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IN THE

Surgery of the Bladder.

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Surgeon to Out-Patients at the Massachusetts General Hospital.*

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A NEW PRINCIPLE IN THE SURGERY OF THE BLADDER.¹

BY OTIS K. NEWELL, M.D.,

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IN the study of any subject we are very apt to find that it has been more or less thoroughly investigated and understood in previous times, and we are led to conclude when we come upon such long since learned and forgotten facts that there is at least no wholly "new thing under the sun." In the *Boston Medical and Surgical Journal* of November 10, 1887, is an extract by Dr. G. L. Goodale, from an article entitled "Observations on Hydrophobia," written in 1812 by James Thacher, M.D., of Plymouth, Mass., in which the experiments were outlined and apologized for as chimerical and visionary which Pasteur seventy years later carried into practical execution. The recent erection of a statue in this city reminds us that Columbus discovered the land of Americus Vespucius, only to have it shown a few centuries later that one if not several enterprising individuals had already preceded him in that commendable undertaking. Many similar instances are familiar to us, both in medical and other history, and I therefore imagine that we should not be discouraged in our efforts to improve or originate in connection with any particular subject, because it may have already undergone more or less consideration.

The fact upon which whatever there may be of value in the present paper is based, I have found to

¹ Read before the Boston Society of Medical Sciences, January 17, 1888.

be known of in one instance, where Professor Grünfeld, in his work on endoscopy, refers to the introduction into the bladder of an instrument fifteen centimetres in length. There may be other instances of a knowledge of this fact, but the practical applications which extended consideration of its possibilities has suggested to me have not, so far as I am aware, been made until now.

I refer to the fact, already laid stress upon in an article of mine published in the *Boston Medical and Surgical Journal* of November 11, 1886, that the applied anatomy of the male urethra is such that in no case is it necessary to have an instrument of more than six inches in length in order to introduce it into the male bladder and leave from one to two and a-half inches protruding through the vesical orifice. This being the fact, we see that in the average case a still shorter instrument can be introduced, and we may decide upon four and six inches as the necessary extremes of this measurement. Practically, however, an instrument of five or six inches length is the best for ready manipulation. Of course there are exceptions to this rule, but in a quite extended experience in the matter I have yet failed to find such a case. It is of interest to know that a hip may be so ankylosed, or a prostate so enormously and peculiarly enlarged, that no instrument at all, or only a specially constructed one, can be introduced into the bladder. But the knowledge of such cases is more of value to us because we may once or twice in a lifetime encounter them, than matter of everyday importance.

If we consider the anatomy of the bladder in the male and female subject we will remember that practically it differs but little in that portion posterior to the pubic arch. This, as ordinarily shown, may be seen in Figure I, a median sagittal frozen section,

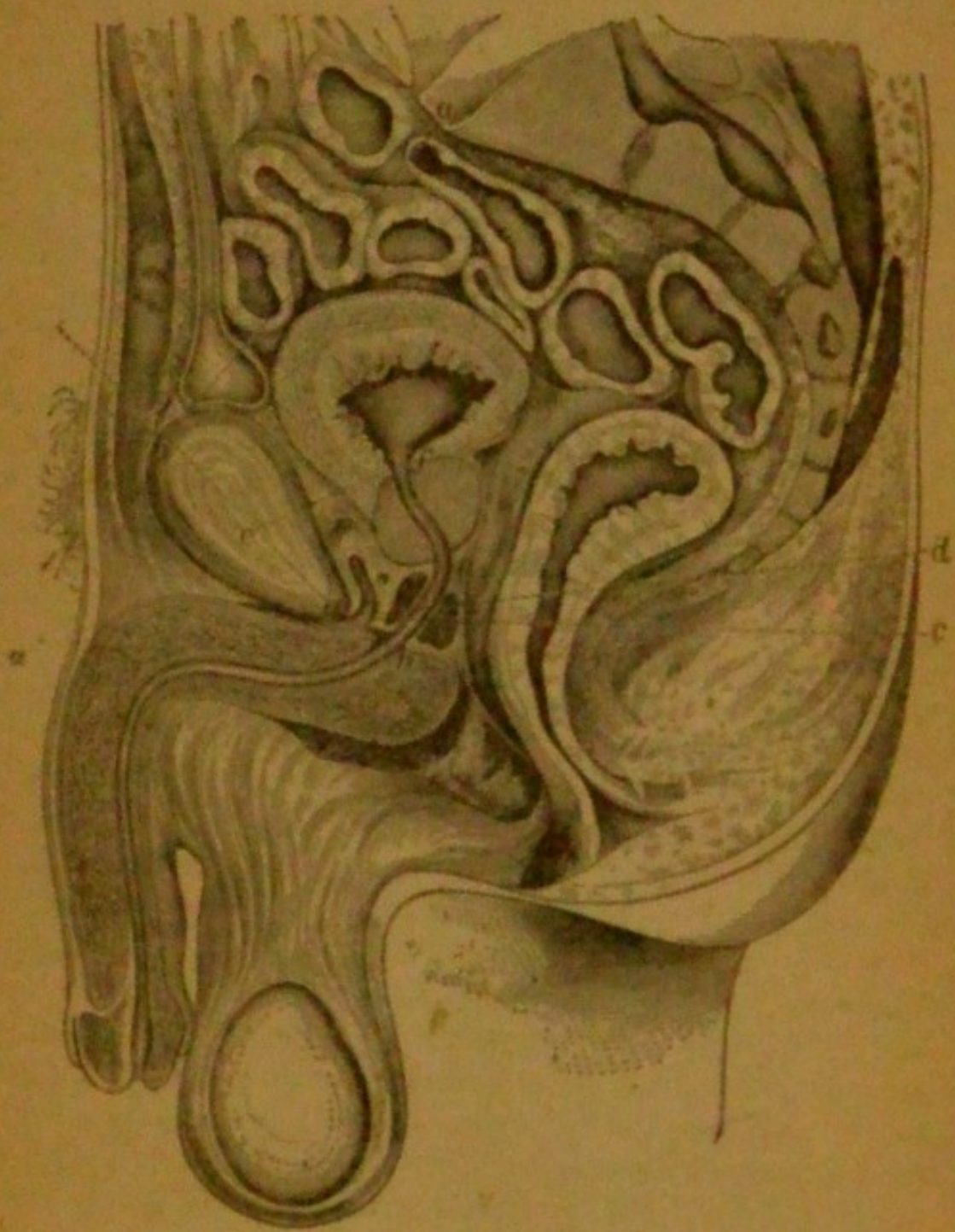


Figure 1.

taken from Dittel's volume in the *Deutsche Chirurgie* on "Stricturen der Harnröhre." The great difference, then, is found in the anterior or pendulous portion of the urethra in the male. This part of the

canal, however, is so readily folded upon itself that its measurements may be easily very much reduced. This, I think, may be very clearly seen in Figures II and III taken from a frozen section of the male, which I made after introducing a split sound marked off into centimetres. The perfectly straight course of the canal when held upon an instrument is plainly seen, and the short 10 c.m. distance between the orifices equally apparent. To demonstrate the short measurement it is only necessary to introduce any unyielding instrument, straight or curved, into the bladder, so as to have one or two inches of its length protruding into the vesical cavity. If the urethra be now pushed together upon the instrument so as to appose its walls as much as possible in the longitudinal direction, without the use of undue force, and the instrument grasped at the point where the external meatus lies; when this is done and then withdrawn, the length beyond the point grasped by the fingers will indicate that of the instrument necessary to readily enter the bladder. Whoever will take the trouble to do this will not be long in becoming convinced of the truth of the stated facts, and, indeed, will begin to realize that by this procedure the parts may be made to correspond closely to those in the female, for in the majority of cases the length of instrument required to merely reach from orifice to orifice will seldom be more than from three and one-half to four inches. In Fig. III, where the parts were not pushed forcibly together, the distance as shown is about eleven centimetres, or say four and one-quarter inches.

Granting, for the present, that such is the case, it will be well, perhaps, to describe in what manner the instrument should be introduced, for it is quite apparent that, being less in length than the undisturbed normal adult male urethra, it cannot possess the distinguish-



Figure II.

ing advantage which its substitutes, particularly the steel sound, are sometimes said to have, of "going in just by their own weight." On the contrary, it is necessary to guide the present instrument by intelligent manipulation, but of no greater degree than the surgeon capable of introducing unyielding instruments into the bladder is always sure to possess. If the instrument be straight, and I believe, as will be stated more fully further on, that all instruments for introduction into the bladder should ordinarily be straight, it should

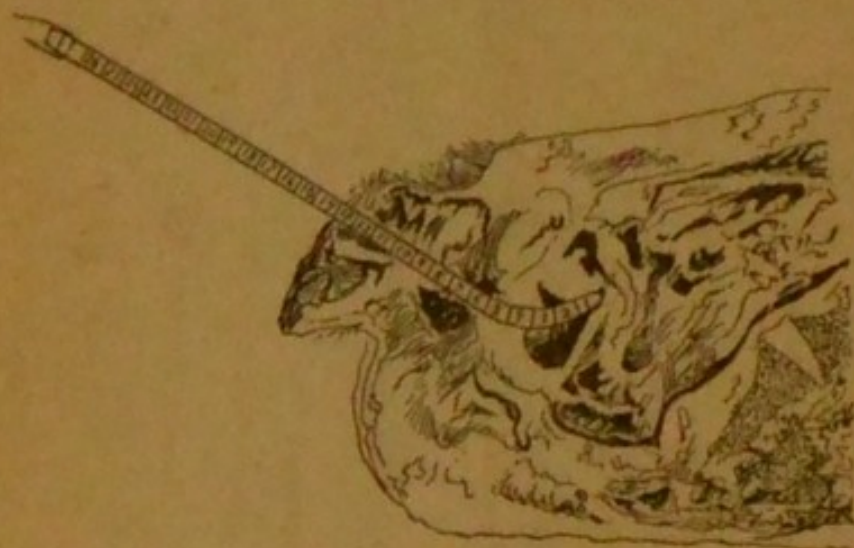


Figure III.

be passed down until it reaches the opening in the triangular ligament. If the instrument is not up to the urethra in calibre, the parts will, by their own weight, naturally fall together upon it, and it will be more than long enough when of the standard length, six inches, to reach this point without being covered. When this is done, the instrument should be depressed so as to correspond in direction with the urethral axis of the prostate as much as possible, and then passed, preferably with a rotary motion, into the bladder cavity. After it has been thus introduced the prostate is fixed upon some portion of its length, and the

instrument can, therefore, as a rule, be easily elevated to an angle of about 45° with the table. In thus introducing it it is best to make the whole movement in one continuous rotation and anterior progression of the instrument in the medium saggital plane of the body, for then, when its point reaches the opening in the triangular ligament it will, since it is being always gently pressed forward and upward, pass through and not beyond that structure, to form a pocket, which it does do when first passed directly down as far as possible, a method often suggested.

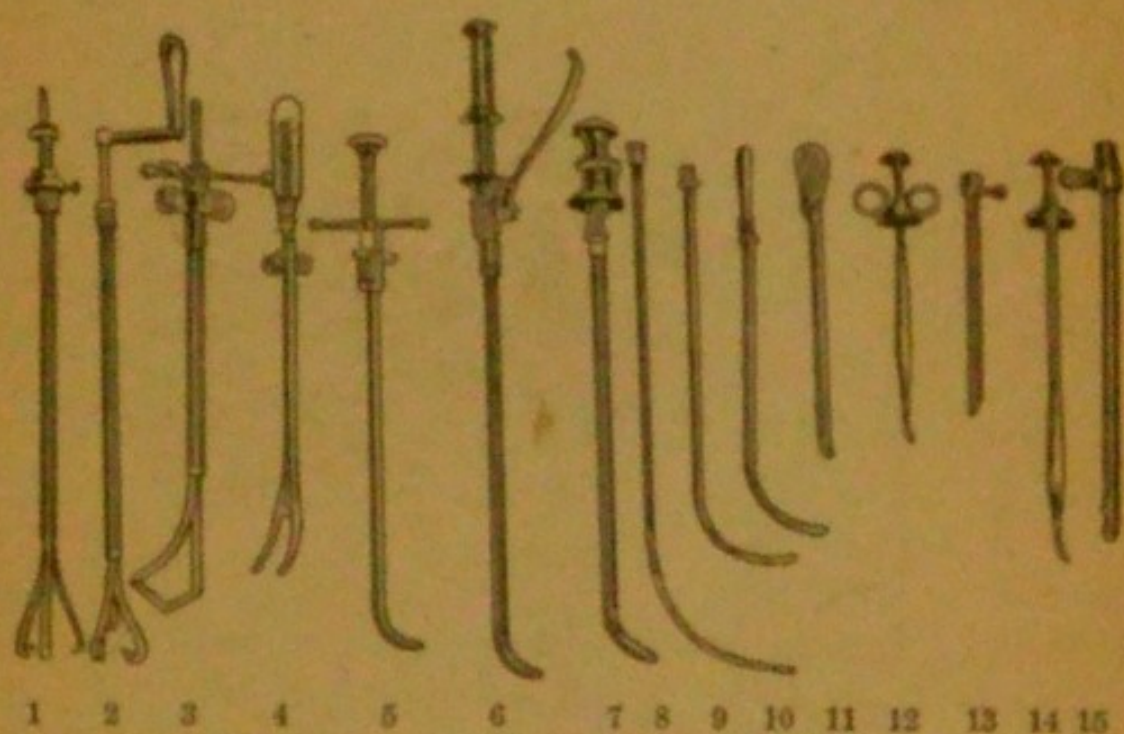


Figure IV.

If we pass before us in a somewhat historical review the ordinary bladder instruments, as we can do by referring to Figure IV, we shall find that there is but little departure from the traditional length, and that wherever this has occurred it has rarely been but to add something to it. On the left of the figure we see various forms of lithotrites, in all of which the part for insertion is of about the same length. On the

right are a number of the more modern instruments compared with those of the short measurement. Over IX and X a catheter and sound of the usual length. At XIV and XV Dr. Bigelow's divulsor and one of his evacuating tubes. Over VIII a catheter, the enormous length (eighteen inches) and curve of which were supposed to better enable it to overcome the difficulty of passing an enlarged prostate.

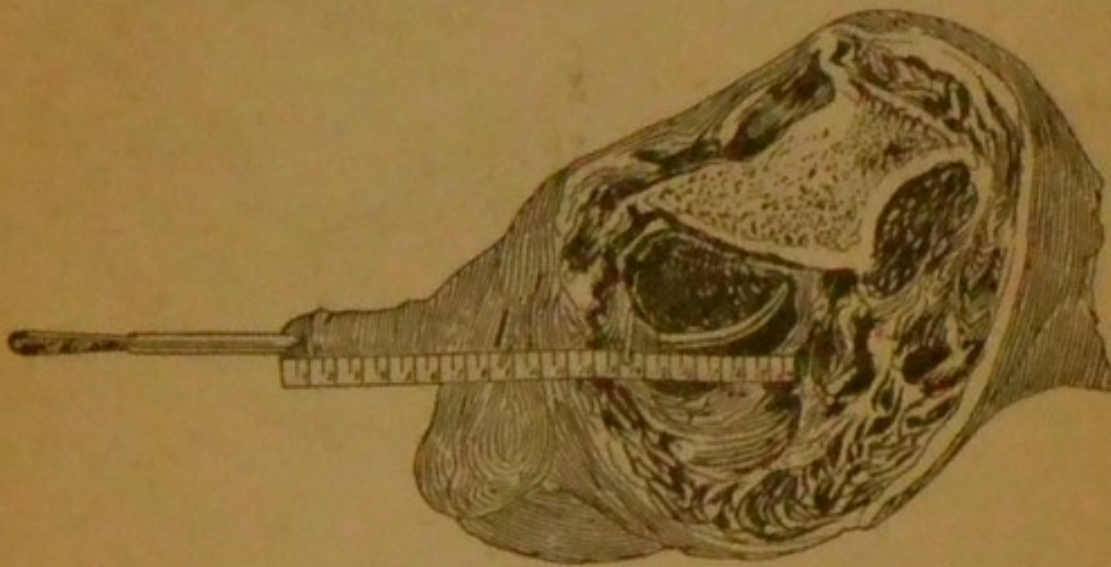


Figure V.

In Figure V we see a steel sound, such as one made by Ultzman, introduced into the bladder. The preparation is from a full-sized adult negro, and the vesico-urethral measurements are much above the average. That is, the urethra, pendulous portion, is longer than usual, and the bladder easily distended to one litre capacity. The measurements are not altered through preparation, and the specimen is preserved for inspection. Now, it will be observed that the sound, in addition to that portion of it engaged in the urethra, measuring, as shown in the figure, 15 c.m., from meatus to vesical orifice, has still left a considerable portion protruding from either end, the outer measuring 9 c.m., the inner 7 c.m. What of these parts of

the instrument are necessary? At the outer end sufficient length for convenient manipulation; at the inner, enough of the instrument to enable it to perform its specific function. For the sound, length sufficient to protrude through the prostate without stretching the

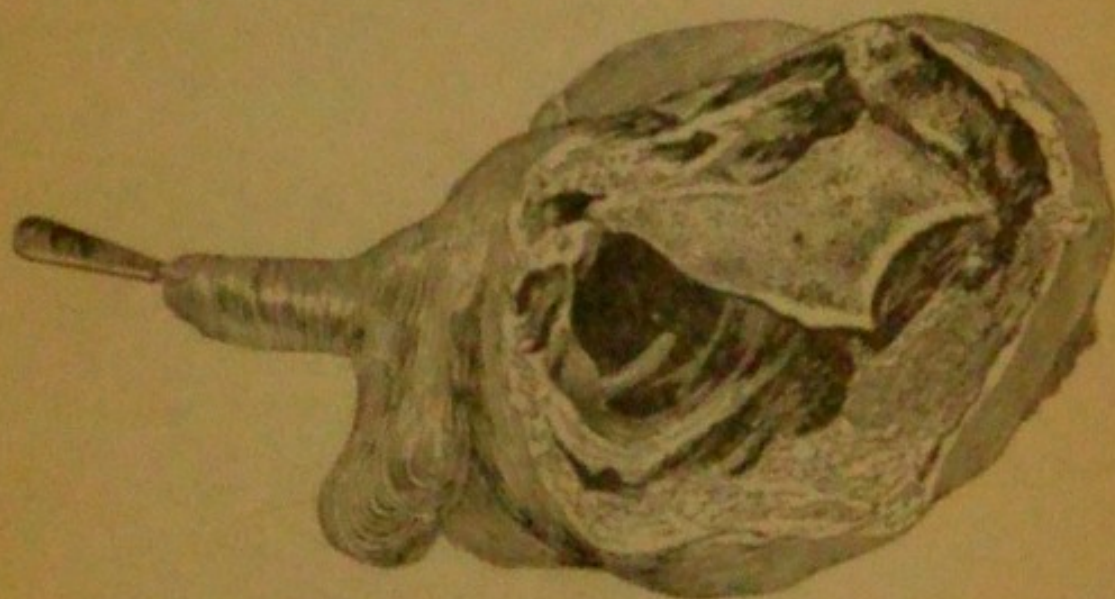


Figure VI.

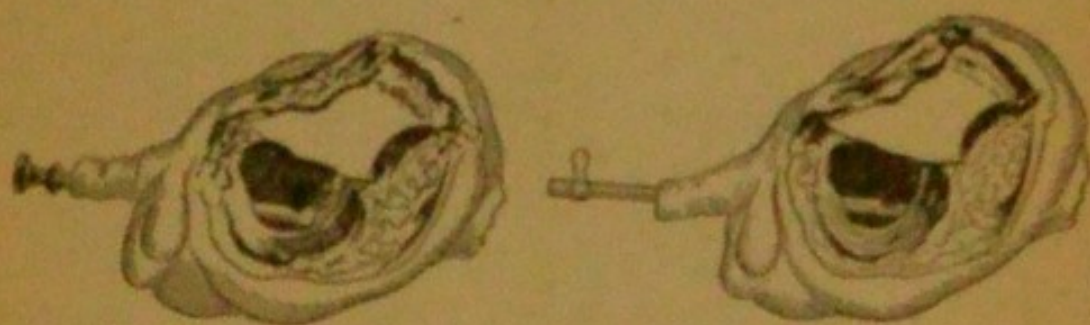


Figure VII.

bladder, as shown in Figure VI, where a six-inch sound is introduced; for the evacuating tube enough to enable its vesical end to depress the floor of the bladder so as to make it the lowest point in the cavity. An idea of what this length should be may be obtained from Figure VII; for the lithotrite the length that best

fits it for manipulation of stone and strength of construction. It would seem that the shaft of lithotrites might advantageously be shortened about two inches. For a catheter, the length enabling it to best drain the bladder without making any unnecessary convolutions through which the urine is to be drawn, and which make it harder to clean. A soft rubber catheter does not need to be much longer than an inflexible instrument as far as the mere act of catheterization is concerned. When any drainage apparatus is used it is better to add it to the soft catheter than to have the latter unnecessarily long. Figure VI indicates about the proper length for metallic catheters. Eight inches seems to me to be the proper length for soft rubber catheters. They are now made thirteen to fourteen inches long. This unnecessary length is well shown in Figure VIII, taken from the fourth and fifth numbers of "Wiener Klinik," 1887, by Dr. J. Englisch, in which ninety-four pages are devoted to the consideration of catheterization. Figure IX shows a modification of Dr. Bigelow's divulsor introduced into the bladder. This instrument measuring seven inches along the part for insertion, is sufficiently long for ready introduction, and when used is held firmly in position by the ulnar side of the hand resting over the pubes, and thus prevented from being forced into or through the bladder wall by the sudden giving way of a very resistive stricture. This, when the divulsor is used, is a very important point. The unnecessary length of a divulsor is shown by comparison in the figure. Endoscopes should, of course, offer the shortest possible visual distance, and that for an instrument to be applicable to the average case would be six inches.

If we look at the sound in Figure V, we notice that its curved end is wholly within the bladder, and that

the urethral canal is practically engaged upon a straight instrument. The curved end, therefore, serves to admit of the more easy and less painful introduction, but is otherwise unnecessary. I previ-

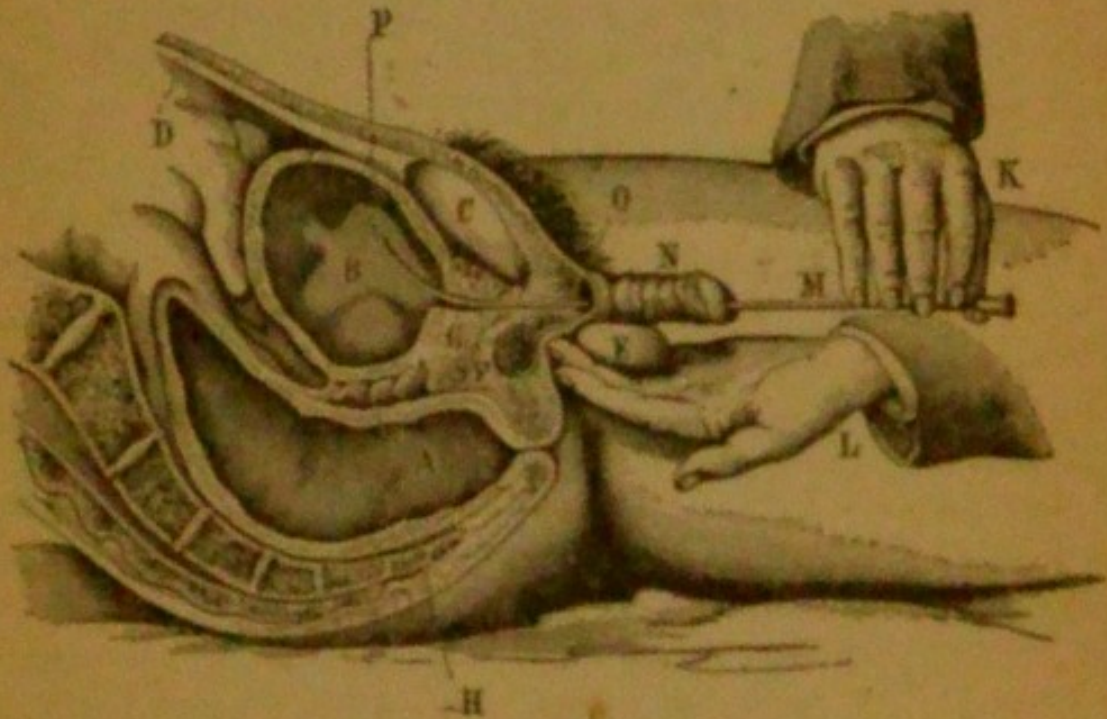


Figure VIII.



Figure IX.

ously stated that I believed the straight instrument to be the best for most purposes, and I refer to its surgical employment, whether as an evacuator, endoscope, porte-remède, or applicator. The usefulness of a steel sound is not interfered with by having its less painful introduction favored by a curved end, especially when

it is to be used by the patient. But by removing the unnecessary three or four inches of length from urethral sounds as they are now made, we have an instrument which we know, when introduced, to be occupying a definite position in the urethral canal throughout its length, and not to be protruding indefinitely into the bladder cavity, with which it should have nothing to do. Ordinary catheterization, and especially when done by the patient, is best performed with a flexible instrument. The straight instrument is best because it is the shortest. It can best be kept aseptic, since, when properly constructed, for whatever purpose; if a tubular instrument, it can be looked through from end to end, and thoroughly cleansed by scrubbing and solutions. The chief objection to straight instruments is that they are more difficult of introduction. But I think that none of us fail to acquire the necessary skill, and it would, perhaps, be well for mankind in general if there were fewer bladder instruments supposed to be somewhat self-introducing. As regards the difference in pain caused by the introduction of straight and curved instruments, I think that whoever is accustomed to passing straight ones has not found it great enough to interfere with the advantages of their use.

I shall not detain you with further evidence in attempting to sustain the facts as stated. In my paper of November, 1886, I mentioned fifteen cases of careful measurement, in all of which six inches had been more than the maximum necessary length of instrument. Since that time I have made many more measurements, both on the dead and living anatomy, and have become so thoroughly convinced of the truth of the matter that to add further statistics would seem to me like doing so for the mere sake of numbers. I will, therefore, in conclusion, consider what changes are

suggested by the above facts in the construction of evacuators.

EVACUATORS.

In considering the construction of evacuators I have, for comparison, confined myself to that of Dr. Bigelow, with which, during two services as his House-Officer, I have had most opportunity to become familiar, and which is undoubtedly the best of the various forms hitherto made. In his article in the *American Journal of the Medical Sciences* for June, 1878, in which he established the great principle of the toleration of the bladder to instrumentation, Dr. Bigelow said, in the introductory remarks: "It is not impossible that convictions in some degree traditional may prevail in regard to certain points connected with the practice of the more recent art of lithotrity." May I possibly again suggest that another, though less important, tradition has been strangely adhered to in the construction of this and all other bladder instruments?

For the most effective action of an evacuator it is apparent that the distance which a fragment must be carried in order to be caught within the bulb should be as short as possible, and we should, therefore, take advantage of the fact under consideration in determining what this length may be. Now, if we compare length of the evacuating canal as shown in Figure X and Figure XI we will readily see the striking difference which the two represent, and realize the effect which must be produced by it in the rapidity of evacuation. We can readily see from the figures that a certain reduction in the length of the tube is possible. Now, another important fact is that the so-called "trap" is unnecessary, for the bulb, if properly constructed, is itself a trap. This is brought about by

making the receiver below of good size, as shown in Figure XI, so that when the fragments have fallen into it, and this they are sure to do, they are eliminated from the current, and when once through the internal orifice never returned to the bladder. This I have

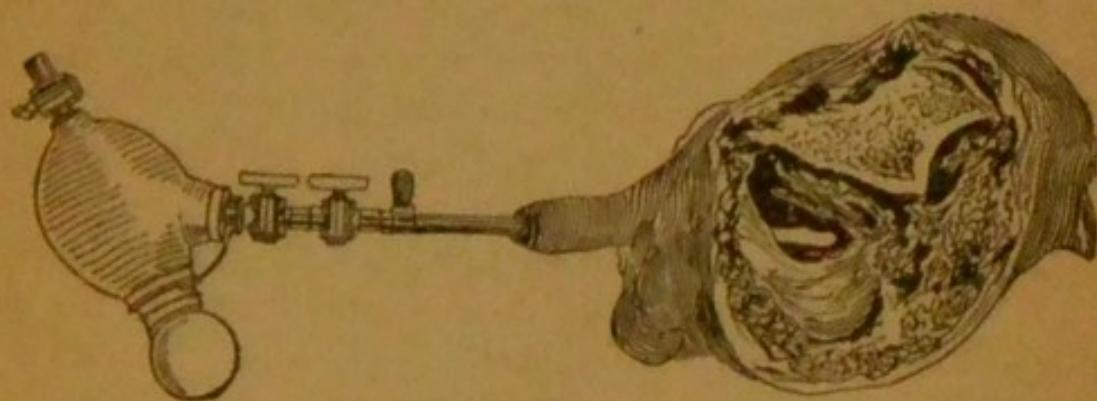


Figure X.

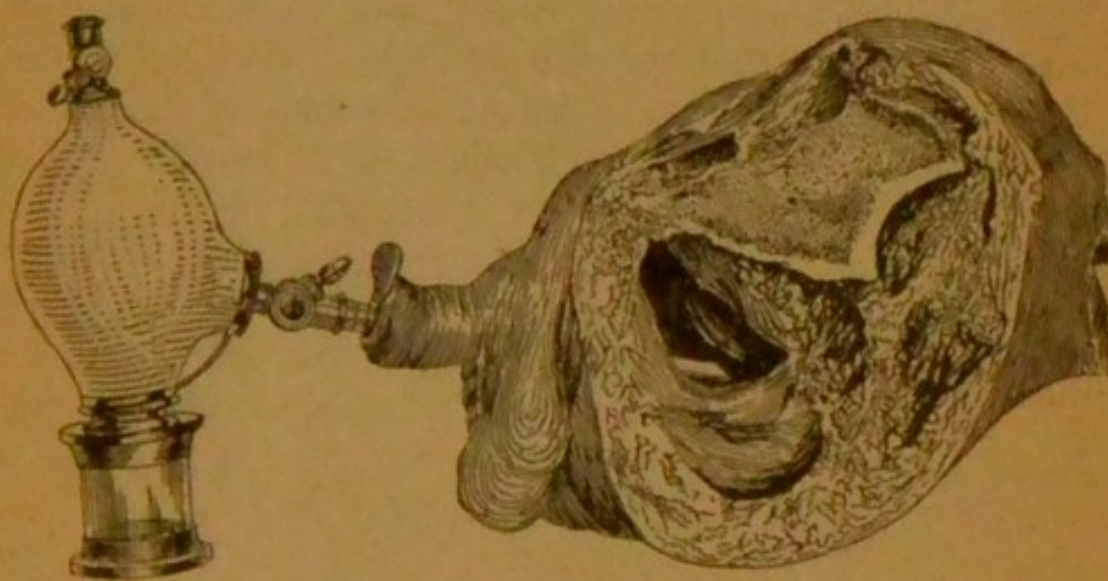


Figure XI.

repeatedly proved by Dr. Bigelow's test and in other ways, and am convinced that no sort of management can make the bulb belie the fact. After full expansion of the bulb it is simply necessary to allow a second or two for the fragments to settle, and this they do rapidly, for they do not float, and then no

matter how forcibly the bulb is compressed, they will remain quietly in the receiver, and *only those fragments will be driven back which have failed to be lifted through the whole length of the tube.* This may be prettily demonstrated by using a glass tube with the Ultzmann evacuator.

How much now can we reduce the length of the evacuating canal? First by elimination of the trap $1\frac{1}{2}$ inches; second, by eliminating an unnecessary stop-cock, as done at times by Dr. Bigelow, and shortening the other $2\frac{1}{2}$ inches. By limiting the evacuating tube to an extreme length of six inches, four inches, making a total reduction of $7\frac{1}{2}$ inches, and thus making it necessary to lift each fragment $7\frac{1}{2}$ inches instead of 15. The present bulb is made of pure gum rubber so as not to be unnecessarily strong or heavy. A nicely finished gum bulb such as are made by the Germans cannot be produced in this country; at least so say the manufacturers. The fittings are made of hard rubber so as to be non-corrodable, disinfectable, and at the same time light. This evacuator, weighing 320 gm., while that of Dr. Bigelow weighs 725, an all-important point when they are filled with water in permitting the best manipulation and tactile sense. With the modified tube orifice as used by me, and the decreased length of canal, the gain in rapidity of evacuation is very much greater than in previous forms; in fact, beyond comparison in one sense, since tubes of this construction remove fragments which the corresponding numbers of the Bigelow pattern will not admit. If this be true, then we have not only increased rapidity of evacuation, but *diminished number of crushings.*

The operation thus consumes much less time, and its value and safety are increased. It is, perhaps, of no little importance to determine just what the value

of this operation is to-day, particularly when we read of long series of cases from countries where litholapaxy has never been done, and the efforts of Bigelow and others are either disregarded or set at naught. Supra-pubic cystotomy with its high mortality, and the other operations of magnitude for the removal of stone are finding their advocates who must have further favorable evidence or condemn the Bigelow method, safer and simpler when properly taught and understood, to become obsolete. I myself have seen a distinguished authority, whose name is known to two continents, removing a stone from the bladder before an audience of various nationalities by a method taught as that of Bigelow. A Clover evacuating bulb with a small tube was used, and the crushings were performed at several sittings without anaesthesia.

Experience has taught me that it will be said of my tubes as shown in Figure XII, where the comparative length of the two evacuating canals is also well shown, that they are more apt to aspirate the bladder wall than the other forms. This may possibly be so, but experimentally I have never been able to determine just what the degree of difference is. Granting, however, that there is a difference, we must remember that it is of no practical importance, for when any tube is aspirating the bladder wall its orifice is either too close to that structure or else the viscus is not sufficiently distended for effective evacuation. With the Bigelow pipe attachment there is no excuse for allowing more than a few seconds to pass before correcting the latter condition. Dr. Bigelow has written that "an evacuator that works best with pieces of coal in a glass vessel of water will succeed best with the fragments in the bladder." "So also will the surgeon if he is otherwise well qualified." Ex-

perimentally there has been no trouble in evacuating coal fragments from not only a glass vessel, but from the most delicate bladder, such as one made of a chicken or turkey crop, and admirably suited to this purpose, without obstruction to the tube or injury to the bladder. This style of orifice is of great advantage in the smaller sizes of tubes, such as are used for litholapaxy in children. It is natural to expect that a

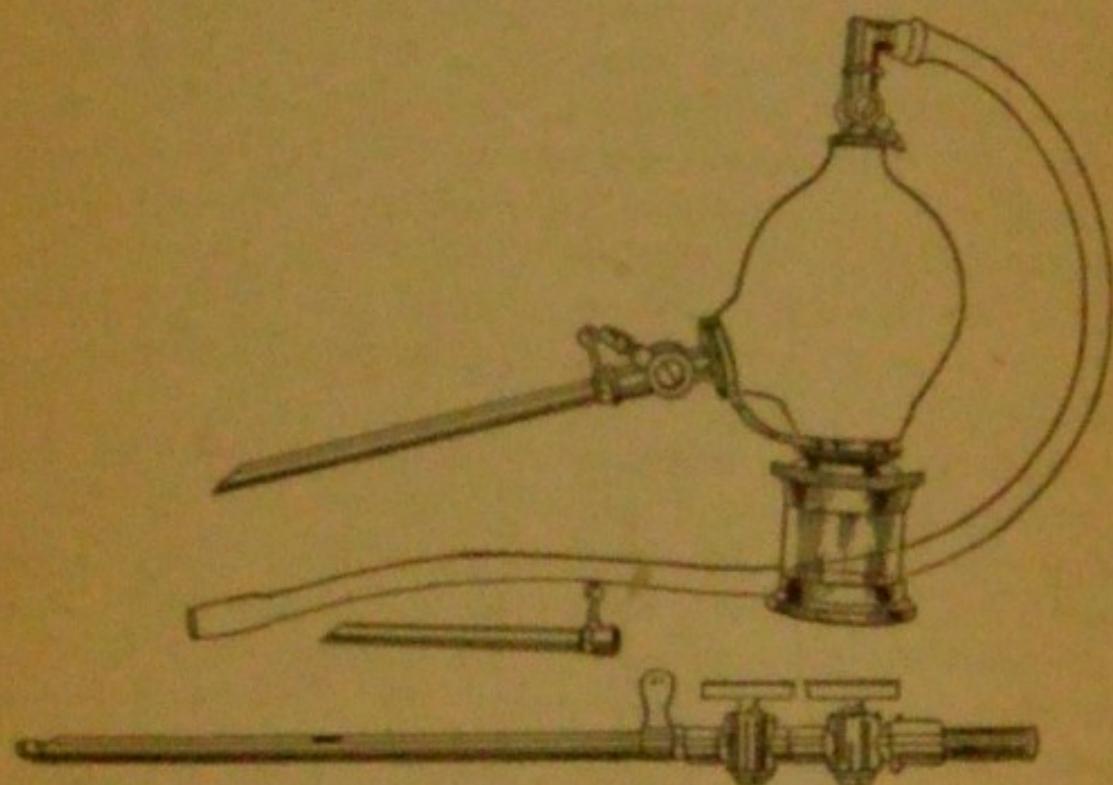


Figure XII.

certain amount of familiarity with this instrument, or with any other, is necessary before one can use it readily. Who expects to take up any complicated instrument, or piece of apparatus, and feel at home with it at once? But who will deny that there are many that work beautifully and successfully, however much or little he may favor their use?

In aspirating fragments it seems to me that it is useless to imagine that we can, by moving the tube

orifice from place to place, sooner remove a fragment or fragments which may have lodged behind or within some prominence or depression about which we can know nothing, excepting, as is nowadays possible, we take the pains to examine the bladder beforehand with the cystoscope. Under ordinary circumstances, however, it is best to place the tube so that its vesical

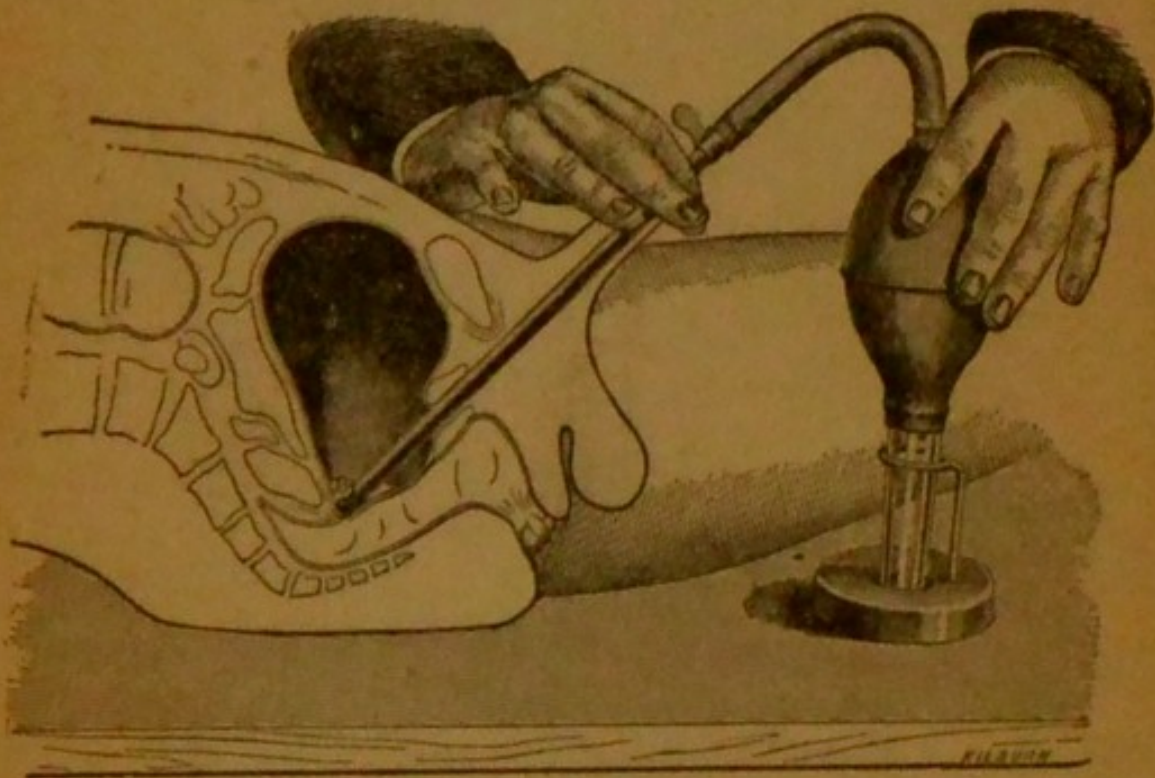


Figure XIII.

end is depressing the bladder floor so as to make the portion with which it is in contact the lowest point. If we look at Figure XIII, taken from Dr. Bigelow's book, we will see how the tube should be held. At first the orifice is somewhat choked by an excess of fragments, but they are soon carried away, as each compression of the bulb sends them flying about in the bladder cavity, out of which they are rapidly drawn by the strong suction of the expanding bulb.

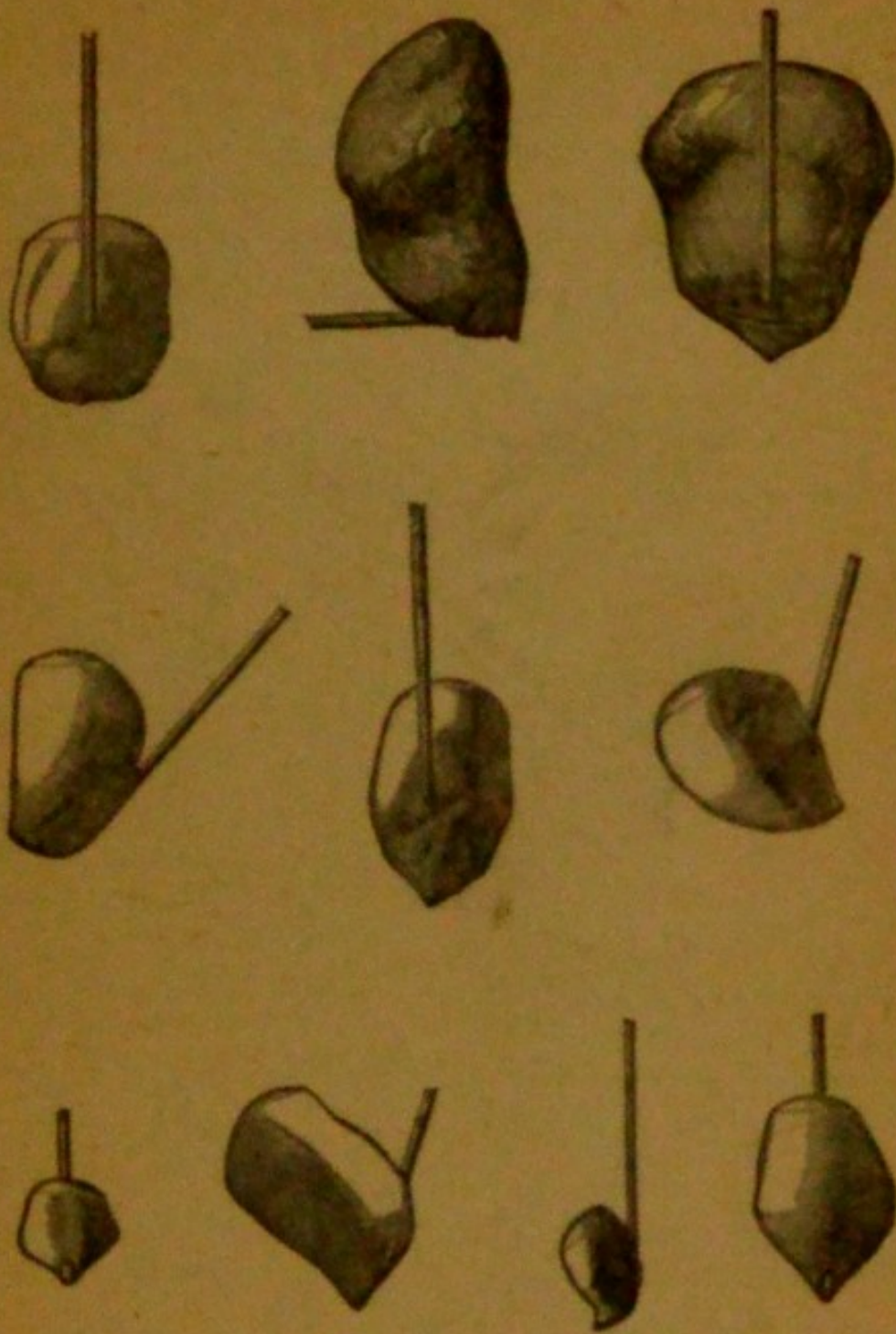


Figure XIV.

In a few moments the familiar click will be heard that indicates, if nothing is falling into the receiver, that all fragments small enough have been carried through the tube. It is now, of course, of advantage

to turn the orifice of the tube to one side or the other, so that with compression of the bulb any fragment or fragments that may have lodged behind the tube will be washed away. In Figure XIV, also taken from Dr. Bigelow's book, we see casts of ten different bladders, in all of which there is no evidence of any prostate formation that would tend to interfere with the typical working of an evacuator. When peculiar malformations of the prostate or bladder, such as are occasionally met with do not admit of proceeding in the regular way, it would seem to me that the patient is exposed to less risk by some form of lithotomy. It also seems to me to be very important to have all of these operations *preceded by several days of antiseptic irrigation of the bladder.*

The advisable modifications in the other bladder instruments have already been suggested, by comparison chiefly, in this and a previous paper. I have no doubt that those of us who are interested in the matter will from time to time find various applications which further consideration of its possibilities may suggest.

These instruments are all made by Messrs. Codman and Shurtleff, whom I have to thank for their unfailing kindness, especially in the loan of instruments and apparatus for comparative tests.