

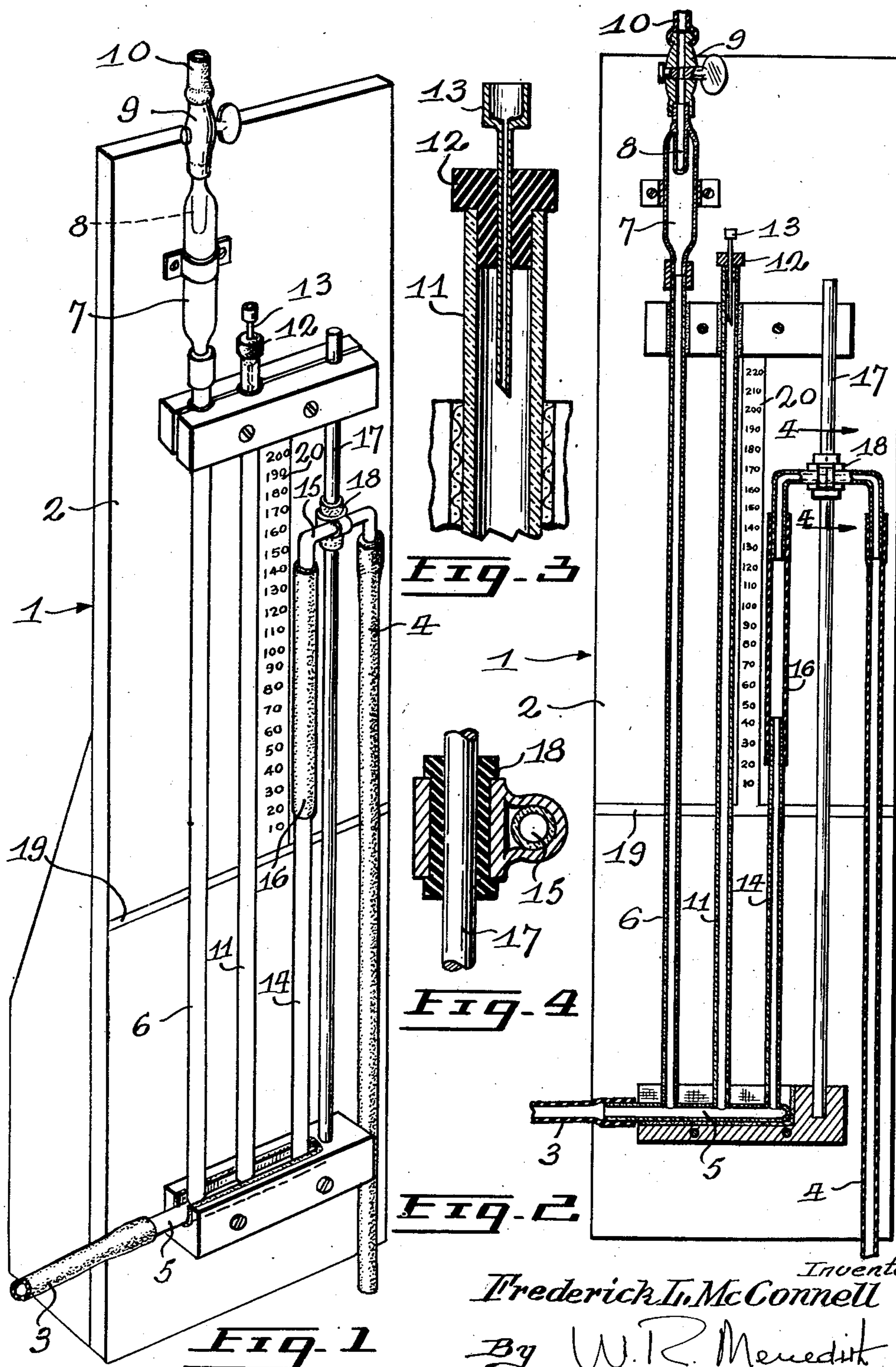
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SURGICAL IRRIGATING DEVICE

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SURGICAL IRRIGATING DEVICE

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This invention relates to a device for mechanically controlling the emptying and filling of the bladder of a patient whose normal bladder function has been rendered inoperative by illness.

In the case of numerous diseases and injuries, particularly those affecting the spinal cord, it is common for the patient to lose voluntary bladder control. In such cases the bladder may become either atonic or spastic and will cease to function in the normal manner.

Heretofore it has been usual in cases where the patient has lost voluntary control to resort to the use of a catheter. In using the latter instrument, its application is necessarily intermittent, and in the intervals between voiding the bladder becomes distended. Over long periods of such treatment, infection has been common, and has been a frequent cause of death in patients so affected.

It is a principal object of this invention to remove the disadvantages of the treatment heretofore used by providing an appliance which proceeds on an entirely different principle from that involved in the ordinary catheter.

It is a further object of this invention to provide an appliance for the aforesaid purpose which in its function causes the bladder to go through operations closely approximating those of a normal bladder, and which will accordingly assist the bladder in regaining its normal function.

An accompanying object is to provide a device for the aforesaid purpose which is simple and economical to manufacture and which involves only the use in combination of components which are readily available.

It is also an object to provide such a device which will reduce the risk of infection, which is easily sterilized and which can be readily operated by hospital personnel without extensive supervision.

Another object is to remove the difficulty found with the conventional treatment in that it is almost impossible with prior art devices to prevent the beds from becoming wet, and the present invention is therefore a boon to nurses and hospital orderlies.

A still further object is to eliminate the odor associated with chronic urinary cases where a catheter is used.

In addition to the objects stated above, other objects will be apparent from the specification as a whole, both from direct reference to the device, and by implication.

A preferred embodiment of the invention will now be described with the assistance of the accompanying drawings wherein,

Figure 1 illustrates an oblique three-quarters view of the device;

Figure 2 shows a cross-sectional view corresponding to Figure 1 and cross-sectioned by a plane parallel to the part denoted by reference numeral 2, and passing medially through the parts denoted by reference numerals 4, 6, 11 and 14;

Figure 3 shows an enlarged, fragmentary cross-sectional

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view of the parts denoted by reference numerals 11, 12 and 13, and,

Figure 4 shows an enlarged, fragmentary cross-sectional view, as cross-sectioned at lines 4—4 in Figure 2.

While a particular embodiment has been illustrated and will be hereinafter described, it will be appreciated by one skilled in the art that this is given by way of example only and that considerable modification may be made without departing from the spirit of the invention.

With reference to the drawings, wherein the same reference numerals denote like parts in all figures, the device is shown generally at 1, and will be referred to as irrigator 1. A number of tubes, preferable of glass or plastic are required in the construction of this device, and it is desirable that they should be rigidly mounted; for this purpose a base such as mounting board 2 is provided. Mounting board 2 may be supported in any convenient manner, such as on a side table or attached to a wall of the room.

A bladder tube, shown at 3, connects with the patient's bladder by any suitable means, such as an indwelling catheter, and the outlet tube of irrigator 1 is shown at 4 through which urine mixed with water (as will be described below) is discharged to a drainage bottle or other suitable disposal means.

Bladder tube 3 connects to a manifold tube shown at 5, which is preferably disposed in a horizontal position, and rigidly attached to mounting board 5. Manifold tube 5 has connected thereto, and preferably integral therewith, three substantially vertical tubes denoted as water tube 6, manometer tube 11 and siphon tube 14, all three of which are also attached to mounting board 2, and will be more fully described below.

Water tube 6 has at its upper end an enlarged portion shown at 7 with a nozzle indicated at 8 inserted therein. A valve shown at 9, which may be of the standard glass tubing variety, controls the flow of water through nozzle 8 as will be described below. A supply tube shown at 10 makes suitable connection with a supply of water under an appropriate pressure or head, so that continuous flow of from twenty to thirty drops of water per minute may be discharged through nozzle 8.

Manometer tube 11 is not essential to the operation of this device, but it is convenient since it is desirable to know the pressure in the tube system in millimeters of water or other units in reference to cysto-metrograms.

At the upper end of manometer tube 11 it is desirable to provide a small opening so that the pressure of the air above the water column in manometer tube 11 may be atmospheric and at the same time substantially closing the tube so that dust and the like cannot enter. For this purpose it has been found satisfactory if the upper end is closed by a stopper shown at 12, and stopper 12 is pierced by a hollow needle shown at 13 which may be a hypodermic needle of a suitable size such as No. 20—No. 24 gauge, with its bevelled point protruding down into manometer tube 11. Changes in the liquid level in manometer tube 11 do not occur rapidly except when the liquid is discharging through outlet tube 4, as will be described below, and the lumen of needle 13 is adequate to admit the amount of air required to maintain substantially atmospheric air pressure inside manometer tube 11.

For further convenience in setting up the irrigator 1 so that the manometer readings are of significance, a bladder level line shown at 19 is preferably marked on mounting board 2, and a vertical scale shown at 20 is also provided, calibrated for instance in millimeters of water.

Siphon tube 14, also disposed vertically on mounting board 2 is connected to a U-tube shown at 15 by means of a length of flexible tubing shown at 16. The opposite

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end of U-tube 15 connects with outlet tube 4, and in the present embodiment the latter is preferably flexible.

It is desirable that the vertical position of U-tube 15 be capable of being varied, and to allow this to be done a vertical rod shown at 17 is provided rigidly attached to mounting board 2, and the U-tube 15 is held in a predetermined vertical position in relation to rod 17 by means of a clamp shown at 18, of any suitable design.

It will be appreciated that instead of mounting board 2 and rod 17 for supporting the various tubular components, a framework of rods suitably connected together may be provided, after the manner of the racks used for mounting laboratory equipment, and if such a framework is used, a part corresponding to rod 17 would be merely one of the elements of such framework.

The operation of the device described above will be apparent from the foregoing description, but for greater certainty will now be outlined. The device is first set up so that the bladder level line is on a level with the pubic symphysis of the patient. Bladder tube 3 is then connected to the patient's bladder by conventional means. Valve 9 is next opened to an extent sufficient to allow a discharge of from twenty to thirty drops per minute into the enlarged portion 7 of water tube 6. After this discharge has been taking place for a time, the repetitive frequency of function of the device will become apparent, and valve 9 may be re-adjusted in accordance with the patient's bladder capacity and rate of urine secretion, so that discharge through outlet 4 takes place at whatever intervals are desired, for example every half hour.

As the water from nozzle 8 flows into tube 6, the water level rises in the latter, and the level also rises in manometer tube 11 and syphon tube 14. Simultaneously, water will flow through bladder tube 3 into the patient's bladder, which, together with the urine collecting therein, builds up pressure in the bladder which will be transmitted to the connecting tubes of irrigator 1. After a period depending on the aforesaid factors, the water level in syphon tube 14 will rise as far as the horizontal portion of U-tube 15, and finally some liquid flows over into discharge tube 4. The descending liquid in discharge tube 4 causes siphon action to occur, and thereupon liquid commences to flow downwardly through outlet tube 4 at a rapid rate, and such rapid flow will continue until the liquid is substantially emptied from irrigator 1 and from the patient's bladder.

The principles of siphons are well understood, and need not be reiterated as applied to this invention. It will only be mentioned that in order to have the siphon operate properly, the discharge end of outlet tube 4 must be kept a substantial distance (of the order of thirty inches) below the lowest point from which it is desired that liquid will be withdrawn, i. e., manifold tube 5.

After siphon action has caused a discharge of liquid as referred to above, the cycle begins over again. Water continues to flow from nozzle 8 into water tube 6 and the water is forced into the patient's bladder again, and also up through manometer tube 11 and syphon tube 14 until the discharge level has been reached in the latter, when there is again a rapid discharge.

While the embodiment of the invention just described is capable of considerable modification, it has been found by the inventor to operate very successfully in the form shown. One such device was still continuing to function without any difficulty after five months of continuous use, and several like devices have operated entirely successfully for lesser periods.

While water has been referred to as the fluid supplied to irrigator 1, this has been used by way of example, and it is thought preferable to use an irrigating fluid of normal (isotonic) saline solution.

As in common with surgical appliances, cleaning must

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be effected at regular intervals, and with the present apparatus it is satisfactory if it is cleaned and sterilized every five days. For sterilizing, any suitable urological disinfectants can be used, and sterilization proceeds in a manner similar to that used with cystoscopes and other urological apparatus.

When the irrigator 1 is first placed in use with a patient who has lost voluntary control, it is usual to find that considerable sediment has collected in the patient's bladder, and the discharge from discharge tube 4 will thus contain considerable sediment. When this condition is present, the irrigator 1 should be disconnected and the bladder properly irrigated until the return is clear. After this is done, the irrigator 1 will prevent any further accumulation of urinary sediment.

It will be seen that the invention described herein represents a considerable improvement over conventional apparatus, prevents infection in treatment of the kind referred to, is simple and economical to produce and operate and is advantageous to both patients and those administering treatment.

I claim:

1. A surgical irrigating device comprising a mounting frame, a horizontally-disposed manifold tube attached to said frame, said manifold tube being open at one end for connection to the bladder of a patient, a vertical tube connected at its lower extremity to said manifold tube, means at the end of said vertical tube opposite said manifold tube for admitting liquid at a predetermined rate, a second vertical tube substantially parallel to said first vertical tube and also connected at its lower extremity to said manifold tube, a U-tube fluxially integral with and flexibly connected to said second vertical tube, and a level line on said mounting frame substantially perpendicular to said vertical tubes for guidance in the operation of the device.

2. A surgical irrigating device comprising a substantially rectangular mounting frame, a vertical tube attached to said frame and substantially parallel to a long side of said mounting frame, means attached to said vertical tube for admitting liquid to said vertical tube at a predetermined rate, a second vertical tube attached to said frame and substantially parallel to said first vertical tube, a horizontal tube connecting the lower extremities of said two vertical tubes, said horizontal tube being open at one end for connection to the bladder of a patient, a U-tube attached to said frame fluxially integral with and flexibly attached to said second vertical tube, said U-tube being inverted with relation to said horizontal tube.

3. A surgical irrigating device comprising two vertical tubes, means at the upper end of one of said vertical tubes for admitting liquid at a predetermined rate, an inverted U-tube having one leg connected to the upper end of the other of said vertical tubes, the other leg of said U-tube being adapted for connection to a syphon tube, a manifold connecting the lower extremities of said vertical tubes, said manifold having an outlet adapted to receive a connection from the bladder of a patient, and the lowest part of said outlet being positioned below the lower extremities of said vertical tubes and at the lowest extremity of said manifold.

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