

Aug. 24, 1954

P. A. DONAHUE
EMBALMER'S SYRINGE

2,686,952

Filed July 21, 1949

3 Sheets-Sheet 1

Fig. 1

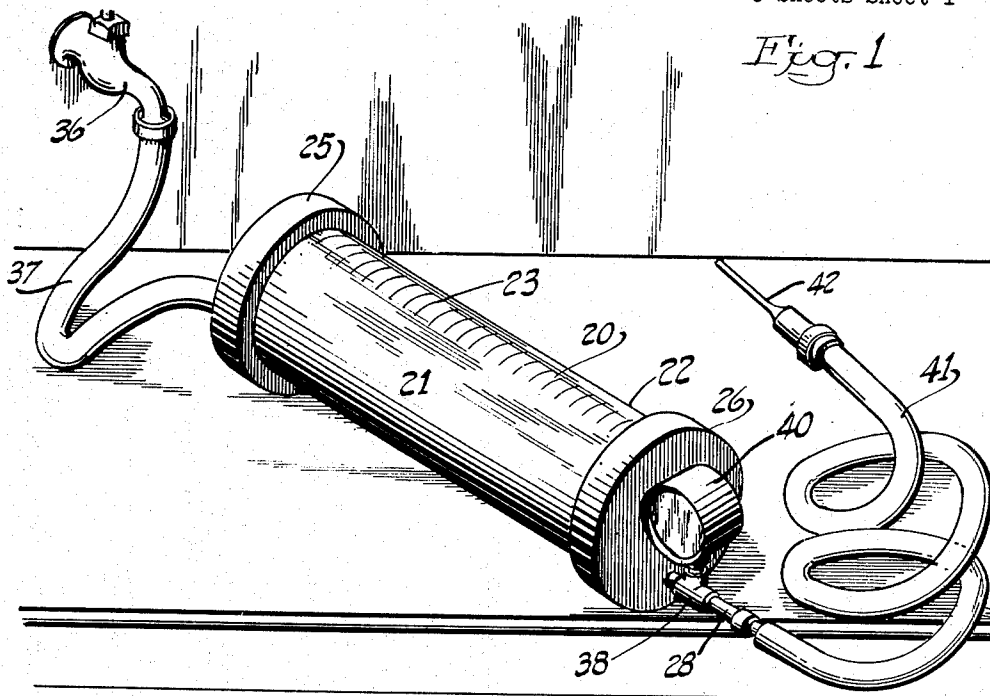
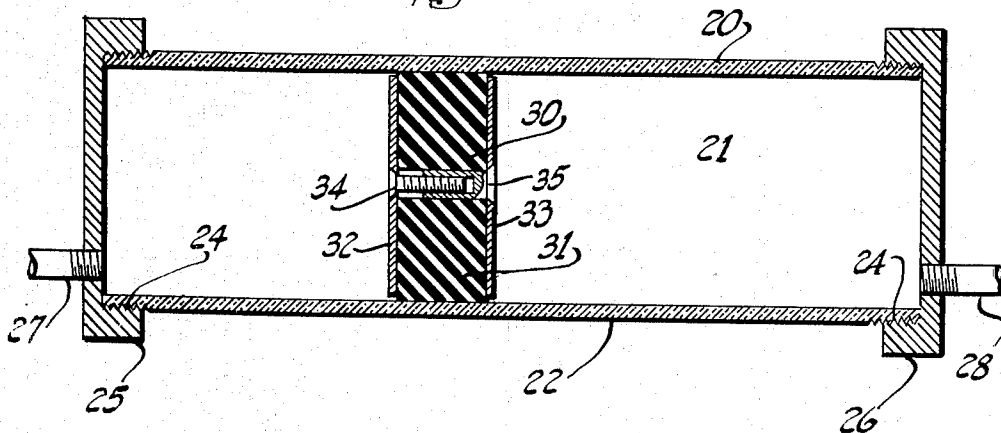


Fig. 2



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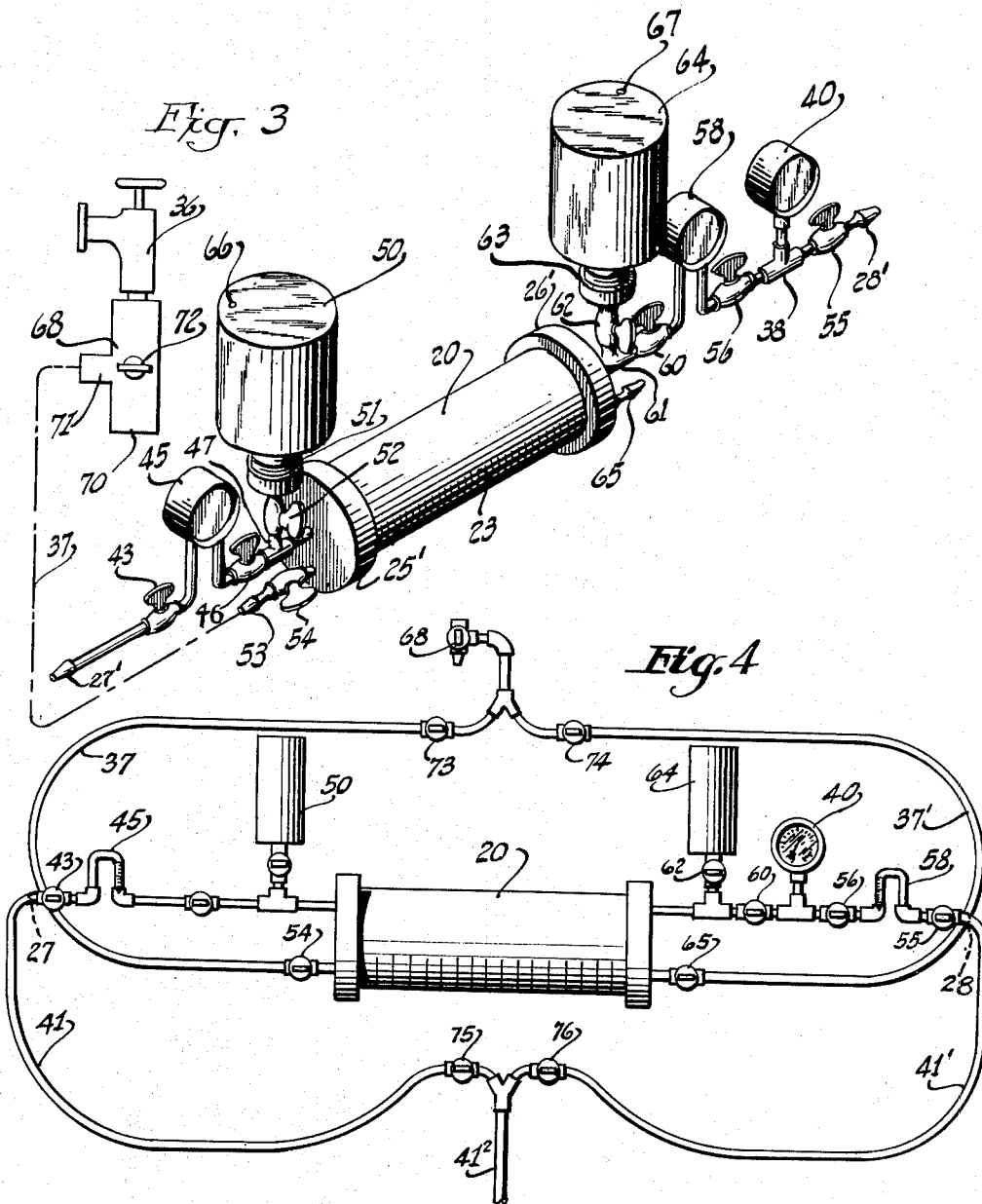
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3 Sheets-Sheet 2



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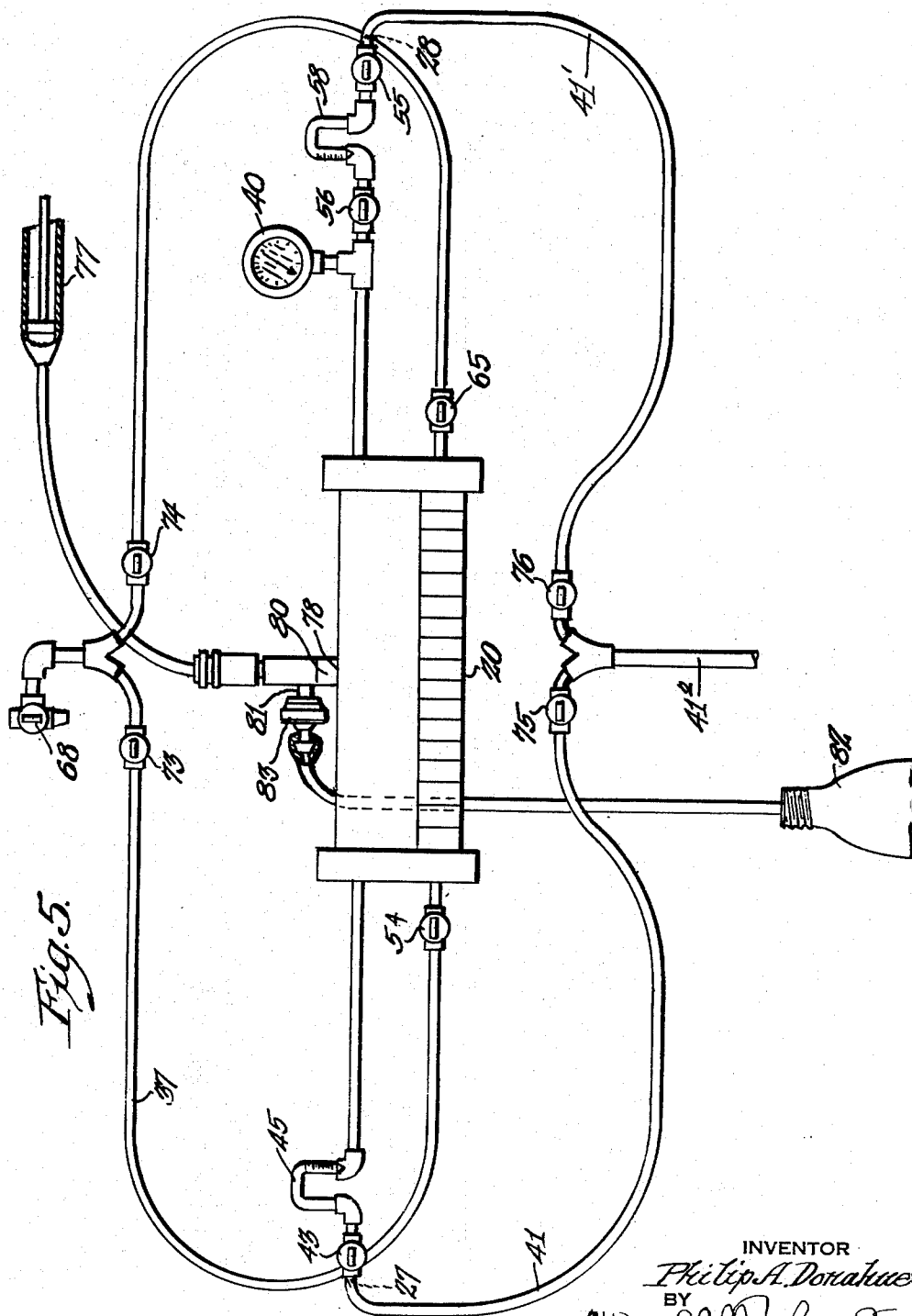
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3 Sheets-Sheet 3



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2,686,952

EMBALMER'S SYRINGE

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Application July 21, 1949, Serial No. 105,950

2 Claims. (Cl. 27-24)

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The present invention relates to embalmer's syringes and processes of embalming.

A purpose of the invention is to permit better control of the conditions and especially the pressure of introduction of embalming fluid into a cadaver.

A further purpose is to avoid swelling and discoloration in a cadaver due to embalming technique.

A further purpose is to simplify the procedure of introduction of embalming fluid so that the embalmer can occupy himself with other tasks such as massaging and sponging which should desirably be carried on during the period of injection.

A further purpose is to avoid the trouble of hand mixing of embalming fluid, and to avoid the skin burns which have commonly resulted by skin contact with concentrated embalming fluid.

A further purpose is to permit the use of regulated pressure to break through obstructions in the arteries and veins of the cadaver.

A further purpose is to introduce embalming fluid by water pressure applied to one end of a syringe, thus filling with water the end to which pressure is applied, then to mix concentrated embalming fluid directly with this water, thus saving time in making up new solutions, and then to reverse the syringe so that the end which formerly contained embalming fluid will now act as the pumping end and be connected to the water pressure.

A further purpose is to supply concentrated embalming fluid to the syringe by means of a T from a vessel containing concentrated embalming fluid.

A further purpose is to employ an auxiliary syringe for introduction of concentrated fluid into the system of the invention, connecting the syringe preferably to an intermediate point between the ends of the cylinder of the main syringe, and desirably providing the auxiliary syringe with a branch connection to a container for concentrated fluid.

Further purposes appear in the specification and in the claims.

In the drawings I have chosen to illustrate a few only of the numerous embodiments in which my invention appears, selecting the forms shown from the standpoints of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

Figure 1 is a perspective of a syringe embodying the principles of the present invention.

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Figure 2 is an axial section of the syringe chamber or barrel.

Figure 3 is a view similar to Figure 1 showing a modification, and omitting the artery tube and hose.

Figure 4 is a diagram of reversible connections to the syringe.

Figure 5 is a diagram of a variant form of the invention.

Describing in illustration but not in limitation and referring to the drawings:

In embalming, it is common practice to open an artery and a vein, and inject embalming fluid, at the same time removing body fluid. This has been accomplished in the past in many cases by the use of hand syringes, although more recently electrical syringes have been used in some cases.

The optimum operating conditions particularly as to pressure vary markedly with each individual case, and the skilled embalmer should make due allowance for the speed with which the cadaver drains. For example, if death has been due to arteriosclerosis, the draining rate is usually very low and due allowance should be made in injection. Careless embalming, particularly in the case of too fast injection, may cause swelling and discoloration of the cadaver, and if this condition once develops it is very difficult to restore the appearance to normal. Much can be done by the embalmer through massaging and sponging during the injection, but in the case of the prior art devices already mentioned it has been necessary to give such concentrated attention to the syringe itself, that if any sponging or massaging has been done at the time of injection it has required the service of an additional operator.

Much difficulty has been caused by the necessity that the embalmer hand mix the solution, and that is not only troublesome but sometimes causes burns which discolor and roughen the parts affected when concentrated embalming fluid comes in contact with the hands or wrists.

In some cases complete embalming has been difficult through the inability of the embalmer to reduce obstructions in the circulatory system of the cadaver.

The present invention permits the embalmer to avoid constant individual attention to the operation of the syringe, making it possible for the syringe to continue operation for periods of the order of five to ten minutes without supervision, while the embalmer can devote his attention to massaging, sponging and other duties. The pressure can be regulated very accurately at any desirable safe value, but in case an obstruc-

tion is encountered will build up automatically to break down or overcome the obstruction. At the same time the rate of injection will be determined by the pressure set.

Not only is hand manipulation of the syringe avoided, but hand mixing of the solution can be wholly or partially avoided as desired.

Considering first the form of Figures 1 and 2, a syringe 20 is shown having a cylinder or barrel 21 consisting of a suitable tubular housing 22, conveniently made of a transparent plastic such as acrylic resin, and having marks 23 indicating quantity. The housing is suitably of circular cross section, and externally threaded at 24 at each end. Heads 25 and 26 suitably internally threaded are screwed on the housing of the cylinder at the ends. The heads may conveniently be of metal such as aluminum alloy, stainless steel or other suitable material. Each of the heads has a liquid fitting 27 or 28, conveniently a nipple intended for connection to a surgical rubber hose.

A floating piston 30 is mounted in the cylinder, conveniently consisting of a rubber body 31 with metallic discs 32 and 33 at the opposite ends, held together by a screw 34 engaging a socket screw 35 in a suitable central opening through the discs and rubber body. The floating piston 30 is suitably lubricated so that it will move back and forth in the cylinder under slight fluid pressure differential.

In the simplest form of the invention, a source of water pressure such as warm or cold water faucet 36 is connected by a hose 37 to the fitting 27 at one end of the cylinder. The other end of the cylinder desirably is provided with a T connection 38 into the fitting 28 which permits attachment of a pressure gage 40.

The fitting 28 is connected by a hose 41 to a suitable applicator 42, known as an embalmer's artery tube.

In operation in the simplest form, the syringe while disconnected from the source of water pressure will have one of its heads 26 open, and the syringe will desirably stand upright with the open end at the top. The floating piston can then be pressed down as by the hand to the bottom of the cylinder or to any desired level, and concentrated embalming fluid and water will be introduced into the upper portion of the cylinder. The marks 23 on the side of the cylinder can be used to measure the number of ounces of concentrated embalming fluid being introduced, after which the space can be filled with water. The head 26 is then screwed on and the artery tube hose 41 is connected to the fitting 28. The device is then desirably placed in horizontal position as shown in Figure 1. The artery tube is then introduced, as into an artery, and the pressure hose 37 connected to the fitting 27 is also connected to the source of water under pressure and the water turned on. The quantity of water turned on can be regulated by the amount of opening of the faucet, or if the pressure on the water system is excessive, another faucet in the water system can be opened to reduce the pressure. The pressure applied can be observed on the pressure gage 40. Good results are often obtained using pressures of 1 to 2 pounds per square inch. At pressures of this order I find that the two quarts content of the syringe which I normally employ will be discharged in approximately six to seven minutes, in the case of a normal cadaver.

If the injection appears to be too fast it can

be cut down by reducing the flow at the faucet or increasing the opening of another faucet on the same system. Similar regulation can be accomplished by a hydroaspirator as later explained.

Once the contents of the syringe have been discharged, the floating piston 30 will move up to a position adjoining the head 26, while the opposite end of the syringe will be filled with the water which applied the pressure. It is then necessary to make up a new charge of embalming fluid. This is done very readily by turning off the water at the faucet 36, raising the syringe with the head 25 uppermost, removing the head 25, pouring out a small quantity of water, and then introducing the required quantity of concentrated embalming fluid to the syringe, partially full of water as desired. Stirring may be employed for mixing, if desired. The head 25 is then put on and the hoses are reversed, the pressure hose from the faucet now going to fitting 28 on head 26, and the artery tube hose 41 now going to fitting 27 on head 25. The syringe is preferably placed on its side, and once again the water at the faucet is turned on, the correct pressure established, and the injection continued until all or any part of the syringe full has been discharged.

Thus it will be evident that the syringe is reversed after each discharge of its contents, and the water which formerly provided the pressure on the previous stroke now makes up solution by mixing with concentrated embalming fluid.

By this procedure much of the trouble of mixing up solution may be eliminated and the likelihood of skin burns may be greatly reduced, while the time of mixing is shortened to a minimum.

Very little attention need be given to the injection while it is going on, the embalmer simply watching the gage as required. He can give his attention to the effect of the injection, applying massage and sponging at points which will aid drainage, and performing other duties.

Whenever an obstruction builds up, I find that the pressure will rise slightly, usually to a level of the order of five to ten pounds, and will then readily break through and continue the injection.

In some cases it is desirable to further simplify and facilitate the procedure, and this is illustrated in the alternate form of Figure 3.

In this case the fitting 27' is provided with a stopcock 43, a flow meter 45 connecting in the line, and a stopcock 46 and T 47 and a bottle or other suitable vessel 50 for concentrated embalming fluid inverted above the syringe and connecting to the T by a screw fitting 51 and a stopcock 52. An auxiliary fitting 53 provided with a stopcock 54 is also made into the head 25'. At the fitting 28' on the head 26', a stopcock 55 is provided, then the T 38 and pressure gage 40; then the stopcock 56, then a flow meter 58, next a stopcock 60 and then a T 61 connecting through a stopcock 62 and screw fitting 63 with a bottle or other vessel 64 for concentrated embalming fluid above the syringe. An auxiliary fitting and stopcock 65 is also provided at the head 26'.

To facilitate introduction of concentrated embalming fluid, each of the bottles 50 and 64 is preferably provided near the top with an air opening 66 or 67, which may for example be sealed as by cork or wax prior to use of the bottle.

The syringe of Figure 3 is alternately connected to the applicator and to the source of pressure as in the case of Figure 1. An additional refinement in pressure application is, however, preferably used, consisting of a hydroaspirator 68, of well known type, connected to the faucet 36, having a drain connection 70 and having a side connection 71. A two-way cock 72 in the hydroaspirator permits adjustment so that water from the hydroaspirator will be discharged through the side connection 71 in one position, but water from the hydroaspirator will be passed down the drain connection 70 in another position, thus applying suction to the connection 71, as well known.

To start the operation, the cylinder is filled with water, for example by introducing water from the pressure hose 37 through the side connection of the hydroaspirator, into the fitting 53 and through open cock 54 (cocks 46 and 52 being closed) until the floating piston moves to a position adjoining the head 26'. At this time, cocks 55, 56 and 60 are open and connected to the artery tube, and cocks 62 and 65 are closed. The cock 60 on the fitting 28' is now turned off, and the cock 62 from the bottle 64 containing concentrated embalming fluid is opened. The stopcock 72 on the hydroaspirator is shifted to discharge water through the drain connection 70, thus applying suction to the side connection 71, the hose 37, and the fitting 53 to the floating piston. The valve 52 is of course still closed. As an alternative procedure, water need not be introduced on the opposite side of the piston before applying suction to suck in concentrated embalming fluid. The application of suction causes the floating piston to move away from the head 26, drawing concentrated embalming fluid to the desired quantity into the syringe at that end, air entering the opening 67. When the floating piston has moved back sufficiently as indicated by the marks on the housing, the valve 62 is shut off, stopping the flow of concentrated embalming fluid into the syringe, and the suction is shut off, stopping the floating piston. The pressure hose 37 is now reversed and connected to the fitting 65, while at the same time the applicator hose 41 (Figure 1) is connected to the fitting 27'. The stopcock 72 on the hydroaspirator is adjusted to cut off flow through the drain connection 70 and apply flow and water pressure to the side connection 71. The valves 43, 46, and 65 are now all open, while the valves 54, 52, 55, 56, 60 and 62 remain closed. If this is the first cycle, the artery tube is simply allowed to discharge its water into the sink while the pressure water enters the fitting 65 and mixes with the embalming fluid on the side of the floating piston toward the head 26'. As the water enters, it dilutes concentrated embalming fluid in T 61 below valve 62.

At this point the stopcock 46 is closed, while the stopcock 72 on the hydroaspirator is shifted to apply suction to the hose 37 through the fitting 65. The cock 52 is opened, and the correct amount of concentrated embalming fluid is now sucked into the cylinder on the end adjoining the head 25'. As soon as this has been accomplished, the valve 52 is closed and the hoses are reversed, while the hydroaspirator is shifted from suction to pressure. Under these conditions the pressure hose 37 is applied to the fitting 53, while the valve 54 is open and the valves 43, 46 and 52 are closed. The artery tube hose 41 is attached to the fitting 28', the valves 55, 56 and 60 being opened and the valves 62 and 65 being closed.

The syringe is now ready to inject embalming

fluid into the cadaver at a pressure which is adjusted at the faucet 36 as previously explained. The flow can be observed on the flow meter 58 and the pressure on the gage 40.

At the end of the cycle, the proper amount of concentrated embalming fluid can be drawn into the cylinder in the manner previously explained before shifting the hoses for application of pressure on the opposite end.

By this procedure the syringe constantly makes up its next charge as it applies the previous charge, the water which is making up the new charge being the same water which applies pressure to the previous charge. In this way all handling of the concentrated embalming fluid is avoided.

The reversal of the hoses can be accomplished without physically removing and changing the connections, as shown in Figure 4. In this form a pressure hose 37 is connected to one stopcock 54 at one end of the syringe, and an alternate branched pressure hose 37' is connected to another stopcock 65 at the other end. Stopcocks 73 and 74 respectively are interposed in the respective hoses 37 and 37' to permit turning on one hose and turning off the other hose.

At the discharge end, alternate branch hoses 41 and 41' run from the respective fittings 27 and 28 to a common connection 41² to the artery tube, valves 75 and 76 being interposed in the respective hoses 41 and 41'.

Thus if a valve 73 is open to apply pressure to one end of the syringe, the valve 76 will be open to permit discharge from the other end of the syringe and valves 74 and 75 will be closed. To reverse the connections it is then merely necessary to close valves 73 and 76 and open valves 74 and 75. In this way the reversal can be accomplished more quickly than by changing the hoses.

In the form of Figure 5, introduction of concentrated fluid for charges subsequent to the first charge in the operation of the device is accomplished through an auxiliary syringe 77, preferably connected as shown at an intermediate point 78 between the ends of the cylinder of the main syringe. This permits elimination of the bottles 50 and 64 and the valves to them. This also dispenses with the necessity for the hydroaspirator as no suction need be used.

The auxiliary syringe connects into the cylinder of the main syringe through a check valve 80 which closes when suction is applied to the auxiliary syringe and opens when pressure is applied on the auxiliary syringe. A branch connection 81 extends from the auxiliary syringe at a point located toward that syringe with respect to the check valve 80, into a suitable open bottle 82 of concentrated fluid. A check valve 83 in this branch connection closes when pressure is applied on the auxiliary syringe and opens when suction is applied on the auxiliary syringe.

In operation of the form of Figure 5, the device can conveniently be started by inserting the required amount of concentrated fluid for one charge at one end of the main cylinder, and filling the rest of that end of the main cylinder with water. The connections are then reversed, the artery tube being connected to the end of the syringe in which the water was formerly introduced, while the source of water pressure is applied to the opposite end of the main syringe, stopping operation, however, before the floating piston has quite reached the other end of the main syringe. The water pressure being turned

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off, the auxiliary syringe is then operated, forcing the floating piston the remainder of the distance toward the end of the main syringe and at the same time forcing concentrated fluid from the auxiliary syringe into the main syringe to create the next charge. The main syringe is recharged through the branch 81 and check valve 83 by suction on the main syringe. This operation is repeated on each stroke of the piston.

It will be evident that the invention makes possible very accurate control of injection, and avoids the necessity of concentration by the embalmer on the mechanism of injection, permitting his attention to other duties during the period of injection.

It will also be evident that the invention makes possible application of low pressure which will assure flow, followed by build-up of pressure to overcome an obstruction in case an obstruction is encountered.

In view of my invention and disclosure, variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the process and structure shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In an embalmer's syringe, a cylinder, a floating piston in the cylinder, fluid connections to both ends of the cylinder, a hydroaspirator hav-

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ing a suction position and a pressure position connected to the fluid connection at one end of the cylinder, a vessel containing concentrated embalming fluid above the cylinder, and a valve connection between the vessel and the other end of the cylinder.

2. In an embalmer's syringe, a transparent barrel, a floating piston in the barrel, heads removably secured to the opposite ends of the barrel, fluid connections at the heads including T's, fluid fittings on one branch of each T, valves in the fluid fittings beyond each T, containers for concentrated embalming fluid connected in the other branch of each T, valves between each container and its T, a hydroaspirator having a suction position and a pressure position adapted to be connected to the fitting at either head and an applicator adapted to be connected to the fitting at the other head.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
419,778	Kendall	Jan. 21, 1890
801,612	Schramm	Oct. 10, 1905
966,591	Payne	Aug. 9, 1910
982,601	Hardy	Jan. 24, 1911
2,112,290	Holland	Mar. 29, 1938
2,118,704	Grontkowski	May 24, 1938

FOREIGN PATENTS

Number	Country	Date
15,173	Great Britain	1897