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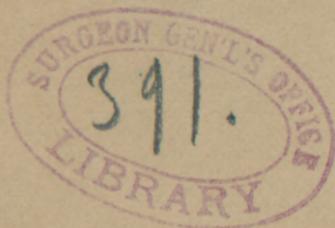
BY ✓

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THE AFTER-TREATMENT OF
KOLPO-URETERO-CYSTOTOMY
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BY A NEW SYSTEM OF
CONTINUOUS IRRIGATION AND DRAINAGE.

BY NATHAN G. BOZEMAN, PH. B., M. D.

MY father, Dr. Nathan Bozeman, published recently an account of his treatment for chronic pyelitis in women by washing out the pelvis of the kidney,* and it will be remembered that this was done for the first time by him in the Woman's Hospital on December 26, 1886. The patient had sustained in parturition very extensive injuries of the urethra, bladder, cervix uteri, and the vesical extremities of both ureters. In this case the end of the left ureter was exposed to view in the everted border of the large coexisting fistulous opening after three months of gradual preparatory treatment by his method of incisions and dilatation. Here the pyelitis, with the choking up of the ureter, existed as a complication of the injuries just mentioned, and the diagnosis of both these conditions was made when the patient was almost in a dying condition from septic poisoning.

* "American Jour. of Medical Sciences," March and April, 1888.



On seeing the marked relief of the patient from her threatening symptoms which occurred almost immediately after washing out the pelvis of the kidney, Dr. Bozeman spoke of the great value of the procedure in the presence of the house staff. He expressed then his intention, as soon as an opportunity offered, to extend the same practice to the treatment of chronic pyelitis in cases where no fistula coexisted by exposing, through the vesico-vaginal septum, the extremity of the ureter of the affected kidney. Three weeks later, curiously enough, he received a letter, dated January 23, 1887, from a lady in Charleston, S. C., whose sister, a child three years old, he had operated on for stone thirty years before, removing from the bladder a calculus of the size of a hazel-nut. She informed him that she had been and was still a great sufferer; and as he believed from her description that the trouble arose from pyelitis calculosa, he at once advised her to come to New York, at the same time acquainting her with the nature of the operation which he contemplated performing. At the time she came on to this city I was house surgeon in the Woman's Hospital, where she was treated, and the principal complication in the case proved to be an exaggerated form of retroversion of the uterus attended with engorgement and occasional metrorrhagia. The cervix uteri was inclined to the right, the side of the affected ureter and kidney. The prominent features of the history pertaining to the kidney, ureter, and bladder were hæmaturia of two years and a half standing, renal colic, with passage of two calculi at different times, and vesical tenesmus. Gradual preparatory treatment by columning the vagina with dry cotton in the supported knee-elbow position was carried on for several weeks, together with the use of tonics and supporting diet, in order to get the uterus in an elevated and easy position for drainage and to build up the patient's general health.

For this patient Dr. Bozeman devised his utero-vesico-urethral drainage support, for the purpose of draining away the urine after the establishment of the proposed artificial fistula.* This original instrument he modified somewhat after the operation by introducing a tube for conducting a stream of water into it, so as to secure at the same time the good effects of continuous irrigation of the vagina and bladder as well as drainage. (See Fig. 1.) He proposed to

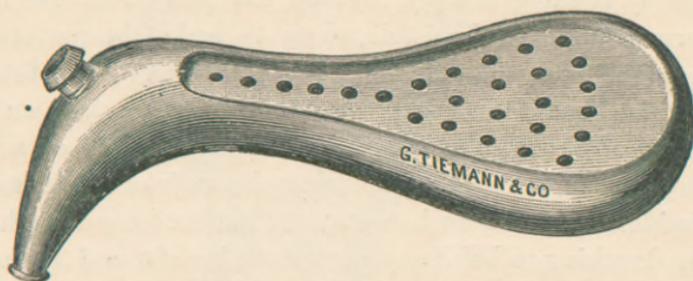


FIG. 1.—Bozeman's utero-vesico-urethral drainage support, with a tube projecting into the instrument for continuous irrigation.

accomplish this by flooding the instrument and then allowing the water to escape through the soft-rubber tube attached to its nozzle. Appreciating the soothing effects of warm water and emollient solutions on the diseased mucous membrane of the vagina and bladder after operations, even with his drainage instrument in position and a soft catheter introduced through the urethra, he found that the bladder could be efficiently douched, the fluid finding an easy out-flow through the instrument. A soft-rubber catheter, No. 20 F., with the closed end cut off, doubled, and having three or four perforations near its middle, so as to allow water to pass into the vagina and bladder to serve as a drainage tube, he also tried with more or less satisfactory results. By a loop of wire passing through it and bent

* *Op. cit.*

upon itself, the appliance was made self-retaining, as shown in Fig. 2. Into one of the two ends which projected outside of the vulva a stream of water was thrown with a piston syringe, and collected as it flowed out at the other end. By this mode of douching comparatively little of the water escaped into the vagina and bladder, but the current carried along with it the urine as it was secreted. Dr. Boze-man further extended this principle of douching and drainage by bending sharply forward the portion of the tube corresponding to the fistula, so as to make the perforated loop thus formed enter the bladder through the fistula. But he soon found that the pressure of the loop on the edges of the fistula and the force of the jets of water through the holes directed against the walls of the inflamed bladder could not be borne by the patient long enough for the douching to be of any permanent benefit, and he therefore gave up the device of the small anterior loop as impracticable, continuing, however, to use the bent tube as shown. It will be seen that all these expedients for securing the beneficial effects of douching and drainage required the constant attention of a nurse.

Now, in order to overcome the defects of the several appliances referred to of my father's, and to secure the beneficial effects of painless and continuous warm-water douching of the vagina and bladder with effective drainage, which he himself regarded as of the greatest practical importance, I instituted a series of experiments from which I hoped to attain this end: to introduce into the most dependent portion of the vagina a small amount of warm water at a time, which does not cause distension, and to have it accumulate there, thus bathing in it the raw edges of the fistula, the mucous membranes of the vagina and bladder, and diluting the urine. But to make this application of warm water continuous it has been necessary to devise a self-retaining

douche-tip which can be easily adjusted to any case, and combine a system of irrigation and drainage by automatically supplying water and draining it away with diluted urine and discharges, without disturbing the patient or causing vesical

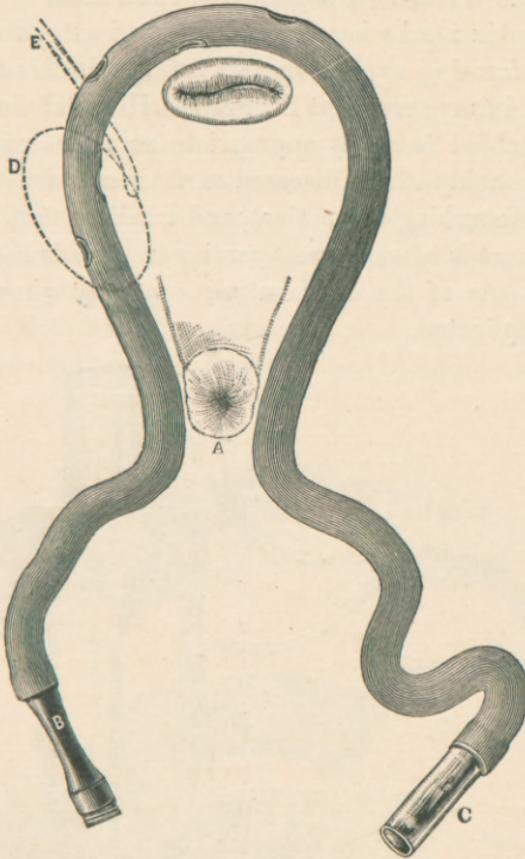


FIG. 2.—Dr. Bozeman's soft-rubber irrigating tube, made self-retaining by a stiff wire inside the intravaginal portion. Drawn half size, and in the supported knee-elbow position, to show the relationship of the tube to the urethra, A, the fistula, D, the ureter, E, and the cervix uteri; B, nozzle of piston syringe; C, outflow.

tenesmus. It has been a difficult task, and has occupied my attention for nearly a year; but I am confident now that I

can apply continuous vaginal irrigation and drainage and keep the patient perfectly dry in any case that may present itself. I have had opportunities to test this in ten cases after kolpo-uretero-cystotomy, most of them in my father's service at the Woman's Hospital, and in one case of carcinoma of the cervix uteri where the disease had extended into the bladder, forming a vesico-vaginal fistula. In this case, which occurred in my service at St. Francis Hospital, Jersey City, I was enabled to apply appropriate solutions continuously and thoroughly to the diseased surfaces and drain them off without disturbing the patient, and I believe that this mode of treatment is of very great service in the advanced stages of carcinoma of the cervix uteri, especially when the bladder is implicated.

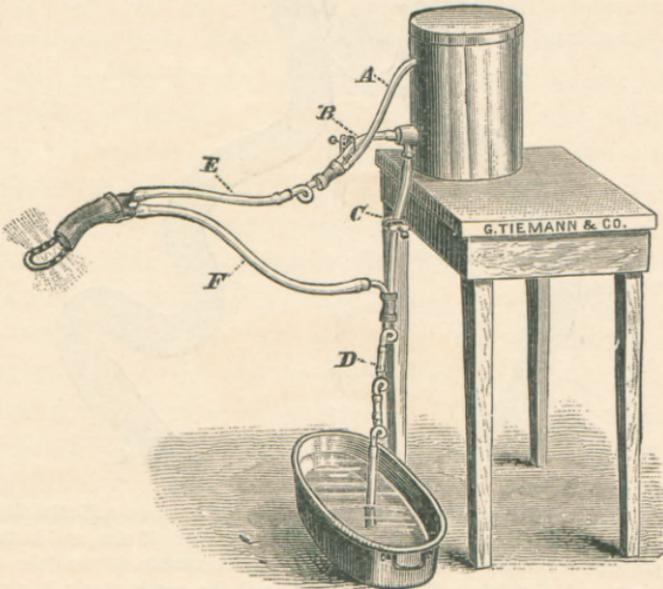


FIG. 3.—Irrigator and self-exhausting drain for continuous vaginal douching.

I will describe as briefly as possible the apparatus, which can be easily constructed of glass and rubber tubing by any

one, though Messrs. George Tiemann & Co. have been very obliging in making it from the models which I have furnished them. The important features of it are :

1. A double-current vaginal douche-tip, combining the principles of the body and nozzle of Bozeman's utero-vesico-urethral drainage support, which can be easily introduced and worn comfortably by the patient.

2. An intermittent siphon, by means of which a current of warm water and heated air is introduced into the vagina from a covered vessel slightly elevated above the patient.

3. A suction-tube which automatically removes the air and fluid from the vagina, and deposits the latter in a convenient receptacle.

The double-current vaginal douche-tip (Fig. 4) is three inches and a half long, is made of hard rubber, and is part-

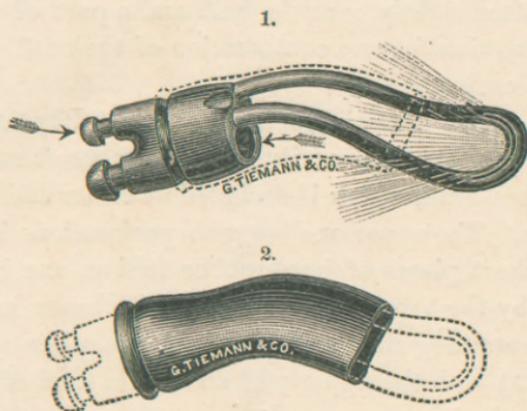


FIG. 4.—1. Double-current vaginal douche-tip, half size. 2. Soft-rubber sheath.*

ly covered with a soft-rubber sheath. The intravaginal portion consists of a hard-rubber tube three sixteenths of an inch thick, which is bent at the middle in a cordate form

* In some cases I use a flat grooved projection from the vulvar portion for the purpose of keeping patulous the rubber sheath, which sometimes has a tendency to collapse.

to render it self-retaining, and is shaped in such a way as to conform to the axis of the vagina. The portion which fits under the cervix uteri is deeply grooved, and this converts it into an open tube. The two ends are inserted, a quarter of an inch apart, into a bulb of hard rubber three quarters of an inch thick and one inch long, which forms the vulval portion of the instrument and constitutes a kind of wedge which occludes the vagina. This bulb is perforated by two openings, and the upper one, three sixteenths of an inch in diameter, bifurcates to form the sockets into which the open ends of the hard-rubber tube fit, and through which the irrigating fluid passes into the vagina. The lower one, a quarter of an inch in diameter, is for the outflow. Both of these openings terminate on the outer surface of the bulb in two projections for attaching soft-rubber tubing. A soft-rubber sheath fitted tightly over the bulb and a part of the intra-vaginal portion forms a continuation of the outflow aperture into the vagina.

The intermittent siphon (see Ganot's "Physics," § 201, p. 161) consists of a cavity formed by a soft-rubber tube two inches long, which is occluded at either end by rubber stoppers. The upper one has two perforations into which fit two short pieces of hard-rubber tubing, one being connected by the tube B (Fig. 3) with the lower part of the vessel containing the irrigating fluid, the other by the tube A (Fig. 3) with the upper part above the level of the fluid. Through the lower stopper is thrust the end A (Fig. 5) of a glass tube having a diameter of three sixteenths of an inch, which is bent in a small coil, the other end C (Fig. 5) being connected with the double-current vaginal douche-tip by the tube E (Fig. 3). When the flow into the small cylindrical cavity, which is regulated by the clamp near the letter B (Fig. 3), is less than that through the tube E (Fig. 3), there is an intermittent discharge of fluid and air into the vagina.

The air is drawn in from the top of the vessel each time that the intermittent siphon formed by the bent glass tube empties itself. The amount of air thus introduced into the vagina depends upon the difference in the quantity of fluid supplied to the siphon and discharged by it in a given time, this being regulated by the elevation of the vessel above the bed. The elevation required varies in different patients, the average being between twelve and eighteen inches. It can be easily determined by experiment, and precaution must be taken to admit the minimum amount of air, which is indicated by the passage of a long column of water through the glass tube, followed by three or four bubbles of air. This means that the rate of supply and discharge is nearly equal; so that the result, so far as the patient's feelings are concerned, is a continuous current.

The suction tube is made up of three separate coils of glass tubing, A, B, C (Fig. 5), having a caliber of three sixteenths of an inch, which are joined one to another by soft-rubber tubing. To one extremity of this series of coils, D (Fig. 3), is suspended a rubber tube ten inches long. The other end passes through a rubber stopper, over which is stretched a rubber tube two inches long, and this is closed by another rubber stopper into which is fastened the end of a glass tube bent at right angles and a short hard-rubber tube. The latter serves to suspend the whole from a vessel over it, and fits a rubber tube, C (Fig. 3), twelve to eighteen inches long, which is supplied with a Hoffmann's clamp.*

* In the "Atlanta Medical and Surgical Journal" for March, 1889, appeared an article, by Dr. William B. Gilmer, describing a new pump and its uses in medicine. The introduction by him of the inverted U-tube in the cylindrical cavity increases the efficacy of his pump for large tubes, the limit, however, being an eighth of an inch. I have never made any clinical use of this pump on account of the small size of the tubes, since they do not afford a sufficient outflow for irrigation, and hence very soon become clogged by mucus sticking to their sides. By

By means of this series of coils, when in a vertical position, an aspirating force is exerted along the tube F (Fig. 3)

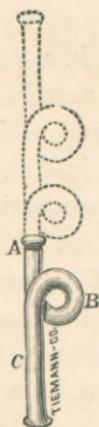


Fig. 5.—A B C, suction tube. Length two inches, diameter of tube three sixteenths of an inch, diameter of coil half an inch. Two additional coils drawn in dotted lines.

by the passage through them of a very small quantity of water from the vessel above them, the amount of the water being regulated by the clamp near the letter C (Fig. 3). This device, which is familiar to every student of practical chemistry, was suggested to my mind from having seen and employed, in the chemical laboratory at Yale University in 1881, long glass tubes, bent in a succession of coils, such as are represented by dotted lines

in Fig. 5. When suspended in a vertical position from a funnel, they collected the few drops of the filtrate of a slow filtering precipitate in order to convert them into columns of fluid, which, falling down through the vertical portions of the tubes, carried bubbles

the use of the coils described in the text, tubes having a caliber of a quarter of an inch very quickly produce exhaustion of air, and require very little water to do it, while a greater quantity of fluid can pass through them, which increases the suction without siphoning. All the clinical experiments described by Dr. Gilmer and many others of a similar character were made by Dr. Bozeman on his patients with the idea of utilizing the pumping action of the bladder resulting from the rise and fall of the diaphragm and viscera in respiration. This phenomenon he demonstrated to both Dr. Gilmer and myself, and he has applied it to great advantage in his new form of utero-vesical drainage support to remove the urine from the instrument as fast as it is collected. The form of vaginal drainage tube (Fig. 2) which Dr. Bozeman devised and used, and which he showed to Dr. Gilmer when he was living with us in New York, has also been described in three different shapes by the latter.

of air with them and exerted suction on the filter paper, thus accelerating the process of filtering. The object in having the coils separate and joined together by rubber tubing is to make them more portable and less liable to break. They should always be made of glass, in order that one may see just how to regulate the flow through them. The T-shaped tube (Fig. 6) makes the apparatus complete. The tube B (Fig. 3) being connected with the short horizontal arm, and the tube C (Fig. 3) with the vertical projection, it is only necessary, for the application of continuous irrigation, to have a convenient vessel, with a small opening near the top, into which the tube A (Fig. 3) is passed, and an orifice in the bottom through which the long arm of the T-tube, provided with a screw-thread, is thrust, the side of the vessel being then clamped between the nut and the rubber stopper.

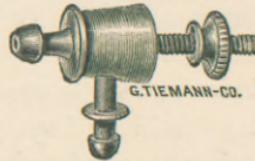


FIG. 6.—T-tube with screw and nut for clamping side of vessel.

In a warm room, with an agate-ware vessel holding one gallon, the irrigation can be kept up for an hour, when it becomes necessary to renew the hot water; but when used as a simple vaginal douche, the same amount of water will run through in half the time.

Dr. Nathan Bozeman has adopted this form of continuous vaginal douching as a part of the after-treatment of his operations of kolpo-uretero-cystotomy and kolpo-cystotomy. The douche-tip is introduced at the time of the operation, and the irrigation kept up almost constantly until the wound in the vesico-vaginal septum has cicatrized (about two weeks), when one of his improved form of utero-vesical drainage supports is fitted, which keeps the patient dry.

The advantage maintained for this system of irrigation and drainage is the facility with which hot water can be con-

tinuously applied to the diseased mucous membrane of the bladder, vagina, and cervix uteri, and drained off, which dilutes the urine, protects the raw edges of the wound, hastens the granulating process, and adds greatly to the patient's comfort. By the introduction of a small quantity of air into the vagina, suction on the tissues is prevented, and the patient is enabled to change her position in bed, and yet still be kept perfectly dry. Patients learn very soon how to regulate the apparatus themselves, and it becomes a source of amusement to them. In conclusion, I wish to express my thanks to Dr. L. G. Baldwin and Dr. A. S. Bird, of the house staff of the Woman's Hospital, for the kind assistance they have afforded me in introducing this system of drainage in Dr. Nathan Bozeman's service at that institution.

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