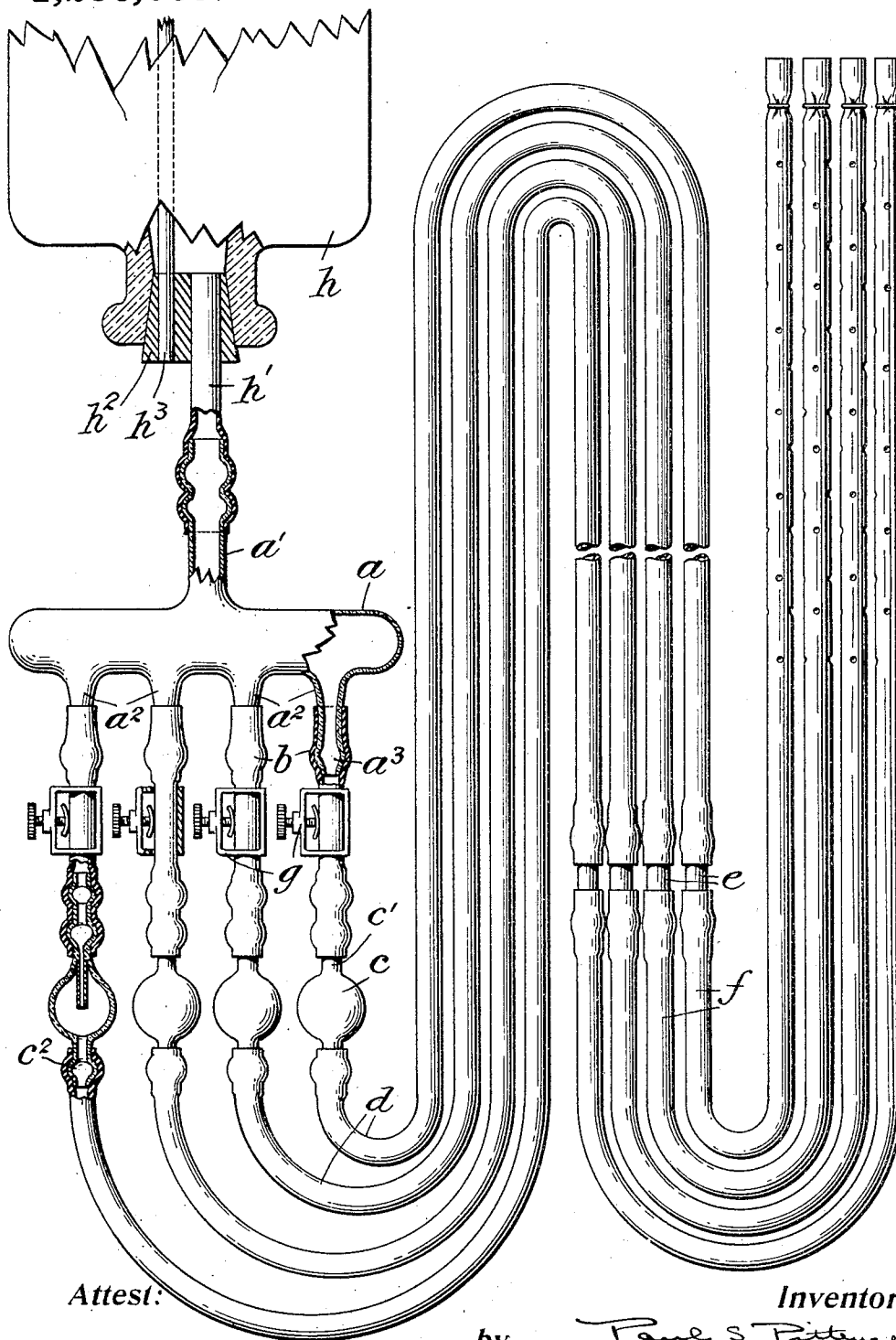


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 INSTILLATION APPARATUS.
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Attest:

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UNITED STATES PATENT OFFICE.

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INSTILLATION APPARATUS.

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To all whom it may concern:

Be it known that I, PAUL S. PITTENGER, a citizen of the United States, residing in the city of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Instillation Apparatus, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

This invention relates to instillation apparatus for administering antiseptic or bactericidal solutions to infected wounds or for the instilling of nutrient solutions into the body for feeding. Since the apparatus will find its greatest range of usefulness in connection with the administering of antiseptic solutions to infected wounds in accordance with an improved method recently discovered for treating wounds, now known as the Carrel-Dakin method, its embodiment is illustrated herein in an apparatus designed primarily for the practise of this method. Since the discovery referred to, of course, apparatus has been devised and employed for instilling the antiseptic solution into the wound, but this known apparatus has not been of such character as to insure the best results or to afford its most convenient use, since it has not permitted the certain regulation of the rate of flow of the solution to the several catheter tubes, nor has it insured a uniform flow to these tubes in accordance with determined requirements. Again, such apparatus as has been devised has not permitted the observation and control of the flow through the various tubes by the patient, as is most desirable where the instilling is carried on over a period of many hours. The present improvements will be described at greater length hereinafter in connection with the accompanying drawing which shows an improved apparatus in its relation to the container for the antiseptic solution, parts being broken away to show in section some of the details which become of great importance in apparatus of this character.

In practising the Carrel-Dakin method an antiseptic solution is led, by gravity feed, from a container to different parts of a wound and instilled therein through catheter

tubes. It is intended that the rate of instillation through each tube shall be fixed in accordance with the local conditions prevailing at the point of application of the particular tube, it being necessary under some conditions, for instance, that the rate of flow be much higher through one tube than through another. Further, the best practice demands that not only shall this flow be apportioned in the manner suggested, but that it be maintained with absolute certainty over a period of many hours. Again, it is necessary that the temperature of the solution thus injected shall be at a predetermined point. Having in mind these requirements it will be appreciated that the apparatus for practising the method must lend itself to these conditions and permit such adjustment as to insure the invariable and proportional flow desired and the instillation at a predetermined temperature. Not only should the apparatus permit of these initial adjustments to meet the conditions of the particular case, but it is obviously desirable that the rate of flow may at least be observed, if not controlled, by the patient, in the absence of the doctor or nurse. Interruption of the instilling might nullify the benefits of the method.

The improved apparatus comprises a reservoir *a*, preferably of glass, in which may be blown a short tube *a'* for connection with the source of supply and several other tubes *a*², the number of which may be determined by the number of catheter tubes which it is desired to employ. As will appear hereinafter these tubes *a*² may be shut off in any number desired according to requirements. Adjacent the ends of the tubes *a*² are formed suitably enlarged sections *a*³ to receive rubber tubes *b* which may be slipped thereover and serve to connect the reservoir *a* with transparent sight-feed bulbs *c*, preferably of glass, by means of which the rate of feed of the solution may be observed. These sight bulbs are also formed with short extensions *c'*, *c*², at opposite sides thereof, to engage the connecting tubes *b* and the instillation tubes *d*, respectively. In the ends of the instillation tubes may be placed short glass pipes *e* having enlarged sections to insure

snug union with the rubber tubes, and on to the end of these pipes *e* may be slipped catheter tubes *f* of well known character. Between the reservoir *a* and the respective
 5 bulbs *c* are attached to the respective connecting tubes *b* manually operable clamps *g* by means of which each of the tubes may be compressed and the rate of flow therethrough of the liquid thereby controlled.

10 The apparatus thus described may be connected to a source of supply shown conveniently as a calorix bottle *h* through a rubber tube *h'* which engages the feed pipe *a'* of the reservoir and passes through a
 15 stopper *h²* for the bottle. This stopper may also support an air pipe *h³* which extends into the bottle.

In operation the solution is placed in the bottle *h* and the latter is supported in an
 20 elevated position to insure a free gravity flow. From the bottle the solution passes into the reservoir *a* from which it is to be distributed to each of the instillation tubes and attached catheters. The surgeon knowing the requirements of the wound at the
 25 different portions thereof inserts the catheters *f* in required number and location and then adjusts each of the hand clasps *g* on the several connecting tubes *b* to give the
 30 required flow to the respective catheters depending upon the local conditions. This rate of flow may be readily timed by observation of the sight-feed bulbs *c*. The flow of each tube, as is observed, is controlled
 35 by means which are entirely independent of the controlling means for the rate of feed through each of the remaining tubes, so that there is no opportunity by capillarity or other conditions for the fixed rate of flow
 40 in the respective tubes to vary or to affect the rate of flow in any of the remaining tubes.

Another important advance in this type of apparatus made by the present invention
 45 resides in the capacity for the control of the temperature of the solution at its point of instillation. By connecting the reservoir *a* to the bottle *h* near the outlet thereof and by placing the controlling clamps *g* near the
 50 reservoir *a*, it is evident that the temperature drop of the solution is to be reckoned with wholly between each clamp *g* and the point of instillation, the flow of the liquid from the clamp to the wound being continuous and free. Knowing the desired temperature of the solution at the point of
 55 instillation and the required initial temperature of the solution in the calorix bottle, the temperature drop in the tubes between each one of the clamps *g* and the point of
 60 instillation becomes a matter of simple computation to figure. Were the controlling devices for the rate of flow placed near the wound and the flow interrupted in the tubes at
 65 some point remote from the bottle *h*, it is

evident that the temperature drop would be variable and such as to make it impossible to control the temperature of the fluid with any accuracy at the point of instillation. Aside from the very important surgical requirements which the present apparatus
 70 meets, other features are to be noted. The sight bulbs *c* are placed in such relation to the clamps and to the bottle as to be readily observable so that not only can the rate of
 75 flow be readily fixed, but a mere glance will indicate at all times whether the liquid is still dropping as it should. Any interruption of the flow will thus be readily observable by the patient and the nurse may
 80 be called immediately, and will also be observable by nurses and doctors generally as they pass.

Another matter having to do with the simplicity and convenience is connected with
 85 the relative disposition of the reservoir, the clamps and the sight-feed bulbs to the bottle, all of these parts being elevated well above the patient, so that the flexible instillation tubes and particularly the catheter
 90 tubes near the wound remain unencumbered and may be manipulated without interference. Again, the glass connecting pipes *e* between the catheter tubes and the respective instillation tubes permit the rate of
 95 flow of the liquid to be observed at these points.

Changes in form, material and the like may be made without departing from the spirit of the invention provided the described advantages are realized by apparatus falling within the scope of the appended claims.

I claim as my invention:

1. Instillation apparatus comprising in
 105 combination with a container, a reservoir connected to the container and having distributing ducts, instillation tubes, a sight-feed bulb interposed in each instillation
 110 tube, catheter tubes connected with the respective instillation tubes and manually operable means disposed between the reservoir and each bulb to control the rate of flow of the liquid from the reservoir through each
 115 of the instillation tubes.

2. Instillation apparatus comprising in
 120 combination with a container, a reservoir connected to the container and having distributing ducts, instillation tubes, a sight-feed bulb interposed in each instillation tube near the reservoir, catheter tubes connected with the respective instillation tubes and hand clamps on each tube between the reservoir and the sight-feed bulbs to control the
 125 rate of flow of the liquid from the reservoir through each of the instillation tubes.

3. Instillation apparatus comprising in
 130 combination with a container, a glass reservoir having distributing ducts, a rubber tube connecting the container directly with the

glass reservoir, rubber instillation tubes pressed on to the respective ducts, a glass sight-feed bulb interposed in each instillation tube near the reservoir, catheter tubes, 5 glass connecting pipes in the ends of the instillation tubes and the respective catheter tubes and hand clamps on each instillation tube between the reservoir and the sight-feed bulbs to control separately the rate of flow through the instillation tubes. 10

This specification signed this 20th day of March, A. D. 1917.

PAUL S. PITTENGER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."