; a separable male coupler member having a projecting tube with a frusto-conical outer periphery matching in shape said conical passage and adapted to fit snugly therein in a metal-to-metal contact; a displacement member projecting from the end of said tube, so as to unseat said valve means when said coupler is inserted in said conical passage; and a syringe nozzle connected to said male coupler.

2. The syringe of claim 1 wherein there is means for restricting the diameter of a portion of said second passage.

3. The syringe of claim 1 wherein said valve means is a ball.

4. The syringe of claim 1 wherein said valve body's diametric passage is adapted for alignment, when being used, with an anti-splash baffle secured to said housing.

5. A hydraulic dental syringe adapted for attachment to a water faucet or the like, including in combination: a female coupler adapted to be secured to said faucet and having a conical passage extending in from its outer side; valve means on the inner side of said passage normally urged to a position where it closes off said conical recess; a separable male coupler member having a projecting tube with a frusto-conical outer periphery matching in shape said conical passage and adapted to fit snugly therein in a metal-to-metal contact, this snug fit constituting the sole holding means for retaining them together; a displacement member projecting from the end of said tube, so as to unseat said valve means when said coupler is inserted in said conical passage; and a syringe nozzle connected to said male coupler.

6. A hydraulic dental syringe adapted for attachment to a water faucet or the like, including in combination: a female coupler adapted to be secured to said faucet and having a conical passage extending in from its outer side; valve means on the inner side of said passage normally urged to a position where it closes off said conical recess; a separable male coupler member having a projecting tube with a frusto-conical outer periphery matching in shape said conical passage and adapted to fit snugly therein in a metal-to-metal contact; a displacement member projecting from the end of said tube, so as to unseat said valve means when said coupler is inserted in said

conical passage; and a syringe nozzle connected to said male coupler, the passage through the projecting tube in said male coupler opening into a perpendicular passage connected to said syringe nozzle, flow regulating means being provided adjacent the intersection of said passages.

7. A hydraulic dental syringe adapted for attachment to a water faucet or the like, including in combination: a female coupler adapted to be secured to said faucet and having a conical passage extending in from its outer side; valve means on the inner side of said passage normally urged to a position where it closes off said conical recess; a separable male coupler member comprising a T having a projecting tube with a frusto-conical outer periphery matching in shape said conical passage and adapted to fit snugly therein in a metal-to-metal contact, the passage through the projecting tube opening at an annular shoulder into a co-axial passage of larger diameter and having a right angle passage means intermediate said shoulder and the end of said coupler opposite said coupler tube; a displacement member projecting from the end of said tube, so as to unseat said valve means when said coupler is inserted in said conical passage; and a syringe nozzle connected to said male coupler at said right angle passage means, flow regulating means being provided adjacent the connection to said syringe nozzle.

8. The syringe of claim 7 wherein said male coupler has a passage of reduced diameter co-axial with said tube and said larger diameter passage and connected therewith by a second shoulder on the opposite side of the right angle connection from the aforesaid shoulder and wherein there is a ball in said larger diameter passage and spring means normally urging said ball against the aforesaid shoulder to close the passage between said syringe and said tube, said ball being urgeable by water against said second shoulder.

9. A hydraulic dental syringe adapted for attachment to a water faucet or the like, including in combination: a female coupler adapted to be secured to said faucet and having a conical passage extending in from its outer side; valve means on the inner side of said passage normally urged to a position where it closes off said conical recess; a separable male coupler member comprising a body member having a projecting tube with a frusto-conical outer periphery matching in shape said conical passage and adapted to fit snugly therein in a metal-to-metal contact and having a straight-through axial passage leading therethrough, the part through said tube being of narrower diameter than a second larger passage and meeting it at an annular shoulder, the outer end of said second passage being interiorly threaded; a hollow threaded member threaded into the outer end of said passage, and providing a third passage of reduced size; a fourth passage entering said second passage at right angles between the inner end of said threaded member and said shoulder; a ball in said second passage between said shoulder and the inner end of said threaded member; spring means normally urging said ball toward said shoulder but overcome by water pressure to permit the ball to seat against said inner end of said threaded member and close off said third passage, the size of opening between said second and fourth passages then being determined by the position of said ball which is regulatable by the position of said threaded member; a displacement member projecting from the end of said tube, so as to unseat said valve means when said coupler is inserted in said conical passage; and a syringe nozzle connected to said male coupler fourth passage.

10. A hydraulic dental syringe adapted for attachment to a water faucet or the like, including in combination: a female coupler adapted to be secured to said faucet and having a conical passage extending in from its outer side; valve means on the inner side of said passage normally urged to a position where it closes off said conical recess; a separable male coupler member having a projecting tube with a frusto-conical outer periphery matching in shape said conical passage and adapted to fit snugly therein in a metal-to-metal contact; a displacement member projecting from the end of said tube, so as to unseat said valve means when said coupler is inserted in said conical passage; and a syringe nozzle connected to said male coupler, said male coupling member including threaded means partially interposed between the opening through said tube and the opening leading to said syringe nozzle, for regulating flow to said syringe.

11. A hydraulic dental syringe adapted for attachment to a water faucet or the like, including in combination: a hollow housing adapted to be secured to said faucet and having a vertical passage therethrough and a horizontal passage substantially closed at one end; a valve body rotatably mounted in said horizontal passage, said body having a first through passage adapted for alignment with said vertical passage and a second passage leading in from its periphery and out through its end at the open end of said horizontal passage; a closure member engaging the open end of said housing horizontal passage, said closure member having an inner face, an outer face, and a conical recess extending through from its outer face; valve means adjacent said inner face adapted to close off said conical recess; yieldable means urging said valve means normally into its closed position; a separable male coupler member having a projecting tube with a frusto-conical outer periphery matching in shape said conical recess and adapted to fit snugly therein in a metal-to-metal contact; a syringe nozzle connected to said tube; and a displacement member projecting from the end of said tube, so as to unseat said valve means when said coupler is inserted in said conical recess.

12. The syringe of claim 11 wherein said valve means is a ball.

13. A hydraulic dental syringe adapted for attachment to a water faucet and including in combination: a hollow housing adapted to be secured to said faucet and having a vertical open-end passage therethrough and a horizontal open-end passage therethrough; a valve body adapted to fit rotatably in said horizontal passage and having an annular bearing face at one end with a stem extending therebeyond, the other end having a substantially radial face, said body having a diametric passage therethrough, adapted for alignment with such vertical passage in one rotational position, and a second passage leading from an opening through the axial periphery substantially midway between the diametric passage openings and leading to an outlet through said radial face; means to regulate the orifice size at said outlet; thrust bearing means in contact with said annular bearing face and closing one end of said housing horizontal passage; handle means secured to said stem for rotating said valve body; a closure member engaging the opposite end of said housing horizontal passage against leaking, said closure member having a central conical opening leading in axially from the outer side thereof; first spring means under compression between said valve body and said closure member and adapted to urge said valve body against said thrust bearing means; valve means between said closure member and said valve body, normally adapted to close said conical opening; a separable male coupler member having a projecting tube with a frusto-conical outer periphery matching in shape said conical recess and adapted to fit snugly therein in a metal-to-metal contact; a syringe nozzle connected to said coupler member; and a valve displacement member in said tube, substantially thinner than the opening through said tube and projecting from the end thereof, so as to unseat said valve means when said coupler is inserted in said conical recess.

14. The syringe of claim 13, wherein said means to regulate orifice size comprises a circular disc plate having a plurality of openings therethrough of different sizes, with their centers at a uniform radius from the center of said disc plate, said disc plate being centrally mounted on the end of said valve body through which said second

passage leaves, so that one of said openings at a time can overlie said second passage outlet.

15. The syringe of claim 13 wherein said means to regulate orifice size comprises hollow tubular means adapted to be threaded into said second passage.

16. A hydraulic dental syringe adapted for attachment to a water faucet and including in combination: a hollow housing adapted to be secured to said faucet and having a vertical open-end passage therethrough and a horizontal open-end passage therethrough; a valve body adapted to fit rotatably in said horizontal passage and having an annular bearing face at one end with a stem extending therebeyond, the other end having a substantially radial face, said body having a diametric passage therethrough, and a second passage leading from an opening through the axial periphery substantially midway between the diametric passage openings and leading to an outlet through said radial face; means to regulate the orifice size at said outlet; thrust bearing means in contact with said annular bearing face and closing one end of said housing horizontal passage; handle means secured to said stem for rotating said valve body; a closure member engaging the opposite end of said housing horizontal passage against leaking, said closure member having a central axial recess leading from the inner side thereof and opposite said valve body, and a central conical recess leading in axially from the outer side thereof and intersecting said central axial recess; first spring means under compression between said valve body and said closure member and adapted to urge said valve body against said thrust bearing means; a ball in said central axial recess adapted to close the opening leading to said conical recess; second spring means anchored in said annular wall and urging said ball normally into its closed position; a separable male coupler member having a projecting tube with a frusto-conical outer periphery matching in shape said conical recess and adapted to fit snugly therein in a metal-to-metal contact; a syringe nozzle connected to said coupler member; and a ball displacement member in said tube, substantially thinner than the opening through said tube and projecting from the end thereof, so as to unseat said ball when said coupler is inserted in said conical recess.

17. A hydraulic dental syringe adapted to be attached to a water faucet and including in combination: a hollow housing adapted to be secured to said faucet and having a vertical passage therethrough and a horizontal passage therethrough, both passages being open at both ends, said horizontal passage having a frusto-conical wall; a valve body having a frusto-conical axial periphery adapted to fit rotatably in said horizontal passage and having an annular radial bearing face at its smaller diameter end, with a reduced-diameter axial stem extending out therebeyond, the larger diameter end having a substantially flat radial face, said body having a diametric passage therethrough adapted for alignment with said vertical passage for passage of water directly therethrough, when said body is in one rotational position, and a second passage leading from an opening through said periphery substantially midway between the diametric passage openings and leading out through said radial face, said second passage being adapted to conduct water from said faucet when said body is in a rotational position approximately 90° from its previously mentioned rotational position; an orifice plate rotatably mounted on said radial face and having a series of openings therethrough capable of alignment, one at a time, with the opening leading out from said second passage; an annular thrust bearing in contact with said annular bearing face and closing the smaller-diameter end of said housing horizontal passage against leakage; handle means secured to said stem for rotating said valve body; a closure member engaging the larger-diameter end of said housing horizontal passage, said closure member having a central axial recess and a concentric annular axial recess therein, both leading from the inner side thereof and facing said orifice plate and defining an annular wall between them said closure member also having a central conical recess leading in axially from the outer side thereof and intersecting said central axial recess, said central axial recess having a conical seat adjacent the intersection; a first coil spring in said annular recess under compression between said orifice plate and said closure member and adapted to urge said valve body against said thrust bearing; a ball in said central axial recess adapted to close the opening connecting the recess to said conical recess; a second coil spring anchored in said annular wall and urging said ball normally into its closed position; a separable male coupler member having a projecting tube with a frusto-conical outer periphery matching in shape said conical recess and adapted to fit snugly therein in a metal-to-metal contact; a syringe nozzle connected to said male coupler member; and a ball displacement member substantially thinner than the opening through said tube and projecting from the end thereof, so as to unseat said ball when said coupler is inserted in said conical recess so that water can flow from said faucet through said valve body, when said body is in a proper rotational position, to said male coupler and said syringe.

18. A valve-coupling unit for use in connection with a hydraulic dental syringe and a water faucet, including in combination: a hollow housing adapted to be secured to said faucet and having a vertical passage therethrough with an anti-splash attachment on its lower end and a horizontal passage therethrough, said horizontal passage having a frusto-conical wall; a valve body having a frusto-conical axial periphery adapted to fit rotatably in said horizontal passage and having an annular radial bearing face at said smaller-diameter end, with a reduced-diameter axial stem extending out therebeyond the other end being a substantially flat radial face, said body having a first passage therethrough adapted for alignment with said vertical passage for passage of water directly therethrough, and a second passage adapted for alignment with the upper end of said vertical passage and leading from an opening through said periphery to said radial face; means to regulate the orifice of said second passage adjacent said radial face; thrust bearing means in contact with said annular bearing face and closing one end of said housing horizontal passage; handle means secured to said stem for rotating said valve body; a closure member engaging the opposite end of said housing horizontal passage, said closure member having a central axial recess on the side facing said orifice plate and a center conical recess leading in axially from the outer side thereof and intersecting said central axial recess; means under compression between said valve body and said closure member and adapted to urge said valve body against said thrust bearing; a ball in said central axial recess adapted to close it off from said conical recess; yieldable means urging said ball normally into its closed position; a separable male coupler member having a projecting tube with a frusto-conical outer periphery matching in shape said conical recess and adapted to fit snugly therein in a metal-to-metal contact, and having a connection leading to said syringe; and a ball displacement member substantially thinner than the opening through said tube and projecting from the end thereof, so as to unseat said ball when said coupler is inserted in said conical recess.

19. A coupling unit for use in connection with a dental syringe attachment or the like, and a water faucet including in combination: a valve assembly having one inlet and two outlets, the inlet being adapted to be secured to said faucet, one outlet leading to said syringe and the other directly through, for use as a faucet, said valve assembly having at one end an interior recess in connection with the syringe passage and a conical recess leading in axially from outside and intersecting said interior recess; a ball in said interior recess adapted to close it off from said conical recess; yieldable means urging said

ball normally into its closed position; a separable male coupler member having a projecting tube with a frusto-conical outer periphery matching in shape said conical recess and adapted to fit snugly therein in a metal-to-metal contact, and having a connection leading to said syringe; and a ball displacement member substantially thinner than the opening through said tube and projecting from the end thereof, so as to unseat said ball when said coupler is inserted in said conical recess.

20. A valve unit for use in connection with a dental syringe attachment or the like and a water faucet including in combination: a hollow housing adapted to be secured to said faucet and having a vertical passage therethrough and a horizontal passage therethrough, both passages being open at both ends, said horizontal passage having a frusto-conical wall; a valve body having a frusto-conical axial periphery adapted to fit rotatably in said horizontal passage and having an annular radial bearing face at said smaller diameter end, with a reduced-diameter axial stem extending out therebeyond, the other end being a substantially flat radial face, said body having a diametric passage therethrough adapted for alignment with said vertical passage for passage of water directly therethrough, when said body is in one rotational position, and a second passage leading from an opening through said periphery substantially midway between the

diametric passage openings and leading out through said radial face; means to regulate the orifice of said second passage adjacent said radial face; an annular thrust bearing in contact with said annular bearing face and closing one end of said housing horizontal passage against leakage; handle means secured to said stem for rotating said valve body; a closure and coupling member engaging the opposite end of said housing horizontal passage against leaking, said closure member having an annular axial recess therein and a central axial recess, both leading from the inner side thereof, opposite said valve body and defining an annular wall therebetween, said closure member having a center coupling passage leading in axially from the outer side thereof and intersecting said central axial recess; spring means in said annular recess under compression between said valve body and said closure member and adapted to urge said valve body against said thrust bearing; and valve means controlling the connection between said central recess and said coupling passage.

References Cited in the file of this patent

UNITED STATES PATENTS

1,940,210	Frederick	Dec. 19, 1933
2,322,877	Parker	June 29, 1943
2,585,184	Storrie	Feb. 12, 1952