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Filed April 8, 1922

2 Sheets-Sheet 1

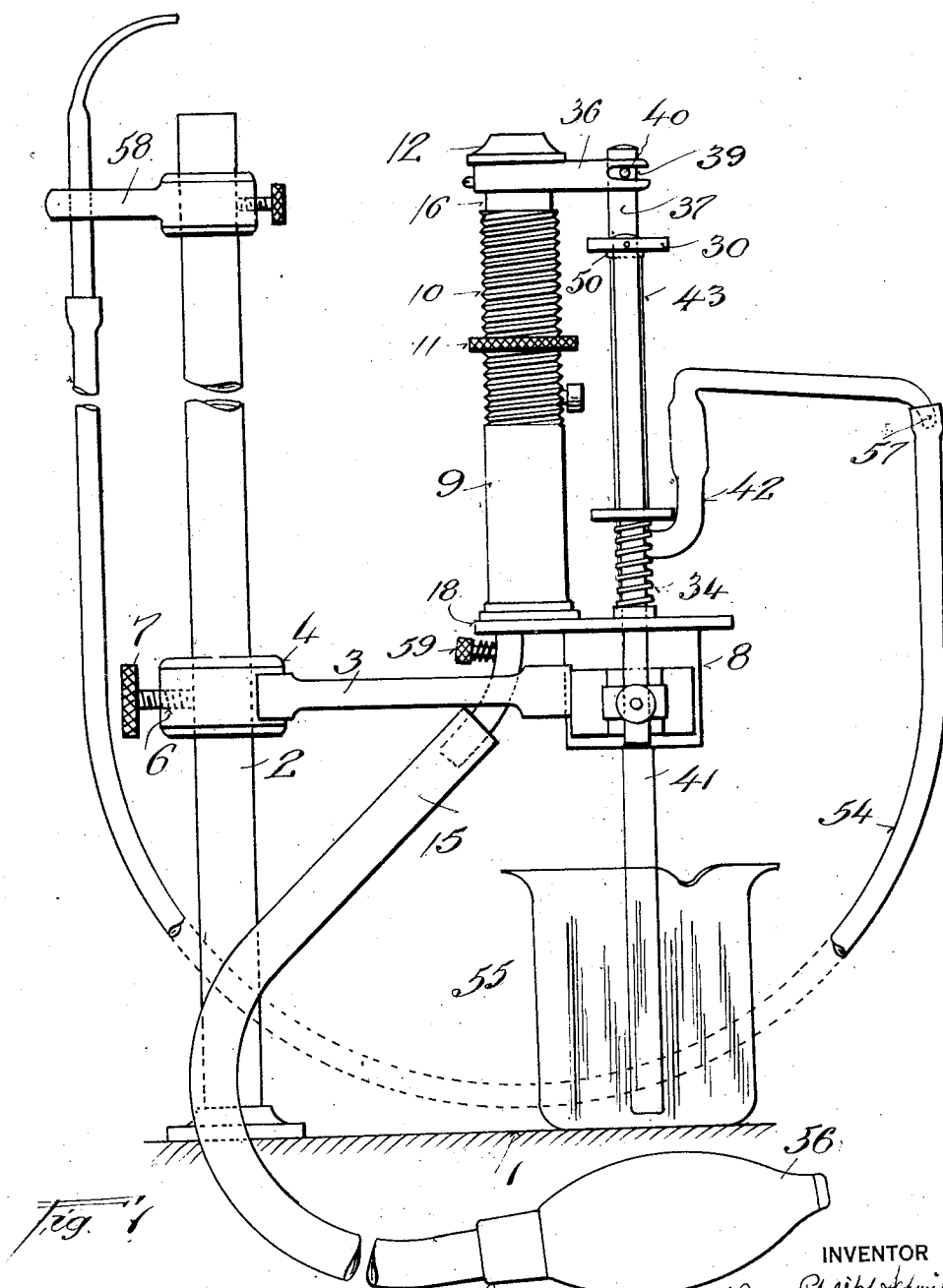


Fig. 1

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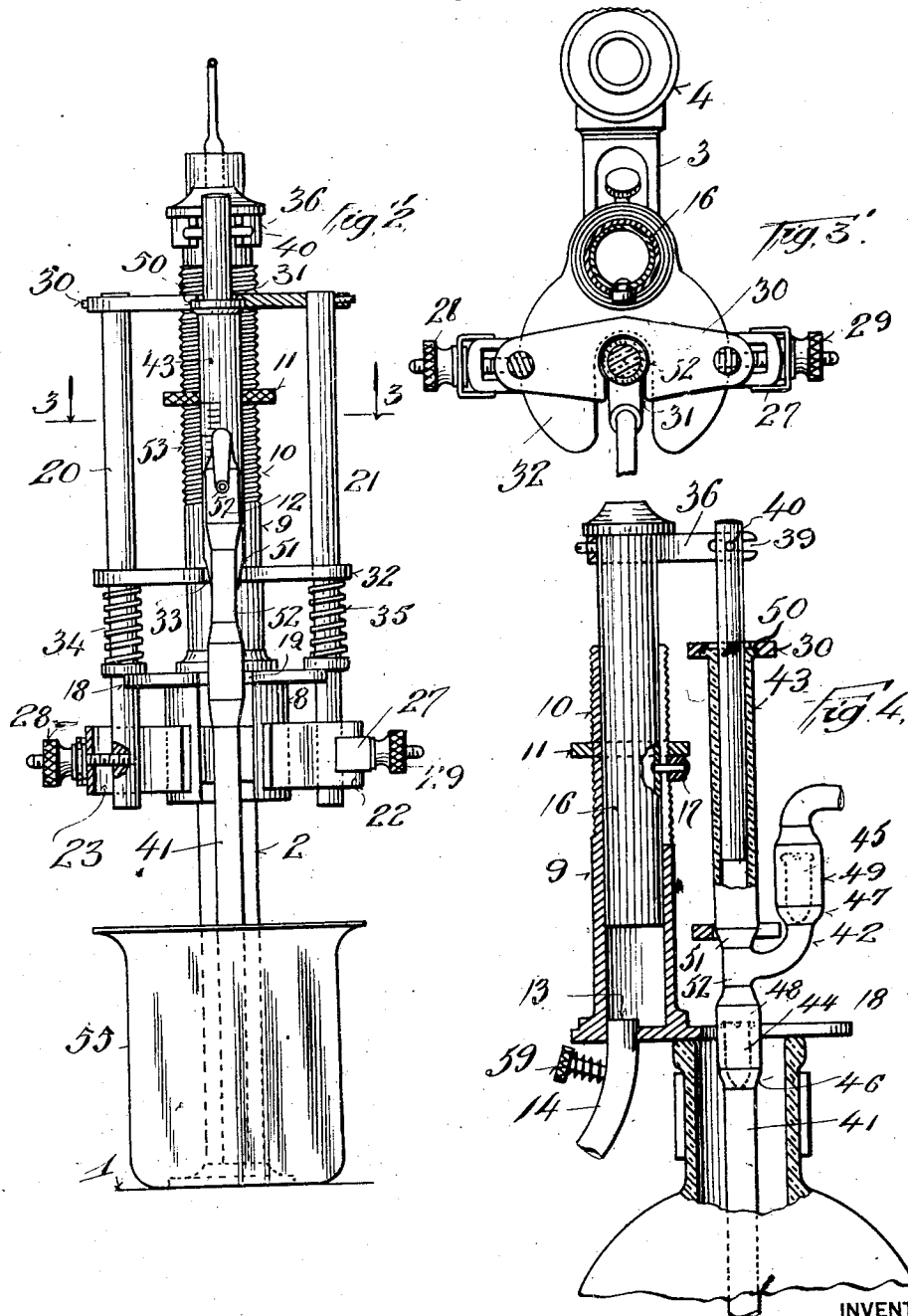
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INVENTOR

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UNITED STATES PATENT OFFICE.

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AUTOMATIC DISTRIBUTING APPARATUS FOR LIQUID.

Application filed April 8, 1922. Serial No. 550,922.

This invention relates to automatic apparatus for use in distributing or transferring liquids from one container to another.

The object of the invention is to provide an apparatus of the nature referred to whereby the quantity of liquid to be distributed may be automatically and definitely measured.

A further object of the invention is to provide an apparatus of the nature referred to in which the distribution of the liquid in predetermined quantities is automatically effected.

A further object of the invention is to provide an apparatus of the nature referred to which is rapid, certain and accurate in operation, and simple and rugged in construction.

Other objects of our invention will appear more fully hereinafter.

The invention consists substantially in the construction, combination, location, and relative arrangement of parts, all as will become fully hereinafter set forth, as shown in the accompanying drawings, and finally pointed out in the appended claims.

Referring to the accompanying drawings,—

Figure 1 is a view in side elevation, showing a distributing apparatus embodying the principles of our invention.

Fig. 2 is a front elevation of same.

Fig. 3 is a sectional plan view of Fig. 2 taken on the line 3—3.

Fig. 4 is a view in vertical section, parts broken off, showing the application of the apparatus to the neck of a bottle.

In distributing liquids in predetermined quantities from one container to another, the present method, most commonly employed in laboratories and other places where accurate and definite quantities of a liquid are required to be transferred to different receptacles, is to use an ordinary straight piece of graduated glass tubing. The aspiration of the liquid is performed by means of a rubber bulb at one end of the tube, or, more frequently, because of the greater accuracy, by suction with the lips. The liquid is then kept in the tube by placing one finger over the open end thereof, and the fluid is delivered to the proper point by releasing the finger. This method is slow, tedious and ordinarily inaccurate. The use of such an apparatus also requires the use of both of the hands of

the person performing the act of distribution of the liquid. One hand is used for holding the graduated tube, and the other for manipulating the bulb or retaining the liquid in the tube after the same has been aspirated therein. It is among the special purposes of our present invention to provide an apparatus wherein provision is made for accurately aspirating and distributing definite quantities of liquid, and whereby the aspiration and distribution is accomplished rapidly and automatically, allowing the operator free use of the hands for manipulating the containers used to receive the liquid or for other purposes.

In carrying out our invention, we provide a suitable supporting stand for the apparatus comprising a base 1, made of any suitable material, size or shape, on which is mounted a vertically extending supporting rod 2, which may also be made of any suitable or desired material. Secured to the supporting rod 2, so as to have a slidable adjustment thereon, is a supporting arm 3. The adjustable securing means of the supporting arm to the supporting rod may be accomplished in any desired manner, and our invention is not to be restricted or limited to the means shown in the drawings. For illustrative purposes only the construction shown consists of a hub portion 4, at the end of the supporting arm. Said hub portion is provided with a hole therethrough which is adapted to receive the supporting rod. A hole 6 adapted to receive a set screw 7 is also provided in the hub portion 4. Said screw is adapted to frictionally engage the supporting rod 2 and thereby maintain the supporting arm in the desired adjustment in respect to its height.

The other end of the supporting arm is provided with an enlarged collar 8 for supporting the distributing mechanism in operating position with respect to the container 55 from which the liquid is to be distributed. The construction and operation of this supporting and receiving collar will be described hereinafter in connection with the distributing mechanism.

The distributing mechanism proper consists of a cylinder 9, having its upper portion exteriorly threaded as at 10, and having a ring 11 adapted to movably engage with said threaded portion.

The lower end of said cylinder has an open-

ing 13 therein which receives a tube 14, to which tube may be attached a rubber tube 15. The tube 14 is provided with a screw valve 59 for regulating the air pressure communicated to said cylinder through the tube 15.

The upper end of said cylinder is open and adapted to receive a piston or plunger 16, which operates therein. Secured to said piston and operating therewith through a slot in said cylinder is a stop 17. The said piston is closed at its lower end and may be hollow; the opening at its upper end may be closed by a removable cap 12.

The cylinder 9 is secured to a plate 18, which has a cut out portion 19 (see Fig. 2). Also secured to said plate are the rods 20 and 21. Said rods extend below said plate, and at their lower extremities there are secured the clamping members 22 and 23, which comprise the clamping cheeks 27, and the set screws 28 and 29, which have a screw engagement with the rods 20 and 21. The clamping cheeks 22 and 23 are so formed as to have a clamping engagement with the collar 8 of the supporting arm 3.

Secured to the upper end of the rods 20 and 21 is a plate 30, which has a cut out portion 31 (see Fig. 3), registering with and corresponding to the cut out portion of the plate 18. Slidably mounted on rods 20 and 21 is a plate 32, which also has a cut out portion 33 (see Fig. 2) registering with the cut out portions 19 of plate 18, and cut out portion 31 of plate 30. The movement of the plate 32 on the rods 20 and 21 in the direction of plate 18 is prevented by means of the springs 34 and 35 interposed between the said plates 32 and 18.

Adjustably secured to the piston or plunger 16 at its uppermost portion thereof, and movable therewith is a supporting arm 36. The free end of the supporting arm 36 is forked so as to receive the end of a piston 37 operating in conjunction with a pipette member. The forked members of the arms 36 are slotted as at 39, to receive a projection or lugs 40 on the pipette piston 37.

The pipette member may be made of any suitable or desirable material, as glass, rubber, bakelite or the like. It consists essentially of a main stem or tube, and a substantially laterally extending branch member 42. The lower end 41 of the main stem or tube is of smaller circumference and bore than the upper end 43 thereof. The upper end 43 is adapted to receive a piston 37 therein. The branch member 42 is open at its outer end and may be of any desired length or shape, and for the purpose of discharging the aspirated fluid it is usually shaped as shown in the form of a gooseneck, but obviously, any other shape may be used if desired.

Located in the main stem or tube, and also in the branch member 42, are the control valves 44 and 45, and there is provided in

the main stem near the lateral branch member 42, an enlarged bore 48, and seat 46, for said valve 44, and in the lateral branch near its inner end the enlarged bore 49 and the valve seat 47, for the valve 45.

Any suitably shaped valve, or valve seat, may be employed in this connection, the main feature being the control of the inflow and expulsion of the liquid through the main stem and branch member. In the type of valves shown we provide the upper ends of valves 44 and 45 with enlarged stops to abut against the narrowed passage of the enlarged bore (48 and 49) when the valve is lifted to more than its normal distance.

The upper end 43 of the main stem or tube of the pipette terminates in a lip portion 50, which is adapted to seat against the under surface of plate 30. The lower end of the upper portion of the main stem terminates in an inclined reduced portion 51.

The cut out portions 31, 33 and 19 in the plates 30, 32, and 18, are of such diameter as to receive the smaller circumference of the main stem of the pipette, but are not of sufficient width to receive the upper portion of said main stem.

It can, therefore, be seen that by engaging the lugs 40 of the piston 37 of the pipette in the slots 39 of the supporting arm 36, and placing the upper portion of the main stem in a position so that the lip 50 thereof engages the under surface of the plate 30, and pressing down the plate 32 against the action of the springs 34 and 35 until the cut out portion of said plate will coincide with the smaller circumference of the main stem at 52, the pipette can be placed in a vertical operating position with respect to the rest of the apparatus. Then by releasing the pressure on the plate 32, the upper surface thereof will be held by the tension of the springs 34 and 35, in secure engagement with the inclined surface of the reduced portion 51, thereby locking the pipette in position for use in connection with the rest of the apparatus.

The enlarged or upper portion 43 of the pipette may be marked as at 53, Fig. 2, with graduations of liquid measurement to regulate the amount of liquid to be aspirated into the tube and discharged therefrom.

The open end of the main stem or tube of the pipette is placed in a container 55, which contains the liquid which is to be distributed, and the outer or free end 57 of the branch member may be either placed over or into the receptacle to which the fluid is to be distributed, or a rubber tubing, as indicated at 54 in Fig. 1, may be attached thereto and the liquid carried to the point of distribution by means of said tube. If a rubber tube is employed, a suitable supporting arm as at 58 may be mounted on the supporting rod 2 for retaining the end thereof when the apparatus is not in operation.

In operation the container of the fluid to be distributed is placed in position on the base or platform of the apparatus, and the supporting arm 3 is adjusted to the proper operating height on the supporting rod 2, with respect to the container of liquid. The pipette is then placed in operating position as above described. The pipette piston 37 is then withdrawn by hand from the stem of the pipette until its lower end registers with the markings on the tube for the required amount of liquid to be aspirated and distributed. The pipette piston being attached to the cylinder piston 16, causes the piston 16 to be withdrawn from its cylinder a distance equivalent to the piston of the pipette and causes the stop 17 to move upward in its slot in the cylinder 16, until it engages the ring 11. The proper distance the cylinder piston should be withdrawn to correspond with the measurement on the pipette is regulated by manipulating the ring 11 on the threaded portion 10 of the cylinder. After the proper measurement has been determined, the two pistons are released and allowed to descend to their normal position. The receptacles for receiving the liquid are then placed in position. The bulb 56 is then pressed which action produces air pressure against the lower end of the piston 16, and causes the same to rise in the cylinder until the stop 17 engages with the ring 11. This action of the piston 16 causes the pipette piston 37 to be withdrawn from the pipette to the measurement on the stem which had previously been adjusted, and to aspirate into the upper portion of the main stem or tube, liquid from the container in the required quantity. The aspiration of the liquid up into the tube causes the valve 44 to be unseated, thus allowing the liquid to pass to the proper place in the pipette above said valve. Upon releasing the pressure of the bulb 56, the pistons 16 and 37 descend by gravity, and the piston 37 forces the liquid in the tube out through the lateral branch 42, unseating the valve 45, and seating the valve 44, and thereby preventing the liquid from being expelled through the main stem through which it had been aspirated. By alternately pressing and releasing the bulb, it can be seen that the operation of distribution of a predetermined quantity may be carried on automatically, and by utilizing the foot instead of the hand, for producing the pressure on the bulb, both hands of the operator may be free for manipulating the receptacles or other purposes. Where the weight of the liquid requires greater force to expel the same than ordinarily, the expelling action of the piston may be increased by placing weights such as lead shots in the piston 16 of the cylinder by removing the cap 12 and placing said shots in the hollow piston.

If it is desired to utilize the distributing

apparatus in work where it is desired to distribute sterile liquids from one container to another without having the contents exposed to the air, the same may be accomplished by removing the supporting arm 3, and clamping the apparatus direct to the neck of the bottle containing the liquid to be distributed, as shown in Fig. 4. In such case the jaws 22 and 23 are clamped directly around the neck of the bottle.

Having now set forth the objects and nature of our invention, and a construction embodying the same, what we claim as new and useful and of our own invention, and desire to secure by Letters Patent, is:

1. An apparatus for distributing liquids having in combination a liquid measuring and distributing member comprising a main stem and a substantially lateral branch stem, a piston mounted to reciprocate in said main stem, valves controlling the opening of the main stem and the branch stem, and means to operate said piston to definite set distances, said means including a power cylinder having a regulating stop ring and a power piston operating in said power cylinder to the distances determined by the position of the stop ring.

2. An apparatus for distributing liquids having in combination a measuring and discharging member comprising a main stem and a substantially lateral branch stem extending from the main stem, a liquid control piston mounted to reciprocate in said main stem, valves controlling the opening of the main stem and a branch stem, a power cylinder and a power piston operating in said cylinder, said liquid control piston and power piston being positively united, a regulating device on said power cylinder, means for adjusting said device, and a limiting stop in said power piston whereby a predetermined quantity of liquid is dispensed and means for operating said power piston.

3. An apparatus for distributing liquids having in combination a measuring and discharging member comprising a main stem and a substantially lateral branch stem extending laterally from the main stem, a liquid control piston mounted to reciprocate in said main stem, valves controlling the opening of the main stem and the branch stem, a power cylinder and a power piston operating in said cylinder, said liquid control piston and power piston being united, a regulating stop member on said power cylinder and a limiting stop in said power piston whereby the quantity of liquid discharged is controlled, and means for seating said apparatus directly on the mouth of a container.

In testimony whereof we have hereunto set our hands on this 3rd day of April A. D. 1922.

LEON H. CORNWALL.

GEORGE PHILIPP SCHMITT.