

BOZEMAN, (NAT.)

COMPLIMENTS OF THE AUTHOR.

THE GRADUAL PREPARATORY TREATMENT
OF THE
COMPLICATIONS OF URINARY AND FECAL FISTULÆ
IN WOMEN,
INCLUDING
A SPECIAL CONSIDERATION OF THE TREATMENT OF PYELITIS
BY A NEW METHOD,
AND THE
PREVENTION OF THE EVILS OF THE INCONTINENCY OF THE URINE
BY A NEW SYSTEM OF DRAINAGE.

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BY NATHAN BOZEMAN, M.D.,
OF NEW YORK,
Surgeon to the Woman's Hospital of the State of New York.

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THE GRADUAL PREPARATORY TREATMENT OF THE COMPLICATIONS OF URINARY AND FECAL FISTULÆ IN WOMEN, INCLUDING A SPECIAL CONSIDERATION OF THE TREATMENT OF PYELITIS BY A NEW METHOD, AND THE PREVENTION OF THE EVILS OF INCONTINENCY OF THE URINE BY A NEW SYSTEM OF DRAINAGE.

LE TRAITEMENT PRÉPARATOIRE GRADUEL DES COMPLICATIONS DE FISTULES URINAIRES ET FÉCALES, COMPRENANT UNE CONSIDÉRATION SPÉCIALE DU TRAITEMENT DE LA PYÉLITE PAR UNE NOUVELLE MÉTHODE, ET LA PRÉVENTION DES MAUX D'INCONTINENCE D'URINE PAR UN NOUVEAU SYSTÈME D'ÉGOUTTAGE.

DIE GRADUELLE VORBEREITENDE BEHANDLUNG VON COMPLICATIONEN DER BLASEN- UND DARMFISTELN BEI FRAUEN, MIT EINSCHLUSS EINER SPEZIELLEN BETRACHTUNG ÜBER DIE BEHANDLUNG DER PYELITIS, UND DIE VERHINDERUNG DER ÜBEL EINER INCONTINENTIA URINÆ DURCH EINE NEUE METHODE DER DRAINAGE.

BY NATHAN BOZEMAN, M. D.,

Of New York; Surgeon to the Woman's Hospital of the State of New York.

SECTION I.—HISTORY.

Cicatricial contraction of the vagina was recognized as a complication of urinary fistula, and as one of the causes of sterility, by the early Grecian and Roman writers, and, judging from several forms of hard pessaries figured in the works of authors soon after the revival of literature, considerable advance had been made at this latter period in the treatment of this condition, when not associated with fistula, by dilatation of the vagina. But it was not until long afterward, when the knowledge of the anatomy of the structures involved and the resources of surgery had increased, that the treatment of vesico-vaginal fistula became a matter of interest. After the curability of some forms of the malady had been demonstrated by Jobert de Lamballe* to the Academy of Medicine in Paris, in 1837, the attention of the profession was at length aroused, and the complications of fistulæ, in so far as they interfered with the performance of the operation for the closure of the opening into the bladder, began to be treated by incisions in an imperfect manner. Jobert divided, at the time of the operation, such prominent bands as hid the fistulous opening from view, and afterward, to increase the mobility of the borders, made parallel incisions in the mucous membrane along the margins of the fistula, and finally extended the method to what has been known as "Jobert's cut."†

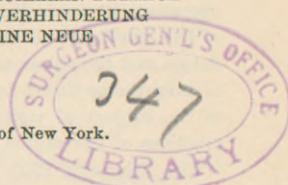
The next advance was made by Mettauer, in the United States.‡ In July, 1847, he reported a case of urethro-vesico-vaginal fistula, in which the vagina was contracted to the size of the little finger. The distortion of the vagina was treated by "dissecting down the adhesions, dividing such bands and contractions as existed, and dilating the passage thus liberated with sponge tents." His first attempt to close the fistula was made three months later, but failed. The operation was repeated at intervals of six months, for four years, and was finally unsuccessful, and the case abandoned. In a second paper, published in June, 1855,§ eight years after the appearance of the first,

* *Bulletin de l'Académie de Médecine*, Seance du 27 Mars 1838, t. ii, page 582.

† "*Traité de Chirurgie Plastique*," Tome ii, 1849, and *Traité des Fistules*, etc., 1852.

‡ *Am. Jour. Medical Sciences*, vol. xiv, p. 119, 1847.

§ *Virginia Med. and Surgical Journal* for June, and *Southern Med. and Surg. Journal*, vol.



in speaking of contractions of the vagina, he says: "In all of the cases in which I have met with them, three in number, they serve to embarrass the operation by rendering the fistula more or less inaccessible. They should, invariably, be corrected before attempting the operation for the fistula; and for the purpose it will generally be sufficient, either to dilate the vagina with graduated tents of sponge covered with oil-silk, commencing with the smallest, or by cautiously dividing the bands causing the contractions and then dilating them with tents. I have employed both these methods with entire success." This is all that Mettauer ever wrote upon this subject, and as neither of his papers attracted much attention at the time, they did not come to my notice until long afterward.

From a study of the above extracts, it will be seen that Mettauer's experience was small, having applied the treatment to three cases only, and that his conception of the ends to be gained, and the bearing of this complication on the treatment of fistula, was limited. He regarded the contraction of the vagina as merely "embarrassing the operation, by rendering the fistula more or less inaccessible," and he carried the section of the bands and dilation of the vagina only so far as to render the exposure of the fistula and the subsequent steps of the operation for its closure more easy. This is all of importance that I have been able to find, by a diligent search through the literature of the subject of vesico-vaginal fistula, concerning the treatment of cicatricial contractions of the vagina, previous to my first paper reporting a case.

In February, 1855, without any knowledge of Mettauer's first paper, and previous to the publication of his second, I encountered a case of fistula, complicated by contraction of the vagina, which I treated by incision of the bands and subsequent gradual dilation with oil-silk-covered sponge dilators. In May of the same year I treated a second case in a similar manner. The first case was reported in *The New Orleans Medical and Surgical Journal*, January, 1860, the second in *The Louisville Review*, May, 1856, but as the numbers of these journals are out of print, and, therefore, not easily referred to, and as the cases are of considerable interest and deserving of a wider circulation, I will give a brief account of them here:—

CASE I.—Matilda Stamper (colored); aged 21; consulted me February 9th, 1855. Examination disclosed the existence of three fistulous openings, one into the urethra and two into the bladder. The vagina, through which constantly flowed ammoniacal urine, was contracted to the size of the index finger. Fig. 1 is a fairly accurate representation of the lesions present.

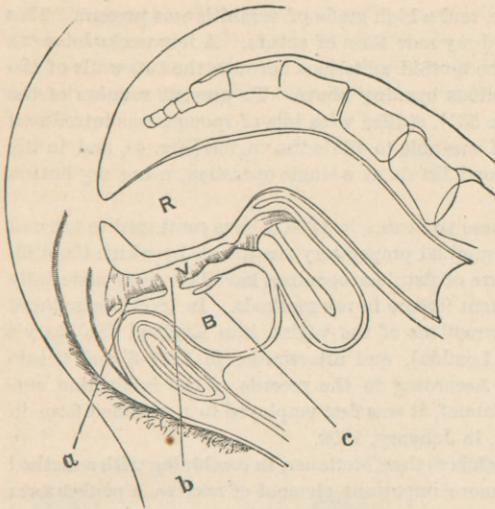
In describing the treatment of the case, I said: "As a preparatory measure for the operation, I had to make deep incisions in the contracting bands of the vagina and then to dilate the organ by means of tents." By tents I meant the instruments which I now call vulvo-vaginal sponge dilators (Fig. 20, page 531). The vagina having been sufficiently dilated (Fig. 2), one of the openings was closed by means of the clamp-suture of Dr. Sims.* The operation failed because the borders of the fistula containing the sutures sloughed away, in consequence of the action of ammoniacal urine and the pressure exerted by the clamps. My experience in this case led me, a few months later, to devise the button suture, in order to protect the line of coaptation from contact with ammoniacal urine.

CASE II.—Kitty Johnson (colored), aged 18, was sent to me May 24th, 1855. Examination disclosed the presence of two fistulous openings separated by a contraction of the vagina. The lower fistula was readily accessible, but the upper, as shown in Fig. 3, involved the cervix uteri, and communicated with the lower part of the vagina only by a long narrow opening. On June 12th I closed the lower fistula with my button suture.† The operation was completely successful, although the vagina was con-

* *Am. Journ. Med. Sciences*, Jan., 1852.

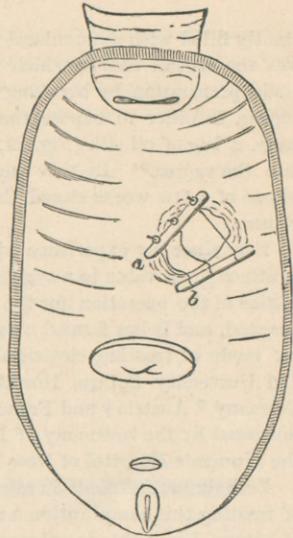
† *Op. cit.*, 1856.

FIG. 1.



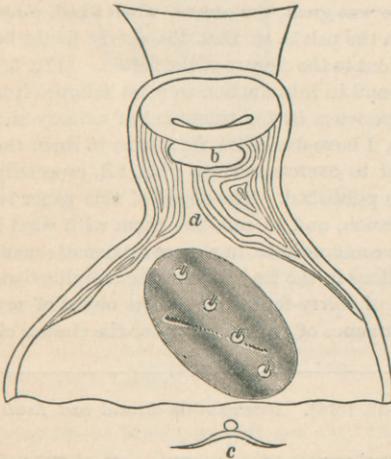
Lesions present in Case I. *a*. Urethro-vaginal fistula. *b*. Urethro-vesico-vaginal fistula. *c*. Vesico-vaginal fistula. R. Rectum. V. Vagina. B. Bladder.

FIG. 2.



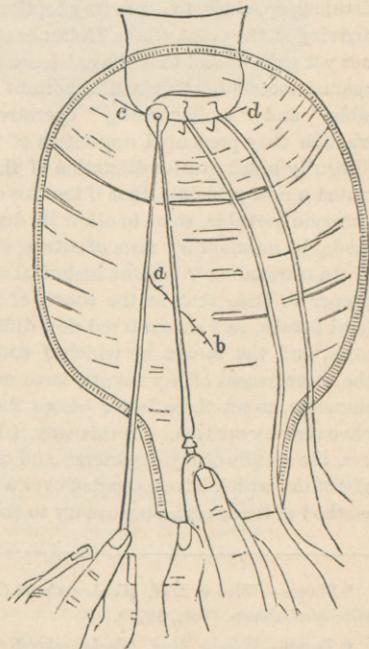
Result of treatment. *a b*. Clamp suture, which had sloughed out.

FIG. 3.



Lesions present in Case II. *a*, cicatricial contraction of the vagina. *b*, fistulous opening. The lower fistula is hidden by the button. *c*, transverse section of button.

FIG. 4.



Result of treatment. *a b*, line of union of lower fistula. *d*, borders of the fistulous opening above, coaptated. The figure also shows my original suture adjuster and method of shouldering the wires, by which I was enabled to discard the "clamp suture," a modification of the quill, devised and used by Dr. Sims for thirteen months after this time (Silver Sutures in Surgery, Nov. 17th, 1857), and to employ the interrupted suture, combined with a leaden button, as Fig. 3 illustrates.

stantly filled with ammoniacal urine, and a high grade of vaginitis was present. This was the second case in which I used my new form of suture. A few weeks later "I made preparation by breaking up the morbid adhesions between the two walls of the vagina, in order to expose the fistulous opening above. To prevent reunion of the parts, a bag of oil silk (Fig. 21, page 531), stuffed with bits of sponge, was introduced into the vagina." By this means I was able to dilate the vagina (Fig. 4), and in the course of a few weeks closed the second fistula at a single operation, using my button suture.

Ever since my experience with these two cases, in 1855, I have continued to use and to attach great value to a system of gradual preparatory treatment, by which the difficulties of the operation for the closure of fistulous openings have been very materially lessened, and it has formed a prominent feature in my methods. In 1858 I introduced my mode of treating cicatricial contractions of the vagina into England (St. Mary's and University College Hospitals, London), and afterwards, in 1874-5 and 6 into Germany,* Austria † and France. ‡ According to the records of the institution, corroborated by the testimony of Dr. Emmet, it was first employed in a modified form in the Woman's Hospital of New York, in January, 1859.

Being more fortunate in my early labors than Mettauer, in combining with a method of treating this complication a still more important element of success, a perfect form of suture, I was able to enlarge my experience, which, instead of being limited to two cases, rapidly extended to more than forty. § I was thus enabled to modify and to perfect the method, to extend its application, and by final success instead of failure in closing the fistulous openings, to cause its adoption by others. Besides, quickly and independently arriving at the point where Mettauer ended, I soon saw that all that was necessary was not yet gained, and that the existence of bands and contractions of the vagina militated against success in other and important respects, besides "rendering the fistulæ inaccessible" and "embarrassing" operative procedures. I recognized that by exerting traction they prevented apposition of the borders of the fistula, and to overcome this difficulty much greater dilatation of the vagina must be secured. I also soon appreciated a new principle, that if the loss of tissue was great, the uterus, when fixed, must be made movable, so as to allow its descent in the pelvis, so that the cervix might be made, by means of my form of suture, subservient to the closure of the fistula. (Fig. 5.)

In concluding this short historical sketch, and in introduction to what follows, it is proper to state that in the course of my experience in the treatment of urinary and fecal fistulæ, as I encountered new difficulties, I have described, from time to time, the cases, and the means by which I endeavored to overcome them; but all, especially the more recent of my results, have not been published. The object of this paper is, therefore, to set these latter before the profession, and to combine them with what I have already written. In this way, I hope to communicate, in a more systematic manner, the results of my experience and observations in the treatment of the complications of fistula, which have extended over a period of thirty-four years. The object of my method of treatment, preparatory to the performance of the operation for the closure of

* Simon—*Wiener Med. Wochenschrift* (No. 27-32, 1876). Bozeman—*Richmond and Louisville Med. Journ.* (Oct., 1877).

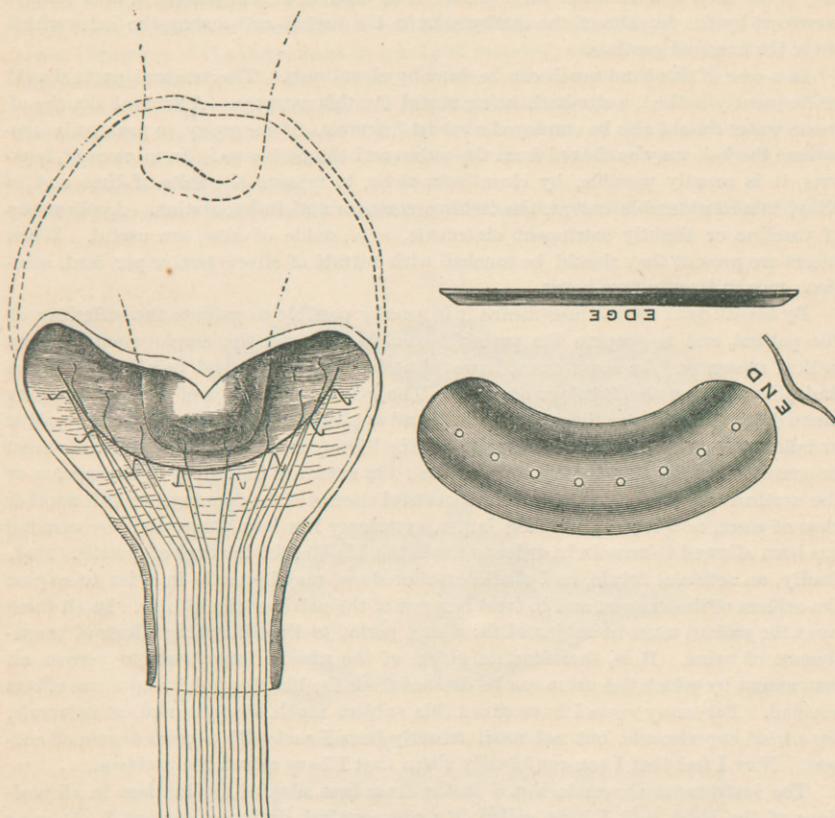
† Bandl—*Wiener Med. Wochenschrift* (1875-1877-1882). Massari—*Wiener Med. Wochenschrift* (No. 25, 26, 1878). Pawlik—*Zeitschrift für Geburtshunde* (Vol. viii, p. 22, 1882).

‡ Paul Berger—*La France Médicale* (May, 1876). Bozeman—*La France Médicale* (June, 1876). See also Hergott—*Annales de Gynecologie*, Sept. and Oct., 1884.

§ *Louisville Review*, May, 1856. *North American Med.-Chir. Review*, July and November, 1857. *New Orleans Med. and Surg. Journ.*, January, March and May, 1860.

a fistulous opening, is to overcome and prevent the injurious effects of incontinence of urine, and to remedy the complicating injuries and diseases of all the organs involved. In other words, to remove, as far as possible, the obstacles in the way of the easy performance and success of the final operation, and to cause the diseased tissues to return

FIG. 5.



A case which I cured at a single operation, July 12th, 1856, by dragging down the uterus and making it subservient to the closure of a large fistulous opening, thus obviating the necessity of "Jobert's cut." (Copied from Fig. 5, Case viii, *North American Med.-Chir. Review* for July and November, 1857.) The borders of the fistula are shown coaptated throughout their entire length with my suture adjuster, ready for the adjustment of the button, and held in apposition simply by the shouldering of the coarse wire employed. Three views of the button used in this case are also presented.

to a state of health, so that not only will the incontinence of urine be cured, but the functions of all the organs be preserved.

SECTION II.—THE TREATMENT AND THE PREVENTION OF THE EFFECTS OF INCONTINENCE OF URINE.

The well known and most important effect of the diversion of the urine by a fistulous opening, from its natural receptacle, the bladder, into the vagina, is incontinence of

urine. The urine consequently comes in contact with the integument and a mucous membrane not suited to withstand its irritating action. When it becomes ammoniacal, as frequently happens, the sufferings of the patient are very great. An intense urinous odor pervades the atmosphere which she breathes, and even the dwelling which she inhabits. The irritant action of the urine is then not only sufficient to cause vaginitis and a dermatitis, with intolerable itching of the vulva, mons veneris and buttocks, but may cause deep ulcerations of these parts. The distress of the patient is still further increased by the deposits of the earthy salts in the vagina and among the hairs which cover the external genitals.

In a case of this kind much can be done by cleanliness. The external parts should be frequently bathed, a sitz-bath being useful for this purpose. A vaginal douche of warm water should also be employed at short intervals. If necessary, to prevent incrustations the hair may be shaved from the pubes and the perineum. In most cases, however, it is usually possible, by cleanliness alone, to remove the salts of lime and to allay, to a considerable extent, the itching, soreness and inflammation. Applications of vaseline or slightly astringent ointments, *e. g.*, oxide of zinc, are useful. When ulcers are present they should be touched with nitrate of silver, twelve per cent. solution, once in twenty-four hours.

By the diligent use of these means it is usually possible to palliate the sufferings of the patient, and to prepare the parts for examination and the employment of more radical measures. In some cases, however, it is not possible, and in others it is not desirable to close the fistulous opening. The general condition of the patient may make delay desirable, or the requisite skill and appliances may not be at hand; cystitis or inflammation of the uterus and pelvis of the kidney may be present, and time must be consumed in treating these complications; the nature of the injury to the septum or the urethra may be such as to prevent successful closure of the opening. In still another class of cases, now rapidly growing larger, cystotomy has been done, and the opening has been allowed to remain in order to drain the bladder for the cure of cystitis. And, finally, an artificial fistula, as I shall hereafter show, may be made in order to expose the orifices of the ureters, and to treat diseases of the pelvis of the kidney. In all these cases the patient must be subjected for a long period to the distressing effects of incontinence of urine. It is, therefore, an object of the utmost importance to possess an instrument by which the urine can be drained from the bladder and its injurious effects avoided. For many years I have given this subject much thought, and, at intervals, have tried experiments, but not until recently have I met with a great degree of success. Now I feel that I can confidently claim that I have solved the problem.

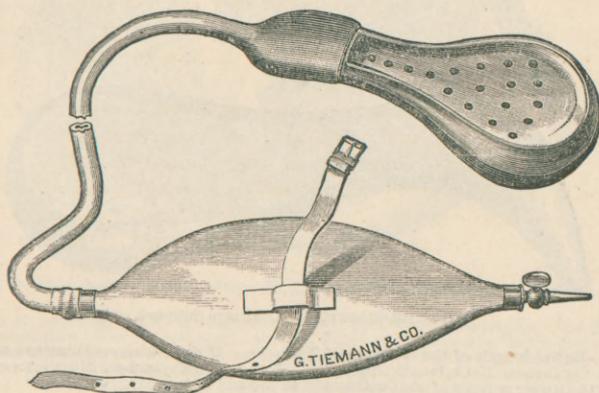
The instrument shown in Fig. 6 is the form best adapted for drainage in all positions of the body, and I have called it a utero-vesical drainage support.* It may be made of brass, silver-plated, German silver, hard rubber, or better still, when the patient can afford it, of silver. The instrument is of a cordate or pyriform shape, resembling, to a certain extent, the uterus in form, and may be described as consisting of a body and neck. Its inferior surface is rounded and rests in contact with the posterior vaginal wall. The upper surface of the body, which supports the cervix uteri and conforms to the vesico-vaginal septum, presents a broad, shallow concavity or dish, which is continued forward on the neck of the instrument for about one-half of its length, in the form of a broad groove. In the bottom of the dish and groove are twenty

*In connecting the idea of support with drainage, I am conscious of introducing something foreign to the original design of the instrument, but experience has shown me that it serves a useful purpose in supporting a retroverted uterus when retroversion accompanies fistula. The name is also appropriate, because the instrument supports the anterior wall of the vagina and the fundus of the bladder, when the latter is prolapsed.

perforations, made of considerable size, in order to prevent clogging by mucus and menstrual blood. The positions of these openings is of importance; they should not be made in the posterior part of the dish, but all should be situated anterior to the transverse diameter of the body, or three-quarters of an inch in front of the posterior border of the concave upper surface of the instrument. The neck is thinner than the body and curves backward, forming an arc of a circle having a diameter of about two inches. The extremity of the neck presents a round opening which leads into the cavity of the interior of the instrument and allows the escape of the urine. The posterior extremity of the instrument is broad and rounded, and occupies the fornix of the vagina behind the cervix-uteri. A flexible rubber tube fits over the neck and connects with a rubber bag, which is buckled to the thigh, near the knee. At the point where the tube joins the bag is a valve, which prevents the return of the urine when the limb is elevated. The lower extremity of the urinal is fitted with a stopcock, so as to allow it to be emptied when necessary.

The instrument drains better in a sitting and upright position than in the recumbent

FIG. 6.



Utero-vesical Drainage Support.

Dimensions of the Instrument.—Entire length, four inches; length of body, two inches; width of body, two inches; thickness of body, three-quarters of an inch; length of dish, three inches; superficial area of dish, four square inches.

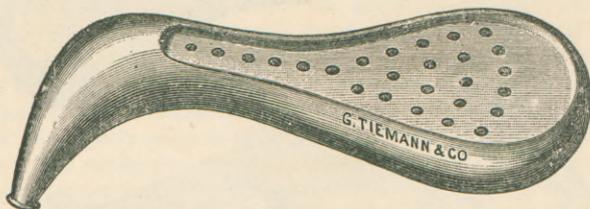
posture; but in most cases the small amount of urine lost when lying down is considered by the patient a matter of slight importance and causes but little inconvenience. When, however, the vagina is excessively voluminous and its walls are prolapsed, or the perineum is lost or badly lacerated, the instrument is retained in place with difficulty. In order to adapt the system of drainage to these cases, and more satisfactorily to the recumbent position when the patient is confined to bed from any cause for a long period, I employ a somewhat different form of instrument, which I have called a utero-vesico-urethral drainage support (Fig. 7).

This instrument is much longer and larger than the one first described. The increase in length is principally in the neck, which is also made much thicker, in order to fill the mouth of the vagina. It terminates in a conical, beak-like extremity or nozzle, which projects outside of the vagina and rests against the perineum. It is possible

to use this instrument in the recumbent posture by simply allowing the urine to drain from the nozzle into some convenient vessel, but usually it is better to attach the tube and urinal, which may lie in the bed or on a chair. As has already been said, this form of the instrument is adapted to the recumbent, and in a less degree to the upright position. It cannot be used with comfort to the patient when she sits, on account of its length.

To explain exactly how and why the urine always finds its way into the perforations in the instrument, sometimes apparently contrary to the law of gravitation, has been a problem of great interest to me, and is still not entirely clear to my mind. The explanation that seems most probable is that it is due to the perfect adaptation of the vaginal walls to the entire surface of the instrument, except at the point where they are deficient, that is, at the fistulous opening. The closeness of contact of the mucous membrane with the instrument is probably increased by the atmospheric pressure and perhaps by contractions of the muscular fibres of the vagina and perineum. Its upper surface conforming exactly in size and shape with the vesico-vaginal septum, the fistulous opening must come in apposition with this part of the instrument. The accurate contact of the mucous membrane preventing its egress in any other direction, the urine finds its way through some one of the perforations, and thence through the tube into

FIG. 7.



Utero-vesico-urethral Drainage Support.

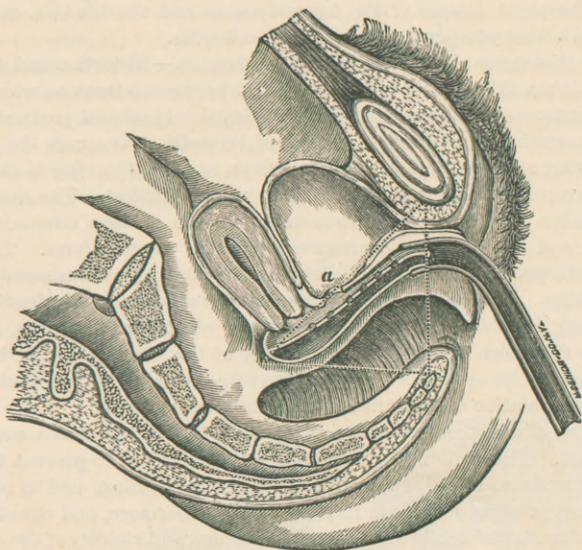
Measurements.—Entire length of the instrument, $7\frac{1}{4}$ inches. Body, transverse measurement, $2\frac{1}{4}$ inches. Body, length, $2\frac{1}{2}$ inches. Neck, length, $2\frac{1}{2}$ inches. Neck, width, $1\frac{1}{2}$ inches. Nozzle, from the extremity of groove on the upper surface of the instrument to the end of nozzle, $2\frac{1}{2}$ inches.

the urinal (see Fig. 8). The principle of the siphon also comes into play to some extent, especially when the patient is in the upright position. As the instrument fills and empties, a partial vacuum is produced and an aspirating force is exerted which tends to draw the urine through the perforations.

In some cases the use of the instrument is prevented by atresia and distortion of the vagina. These complications should first be treated in the manner presently to be described. Great tenderness and irritability of the vagina, due to the action of the urine, may render the introduction of the drain painful, and should be allayed by the use of douches and other measures already mentioned. When these difficulties have been overcome, either of the forms of the instrument can be introduced and removed by the patient whenever necessary, without difficulty, and remain in place in virtue of their form, without the aid of a T bandage. They are small, simple, free from angles and sharp borders, are readily kept clean, cause no discomfort or irritation of the vagina and do not press upon the rectum or bladder, nor interfere with locomotion. While possessing all these qualities they collect the urine and conduct it away with a degree of perfection, that to the patient is a constant cause of wonder and delight. I have now five cases in which the different forms of the instrument are in use. In one of

them there is entire destruction of the urethra. In all the instrument functions satisfactorily. Frequently, patients with urinary fistula come to my office after having traveled long distances, and when the instrument has not been touched for hours, and I find the linen and the skin of the perineum and neighboring parts almost perfectly dry.*

FIG. 8.



Utero-vesical Drainage Support in place. (Diagrammatic section in dorsal position, $\frac{1}{4}$ size.)

The openings in the upper surface of the instrument are shown cut longitudinally. The fistulous opening is seen immediately below the letter *a*, in section. The dotted triangle indicates that the axis of the instrument makes an angle of about 35° with the horizon when the patient is lying down. The urine must, therefore, collect in the instrument and the bladder until it rises to the level of the perineum. It is prevented from escaping into the vagina by the intimacy of contact of the mucous membrane with the instrument.

SECTION III.—THE TREATMENT OF THE COMPLICATIONS OF URINARY AND FECAL FISTULÆ.

Having, by the means already described, overcome or prevented the inflammation and tenderness of the vagina and surrounding parts, due to the contact of urine, in per-

*The instrument drains not only the urine but the menstrual blood and the uterine discharges. Although I have not yet had the opportunity to make the experiment, I believe that the utero-vesico-urethral form could be used with great advantage after labor, at the time when the fistulous opening was formed. It would prevent the contact of the urine and lochial discharges with the granulating surfaces of the injuries of the vagina. The healing process would be carried on more rapidly and with the formation of less cicatricial material, and adhesions between the walls of the vagina would be prevented by its use. The instrument may also be used to drain the lochial discharges in cases of puerperal septicæmia, and might be combined with irrigation of the vagina. In cancer of the cervix uteri benefit would probably result from its employment, by lessening the discomfort and the injurious effects of an abundant and fetid discharge. If an opening had been formed in the bladder, by drawing away the urine, it would relieve a most distressing symptom.

fectly simple cases we may at once proceed to close the fistula. But, unfortunately, very few fistulæ the result of difficult labor are perfectly simple. The same cause, the pressure of the child's head, which produces the perforation of the vesical or rectal wall, injures to a greater or less extent other parts of the vagina, and frequently the uterus, ureters and urethra. These injuries, and the distortions of the structures involved, the result of the contraction of the cicatricial material produced in the healing process, constitute the most frequent complications. In the worst cases, to them are added subsequent disease of the injured organs and the bladder, and fixation of the uterus, following puerperal cellulitis and peritonitis.

Cicatricial Contractions and Distortions of the Vagina.—Distortion and diminution or obliteration of the calibre of the vagina result, either from adhesions which take place between its surfaces or from the contraction of cicatricial material produced in the slow healing, by granulation, of deep ulceration of its walls. As a rule the injury to the vagina is greatest at its cervical and pubic portions, and it is therefore in these situations that the change in its form is most frequent and the greatest. The sloughing of the vagina also takes place in planes corresponding to the greatest circumference of the child's head, and the resulting contractions have an annular form. The cicatricial tissue frequently projects prominently above the surrounding mucous membrane as hard bands and bridles. Sometimes we find these bands radiating in all directions from the fistula, separating widely and fixing its borders; at others the vagina, and in consequence of the distortion of the septum, the base of the bladder, are divided by them into a series of cavities or pouches in which the urine remains for long periods, putrefies and causes inflammation and ulceration of the mucous membrane.

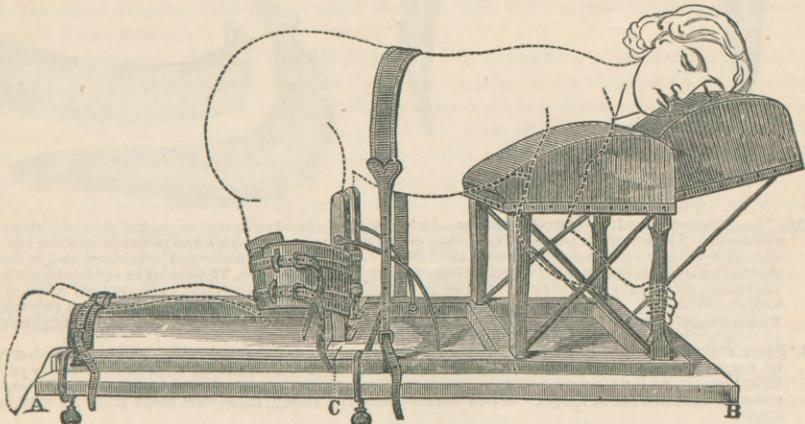
The relation which these pathological changes bear to the treatment of fistula is most important. The vagina may be so much contracted as to prevent the introduction of instruments and the exposure of the fistulous opening, and to make the performance of the operation difficult or impossible. Furthermore, and equally important, the presence of cicatricial bands and general thickening and rigidity of the vaginal walls oppose approximation of the borders of the fistula. In these cases, if by the exertion of great force the edges are brought in contact, the sutures cut out and the operation fails. It is, therefore, of the greatest importance to overcome these obstacles in the way of the success of the operation, to distend and soften the vagina, and to secure, as far as possible, the perfect relaxation of its walls. The means which I employ to accomplish these results are mainly the section of bands and masses of cicatricial material, separation of adherent surfaces and the gradual distention of the contractions by means of dilating instruments. In cases where the vagina is very much contracted my method consists, first, in the division of all the prominent bands, and, if necessary, in dissecting adhesions, especially such as lie near the vaginal orifice, at a primary operation, so as to give the vagina a regular cylindrical form and to increase its dimensions to an extent sufficient to allow the introduction of my smallest vulvo-vaginal dilator. Afterward, as the dilation proceeds and larger and larger instruments are used, I cut such bands, at frequent intervals, as become prominent, and make more delicate dissections of such adhesions as are situated high up in the cervical portion of the vaginal canal.

The details of the primary operation, and the instruments employed, are of importance. As a rule an anæsthetic is necessary. When the orifice of the vagina is too small to admit any form of speculum, the patient should be placed in the lithotomy position and the finger inserted in the rectum so as to guard against injury of that organ. When the contraction of the vagina is less great, or is situated high up, I employ the knee-chest position in conjunction with my supporting apparatus (Fig. 9), which restrains the movements of the patient and makes the administration of an

anæsthetic possible.* I prefer this position because in it the pelvic viscera fall forward and the greatest distention of the vagina is secured, and because, having the body straight before me, the normal relations of the bladder and rectum to the vagina are less likely to become confused in my mind, than when the patient's body is twisted, as in the lateral prone position. The objections to the latter position seem to me very much the same as would obtain in its use for the lateral operation for stone.

By simply lifting up the perineum, the gravitation of the pelvic viscera forward and the pressure of the atmosphere become sufficient to distend a normal vagina and to bring the cervix uteri into view. But this is not true when distortion of the organ, the result of cicatricial contraction, exists, and something more is needed. The use of a speculum in these cases is twofold: first, to explore the vagina, and secondly, to put the bands on the stretch so as to make them tense and prominent, in order to facilitate their division. Since 1867† I have used my dilating speculum (made of steel, by George Tiemann & Co.), Fig. 10, which has many advantages. It dilates bilaterally the vaginal canal throughout its entire length, at the orifice as well as in the cervical portion. Greater

FIG. 9.



Supporting Apparatus for long operations and Anæsthesia in the Knee-chest position.

space is, therefore, afforded, and the light admitted more freely. The divergence of the blades, being greatest at their extremities, is exactly proportional to the dimensions of the canal, and the adaptation of them to the vagina is secured by their spoon shape and appropriate width and curvature. The blades being placed laterally, the interval left between them above and below corresponds somewhat in shape with the recto- and vesico-vaginal septa; the anterior and posterior walls of the vagina are thus left uncovered, and the bands, in these situations, free to be divided. The most important advantage is the power, perfectly under the control of the surgeon, of distending the bands exactly to the necessary degree to make them tense and prominent for division.

The force of the thumb-screw, being transmitted by long, slender arms, the pressure

* *The New York Medical Record*, January 1st, 1868.

† *Op. Cit.*

FIG. 11.

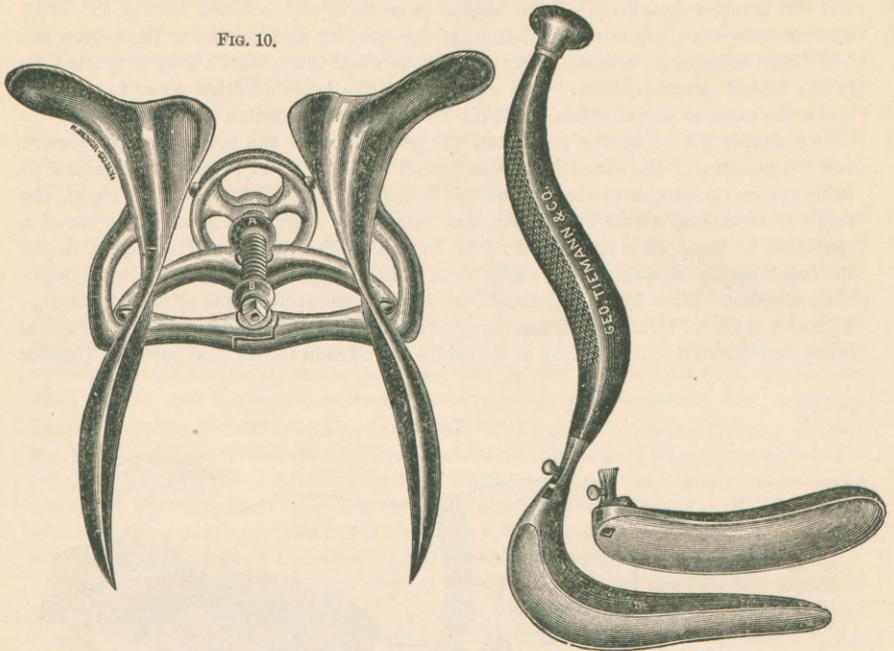


FIG. 10.

FIG. 10.—Dilating speculum—two-thirds size—Anterior view, showing the intra-vaginal portions of the instrument. The external portion, consisting of the mechanism by which the power is applied, and the curved, elastic arms connecting it with the blades, seen here imperfectly in the background, is better shown in Fig. 36, page 549, where the instrument is represented in use. The blades in the figure are fully expanded, and their spoon shape and appropriate curvature, adapting them to the lateral walls of the vagina, are shown. Projecting inward, from the outer extremities of the blades, are seen two arches which support the perineum, and, extending outward from the same part, are two flaring expansions, or wings, which serve to elevate and support the buttocks.

A. Pivot which unites the two lateral halves of the instrument, and through which passes a thumb-screw, by means of which the power is applied. B. A second pivot, connected with the extremity of the thumb-screw, and uniting two small, transverse bars, which serve to transmit the power from the screw to the arms of the blades. When the instrument is closed, these bars make an angle with each other.

FIG. 11.—Perineal elevators and adjustable handle, to be used in conjunction with the dilating speculum, or without it.

FIG. 12.



Vaginal Depressor.

FIG. 13.



Uterine forceps.

exerted by the blades is elastic and adapts itself to the varying dimensions of the vagina. All danger of injury from undue distention is thus prevented. The instrument is self-retaining and may be employed alone, but greater expansion of the vagina is secured by using it with a perineal elevator (Fig. 11). My vaginal depressor (Fig. 12) is also useful in exposing and steadying bands, and my uterine forceps (Fig. 13) may be employed as a sponge-holder during the operation, and in the course of the after-treatment, to make applications.*

I divide the bands with the sharp and probe-pointed scalpels, with long handles, shown in Fig. 14. For the more delicate work, and when the cicatricial tissue is situated in positions difficult of access, I use the knife shown in the same figure, the blade of which resembles a gum lancet. Its peculiar shape and the angles that it makes with the handle enables me to bring its sharp cutting edge in contact with bands which, while distinctly felt, are hidden from view.†

In the performance of the operation, care should be taken to avoid wounding the ureters, urethra, bladder or rectum, and if the posterior cul-de-sac of the vagina is reached, the relation which it bears to the peritoneum should be remembered. When

* I devised my dilating speculum in 1867, in order to overcome a difficulty of another kind. It was made to distend a voluminous vagina where the folds of the mucous membrane enveloped a small fistulous opening.

To those who are not familiar with the instrument, an explanation of its mechanism may be of interest. The power is applied between the fulcrum A (Fig. 10), or the joint which unites the lateral halves of the instrument, and the blades, or intra-vaginal portions, where the resistance is overcome. The two levers employed belong, therefore, to the third class. The power which the instrument possesses of distending bilaterally the orifice, as well as the interior of the canal, depends upon the fact that the fulcrum A is situated in a vertical plane posterior to the ostium vaginae. In order to prevent obstruction of the line of vision, the joint is also placed, when the instrument is in position, by an anterior curve of the arms of the blades, in the same horizontal plane as the mons veneris. This instrument was the first, and is, so far as I know, the only, speculum in which the levers are of the third class. The earlier dilating instruments of the present century consisted of two or more levers of the first class. The fulcrum was situated near, and in the ruder ones, at, the vaginal orifice. In consequence of this arrangement there was little divergence of the blades at the ostium vaginae, and the view was more or less obstructed by the joint. The more recent dilating specula are modifications of these old instruments, and, like them, consist of levers of the first class, but differ from them in that each blade moves on a separate fulcrum, which is placed laterally, and, in some instances, is adjustable, in others, fixed in one position. By this change, some dilatation of the vaginal orifice is secured, but the instruments are bulky, ill-adapted to the exploration of the vagina, and the power is applied at such a disadvantage as to render them almost useless for the distention of cicatricial bands.

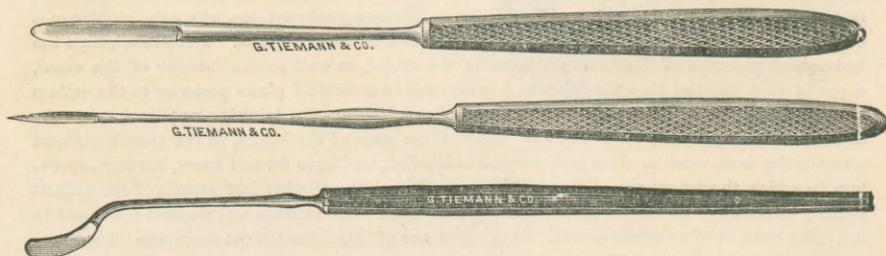
My speculum is introduced closed, and the blades are then separated by turning the thumb-screw, which passes through a nut at A, and is attached at its extremity to the pivot B, which unites two small, transverse bars. These bars are connected at their distal extremities with the arms of the blades by a joint of the same kind. When the blades are closed, the two bars make an angle with each other. As the pivot B, which is situated at the apex of this angle, is moved forward by the pressure of the thumb-screw, the angle widens out, the distal extremities of the two bars become more widely separated, and the blades to which they are attached open like a pair of sugar tongs. An additional fact about the instrument, the cause of which it is unnecessary to explain, is, as the blades separate, and the resistance offered by the lateral walls of the vagina increases, the power acts at a greater mechanical advantage, and less force is required to turn the thumb-screw. In other words; as the resistance becomes greater, the power is correspondingly increased.

† I have been so particular in the description of these different instruments, because I consider them important in the thorough and easy performance of the primary operation, and because they will be in constant use in the subsequent division of bands and gradual dilatation of the vagina.

the danger of wounding these structures is great it is sometimes better to advance, as is generally possible, in the lower part of the vagina, by tearing with the finger rather than by cutting. In the division of the adhesions and bands it should be also borne in mind that it is desirable to give the vagina, as far as possible, a regular cylindrical shape, to allow the more easy and efficient use of dilators. Too much should not be done at the first operation, because the gain would be afterward lost by the slowness of the healing process and the patient would be exposed to unnecessary danger. It should always be remembered that this operation is but the beginning of the treatment, and without the dilatation to be afterward employed, but little is gained.

Having partially restored the calibre of the vagina, a dilator should be introduced so as to maintain the separation of its walls and of the cut surfaces of the bands and adhesions during the healing process. A suitable instrument for this purpose is a small-sized vulvo-vaginal dilator of hard rubber; or the use of a soft instrument made of bits of sponge covered with oil-silk may be begun at once. Indeed, the latter is preferable, because it causes less pain and does not produce, by pressure, inflammation of the mucous membrane beneath the arch of the pubes. The instrument is retained in place by a T bandage. It should be removed three or four times a day, to allow the use of douches. If the patient suffers much pain opiates may be administered or the hard rubber dilator may be replaced by the soft, but on no account should the dilata-

FIG. 14.



Knives used in dividing adhesions and cicatricial bands.

tion be discontinued, because much that had been gained would then be lost. The healing process is hastened by the application of a solution of nitrate of silver (60 gr. to ℥j) to the granulating surfaces. This should be done at first daily, afterward less frequently. The silver stimulates the granulations, diminishes sensibility, and produces a very superficial eschar which protects the parts beneath from the action of the urine.

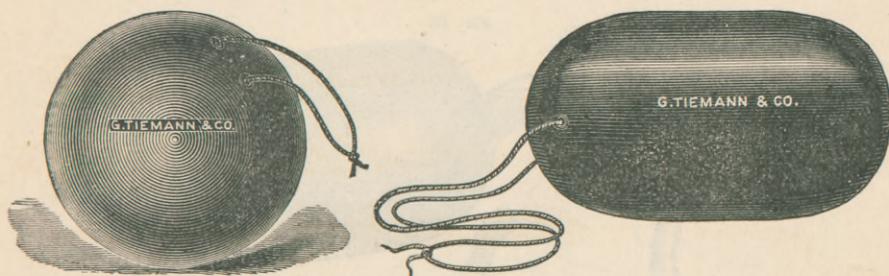
At the end of ten days or two weeks the tenderness of the vagina, as a rule, has greatly diminished, and the incisions have so far healed that measures having for their object the greater dilatation of the vagina may be begun. As I have already stated, an extensive operation like the one described is only necessary when the contraction of the vagina is very great. In the milder cases I depend entirely on the method of gradual dilatation and division of the cicatricial material now to be described.

The dilating instruments which I employ are of two kinds, hard and soft, and of two forms, the vulvo-vaginal and intra-vaginal. The hard vulvo-vaginal (Fig. 16), as the name implies, are cylindrical instruments which fill the vagina and project from the vulva, distending the orifice as well as the deeper parts of the canal. The vulval extremity of the instrument is flattened transversely, so as to lie more easily between the folds of the labia, and is prolonged below in a sort of beak, which rests against the

perineum in order to prevent injury to the uterus from too great pressure of its upper extremity. A set of these instruments consists of five sizes, the smallest being thirty millimeters in diameter, the largest fifty. I have had them made, at various times, of German silver, polished wood, aluminum and hard rubber. I much prefer the hard rubber, and my patients consider the red ones, now made by George Tiemann & Co. of New York, less objectionable in color than the black. The hard intra-vaginal dilators, Fig. 15, are made of the same material, and, as the name implies, are intended to be worn entirely inside of the vagina. The lower extremity of these instruments rests on the perineum and the posterior surface of the arch of the pubis, and they are consequently self retaining. My employment of them antedated the use of the vulvo-vaginal instruments. I introduced them, together with my dilating speculum, devised about the same time, into the hospitals of Vienna, Heidelberg and Paris, in 1874-6. The form of intra-vaginal instruments which I commonly employ is a short cylinder ranging from two to three inches in length. The spherical dilator, also shown in Fig. 15, is useful only in exceptional cases, when the vagina is much shortened. The smallest intra-vaginal instrument is thirty millimeters, the largest sixty-five millimeters in diameter, and a full set consists of eight sizes.*

In both of these forms I have recently been able to combine drainage with dilatation.

FIG. 15.



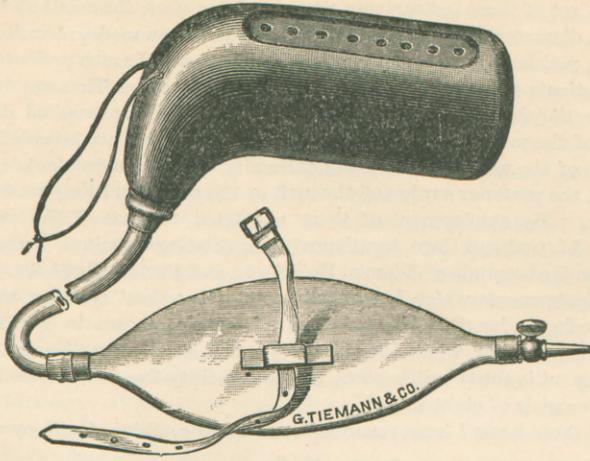
Early forms of intra-vaginal dilators.

In 1878 I made a deep groove along the upper surface of the vulvo-vaginal dilators, as is shown in Fig. 18, in order to prevent pressure on the urethra, and in the hope that urine would flow along it, and be conveyed outside of the vagina; but the contact of the mucous membrane with the instrument was so close as to prevent drainage. Recently, by blocking up the ends of the groove, by making perforations along its course, and connecting the beak by a rubber tube with a urinal, as shown in Fig. 16, I have been able to accomplish this most desirable result. In order to convey away the menstrual blood a small opening is made in the central part of the upper extremity of the instrument, where it lies in contact with the cervix uteri. Corresponding modifications have also been made in the intra-vaginal instrument, as is shown in Fig. 17. In order to indicate the double functions of the improved instruments I have called them drainage dilators. The advantages thus gained will be stated in another connection. It is sufficient to say here that the new forms should entirely replace the old.

The soft dilators are cylindrical bags of oil silk or *taffetas de soie*, firmly packed with

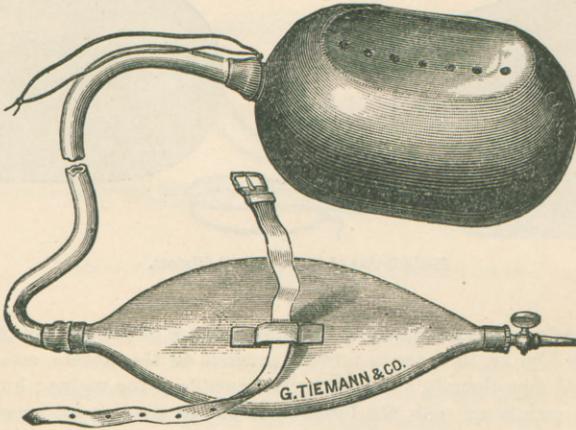
* These instruments are made by Litter & Co. of Vienna, as well as by George Tiemann & Co. of New York.

FIG. 16.



Vulvo-vaginal drainage dilators.

FIG. 17.



Intra-vaginal drainage dilators.

FIG. 18.

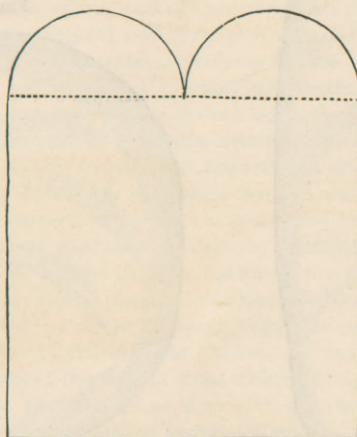


Early form of vulvo-vaginal dilator.

a coarse, cheap variety of sponge. The sponge should be torn into bits of a size corresponding to the dimensions of the bag. After having been washed and disinfected it is packed, while moist and soft, piece by piece, into the bag, which is afterward closed by tying its lower extremity with strong twine. The consistency of the dilator should be sufficiently firm to cause the necessary degree of distention of the cicatricial narrowing of the vagina; but the sponge must not be compressed so tightly as to make it impossible to diminish the size of the instrument during its passage through the orifice of the vagina or to prevent absorption of the urine by the sponge when the dilator is in place.

The sizes of the sponge dilators should, as a rule, correspond with the hard instruments; but as they can be made of any diameter, sometimes an advantage is gained by making more minute gradations. The width of a bag corresponding to a dilator of any given diameter may be determined by the following formula; the diameter of the dilator $\times 1.57 =$ the width of the bag. The length of the bags vary, for the vulvo-vaginal dilators (Fig. 20) from ten to twenty, and for the intra-vaginal (Fig. 21) from

FIG. 19.



The shape into which the oil silk should be cut in order to make the bags.

The above diagram is drawn to a scale half the natural size, in order to show the relation between the length and width of a bag for making a dilator thirty millimeters in diameter. The dotted lines on the diameters of the two semicircles forming the upper extremity of the figure.

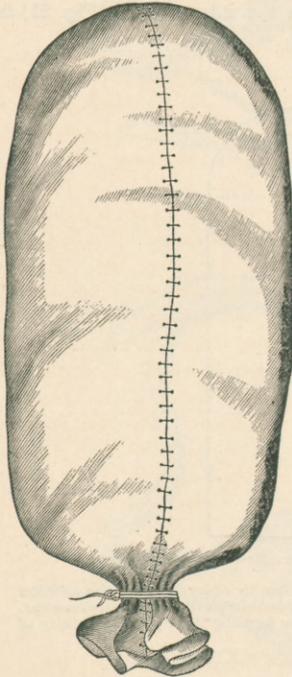
seven to fifteen centimeters, according as the diameter of the instrument is large or small. Instead of making the bags by sewing together two separate halves, it is better to cut the silk in one piece. The most convenient method is to make a paper pattern having the width of the desired size of bag (determined by the above formula); the silk should then be folded and, allowance having been made for the seam, cut after the pattern in such a manner that when spread out it will have the form shown in Fig. 19. Patients readily learn to make the dilators; but the surgeon must carefully supervise their construction and use. The best results will be obtained when he carries out the details of the treatment with his own hands.

Some skill and practice are required in order to introduce the larger dilators in such a manner as to cause the least discomfort to the patient. The best plan is, first to compress the sponge as much as possible by rolling the bag between the palms of the hands, the fingers being interlocked. The dilator having thus been temporarily diminished in

size, should be lubricated with vaseline, and each portion during introduction, as it engages in the vaginal orifice, should be compressed as much as possible with the fingers. When more than ordinary difficulty is experienced, the perineum may be depressed, and a smooth inclined plane afforded by using the flat blade (Fig. 11) described in connection with my speculum.

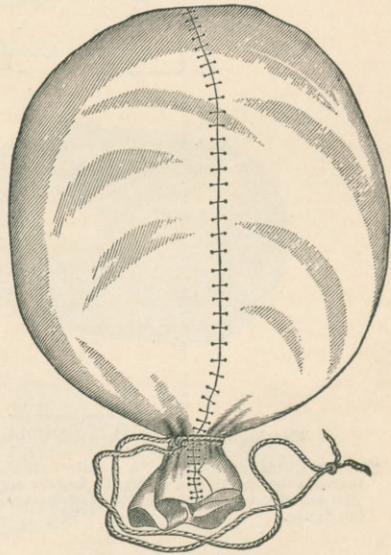
Although I have never been able to conduct away the urine absorbed by the sponge by means of a tube, I have long observed the fact that the injurious effects of incontinence were mitigated by the employment of the soft dilators. I found that if the instrument, especially if of large size, were removed every two or three hours and the urine pressed out, the vagina was kept comparatively dry. It is only when the

FIG. 20.



Vulvo-vaginal sponge dilator.

FIG. 21.



Intra-vaginal sponge dilator.

capacity of the sponge for absorption is exceeded that the urine fills and overflows the vagina.

Corresponding to the two forms of dilators, I employ two methods of continuous dilatation, vulvo-vaginal and intra-vaginal, which are applicable to different cases and to the same case at different stages of the treatment. The distinction is based upon the anatomical form of the vagina. Its orifice is fixed by the bony arch of the pubes, and is of comparatively small size, whereas the interior of the canal, especially at its upper extremity, is larger and capable of much greater expansion. Were we restricted to the use of vulvo-vaginal dilation, the maximum amount of distention attainable would be measured by the largest instrument that could be tolerated by the patient at the small and sensitive ostium vaginæ. I have found that this does not, as a rule, exceed fifty

millimetres in diameter. Although fifty millimetres is the limit of vulvo-vaginal distention, the orifice may be temporarily stretched to a much greater degree, and a larger instrument can be introduced and worn in the interior of the vagina. The largest hand intra-vaginal dilator that can be employed in a favorable case I have found to be sixty-five millimetres; but by compressing the sponge a soft instrument seventy millimetres in diameter, or even larger, can be made to pass the orifice. Intra-vaginal dilatation can, therefore, be carried to a much greater extent than vulvo-vaginal. The effect of the latter is to impart to the vagina a cylindrical shape; the former restores the natural form of the organ. Both have their uses, because the intra-vaginal method is not immediately applicable to all cases. When the contraction of the vagina is situated high up, it can be used at once, but when the canal is narrowed to any great extent at an intermediate part or near its orifice, the contraction must be first dilated to a considerable size by vulvo-vaginal dilatation. The reason for the rule is, that the vulvo-vaginal dilators are retained in place by a T bandage, whereas the intra-vaginal instruments rest on the perineum and posterior surface of the symphysis pubis, and are self-retaining. In order that this support may be afforded, it is evident that the calibre of the vagina must exceed that of its orifice. So in many cases the treatment must be begun with vulvo-vaginal and completed with intra-vaginal instruments, the greatest possible distention being attained only by the use of sponge dilators.

Experience in the employment of soft and hard instruments by the two methods just described teaches that both possess certain advantages and defects, which render each kind desirable or prevent its use under certain circumstances. As compared with the hard dilators, the sponge instruments are soft and cause less pain. They can be compressed before and during their passage through the vaginal orifice, and larger instruments can be introduced and greater expansion of the vagina obtained. When in position, the instrument gradually enlarges by imbibition of urine, and exerts an augmented pressure. If, by the primary operation for the section of bands, it is impossible to make the vagina nearly cylindrical, irregularity of the canal is an obstacle to the convenient use of hard dilators, but not of soft. The sponge accommodates itself to all the irregularities of the vagina. It exerts pressure equally in all directions, and those parts of the vaginal canal which contain the least cicatricial tissue, and therefore afford the least resistance, first give way before it. Cicatricial bands are consequently developed or made to stand out prominently above the surrounding mucous membrane, so that they may be divided. Finally, the sponge dilators are especially useful, as will be seen hereafter, in overcoming fixation of the uterus, when it is desirable to draw down the cervix to aid in closing a fistulous opening of large size.

On the other hand, there is more labor involved in the use of the soft instruments, because the sponges, becoming saturated with urine, must be removed at frequent intervals, in order to be washed and disinfected. Another objection to the sponge dilators is, that frequently their use must be discontinued during the menstrual period, on account of their interference with this function. The instrument fitting closely to the cervix opposes the flow of the menstrual blood and may cause discomfort. In a similar manner, when the ureters are exposed in the upper border of the fistula it may close one or both and occasion renal colic.

The chief advantages which the hard instruments possess are, that being smooth they are easily kept clean, and it is possible to combine with them a more nearly perfect system of drainage. The combination of drainage with dilatation is of great utility. The inconvenience and discomfort arising from incontinence of urine are in this way entirely, or to a great extent, removed, and the contact of the urine with the raw surfaces made by the knife in dividing the bands and adhesions is prevented. Healing is consequently more rapid and less cicatricial material is produced in the pro-

cess; the advance made by the division of each band is greater and more permanent, and the complete expansion of the vagina more quickly produced. As the blood is drained away with the urine, there need be no interruption of the treatment during the menstrual period. For these reasons I employ the hard instruments when they do not cause too much pain and the special indications for the use of the sponge dilators, viz., irregularity of the vagina, the development of bands, mobilization of the uterus and the production of great expansion of the vagina, do not exist. The disadvantage of causing pain applies especially to the vulvo-vaginal instrument. In cases where the perineum is hard and unyielding, from the presence in it of much cicatricial tissue, the upward pressure exerted by the dilator on the mucous membrane beneath the arch of the pubis is great, and unless care is exercised, injurious ulceration will be produced. The instrument also frequently interferes with walking and sitting.

The practical association of gradual dilatation with division of cicatricial tissue will now be more easily understood. As the expansion of the vagina goes on by the judicious and systematic use of larger and larger dilators, the natural anatomical relations of the parts become more clear and the lines of greatest resistance, that is, where the deposit of cicatricial material is the greatest, become prominent, in consequence of the more rapid expansion of the surrounding mucous membrane. When new bands are developed or those already visible are rendered sufficiently distinct, they should be successively divided. As in the primary operation, it is very important not to attempt to do too much at one time, but to make the division of cicatricial contractions subservient to continuous dilatation. The development of the bands by the latter process points out the tissues that should be cut and diminishes the danger of their section. In this way the healthy parts are spared and accidental wounding of neighboring organs avoided.

The instruments already described in connection with the primary operation for section of bands are also well suited for the division of cicatricial material at this stage of the treatment. But the apparatus for securing the patient in the knee-chest position is unnecessary, as the operation is not very painful, and may be done without an anæsthetic, or cocaine may be applied to the surface to be incised. For reasons already given, the supported knee-elbow position is preferable, and the most convenient mode of using it is shown in Fig. 22.

I find my dilating speculum* even more indispensable in this stage of treatment than in the primary operation for the section of bands. The necessity of complete symmetrical dilatation of the vagina is greater, and an instrument corresponding at all degrees of separation of the blades to the natural shape of the vagina, renders those parts of the organ which depart most widely from this form the most tense. In this way it furnishes, to a certain extent, a guide as to what should be divided. Its principal use, however, is to render the bands tense and prominent.

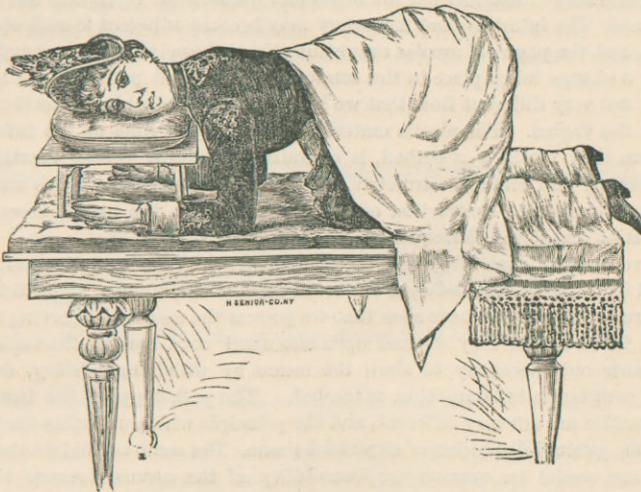
As the dilatation and division of cicatricial material proceeds, the exact nature of the perforating lesions present becomes more evident, and the form and relations of the fistula to the surrounding structures are more distinctly exposed to view. The cervix, which was, perhaps, altogether hidden, gradually becomes visible, and the anterior and posterior culs-de-sac are restored. The vaginal walls are relaxed and the uterus made movable. The vaginal mucous membrane loses its fiery-red hue, assumes a natural pink color, and all inflammatory thickening melts away beneath the pressure. The borders of the fistula lose their leather-like hardness, become smooth and soft, and may be more easily approximated. Time, patience and perseverance are all that are necessary, in most cases, to produce, by the careful and systematic employment of the method of gradual

* Three sizes are made; although the small size will do in most cases, when the dilatation is great the intermediate or largest size is preferable.

division and dilatation of cicatricial material, a distention of the vagina nearly equal to that caused by the child's head at the time when the injury was done. The degree of expansion necessary and the time required to produce it vary with the gravity of the case, the amount of cicatricial contraction present, and the extent of the loss of tissue at the fistulous opening to be supplied by the increased mobility of its borders. All may be done in a few weeks or months, or, in severe cases, a whole year may be consumed. My experience has shown, however, that as long as the surgeon works persistently and intelligently toward a definite end, the patient does not become discouraged. However slow the advance, her faith remains strong, and she will aid all she can and persist until the final triumph is achieved.

Fixation of the Uterus.—If the resources of treatment were now exhausted, a large class of fistulae would still defy our efforts. When the greater part of the septum is destroyed and the cervix forms a part of the upper border of the fistula, or only a small portion of the vaginal wall intervenes between it and the opening, while the uterus

FIG. 22.



Supported knee-elbow position as I usually employ it in my private office. No special arrangement of the dress of the patient necessary.

remains fixed, even the most extreme vaginal distention, and relaxation will not furnish sufficient tissue to fill the hiatus. The lower border of the fistula is fast fixed to the pubic arch, the upper corresponds to the immovable cervix, and if the loss of substance is great the remnants of the septum can never be sufficiently stretched to bridge the interval.

Jobert's solution of this problem is historical. He severed the connections of the borders of the fistula from these fixed points above and below, and achieved a mechanical success. Unfortunately the mortality following the operation was very great; a large proportion of his cases died of peritonitis and pyæmia, due to extravasation of urine. The operation was denounced by the profession and much of the appreciation of the value of his previous labors was lost, in the opprobrium which was attached to this operation, which was known as Jobert's cut. To Simon, the closure of the fistulous opening under these circumstances seemed impossible, and in his opinion this condition constituted an indication for the performance of the operation of Kolpo-

kleisis. The lesion was by this practice perpetuated, the genital functions destroyed, and a sac, which could never be completely emptied of urine, was formed. Inveterate cystitis and frequently the formation of renal and vesical calculi, pyelitis and the death of the patient were the results of the unnatural association of the urinary and genital organs.

But this grave difficulty which these great men sought in vain by different methods to overcome, can be surmounted by gradual and patient efforts, similar to those already described. The immovable uterus, by long continued and constantly increasing pressure, can be made movable, and in process of time be drawn down, without loss of function or great tension, to fill the opening.

Fixation of the uterus, when it complicates fistula, may result from injuries of the vagina, or may be due to a complicating cellulitis and peritonitis or both of the causes may operate in the same case. The formation of cicatricial bands, obliteration of the culs-de-sac, rigidity of the vaginal walls and infiltration of the surrounding areolar tissue and reflections of the pelvic fascia, as has been seen, are consequences of injuries of the vagina occurring during labor, and tend to limit the mobility of the uterus. As the result of periuterine inflammation the broad and utero-sacral ligaments are thickened and shortened. The intestines and mesentery may become adherent to each other and to the uterus, and the planes of areolar tissue throughout the pelvis indurated and inelastic. In a word, a change takes place in the connective tissue and peritoneum surrounding the uterus, not very different from that we have already studied in connection with the injuries of the vagina. The plastic material exuded at the time of the inflammation having been only partially absorbed, is organized into new tissue, identical, in its minute anatomy and clinical characters, with cicatricial tissue. As the result of the rigidity and subsequent contraction of this new material, the uterus becomes fixed, and its position and form are frequently changed and distorted.

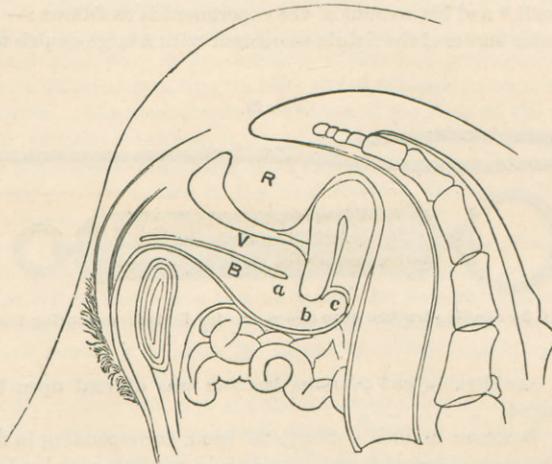
We have already considered the method by which the normal dimensions of the vagina and its obliterated culs-de-sac are restored, and the rigidity and thickening of its walls are overcome, and have seen that we possess the means of removing the causes of fixation in so far as they depend upon abnormal conditions of the vagina. It is, therefore, now only necessary to show the means by which immobility, due to the results of periuterine inflammation, is treated. The pathology of the two classes of causes of fixation are not very different, and the principle which underlies the treatment of both is the gradual distention of cicatricial tissue. The same vaginal dilators already described are useful in overcoming immobility of the uterus, because they exert pressure upon the cervix uteri as well as on the walls of the vagina. By gradual elevation the uterus is made movable. The lengthening of the ligaments and adhesions which permits ascent in the pelvis allows a corresponding descent.

The manner in which the upward pressure is exerted varies with the form of dilator employed. In vulvo-vaginal dilatation, the pressure of the T bandage is transmitted by the instrument to the uterus. The intra-vaginal dilators, resting on the perineum and posterior surface of the symphysis and arch of the pubes as fixed points, raise the organ to an extent varying with their size and length. As the dimensions of the instruments are gradually increased the uterus is more and more elevated and its rigid ligaments are stretched. Although something is accomplished by the use of the hard dilators, the intra-vaginal sponge instruments are peculiarly well adapted for this purpose. Being soft, they cause much less pain and do not excite pelvic inflammation, and being compressible, a much larger instrument can be introduced through the constricted orifice of the vagina. The elastic sponge adapts itself to the form of the cervix and the upper part of the vagina, and transmits the pressure more perfectly in the direction of the broad ligaments. The distensible force of the instrument is gradually increased after its introduction, by the imbibition of urine. These qualities make the

Incarceration of the Cervix Uteri in the Bladder.—Incarceration of the cervix uteri in the bladder (Fig. 24) occurs as a complication of vesico-utero-vaginal fistula. The injury involves the anterior lip of the cervix which forms part of the upper boundary of the fistulous opening. The whole of the anterior lip, as far upward as the vaginal junction, may be destroyed,* or a portion may be left. In the latter case an adhesion is formed between the stump of the cervix and margin of the fistula. As a rule the loss of tissue in the vesico-vaginal septum is considerable. One or both of the ureters may be involved in the slough, and in consequence of subsequent contraction of the cicatricial borders of the fistulous opening their lower extremities may become distorted and their orifices drawn toward the cervix, as shown in Fig. 26.

The incarceration of the cervix uteri in the bladder results from retroversion or retroflexion of the uterus occurring after labor. In consequence of the displacement the posterior lip of the cervix is rotated forward, so that its extremity lies opposite to the lower border of the fistula or, in extreme cases, it is carried altogether within the

FIG. 24.



Incarceration of the Cervix Uteri in the Bladder (Knee-chest position, Diagrammatic section, $\frac{1}{4}$ size).
a, lower border of the fistula. *b*, posterior lip of the cervix uteri, the apparent upper border of the fistula. *c*, stump of the anterior lip of cervix, the real upper border of the fistula, turned into the bladder. *R*, rectum. *V*, vagina. *B*, bladder.

bladder. The gradual contraction of the cicatricial borders of the fistula tends to increase the deformity by drawing the anterior lip of the cervix upward, and no doubt the traction thus exerted is also a factor in the causation of the backward displacement of the fundus of the uterus. It is probable that this condition develops gradually. In a case which came under my care while in Edinburgh, the incarceration of the cervix was certainly produced slowly. Prof. Küller,† in his report of the case, and the operation, which I did on August 4th, 1858, states that the patient had been under his observation for three years, and that the condition was not developed until long after the fistulous opening was formed.

* See Case xv, with Fig. 7. *North American Medico-Chirurgical Review*, for July and November, 1857.

† *Edinburgh Medical Journal*, October, 1858.

When the incarceration is complete the upper part of the vagina is narrowed by the approximation of the posterior cervical reflexion of the vaginal wall with the lower border of the fistulous opening. The posterior lip of the cervix can be indistinctly seen through the fistulous opening; the os is hidden from view and the menstrual blood flows directly into the bladder.

The disengagement of the cervix from the bladder and the restoration of the uterus to its normal position is not easy, and so far as I am aware, had not been attempted previous to my first case successfully treated and reported in November, 1857. The operation which was then ordinarily done consisted in attaching the posterior lip of the cervix to the inferior border of the fistula. This is easily accomplished, and the incontinence of urine is relieved, but the patient is not cured. The incarceration of the cervix is perpetuated, the menstrual blood flows into the bladder and the uterine functions are interfered with. A pouch is necessarily formed in the vesical wall. Cystitis follows, and it in turn may induce pyelitis, or lead to the formation of vesical and renal calculi. Another objection to this operation is, that the distortion of the ureters, if present, is not relieved, and that their orifices are liable to be closed by being brought in contact with the cervix uteri.

In order to preserve the functions of the uterus, and to avoid the risk of these dangers, the cervix should be disengaged from the bladder, the uterus restored to its normal position, and the anterior lip of the cervix, instead of the posterior, attached to the lower border of the fistula. An account of a method by which this result was

FIG. 25.



Angular-bladed knives.

accomplished, together with an accurate description of the incarceration of the cervix, was published by me in the *New Orleans Medical and Surgical Journal*, May, 1860.* (Case xxxviii.)

The plan of treatment used in the case reported was successful, and I have continued to employ it until the present time. The method may be described as follows: An incision through the entire thickness of the septum, as shown in Fig. 26, is made with scissors or my angular-bladed knives (Fig. 25), in the lateral borders of the fistula. The fistulous opening is thus increased in size and the cervix is liberated. The mobility of the uterus is afterward gradually increased by the pressure of sponge dilators, until the fundus can be raised and the cervix drawn into the vagina without difficulty. When this has been accomplished, the fistulous opening assumes the form shown in Fig. 27. The diagram is also intended to explain the effect of the treatment upon the distortion of the lower extremities of the ureters when it exists, and shows that their orifices are drawn away from the cervix uteri and returned to their normal positions.

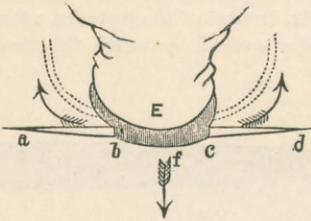
* In speaking of the treatment of the case, I said: "The preparatory treatment in the case consisted in cutting the constricted portion of the vagina, and then enlarging the fistula laterally, so as to admit of a disengagement of the neck of the uterus from its confined situation. This being done, a sponge tent large enough to fill the vagina was introduced. Twice a day this tent was removed and injections of cold water used. By this course the canal was kept dilated and the uterus thereby prevented from returning to the malposition in which it was found."

The complication having been overcome by this preparatory treatment, the subsequent operation for the closure of the fistula is comparatively easy.*

Incarceration of the cervix in the rectum is a complication of extreme rarity. I have seen only the case which I published in the *Trans. Am. Gynecological Society, 1879*, page 373. In this instance the cervix was destroyed above the vaginal junction, and the stump formed a part of the upper border of the fistulous opening. The fistula extended through the posterior cul-de-sac of the vagina into the rectum. From its relation to these parts, the peritoneum must necessarily have been implicated, but a fatal peritonitis was no doubt prevented by the agglutination of two layers of the peritoneum forming Douglas's pouch, previous to the separation of the slough. The opening, if (as should always be done) all the important structures involved are designated, was a *recto-peritoneo-utero-vaginal fistula*. The uterus was anteflexed and the os turned into the rectum. The lower border of the fistula was drawn forward by a cicatricial band, and lay in close proximity with the anterior lip of the cervix. (Fig. 28.)

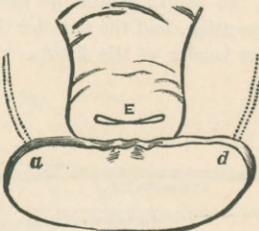
The treatment of this case consisted in the section of the cicatricial bands, and the dilatation of the vagina with sponge dilators to the greatest possible extent. Fig. 29.

FIG. 26.



Operation for disengaging the cervix uteri from the bladder.
a b, c d, lateral incisions extending through vesico-vaginal septum. *E*, posterior lip of cervix uteri; *f*, lower border of the fistula. The dotted lines indicate the situations of the ureters, and the arrows the directions in which pressure will be exerted by the subsequent use of vaginal dilators.

FIG. 27.



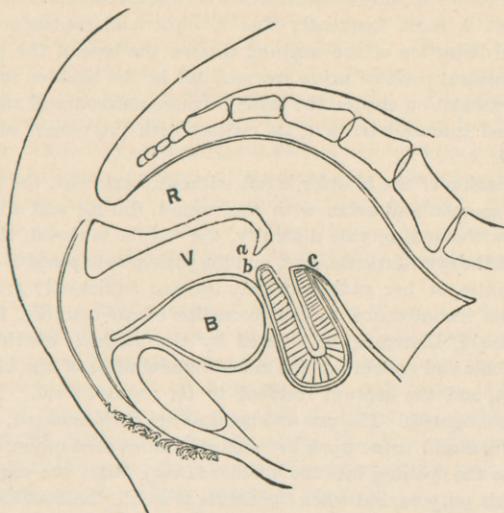
Result of Treatment.
a d, orifices of the ureters restored to their normal positions. *E*, posterior lip of the cervix. The os uteri and anterior lip of the cervix have been brought into view.

By these means the displacement of the uterus was corrected, the cervix restored to the vagina, and the inferior border of the fistula was passed backward, so as to be opposite to the posterior instead of the anterior lip of the cervix. The case having been thus made comparatively simple, the fistula was closed at a single operation with my button suture.

Cystitis.—Cystitis is a frequent and important complication. When it occurs in connection with urinary fistula, it is almost uniformly due to the retention of urine in the bladder. Small quantities of urine remain in the bladder when the situation of the fistulous opening is unfavorable for perfect drainage, or in consequence of sacculation of its

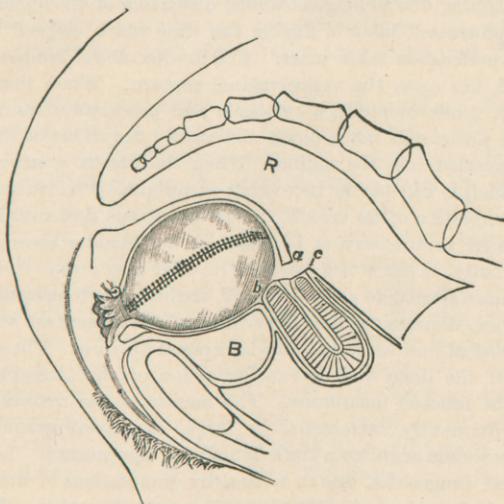
* My button suture, while possessing many other advantages, is particularly useful in this class of cases. When the opening has been closed by the sutures, the posterior lip of the cervix rests against and is supported by the upper border and convex surface of the leaden button, and the tendency to the reproduction of the incarceration, before union of the borders of the fistula has occurred, is by this means prevented. The tension which would otherwise be sustained by the central sutures alone is thus distributed, by the plate, upon all.

FIG. 28.



Incarceration of the Cervix Uteri in the Rectum (supported knee-elbow position, diagrammatic section, $\frac{1}{4}$ size).
a, lower border of the fistulous opening drawn forward by the contraction of a cicatricial band. *b*, anterior lip of the cervix, the apparent upper border. *c*, stump of the posterior lip of the cervix, obliterated recto-vaginal fold of the peritoneum, and the rectal wall, which structures form the real upper border of the fistula. *V*, vagina. *R*, rectum. *B*, bladder.

FIG. 29.



Dilatation of the Vagina after the division of the cicatricial bands. Intra-vaginal sponge dilator in place. (Diagrammatic section, supported knee-chest position, $\frac{1}{4}$ size.)
a, lower border of the fistula, now almost opposite *c*, the upper border. *b*, anterior lip of the restored cervix uteri. *R*, rectum. *V*, vagina. *B*, bladder.

walls. The latter condition may be associated with displacements of the uterus or pelvic inflammations, but is most frequently due to cicatricial contraction of the vagina, which, producing distortion of the septum, throws the base of the bladder into folds and pouches. Stagnant pools of urine are retained in the bladder in contact with the atmosphere. Fermentation ensues, the urine becomes ammoniacal and putrescent, and being thus rendered intensely irritant, its contact with the vesical mucous membrane engenders cystitis.

If the inflammation of the bladder is left without treatment, the deleterious effects of the contact of ammoniacal urine with the wound, during and after operation, are obvious. If, notwithstanding this difficulty, the fistula is closed, the sacculation of the bladder makes the cystitis permanent, and the patient is exposed to the danger of the occurrence of pyelitis, or her sufferings may become sufficiently great to justify the reproduction of the incontinence by the formation of an artificial fistula. The distorted vagina should, therefore, be dilated by the method which I have already described. The folds and pouches of the mucous membrane of the bladder are in this way smoothed out, and the septum restored to its natural form. The bladder must also be frequently irrigated. The pus and bacteria are thus removed, and the injurious action of the ammoniacal urine upon the vesical mucous membrane, to a great extent, prevented. When the opening into the bladder is very large, the vaginal douches will be sufficient for this purpose, but when the fistula is small, the bladder must be washed out by means of a soft catheter.

Prolapse of the Bladder.—There is frequently a tendency of the fundus of the bladder to protrude through the fistulous opening. The disposition to prolapsus is greatest when the fistula is large and involves the urethral portion of the septum, but that the complication does not depend entirely upon the size of the opening is evident, because frequently it does not occur when the fistula is large, and may be present to an extreme degree when the opening in the septum is of a comparatively small size. This fact and observation of cases have led me to attribute the prolapsus to dilatation and atony of the walls of the bladder, due to long-continued distention of the organ by retention of urine during the protracted labor or during the time which elapsed before the slough separates and the perforation takes place. The fundus of the bladder being thus enlarged and flaccid, lies upon the vesico-vaginal septum. When there is no fistulous opening its weight tends to produce cystocele and procidentia uteri. If a fistula is present a gradual protrusion takes place, and nearly the whole of the interior of the bladder may be inverted into the vagina. When the uterus is movable the traction of the bladder, which is constantly increasing in weight by relaxation of the mucous membranes and congestion of its vessels, draws the uterus downward. As the organ sinks in the pelvis the protrusion and inversion of the bladder become more and more complete, until, finally, in the worst cases the bladder may escape from the vulva, presenting an appearance similar to an extroverted bladder due to congenital defect in the pubic arch. In these distressing cases the orifices of the ureters are visible, and nearly the whole of the vesical mucous membrane is exposed to view. The congestion of the vessels, attrition of the linen and desiccating action of the atmosphere soon induce inflammation of the mucous membrane. The mouths of the ureters become everted, cedematous, and frequently surrounded by large, exuberant granulations, and the whole mucous membrane acquires a dark bluish-red appearance. Large numbers of granular points and fungosities, due to unhealthy granulations of numerous abrasions and small areas of ulceration are formed on the exposed surface. Such an extreme degree of prolapse rarely occurs unless the uterus is movable. When that organ is fixed the utero-vesical ligaments and the attachment of the upper part of the vesico-vaginal septum to the cervix prevent great mobility of the bladder.

The treatment of the grave cases of prolapse of the bladder is important and some-

times difficult. The granulations should be brushed with a solution of nitrate of silver (twelve per cent.) every day. The patient should be placed in the supported knee-elbow position, and the protrusion of the bladder reduced. To prevent recurrence of the prolapse is difficult, but this can usually be done by means of a sponge dilator introduced into the vagina, and kept in place, if necessary, by a T bandage. The instrument should be removed once or twice a day, to allow the use of douches. The sponge dilator supports the bladder by sustaining the uterus, and by occupying and distending the vagina it prevents the recurrence of the prolapse. By obturating the fistulous opening it leads to the collection of urine in the bladder, which distends its cavity and lifts up the fundus. The congestion is thus relieved, and the unhealthy condition of mucous membrane so far disappears as to justify the closure of the fistulous opening.*

Injuries of the Ureters.—In the study of the injuries of the ureters, it is important to remember the anatomical fact that they enter the vesico-vaginal septum at a point on each side of and about three-quarters of an inch distant from the cervix uteri, and traverse its substance to the extent of about one and a half inches before opening into the bladder. One of the ureters may therefore be laid open, constituting a uretero-vaginal fistula (Fig. 32), without perforation of the bladder, but more frequently the slough extends through the entire thickness of the septum, and a vesico-uretero-vaginal fistula (Fig. 30), involving one or both ureters, is produced.

In either of these forms of fistula the broken end or new orifice of the ureter may be everted or stenosed. The lower extremity of one or both of the ureters is everted when the free border of the fistulous opening in which it lies is turned into the vagina. This distortion of the margin of the fistula is frequently the result of the traction of cicatricial bands in the vagina, or it may be associated with prolapse of the bladder. Obstruction or stenosis is commonly due to the implication of the orifice of the ureter in the cicatricial tissue which forms the border of the fistula.

In the performance of the operation for the closure of a fistula involving the ureters, obstruction of the orifice of one or both is liable to be occasioned by the approximation of the borders of the fistulous opening, or a suture may pierce and partially or entirely occlude its lumen. Something must therefore be done to prevent the occurrence of these accidents.

As my claim of priority in the recognition of these dangers and the employment of a successful method of avoiding them has been questioned, I will refer to my first description of the lesion and the treatment of uretero-vesico-vaginal fistula. I encountered the case in June 1856.† Fig. 30, which is copied from the original drawing, shows the positions of the orifices of the ureters. In the description of the operation for closure of the fistula I said: "In addition, I may state, however, that in the paring process, the end of each ureter was cut off and slit on the vesical side of the septum to the extent of a quarter of an inch, the object of this being to throw the entrance of the urine into the bladder away from the approximated edges of the fistula." The knife which I used to incise the ureters is shown in Fig. 31. I also appreciated the importance of "straddling" the ureters and urethra; that is, I introduced the sutures in such a manner as to avoid including these structures.

Subsequent experience has convinced me that it is better to slit the ureter and to allow the healing of the incision to take place some time previous to the performance of the operation for closure of the fistula. Two advantages are gained by this modi-

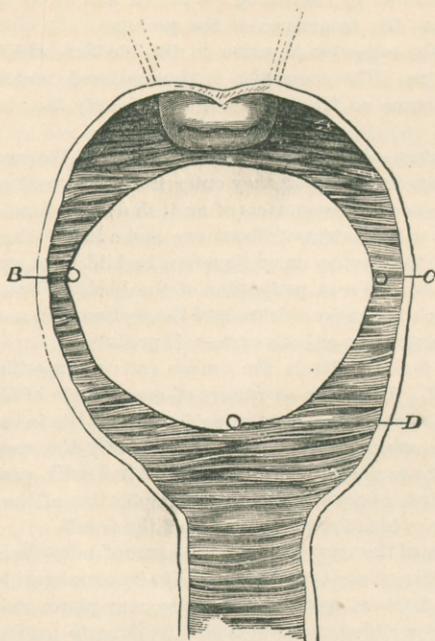
*In the performance of the operation an advantage of the knee-chest position is well seen. The force of gravitation generally causes the fundus of the bladder to fall forward, and it is rarely necessary to resort to such expedients as filling the bladder with sponges to prevent prolapsus.

† Case VIII. *North American Medico-Chirurgical Review* for July and November, 1857.

fication. If hemorrhage from the ureter follows the incision, the bleeding point is not shut up in the bladder, and if after healing has occurred, the orifice of the ureter is not sufficiently turned into the bladder, it may be incised a second time.

Stenosis of the ureters may also be treated by incision or excision. Care must be

FIG. 30.



Urethro-uretero-vesico-vaginal fistula.

B, C, orifices of the ureters. D, vesical extremity of the urethra.

taken to lay open the whole length of the constricted portion. The orifices of the ureters may also be dilated with sounds.

Uretero-vaginal fistula is extremely rare. In 1870 I encountered a case (the only one I had then ever seen) complicated with cicatricial contraction of the vagina (Fig. 32). I first divided the cicatricial band and dilated the vagina. In order to reestablish the

FIG. 31.



Knife for slitting lower extremity of ureter.

communication with the bladder, I removed a small circular piece of the septum, including the extremity of the injured ureter.* In other words, I converted the uretero-

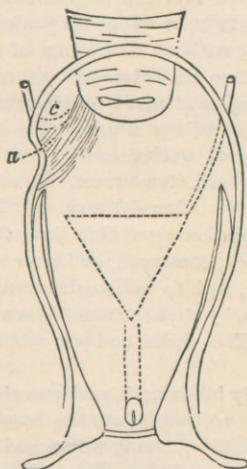
* When this operation is done in order to expose the orifice of the ureter when no fistula is present, I have given it the name of *kolpo-uretero-cystotomy*.

vaginal into a uretero-vesico-vaginal fistula (Fig. 33). The lower extremity of the tube was then slit on its vesical side and in closing the opening in the bladder with my button suture, which was done at a single operation, the sutures were made to straddle the ureter.

Pyelitis.—The principal causes which lead to the development of pyelitis as a complication of fistula are obstruction of the ureters and cystitis. We have already studied stenosis of the ureter in that portion of its length which is contained in the vesico-vaginal septum, but the calibre of the duct may also be obstructed or contracted by the impaction of a calculus or the pressure of a peritoneal cicatrix at any point between this part and the pelvis of the kidney.

The symptoms which I have observed to be present in this disease are: more or less

FIG. 32.

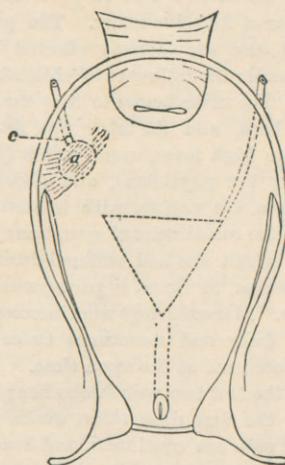


Uretero-vaginal Fistula complicated by cicatricial contractions of the vagina. (Horizontal diagrammatic section, knee-chest position).

a. Cicatricial band. The distorted lower extremity of the ureter indicated by dotted lines.

c. Is placed a little external to the fistula, which is hidden from view by the cicatricial band. The blades of my dilating speculum are shown in position, and between them, in dotted lines, is seen the trigone of the bladder and its relations to the ureters.

FIG. 33.



Result of treatment. Cicatricial contraction of the vagina expanded by dilatation and incisions. c. Orifice of ureter restored to the bladder. a. Uretero-vesico-vaginal fistula, made by removing a circular piece of the septum, in order to turn the ureter into the bladder. Ureter obliterated between opening and corresponding angle of trigone.

constant pain in the lumbar region, attacks of renal colic, nausea and vomiting, anæmia, emaciation and the cachexia of chronic suppuration. At times the course of the disease is varied by the occurrence of severe rigors, accompanied and followed by fever. Pus and blood may be seen to exude from the orifice of the ureter, which is exposed to view by the fistulous opening.

I have recently devised a new method of treatment for this disease, and have used it in two cases, both of which are now cured. In my first case, the pyelitis occurred as a complication of a fistulous opening in the bladder. As, in addition to its interest in this connection, it illustrates many of the complications of urinary fistula which we have studied, I will report the case at length.

The patient was sent to me by Dr. Sands, of Port Chester, N. Y., and was admitted into my service in the Woman's Hospital. The following record of the case was kept by Dr. William Gilmer, and the accompanying drawings were made during the course of the treatment by Dr. John Aspell,* both members of the House Staff. The details of the treatment of the case were carried out by the House Surgeon, my son, Dr. Nathan G. Bozeman. The urine was examined by Dr. H. C. Coe, Pathologist of the Hospital.

Mrs. S. L.; aged 34; was admitted September 20th, 1886. The patient has borne four children at full term, and had one miscarriage. During the two months preceding delivery in her last three pregnancies, which were normal in other respects, she complained of pain in the left lumbar region. In her last pregnancy this was more severe than before, and was increased by sudden jars of the body or by moving about. She also then noticed, for the first time, the occurrence of an abundant red sediment and a deposit of thick, ropy mucus in her urine. She was delivered of a dead child April 25th, 1886, about five months previous to admission into the hospital, after a protracted labor of fifty-five hours. The presentation is believed by the patient to have been a foot, and the delivery effected by traction, without mutilation of the child, but being under the influence of chloroform at the time, she is ignorant of exactly what was done. The urine began to flow through the vagina almost immediately after the child was born, and the labor was followed by a serious illness. The symptoms present were high fever, rapid pulse (130 for several weeks, as she was afterward informed by her physician), and abdominal pain and tenderness. A slough was removed from the vagina, with scissors, three weeks after delivery. Although the violence of the constitutional symptoms abated somewhat about this time, the lumbar pain, from which she had suffered during pregnancy, continued, and grew worse, and began to assume, at times, a paroxysmal character, and to radiate downward toward the bladder. Her sufferings were increased, at times, by the occurrence of severe rigors, sometimes daily and sometimes twice a day. The chills and paroxysm of pain frequently occurred at the same time.

During the last two months she has gained slowly in strength, and was able to walk a little, for the first time, three weeks previous to admission into the hospital. But the lumbar pain has continued, and has been gradually growing worse, and the chills and acute paroxysms of pain still occur at frequent intervals. She also suffers from anorexia, nausea, occasional vomiting, night sweats, cold hands and feet, and she has noticed that her complexion has become pale and sallow. The incontinence of urine has continued. At times large pieces of mortar-like substance have come away from the vagina. The contact of the urine has caused burning pain, itching and excoriation of the labia and buttocks.

The patient is now somewhat emaciated, pale and cachectic-looking. Her temperature and pulse are normal. Her urine contains a trace of albumen, and deposits an abundant sediment consisting of pus, triple phosphates, bacteria, epithelium and a few blood corpuscles.

Sept. 21st. The patient was placed in the supported knee-elbow position, and an examination made. The external genitals and buttocks presented the ordinary appearances of inflammation due to the action of alkaline urine. The perineum was torn, the laceration extending down nearly to the sphincter ani. The finger passed readily into the vagina, and disclosed the presence of a large opening into the bladder, but the cervix uteri could not be made out. Bozeman's dilating speculum and perineal

* All the other drawings in the paper, except those representing instruments, were also made by my friend, Dr. Aspell. I am greatly indebted to him for the care and skill with which he embodied my ideas in regard to the normal and pathological relations of the organs represented, and with which he pictured the lesions and results of treatment described in the text.

elevator were then introduced, and the lower part of the vagina and the fistulous opening were easily exposed to view. The vaginal mucous membrane was tender to the touch and of a bright-red color.

The fistulous opening was seen to involve the greater part of the vesico-vaginal septum, and its form to be heart-shaped, the apex corresponding to the symphysis pubis. A sound was passed into the remnant of the urethra, and it was found that its root formed a part of the border of the fistula, and that obliteration of its vesical extremity had occurred. The left border of the fistula was fixed, inverted and distorted by cicatricial thickening, which extended partly around the vagina and contracted its calibre at this part. The upper border of the fistula was immovable. Beyond this point the vagina was obliterated, and the cervix uteri invisible.

The narrowing, at the expense of its posterior wall, of the upper part of the vagina gives the interior of the organ a conical shape, its apex corresponding with the upper border of the fistula, and the base with the vaginal orifice. When the vagina is dilated by the speculum, it is easy to look through the large fistulous opening into the bladder, and to see its swollen, red and inflamed walls, and the urine occupying its lowest part. The cavity of the bladder is very much contracted, and its mucous membrane thickened and thrown into folds and pouches. There is no tendency to prolapse, except along the upper border of the fistula, where an oedematous fold of mucous membrane appears at the margin of the opening.

From the extent and situation of the fistula, it is almost certain that one or both ureters are involved in the injury, and that the slough extends through the septum up to the cervical junction. The anterior lip of the cervix is probably destroyed. The posterior lip is hidden from view by obliteration of the posterior cul-de-sac and cicatricial narrowing of the vagina. The fistula, in order to designate the implicated structures, should be called an urethro-utero-uretero-vesico-vaginal fistula. See Fig. 34.

Sept. 24th. The patient was secured in the knee-chest position, by means of Bozeman's apparatus (Fig. 9, page 524), and etherized. A number of transverse bands, constricting the vagina, having been stretched and rendered prominent by Bozeman's dilating speculum, were divided. A few superficial incisions were also made in the adhesion already described as obliterating the upper part of the vagina. A vulvo-vaginal dilator, forty-five millimetres in diameter, was then introduced into the vagina and secured in place by a T bandage.

Sept. 30th. The size of the dilator has been increased to fifty millimetres. Nitrate of silver (12 % solution) has been applied daily to the raw surfaces, which are now granulating in a healthy manner. The vagina is still sensitive, and the introduction of the instrument causes a good deal of pain, and its pressure beneath the pubes has caused inflammation and a superficial slough of the mucous membrane. Considerable space has been gained. Traction was made to-day upon the upper border of the fistula, and it was found to be immovable.

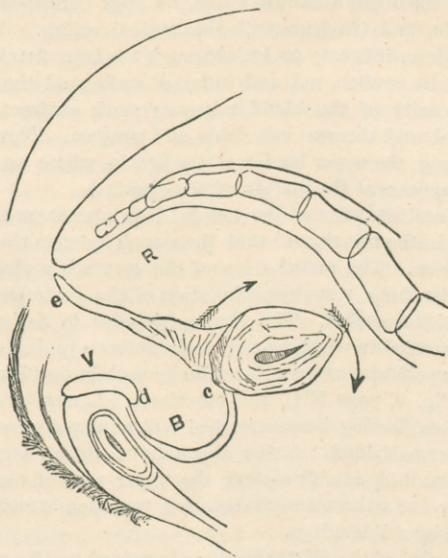
Oct. 3d. The instrument no longer causes pain, and the patient is more comfortable.

On Oct. 4th the patient had a severe chill, followed by a temperature of 104.8°, headache, nausea and vomiting. The temperature soon returned to normal, and she was better until the 6th, when the chill was repeated. Since the latter date there has been no return of the fever. The dilatation has been continued without interruption since the operation, and the cut surfaces have healed. The relation of the parts can now be more exactly made out; the remnant of the anterior lip of the cervix is now recognized as forming a part of the upper border of the fistulous opening, but the posterior lip is still hidden from view by the contraction of this part of the vagina and the obliteration of the posterior cul-de-sac. To-day, in order to facilitate the expansion

of this part, several bands, which had gradually become prominent, were put on the stretch and divided.

Oct. 20th. The dilatation has been continued, and the bands divided from time to time when they became prominent. Progress is gradually being made. The extremity of the posterior lip of the cervix is now visible, and superficial incisions are being made along its surface, with the object of gradually severing the adhesion between it and the vaginal wall. The os uteri is pervious, and a probe passes into the uterus about one inch. The borders of the fistula are somewhat more movable, but cannot be brought in apposition by even an extreme degree of traction, with a hook fastened in the cervix.

Oct. 27th. Having reached the highest degree of dilatation attainable by the use of



Lesions present at the time when treatment was begun. (Diagrammatic section, knee-chest position, $\frac{1}{4}$ size.)

a, Lower border of the fistula and obliterated vesical extremity of the urethra. c, upper border, formed by the stump of the anterior lip of the cervix and wall of the bladder. Above c is shown the cicatricial narrowing of the vagina, the adhesion between vagina and the cervix uteri, and the obliteration of the posterior cul-de-sac. e, Perineum lacerated down to the sphincter ani. Uterus cut obliquely, in consequence of the lateral displacement of the organ. Arrows show direction of dilating force and movements of structures. V, vagina. R, rectum. B, bladder.

a hard vulvo-vaginal instrument, an intra-vaginal sponge dilator, about fifty-five millimetres in diameter, was introduced.

Nov. 20th. The patient has worn the soft instrument without discomfort, and has been able to walk about with it in place. Incisions have been made at intervals, whenever a band became prominent. Passive motion of the uterus has been employed to increase its mobility. The advance in expanding the upper part of the vagina has been more rapid since the use of the sponge dilator was begun. The posterior lip is now fully exposed to view, and it is evident that it, like the anterior, was in great part destroyed by the slough, the os uteri lying almost on a level with the attachment of the vagina; the uterus is movable, and allows the borders of the fistula

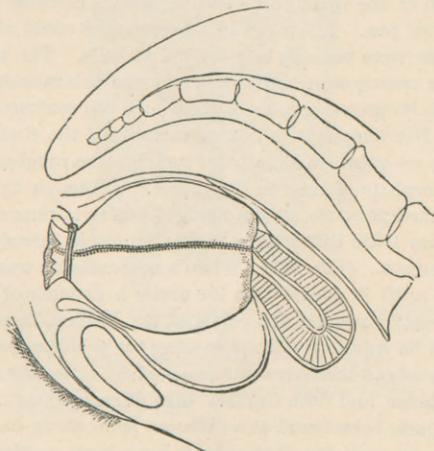
to come together partially on the right side, but not without great tension. The fundus is drawn to the right and the cervix to the left. No difficulty has been experienced in keeping the vagina free from urinary deposits, although the urine has been constantly alkaline and contained pus. The size of the sponge dilator has been increased to sixty-five millimetres (Fig. 35).

Nov. 30th. The borders of the fistula can now be imperfectly approximated with much less tension, and the vagina is much distended at its upper as well as its lower part. The general health of the patient has improved, but she is still anemic and weak, and her skin retains its sallow, unhealthy appearance. She menstruated since the last note, for the first time after her confinement.

Dec. 3d. To-day, by the use of the *linen test*, the orifice of the right ureter was found lying in the bladder, just beyond the edge of the free border of the fistulous opening, and about three-quarters of an inch from the cervix, and was displayed by turning it out with a tenaculum; the left was not discovered.

Dec. 12th. The patient has had, during the past week, a number of paroxysms of

FIG. 35.



Progress made in the treatment. Intra-vaginal sponge dilator in place. (Diagrammatic section in supported knee-elbow position.)

severe pain, lasting several hours, accompanied by vomiting, great prostration and weak pulse. The pain was felt in the left lumbar region, and radiated along the course of the ureter.

Dec. 15th. The patient had a chill yesterday, accompanied by the pain in the left lumbar region and a temperature of 105° , which to-day has fallen to 101° .

Dec. 17th. A second search was made for the left ureter, and it was discovered. Pus was seen to exude, drop by drop, from a small point on the everted border of the fistula, almost in immediate contact with the mutilated anterior lip of the cervix. Upon closer inspection, the orifice of the left ureter was found at this point. A delicate probe was then passed into the ureter for two inches, when it met an obstruction. The orifice of the ureter was found to be very much contracted. It lay imbedded in a mass of cicatricial tissue, and was bent at its lower part by being drawn toward the cervix. The use of vaginal dilatation was ordered to be discontinued.

Dec. 22d. The alarming symptoms continue, and the patient's strength is rapidly

becoming exhausted by the temperature and the pain. The discharge from the left ureter is profuse. It consists of urine, containing a large proportion of pus, and has a very offensive odor.

Dec. 24th. Dr. Bozeman passed a filiform bougie into the left ureter for seven inches, when it met an obstruction.

Dec. 25th. A French, No. 7, olive-tipped catheter was introduced into the ureter this morning, without difficulty, for six and a half inches, when it met an obstruction. A warm solution of carbolic acid (1-80) was repeatedly injected through the catheter with a small piston-syringe and allowed to escape. The injection of a larger quantity than half a drachm at one time caused pain in the lumbar region. About one drachm of putrid pus was washed out in this way. Immediately after the irrigation of the ureter the patient's temperature was 101°, pulse 104, and she has since been more comfortable. At 4.30 P. M., the ureter was again washed out by means of the catheter, which had been left in place. Much less pus was removed than in the morning.

Dec. 26th. The douching of the ureter has been repeated at intervals of four hours since yesterday. The secretion of the left kidney which flowed from the catheter was collected for two hours. It amounted to about half an ounce. The sediment which formed at the bottom of the vessel, constituting about one-third of the whole volume, consisted principally of pus. A few red blood corpuscles could also be seen under the microscope, but there were scarcely any epithelial cells. The catheter, after having remained in place for twenty-four hours, was removed this morning. No pain or other symptom referable to its presence has occurred. On the contrary, the patient's condition has improved. Her temperature is now normal for the first time since the 12th, and she is suffering no pain. The catheter had become roughened by the deposit of small particles of phosphate of lime on its surface. Although the ureter seemed very tolerant of its continued presence, it was thought better to remove it after each irrigation in future, as very little difficulty was experienced in introducing it by means of Bozeman's uterine forceps. (Fig. 36.) When a new catheter was introduced to-day, it met no obstruction until it passed into the ureter a distance of eleven inches. It is believed that its extremity reached the pelvis of the kidney, because now two or three drachms of fluid can be injected without causing the peculiar pain already described, and a larger quantity of pus than ever was removed.* From the sensation imparted to the hand by the catheter, and from the fact that at each examination an obstruction of the ureter has hitherto been found at a different point along its course, together with the symptoms, it seems probable that calculi have been passing through the ureter. None have been found in the urine, but this is not important, because they would almost necessarily have been washed away by the vaginal douches, and lost. It is also highly probable that dilatation of the ureter resulting from the continued presence of the catheter, and afterward from its frequent introduction, favored the passage of the concretions.

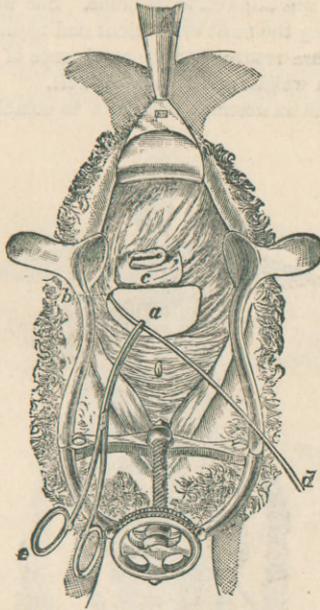
Jan. 5th. The washing out of the pelvis of the kidney has been continued daily since the last note, and a solution of bichloride of mercury (1-20,000) has been substituted for the carbolic acid.

Jan. 22d. A remarkable change has taken place in the patient's condition. Her temperature has remained normal since the 26th of December. She has gained flesh and strength and has had no pain. The discharge from the left ureter has gradually become so slight that the pelvis of the kidney is now washed out only every second day.

* My observations have led me to determine the average length of the ureter to be twelve inches. About one inch of the lower end of the ureter had been destroyed. The catheter, therefore, had reached the pelvis of the kidney.

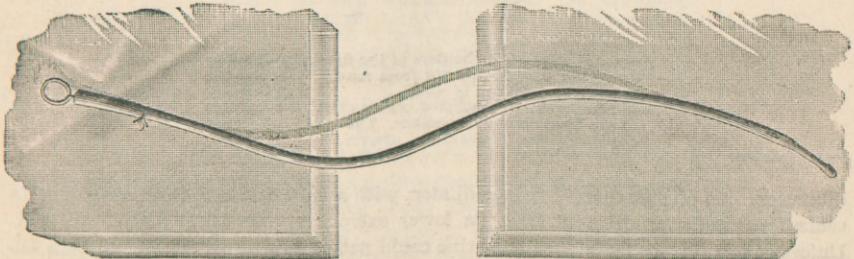
Feb. 2d. The urine now contains only a trace of pus. The irrigation is still kept up, but only at intervals of three or four days. The constricted orifice of the left ureter has been slit up with an angular knife for about a quarter of an inch on its vesical

FIG. 36.



Catheterization of the ureter preparatory to irrigation of the pelvis of the kidney. (Drawn from nature.) (supported knee-elbow position and my dilating speculum, with perineal elevator, in use. $\frac{1}{4}$ size.)
f, fistula; *b*, connected by a dotted line with the orifice of the left ureter; *d*, catheter; *e*, uterine forceps; *c*, mutilated cervix uteri.

FIG. 37.



Catheter, showing spiral or corkscrew course of the ureter.

When introduced, the instrument was straight. When removed, it retained the form given to it by the ureter. A stilet was afterward shaped, as shown in the figure, in order to preserve the peculiar curvature of the catheter.

surface, in order to turn its orifice into the bladder. The use of the sponge dilator is to be renewed, the instrument to be worn for a few hours only every day.

Feb. 20th. Bands have been cut at intervals since the last note, and the dilatation

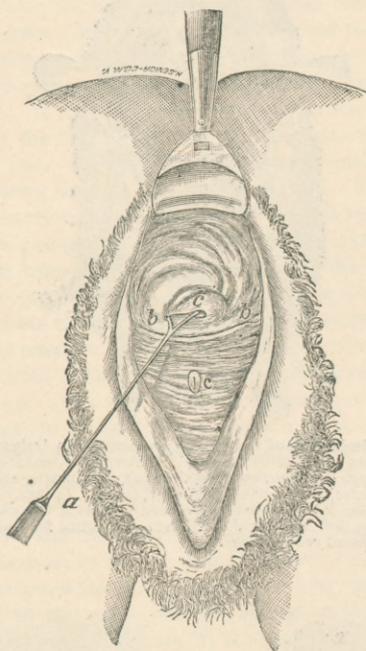
has been continued. The uterus is returning to its normal position and is more movable. The orifice of the ureter has been dilated with steel sounds every second day; it now admits a No. 20 of the French scale. There is no longer any pus in the urine, the renal symptoms having subsided; the irrigation of the ureter and the pelvis of the kidney has been discontinued.

March 2d. The patient was allowed to go home. She was directed to wear a hard vulvo-vaginal dilator, it being the most convenient and manageable in her hands.

April 1st. The patient has returned, after an absence of about three weeks. She has gained twelve pounds in weight and is looking well.

April 27th. On April 8th an attempt was made to combine drainage with sponge

FIG. 38.



Approximation of the borders of the fistula by drawing down the cervix. Drawn from nature. (Supported knee-elbow position, $\frac{1}{4}$ size.)
a double hook. *c*, mutilated cervix uteri. *b b*, borders of the fistula brought together. The letters are placed opposite to the orifices of the ureters.

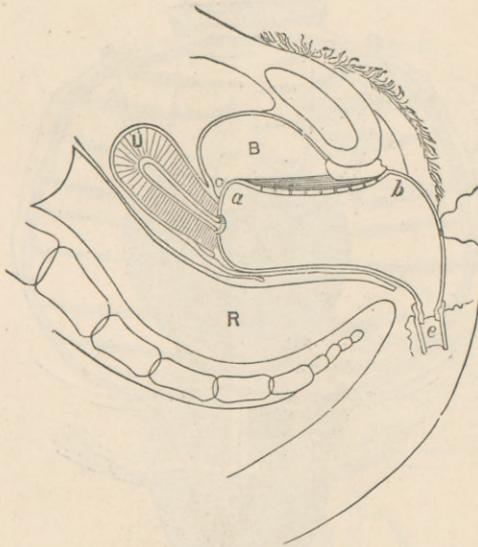
dilatation. An oil-silk-covered sponge dilator, with a hard drainage tube occupying its central part and extending out from its lower extremity, was made and introduced. Unfortunately, it was found that the urine could not be made to flow out through the tube; but although the drainage was a failure, the presence of the tube not only did not interfere with dilatation, but was useful in giving firmness to the bag, making it easier of introduction and increasing its upward pressure. Since the above date the dilatation has been energetically carried on; the sponge instrument now used measures seventy millimetres in diameter. Bands have also been divided at frequent intervals. The vagina is now greatly distended and the uterus has become sufficiently movable to allow complete approximation of the borders of the fistula (Fig. 38). Still, the traction

necessary to do this, being about six pounds, is great enough to endanger the success of the operation for closing the opening.

April 28th. During the past week the patient has had some pain along the course of the left ureter and last night a slight elevation of temperature. Dr. Bozeman believes that the sponge dilator is pressing on the orifice of the ureter (the first time in his experience) and is causing obstruction to the flow of urine. Dilatation with the large sponge instrument is ordered to be discontinued, and the No. 50 hard vulvo-vaginal drainage dilator used instead.

May 11th. A vulvo-vaginal drainage dilator (Figs. 39 and 40), which Dr. Bozeman has devised since the last note, was introduced to-day for the first time.

FIG. 39.



Vulvo-vaginal drainage dilator in place. (Diagrammatic section in the dorsal position.)
a is placed at one extremity of the groove on the upper surface of the instrument, *b* at the other. The perforations at the bottom of the groove are seen in section. A little behind *a* is seen, in the background, the orifice of the left ureter. *e*, tube connecting with urinal. *U*, uterus; the os uteri is shown in apposition with the opening in the extremity of the dilator, through which drains urine from left ureter also. *R*, rectum. *B*, bladder.

May 20th. The drainage is almost perfect; the patient is able to keep dry, and is more comfortable than she has been since the fistulous opening was formed.

The redness and inflammation about the vulva and vagina, which could not be entirely removed by douches and cleanliness, are rapidly disappearing.

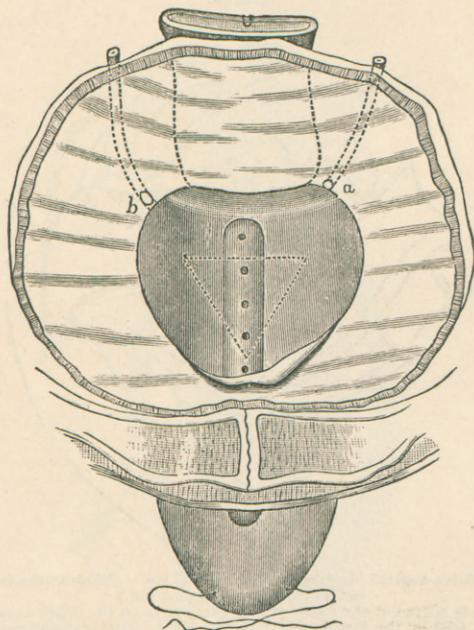
June 15th. A comparison was made between the relative secreting capacities of the two kidneys; a No. 8 French catheter was passed into the pelvis of the left kidney and a No. 10 into the right, and the urine collected separately from each. It was found that in fifteen minutes the left kidney secreted 5 ccm., and the right 15 ccm. The urine from the right kidney was normal, that from the left contained a trace of albumen, and the percentage of urea was small. The capacity of the pelvis of the left kidney when distended was also measured, and found to be 2½ drachms.

June 16th. A flexible steel renal sound (Fig. 41) (which Dr. Bozeman has had constructed for the purpose) was introduced into the pelvis of the kidney to-day without difficulty (Fig. 42). After the use of the sound, the pelvis of the kidney was irrigated, and irregular flakes and masses of muco-pus were removed. Previous to the introduction of the sound no detritus had come away for a long time.

June 22d. There is no longer any discharge from the kidney, and the drainage dilator is working satisfactorily.

July 1st. The patient was discharged to day, because the hospital is to be closed for the summer months. (The record of the case ends here.)

FIG. 40.



View from above, of the interior of the bladder, fistulous opening and drainage dilator. (Diagrammatic.)
b, orifice of right, and *a*, of left ureter. The normal position of the trigone is indicated by the dotted lines and the distance between *a* and *b* and the posterior angles of the triangle show how much of the lower extremities of the ureters was destroyed. The diagram illustrates the principle of drainage. The dilator obturates the fistulous opening. Its upper surface takes the place of the loss of tissue at the base of the bladder, and the margins of the fistula are closely applied to the instrument. *a* also shows the abnormal relation of left ureter to cervix uteri and its restored position in this cavity of the bladder from the vagina.

Aug. 23d. The patient has been under the care of my son since she left the hospital. The dilatation has been continued. The traction force necessary to secure complete coaptation of the borders of the fistula is now 2½ pounds.

The operation for the closure of the fistula will be done as soon as the hospital reopens. This delay is to be the less regretted because it is desirable to be certain that there will be no return of the inflammation of the pelvis of the kidney.

[NOTE, Dec. 13th.—Since the above history went into the hands of the printer, the resistance to the coaptation of the borders of the fistula having been reduced to one and a half pounds; the operation for the closure of the opening was performed on November 13th. It was done in the knee-chest position.

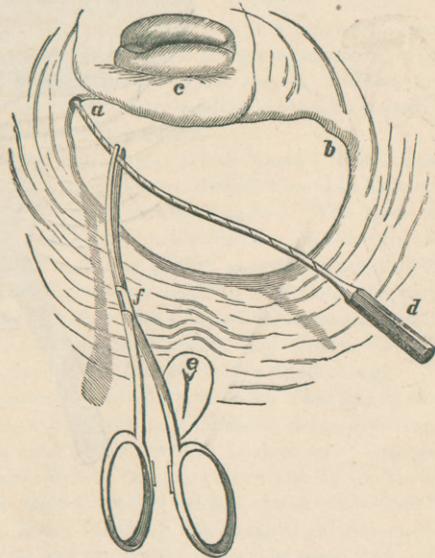
The patient was secured during the administration of ether, and the parts exposed

FIG. 41.



Flexible steel renal Sound.

FIG. 42.

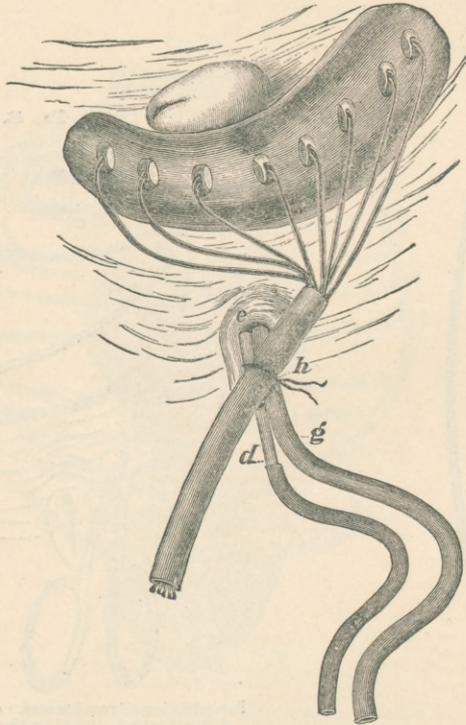


Introduction of renal sound. *a*, orifice of left ureter. *d*, renal sound. *b*, is placed opposite the orifice of right ureter, which is turned into the bladder. *f*, uterine forceps. *c*, mutilated cervix uteri. *e*, urethra. The natural size of the fistulous opening is represented.

in the manner already described in connection with the primary operation for the division of cicatricial bands. The calibre of the urethra, which was impervious, was restored by incising its vesical extremity with a narrow-bladed knife passed along the canal upon a grooved director. The borders of the fistula were then pared and brought

together by eight silver interrupted sutures secured by the button as shown in Fig. 43. Coarse, stiff wire (No. 24) was employed, as has always been my practice, so that the borders could be coaptated along their entire length and retained in perfect apposition by merely shouldering the sutures by means of my suture adjuster (Fig. 4). In this way the exact degree of traction which should be exerted on each suture can be accurately determined and the adjustment of the button is made more easy. The sutures on either side of the right ureter were passed about two-thirds of an inch from

FIG. 43.



The fistula closed by the Button Interrupted Suture.
(Knee-chest position.)

e, meatus urinarius, *d*, ureteral catheter, to the extremity of which is connected a soft-rubber tube, and *g*, soft vesical catheter, draining respectively the left and right kidneys; both are secured in place by a thread uniting them to the elastic tube *h*, enclosing the sutures. The orifice of the left ureter lies in the bladder, beneath the first shot, and that of the right between the 6th and 7th sutures. The various curves imparted to the button, in order to make it conform to the stump of the cervix, and the uneven lines of coaptation, are imperfectly represented by the shading.

each other, in order to avoid all danger of obstructing the duct. Along the remainder of the line of coaptation they were placed about half an inch apart, except immediately to the left of the cervix, where the tension was greatest. Here the sutures were separated along the upper border of the opening only by about $\frac{3}{8}$ of an inch. Occlusion of the ureter was guarded against on this side by passing a small flexible English catheter No. 4 through the urethra, across the bladder and into the duct for about six inches.

The wires were left long, in order that they might be loosened in case there occurred any symptoms of obstruction of either of the ureters. To prevent irritation of the mucous membrane of the vagina, they were bent so as to lie in contact with the button, and passed through a soft-rubber tube, as shown in the accompanying figure. A soft catheter was placed in the bladder. The vesical as well as the ureteral catheter was secured in place by tying it opposite the meatus urinarius to the wires, the ends of which extended out of the vagina.

The greatest difficulty in this operation was encountered on the left side of the fistula. Here, as will be seen by referring to Fig. 42, which shows the form of the opening, the upper and lower borders did not meet gradually, but the loss of tissue extended abruptly from a point opposite to the vesical extremity of the urethra to one on a line with and to the left of the cervix uteri. The difficulty of securing coaptation was further increased by the fact that the lower border of this part of the fistula lay on a lower plane anterior to that of the remainder of the opening. These peculiarities led me to modify my usual method of operating. Instead of dragging the uterus directly downward and attaching it to the urethra, it was drawn down obliquely and the stump of the cervix (see Fig. 43) was utilized to fill the space on the left where the loss of tissue was greatest. The difficulty in adjusting the button, resulting from the unevenness of the line of coaptation, was overcome by bending it upon its concavity, so as to make it conform accurately with the surface beneath.

The ureteral catheter was removed at the end of twenty-four hours. It had caused no inconvenience. The vesical catheter was kept in place during the week following the operation, and for several days after the sutures were removed. The urine was retained until the fifth day, when it began to escape into the vagina. Seven days after the operation the sutures were removed. Union was perfect except at a point a little to the left of the cervix, where an opening sufficiently large to admit the end of the little finger was left. The position of the opening corresponded to the second suture, (counting from the left), which was passed, as has been stated, very close to the third. The cause of failure at this point was due to the formation of a small slough. The closeness of the sutures in this situation probably interfered with the blood supply along the upper border of the fistula, which was composed of cicatricial tissue deficient in vitality. Tension may also have contributed to this result. Coaptation at this point was opposed, not only by the retrogressive force of the uterus, but also by the traction of the sutures on the opposite side of the vagina, tending to draw the cervix toward the median line. During the twenty-four hours following the removal of the sutures, slight separation of the borders took place and the opening enlarged somewhat. The cicatrix is now, four weeks after the operation, firm and the fistula barely admits the tip of the index finger. It is situated a little to the left of the cervix and internal to the ureter, the orifice of which is partly hidden from view by the line of union. The borders of the opening can be brought together, and its closure by a second operation will be easily effected.]*

Encouraged by my cure of the pyelitis in this case, I conceived the idea of extending the method of treatment to cases of pyelitis when no fistulous opening existed. Fortunately, I soon had an opportunity. Mrs. B. came under my care. She gave a history of symptoms similar to those already described. Hæmaturia formed a marked feature of the case, and had continued for two and a half years. The pelvis of the right kidney was suspected, from the location of the pain, to be the seat of the disease. In order to expose the right ureter, May 6th, 1887, I made an opening in the bladder at the point where it pierces the vesical mucous membrane. †

The name which I suggest for this new operation is kolpo-uretero-cystotomy; it is

* July 1, 1888.—Remaining fistula completely closed, by the method described on April 20th, and the patient discharged, cured.

† See Fig. 33 and note on page 543.

appropriate because it corresponds with the established nomenclature, and serves to distinguish the operation from kolpo-cystotomy, done for cystitis, and kolpo-uretrotomy, which may be done in future.

When the orifice of the ureter was thus exposed, blood was seen exuding from it. The ureter having been made accessible, the subsequent treatment was the same as in the previous case, and the result equally fortunate. The discharge disappeared in a few weeks. The use of my utero-vesical drainage support prevented all inconvenience from incontinence of urine, and made the patient so comfortable that haste in closing the opening was considered unnecessary. She was, therefore, sent home to Charleston, and instructed to return for this purpose when she was stronger and fully restored to health.

She wrote me, on August 12th, the following report of her condition: "The drainage works perfectly. There is no escape of urine, except sometimes a little while lying down. I do not suffer from any irritation whatever. The instrument keeps the uterus in position. I have not suffered any pain in the kidneys. I feel better than I have for years. I have just been weighed; so will acquaint you with the numbers—one hundred and nine pounds, having gained nineteen pounds in three months (that is, since the operation). I am able to attend church services. I can either ride or walk. Neither gives me any uneasiness. My friends look at me, and speak of my improvement with astonishment."*

SECTION IV.—CONCLUSIONS.

All the complications of gravity of urinary and fecal fistulæ having now been studied, what I have already said may be, in conclusion, enforced, by a brief summary of certain important facts and principles, and an enumeration of the results that I believe may be secured by the employment of the methods of treatment which I have described.

1. The importance of the complications has not been duly appreciated. They form, in many cases, the principal difficulty in the way of the successful performance of the operation for the closure of the fistulous opening. In other cases, when the fistula is cured, but the complications left without treatment, they lead, sooner or later, to suffering or to the death of the patient. The greatest care should, therefore, be taken to discover and to remove them.

2. Kolpokleisis, occlusion of the os uteri and incarceration of the cervix in the bladder or rectum are unjustifiable operations. They destroy the functions of the genital organs and lead to cystitis, the formation of renal and vesical calculi, pyelitis and other grave diseases. Moreover, they are unnecessary operations. By means of the gradual preparatory treatment of the complications, and by the aid of my button suture and dilating speculum, I have been able to overcome all the difficulties which have been described as indications for their performance.

3. The association of drainage with dilatation of the vagina is a great improvement. The inconvenience and evil effects of incontinence of urine are thereby lessened, and the duration of the treatment is shortened, by the more rapid healing of the incisions and the formation of less cicatricial material in the reparative process.

4. We now possess a means of palliating the suffering due to incontinence of urine in the small percentage of cases of fistula which are incurable by any method, even the dangerous one of kolpokleisis. I believe some form of drainage instrument may be adapted to every case, and these patients may be thus restored to the enjoyment of life and the performance of its duties.

5. The possession of a means of draining the bladder will widen the scope of the

* Fistula closed Dec. 4th, and patient discharged, perfectly cured. *Am. Journ. Med. Sciences* for March, 1888.

operation of kolpo-cystotomy, done for cystitis, by removing the evils of incontinence of urine, now the chief objection to its performance.

6. Finally, I believe the operation which I have called kolpo-uretero-cystotomy, followed by the exploration and treatment of the diseases of the ureter and pelvis of the kidney, has a brilliant future of usefulness before it. In the treatment of pyelitis, renal calculi, and other obstructions of the ureters, it will restrict within narrow limits the operations of nephrotomy and nephrectomy.

