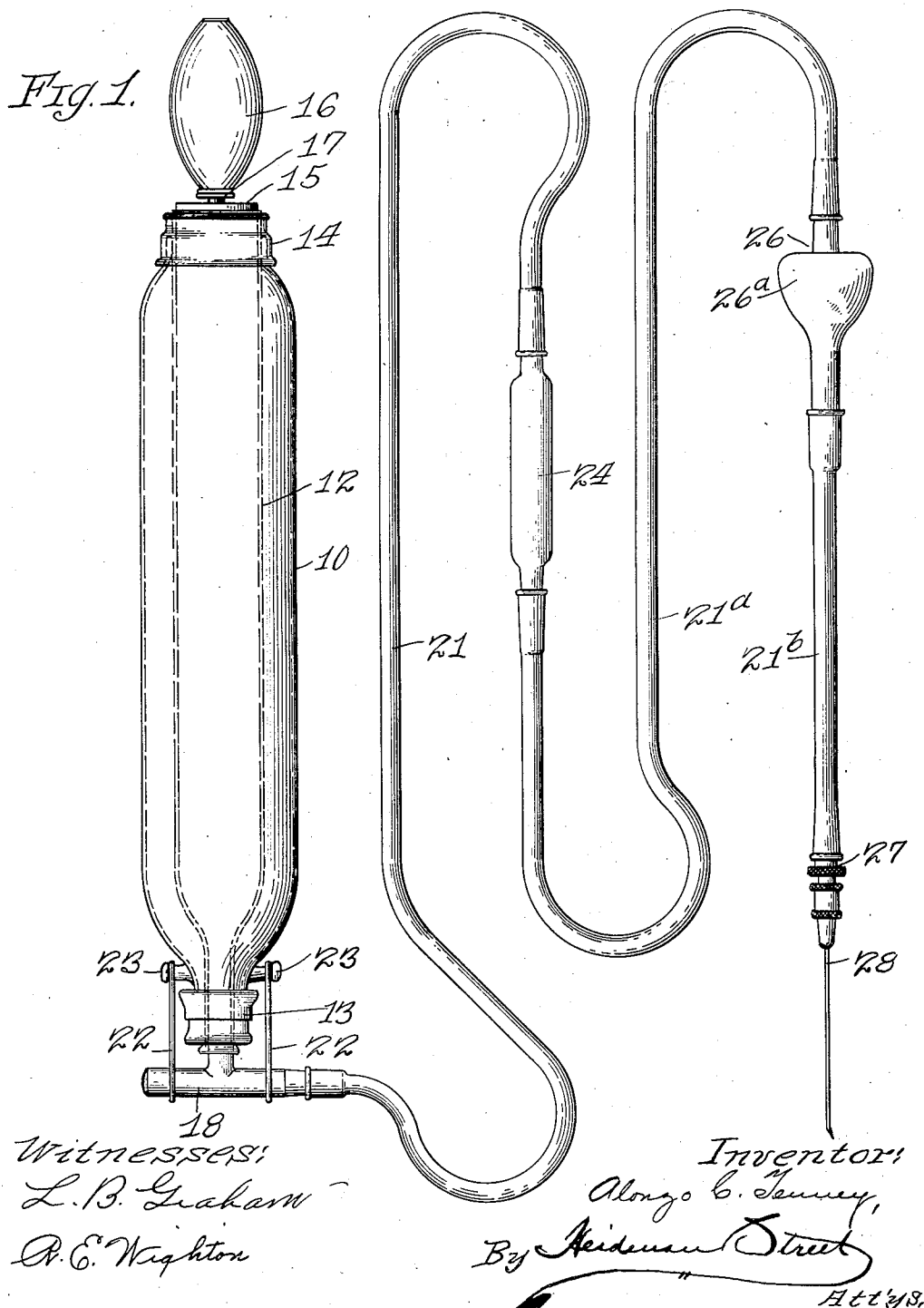


A. C. TENNEY.
INJECTION APPARATUS.
APPLICATION FILED JAN. 7, 1914.

1,205,410.

Patented Nov. 21, 1916.

3 SHEETS—SHEET 1.

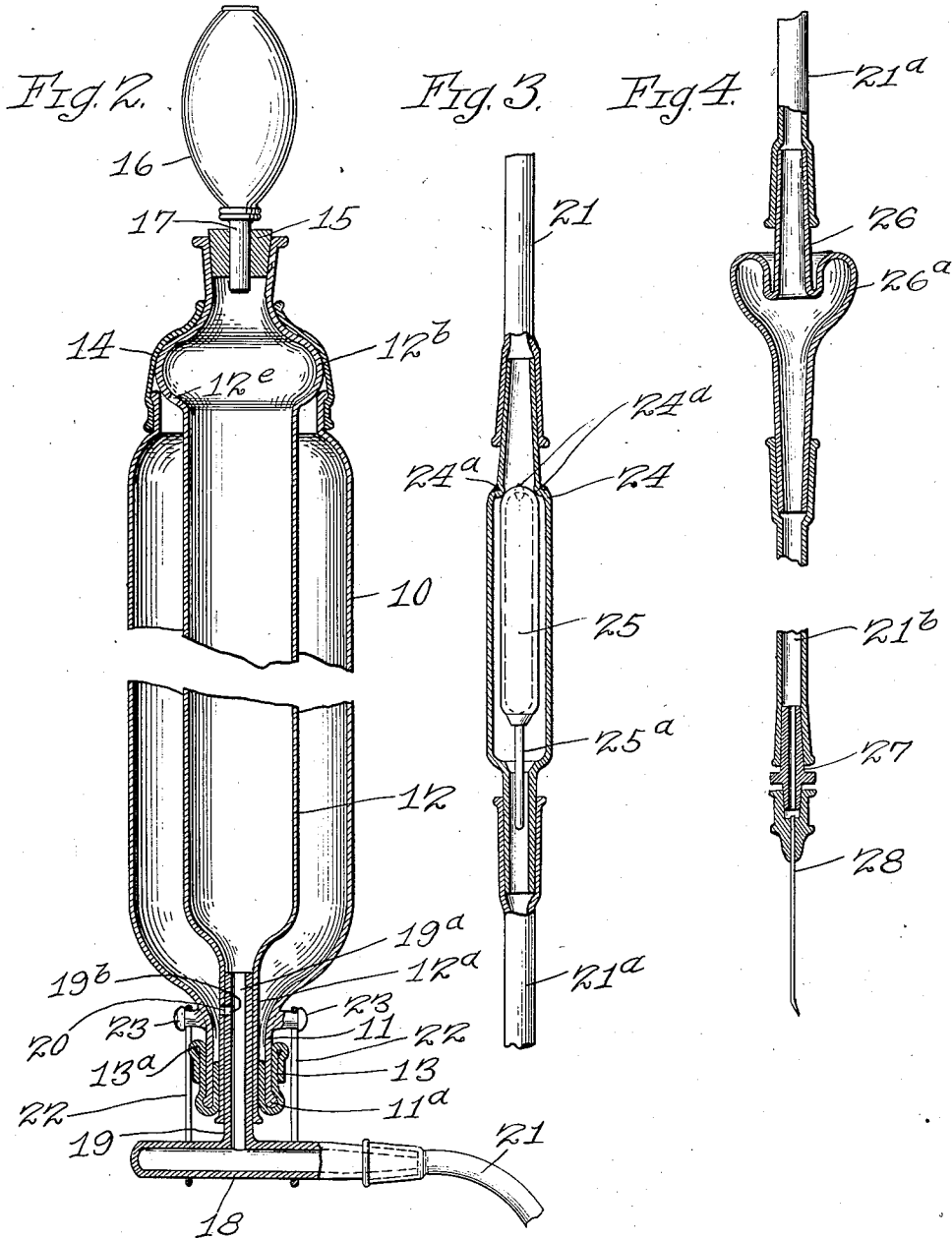


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3 SHEETS—SHEET 2.



Witnesses:
L. B. Graham
R. E. Nighton

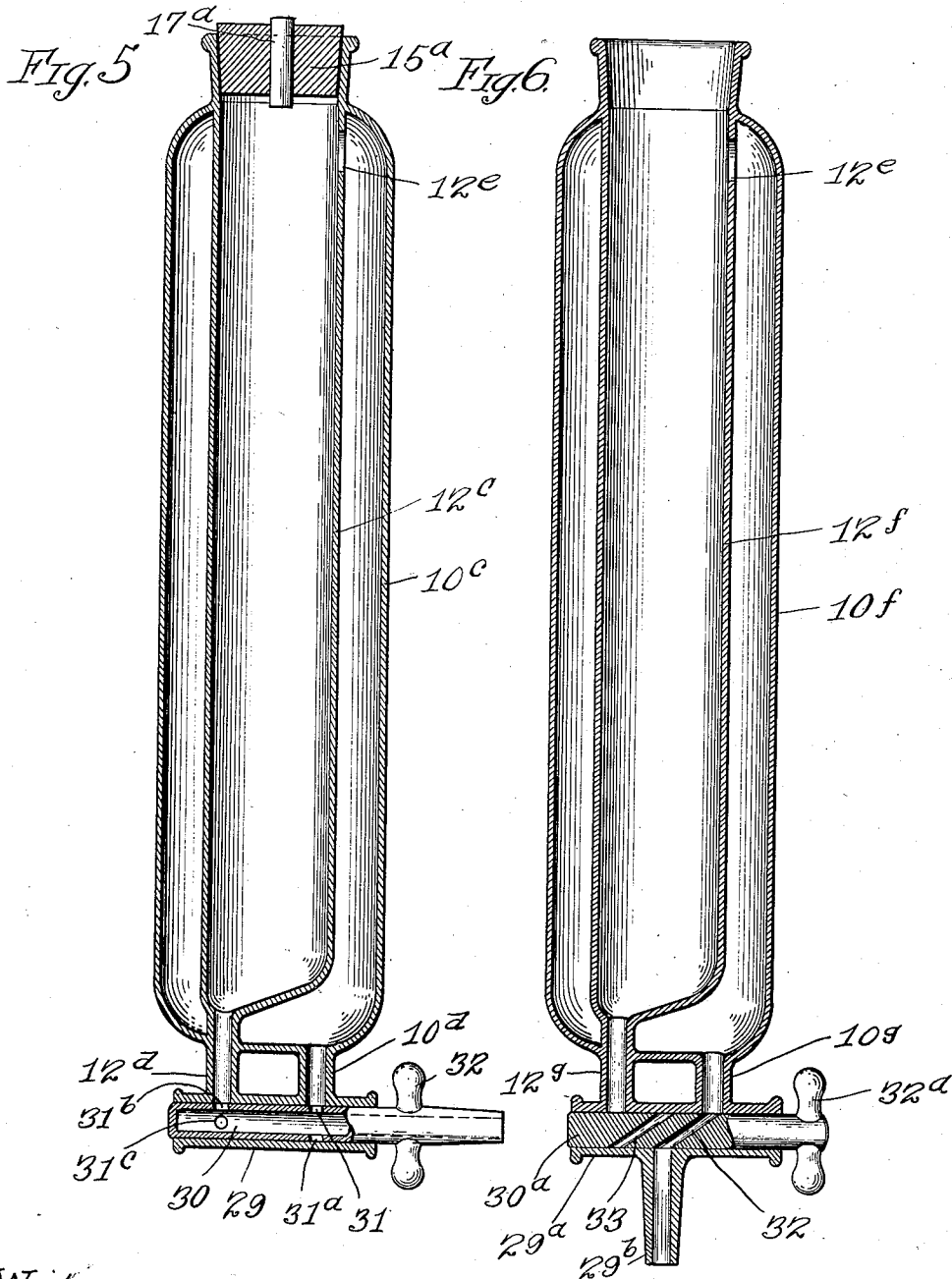
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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INJECTION APPARATUS.

1,205,410.

Specification of Letters Patent.

Patented Nov. 21, 1916.

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To all whom it may concern:

Be it known that I, ALONZO C. TENNEY, a citizen of the United States, and resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Injection Apparatus, of which the following is a description, reference being had to the accompanying drawings, which form a part of my specification.

My invention relates more particularly to an apparatus adapted for the intravenous or subcutaneous administration of medicines or solutions, having for its object the provision of a self-contained construction, wherein one receptacle or compartment is located within the other; both compartments being closed and sealed by a single sealing or closure, thus permitting of a complete and simultaneous sterilization of both compartments.

A further object of the invention is the provision of an apparatus wherein the fluid from either compartment or chamber will be controlled by a single valve or cock and be discharged through a single conduit or tube, the end whereof is provided with a suitable needle, thereby reducing the number and size of openings necessary, and consequently reducing the danger of contamination from the atmosphere or in preparation and handling; the relation or connection between the two receptacles being such that operation of the same valve will permit of the liquid or fluid contents of the two receptacles or chambers being drawn therefrom either independently or conjointly.

Still another object of the invention is the provision of an apparatus which permits of the use of pressure, either by means of gravity or otherwise, without the direct application of a syringe; and furthermore wherein all chambers or compartments with their passages and the various passages or channels of the valves, etc., are made visible so that any air entrained with, or other substances contained in the solutions may be observed and the final discharge thereof arrested or prevented, as will be readily understood from the following detailed description.

In the drawings: Figure 1 illustrates one form of my improved apparatus in side elevation. Fig. 2 is a longitudinal sectional view of the receptacle portion of the apparatus. Fig. 3 is a longitudinal sectional detailed view of the automatic valve mechanism intermediate of the receptacle portion

and the needle of the apparatus. Fig. 4 is a longitudinal detail sectional view of the needle end thereof. Fig. 5 is a longitudinal sectional view of a modified form of the receptacle portion of the apparatus. Fig. 6 is a longitudinal sectional view of still another modified form of the receptacle portion of the apparatus.

The apparatus is constructed with the receptacle portion formed of suitable material, preferably glass; and in the particular exemplification of my invention, the receptacles are shown in the nature of tubes or cylinders, which may either be separately formed or made integral. This portion of the apparatus comprises the outer receptacle or chamber 10, open at both ends, with the lower end preferably contracted or made tapering, as very clearly illustrated in Fig. 2 at 11, adapted to receive the contracted lower portion 12^a of the inner tube or receptacle 12, as very clearly shown in Fig. 2. The upper end of inner tube 12 is shown bulged or enlarged as at 12^b, which prevents the inner tube 12 from dropping farther into outer tube or receptacle 10; the contracted portion 12^a and enlarged portion 12^b thus maintaining the relative position of the tubes as is clearly evident from the construction shown.

In order that a fluid tight connection may be effected between the two tubes or receptacles, I illustrate the lower end of outer tube 10 provided with a suitable gasket or fluid tight effecting means 13, which may be in the nature of a rubber band arranged to overlap and extend into the orifice of the outer tube 10 so as to firmly engage with the contracted end 12^a of inner tube 12; while the outer edge of the band 13 may be provided with a reinforced rim as at 13^a which causes the band to firmly hug the neck of the outer receptacle 10. It is understood, of course, that the gasket or band should be of a thickness commensurate with the space intervening the contracted ends 11 and 12^a of the outer and inner tubes respectively. In order to insure the gasket or band remaining on the outer receptacle, the orifice of the contracted portion 11 may be provided with a rim as at 11^a.

The upper end of outer receptacle or tube 10 is made air tight and fluid tight by means of a suitable ferrule or band 14, preferably of rubber, adapted to snugly fit about the neck of the outer receptacle and the enlarged

or bulged portion 12^b of the inner tube or receptacle. The orifice of the inner tube or receptacle 12 is intended to be closed by any suitable means, as for example the stopper 5 15, which in the particular exemplification is shown provided with a pressure applying bulb 16 of well known construction, having the stem 17 extending through the stopper 15.

10 The contracted end 12^a of lower orifice of inner tube or compartment 12 is provided with a valve, which in Fig. 2, comprises the outlet portion or stem 18 provided with the perpendicularly formed inlet stem 19 which 15 latter is made to extend into the contracted neck or orifice 12^a of inner tube 12, preferably to a considerable extent so as to provide a fluid tight connection. In addition to the longitudinally disposed passage 19^a, 20 the inlet stem or portion 19 is provided with the lateral port or opening 19^b which may be brought to register with the port 20 formed in the contracted stem 12^a of inner receptacle 12, thus permitting communication 25 between the outer receptacle 10 and the inner receptacle 12, as well as the valve. Inner receptacle 12 is also provided with an overflow and air vent or port 12^c, preferably arranged in the base of the enlarged or 30 flared portion 12^b at the upper part of the receptacle, thus permitting both receptacles to be substantially filled without, however, allowing the fluid or solution of one receptacle to enter or mix with the solution in the 35 other receptacle.

With the valve in the position illustrated in Fig. 2, it is evident that the contents of both the inner and outer tubes or compartments will be permitted to flow through the 40 stems 19 and 18 of the valve and be discharged into the flexible tube or conduit 21 which is secured to the outlet portion or stem 18. The end of flexible tube 21 and the end of outlet portion 18 may be so 45 constructed as to permit of a slip connection being formed; and the valve may be maintained in proper relative position by any suitable sustaining means, as for example, by means of bands or wires 22, which 50 are shown fitting about the outlet portion 18 of the valve and suitable lugs 23, 23, shown integrally formed on the outer tube or receptacle 10. By sustaining the valve in place with means of the description 55 shown and described, it is made possible to not only remove the valve when desired, but also permit the valve to be oscillated so as to bring the port 19^b into and out of register with the port 20 so that flow from 60 the outer receptacle or tube 10 may be obtained or shut off; it will be understood, however, that other suitable means may be employed for sustaining the valve in place.

The conduit or tube 21 is preferably of 65 flexible material and of a suitable length

as clearly shown in Fig. 1, where it is shown made in sections so as to receive the automatic valve shown in Fig. 3. The valve and casing preferably consist of the glass shell or member 24, the ends whereof are 70 preferably reduced and tapered as clearly shown in Fig. 3 to receive the ends of the flexible conduit or tube 21 and permit of the flow therethrough. The member 24 is provided with a suitable hollow member or float 75 25 having an elongated stem portion 25^a, which extends into the lower reduced end of member 24 and insures proper seating of float or valve 25. The float or valve 25 may be of any suitable material, preferably 80 glass, and is of a size which will permit passage of fluid through the member 24 when the float 25 is raised from its seat as shown in Fig. 3. In order that the float 25 will not shut off the flow through mem- 85 ber 24 when the valve is in its raised position, the tube 24 at its upper reduced end may be provided with suitable projections or lugs as clearly shown at 24^a in Fig. 3, which will permit the fluid to flow between 90 the lugs and around the upper end of the float when the valve is in the position shown in Fig. 3.

Under normal operating conditions, the fluid flowing through conduit or tube 21 and 95 tube 24 will compel the float member 25 to rise from its seat and allow the fluid to pass about the elongated stem 25^a of the float and into the section 21^a of the flexible tube or conduit and be discharged into the 100 enlarged or flared member 26 whose function is to arrest any air bubbles that may have been carried along with the fluid and beyond the automatic valve just described. The member 26, which is also preferably 105 constructed of glass, is provided with an enlarged or flared portion intermediate of its ends, as shown at 26^a, whereby the fluid and air will be allowed to separate; the fluid continuing through the lower reduced portion 110 of the member 26 and into the section 21^b of the flexible tube or conduit, while the air will rise and pass into the flared or enlarged portion 26^a, where it will be held in check as long as the fluid is passing 115 through the conduit or tube. The flexible section 21^b is shown provided with the metallic end 27 which is intended to receive the needle 28, which, in the particular construction shown, has a slip connection with 120 member 27.

By constructing the receptacles, their discharge ports, the valve or cock, the automatic valve, and the bubble arresting member 125 of glass, it is possible to detect any bubbles of air or particles of foreign matter that may have entered the apparatus during the process of filling the same. Should a considerable quantity of air find its way 130 into the receptacle and, therefore, into the

conduits, it is evident that as soon as the large bubble or pocket of air reaches the member 24, it will permit float valve 25 to drop to its seat and, therefore, close off further flow until the air has been liberated. If the air should become finely divided into small bubbles and be allowed either partially or wholly to pass beyond valve 25, these small bubbles will immediately separate themselves from the fluid when the enlarged or flared portion of member 26 is reached in the flow of the fluid; the air rising within the flare or bell of the member 26 while the fluid, free from any particles of air, will continue in its flow through conduit section 21^b, thimble or member 27, and be discharged through needle 28.

In Fig. 5, I show a modified form of the receptacle portion of my improved apparatus, which, as is readily apparent from the drawings, may be of various forms. In this form, the outer tube or receptacle 10^c and inner tube or receptacle 12^c are made integral, thus obviating the necessity of employing the sealing bands 13 and 14, as in the construction shown in Fig. 2. The inner tube or receptacle has the lower contracted end thereof passing through the lower wall of the outer receptacle, as very clearly shown at 12^a, while the outer receptacle has an independent or separate discharge port or spout 10^d, both of which discharge ports or spouts, however, communicate with the valve-chamber 29 provided with the cylindrical, horizontally disposed, hollow valve 30. The hollow valve 30 is provided with several ports 31, 31^a, 31^b, and 31^c, arranged at predetermined points so that port 31 may be brought to register with spout 10^d at the same time that port 31^b is made to register with spout 12^d, as shown in Fig. 5. Valve 30 is provided with suitable means as at 32 whereby the valve may be rotated in a vertical direction whereby the flow is controlled. It is evident from the construction shown in Fig. 5, that the contents of both receptacles or chambers 10^c and 12^c will be discharging therefrom when valve 30 is in the position shown in Fig. 5. A slight rotation of valve 30, so as to bring port 31^c to register with spout 12^d, will shut off the flow from outer compartment or receptacle 10^c and merely allow the contents of inner receptacle or compartment 12^c to discharge through the valve; while a further rotation of valve 30 will bring port 31^a into position where it will register with spout 10^d, thereby shutting off the flow from the inner compartment or receptacle 12^c and merely allow the contents of outer compartment or receptacle 10^c to be discharged.

With the construction shown in Fig. 5, the fluid for both compartments or receptacles is poured through the single inlet orifice which is closed by a suitable stopper, as

shown at 15^a, which may be provided with a pressure applying bulb as in Fig. 2; the portion of the stem whereof is shown at 17^a. The inner tube 12^c is provided with an overflow and air port or spout 12^e which will permit the fluid to flow into the outer receptacle or compartment and allow the air to discharge therefrom.

In Fig. 6, I show the construction of receptacle illustrated in Fig. 5, provided with a modified form of valve. As in Fig. 5, the inner and outer receptacles 12^f and 10^f are formed integral and provided with their separate discharge spouts 12^g and 10^g respectively, which connect with the valve-chamber 29^a, which latter is provided with a discharge spout 29^b, adapted to receive the end of the flexible conduit or tube 21. The chamber 29^a is provided with a valve 30^a provided with the ports 32 and 33 extending there-through, the ports being arranged at an acute angle to the longitudinal axis of valve 30^a, as clearly shown, so that port 32 may be brought to register with spout 10^g, of outer receptacle 10^f and with discharge spout or outlet 29^b of valve-chamber 29^a, as shown in Fig. 6. The ports are so arranged that when they are in the position shown in Fig. 6, the contents will be allowed to flow from receptacle or compartment 10^f while the flow from inner compartment 12^f will be shut off. A rotation of valve 30^a, which may be accomplished by the means 32^a, will bring port 33 into register with spout 12^g of inner compartment 12^f and the discharge spout 29^b, while port 32 will be moved out of register with spout 10^g and discharge spout 29^b, thus only permitting the contents of inner compartment 12^f to be discharged therefrom. As in Fig. 5, the inner receptacle 12^f is provided with a spout or overflow orifice 12^g; and the inlet orifice of the receptacle is intended to be closed by a suitable stopper as in the constructions previously described. The construction shown in Fig. 6, differs from that shown in Fig. 5, in that the contents of but one compartment or receptacle may be discharged at a time, while with the construction shown in Fig. 5, the contents of either receptacle or compartment may be independently or separately discharged, or the contents from both receptacles may be simultaneously discharged. Both of these constructions differ from that disclosed in the first two figures of the drawings in that in the construction shown in Fig. 2, the contents of both compartments or receptacles may be simultaneously discharged, or the contents of the inner chamber or receptacle alone may be discharged.

It is evident from the constructions shown and described, that separate fluids may be had in the different compartments or receptacles, and the fluid intended to be stored in the outer compartment or receptacle is

first poured into the orifice of the inner receptacle or compartment, and either allowed to overflow by means of the port 12^e; or the valves so arranged that the fluid may pass
 5 through the valve from the inner compartment or receptacle into the outer, which can be accomplished by shutting off the flow through the flexible tube or conduit 21. For example, in Fig. 2, the fluid it is intended to
 10 store in outer receptacle 10 is poured into the inlet orifice of receptacle 12 and the valve turned into the position shown in Fig. 2, while flow through conduit 12 may be shut off by any suitable means which will compress the tube, thus compelling the fluid to
 15 flow through the registering ports 19^b and 20, until the outer receptacle is provided with the desired quantity of fluid. It is evident that the air in outer receptacle or compartment 10 will be forced upward and out
 20 through the port or vent 12^e. After the outer tube has been filled with the desired amount, and while the flexible conduit 21 is still compressed, the valve is so operated
 25 as to shut off the flow through port 19^b; the fluid it is intended to store in inner compartment 12 is then poured in through the inlet orifice thereof until the required quantity has been supplied. In supplying the
 30 outer compartment in the manner just described, it is evident that inner compartment will fill to the same extent as the outer, so that the quantity contained in the inner compartment will have to be drained there-
 35 from before said compartment is filled with the solution it is intended to place therein. This draining can be accomplished through proper operation of valve 18 so as to shut off flow from outer compartment 10, and al-
 40 lowing the surplus fluid in inner compartment to flow out through the valve and tube or conduit; after which flow through tube or conduit 21 is again shut off.

With the construction shown in Fig. 5,
 45 the valve may be turned into the position shown in Fig. 5, so that, with the flexible conduit or tube 21 compressed, the fluid it is intended to store in outer chamber or compartment 10^e, will pass from the inner compartment 12^e, through spout 12^a, thence
 50 through the hollow valve 30 and upward through port 31 and spout 10^d, into the outer compartment, thereby forcing any air in outer compartment upward and out through
 55 port or vent 12^e. After the outer compartment has been properly supplied, the valve 30 is turned so as to shut off the flow from outer compartment and the surplus fluid drained from inner compartment, after
 60 which the valve is turned so as to shut off flow from either compartment, when the fluid it is intended to store in inner compartment or receptacle 12^e is poured therein. In the construction shown in Fig. 6, the
 65 valve is turned so as to shut off flow from

both receptacles or compartments, and the fluid it is intended to store in the outer compartment 10^e is poured into the single inlet orifice until inner compartment or receptacle 12^e is filled to the point where it
 70 will overflow into outer receptacle, namely through the port or vent 12^e. After the outer compartment is sufficiently charged, the valve is turned so as to draw off the surplus fluid from the inner chamber or recep-
 75 tacle, after which the valve is turned so as to shut off flow from the inner as well as the outer receptacle, when the inner receptacle may be charged with the desired fluid.

My invention is especially intended for
 80 intravenous or subcutaneous medication, by the use of any solution, especially salvarsan and neo-salvarsan; or for isotonic saline solution, isotonic sea water, and solutions of colloidal metals, etc., the apparatus permit-
 85 ting of use for enteroclysis.

As previously set forth, the apparatus permits of complete sterilization in one piece, by reason of the fact that both compart-
 90 ments are located within a common outer shell, which enables the outer compartment being filled either by way of the inner one,—through overflow at the top; through a valve or stop cock common to both compart-
 95 ments,—or, if desired, by a separate opening in the exterior wall or shell.

In the use of my improved apparatus, the valve or stop cock,—which controls the flow from both compartments—is arranged as
 100 previously described with reference to the different modifications, and the solution of sodium chlorid or other fluid is poured into the opening at the top of the apparatus. After both compartments have been supplied with the proper medication and quan-
 105 tity, the valve is operated to demonstrate a free flow from either compartment. The needle is then introduced into the patient for administration of the medicant—either
 110 subcutaneously or intravenously—and the valve operated so as to permit flow from the compartment containing the solution it is desired first to administer. After the prescribed dose has been consumed—and
 115 preferably before the compartment is entirely empty—and while the needle is still in place,—the valve is operated to permit flow from the other compartment, thereby clearing the apparatus and needle of the
 120 medicament or solution first administered, and—if used intravenously—to clear or wash the vein of said medicament. It is apparent, that the flow may be accelerated either through the action of gravity, induced
 125 by elevating the compartments, or by air pressure obtained through the use of bulb 16, or other suitable means for supplying a controllable air pressure on the solutions, where-
 by a continuous flow may be insured.

I have shown and described what I be- 130

lieve to be the best forms of my improved apparatus, but it is evident that the same may be altered in certain details, without, however, departing from the spirit of my invention, and I do not wish to be understood as limiting myself to the exact constructions shown and described.

What I claim is:—

1. An apparatus of the class described, comprising a receptacle provided with several compartments for retaining liquid and having communication with each other at a predetermined point and provided with outlets, a member with which the outlets of the compartments communicate, a single valve arranged to shut off the flow into said member from either one or all of said compartments, and a single conduit connected with said member and provided with means for automatically closing off said conduit when gaseous matter is entrained with the liquid flowing from the compartments.

2. An apparatus of the class described, comprising a pair of liquid retainers arranged one within the other and having communication with each other adjacent the upper ends thereof, a single member having communication with both retainers and provided with a single outlet, a single valve whereby the flow into said member from either one or both of the retainers may be shut off, and a conduit connected with the discharge end of said member and provided with means whereby the flow therethrough may be observed.

3. An apparatus of the class described, comprising a pair of glass liquid retainers arranged one within the other, said retainers having communication with each other adjacent the upper ends thereof and provided with discharge ports, a cylindrical valve member provided with several ports so arranged as to separately or simultaneously establish communication with the ports of either or both of said retainers and control the flow therefrom, means whereby the orifices of said retainers are sealed, a single conduit secured to the discharge end of said cylindrical valve member, and means located in said conduit whereby air entrained with the flow of liquid through the conduit will be arrested.

4. An apparatus of the class described, comprising a pair of glass retainers arranged one within the other, the inner retainer being provided with a port at a predetermined point for effecting communication between said retainers while both retainers are provided with outlets, a valve common to both outlets whereby the flow from either or both of the retainers may be controlled, a conduit connected with the discharge end of said valve, a needle arranged

at the discharge end of said conduit whereby the contents of the retainers may be intravenously or subcutaneously applied, and means whereby the flow through the conduit may be automatically controlled.

5. An apparatus of the class described, comprising a pair of liquid retainers arranged one within the other and provided with inlets and outlets at opposite ends thereof, means arranged at the outlet ends of said retainers whereby the flow may be controlled, a single conduit communicating with said means, a needle arranged at the discharge end of said conduit whereby the fluid from said retainers may be intravenously or subcutaneously administered, and means intermediate of the ends of the conduit whereby the flow therethrough may be automatically shut off by gaseous matter entrained with the liquid.

6. In an apparatus of the class described, a fluid-conveying conduit provided with a dilated or enlarged portion intermediate of its ends, and means arranged in said dilated or enlarged portion adapted to automatically close off the flow of fluid through the conduit when gaseous matter is entrained with the fluid.

7. In an apparatus of the class described, a fluid-conveying conduit provided with a dilated or enlarged portion, a float-member arranged in said portion and adapted to automatically shut off the flow through the conduit beyond said portion when gaseous matter entrained with the fluid enters said dilated or enlarged portion.

8. An apparatus of the class described, comprising a number of liquid retainers arranged to permit observation of the solution within, a valve-casing with which the discharge ends of said retainers communicate, a single valve in said casing whereby the flow from said retainers may be controlled, a single conduit for receiving the liquid discharged from the retainers, said conduit being provided with a needle at the discharge end thereof for intravenously or subcutaneously administering the liquid, a member intermediate of the ends of the conduit through which the liquid is adapted to flow, said member being formed to permit observation of the flow therethrough, a float-member arranged within said member adapted to shut off flow through the first mentioned member when air or extraneous matter is entrained with the liquid, and an air arrester in said conduit intermediate of said member and said needle.

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