

INSTRUMENTS FOR DIVULSION.

DIVULSION signifies forcible rupture. There are three instruments well suited for the treatment of stricture by this method. Thompson's instrument for "rapid dilatation," as he terms it, consists of two parallel blades, slightly curved toward the beak, at which they are joined. The blades may be separated laterally, to the desired extent, by turning the handle. When the blades lie in contact, the instrument resembles a slightly conical metallic sound, size 8, a little curved toward the beak, which terminates in a slight bulbous expansion. By turning the handle, the blades may be separated to an extent corresponding to size 17, or larger. The degree of separation is indicated by a register in the handle. The instrument is marked by lines one inch apart, commencing from the point of greatest dilatability. These lines are to indicate the depth of this point from the meatus, after the instrument has been introduced. A small metallic slide, on the outside of the shaft, is so arranged as to slip up and down when the instrument is closed.

In using this instrument, the depth of the stricture to be acted upon is first accurately determined with the bulbous bougie. The metallic slide is then pushed down upon the closed instrument, until its distance from the point of greatest dilatability equals the distance from the meatus to the centre of the stricture. The instrument is now passed into the urethra until the meatus is touched by the slide, whereupon the latter is slipped up to the handle, and the operator is confident the point of greatest dilatability of the instrument corresponds to the centre of the stricture. No anæsthetic is required. The patient is lying upon his back, Thompson's idea of the proper use of this instrument (as expressed by his naming it a "rapid dilatator") was, that it should stretch as much as possible without tearing. To obtain the greatest usefulness from the instrument, however, this idea must be abandoned;¹ on the contrary, it should be used with the avowed object of rupturing (divulsing) the stricture. In this way only can its full and best effect be obtained, and, so employed, it is the best instrument we possess for performing divulsion. It accomplishes all that Reybard claimed for deep internal section, in his celebrated monograph,² which obtained the Argenteuil prize from the French Academy in 1852, and it does this without the dangers to which these deep internal sections were liable—hæmorrhage, infiltration, abscess. It splits the stricture, and allows a splice to be put into it by the healing process. The dense, hard tissue constituting stricture gives way under the application of sufficient force before the soft, naturally elastic parts around it; and the fact, that a torn wound bleeds less than an incised wound of the same part, at once establishes the advisability of preferring divulsion to incision, and that all the more

¹ Thompson has recently given up the use of the instrument.—BUMSTEAD (oral com.).

² "Traité pratique des Rétrécissements du Canal de l'Urètre," Paris, 1843.

strongly for strictures situated low down in the urethra, where it is difficult to arrest severe bleeding, should it come on.

Thompson's instrument has been very advantageously modified by American ingenuity. The modifications consist in making it smaller in its shaft and tunneling its beak (Fig. 40), so that it may be introduced through a tight stricture with safety, over a whalebone guide (p. 104). It is also made to terminate in a little screw, so as to be adaptable to a soft filiform guide passed through the stricture. In the latter case



FIG. 40.

the instrument is provided with a slightly bulbous tip, which may be screwed upon its beak, instead of the filiform bougie, bringing it back to its original simplicity, where it may be used without a guide, if desired. The American instrument, furthermore, is made to expand to a greater extent than Thompson's, fully up to size 20 (or larger, if desired)—a degree of distention which it is often desirable to bring to bear upon a tight stricture in a naturally large urethra.

After the instrument, with or without a guide, has been introduced to a proper depth, the operative procedure is as follows: The handle is turned rapidly until the blades have been separated to an extent several sizes larger than the patient's meatus will admit. The failure of the operation, if it is unsuccessful, usually depends upon the employment of too little force. It is better to tear too much than too little. If any thing gives way it will be the stricture, and not the healthy urethra, and this is the object which the operator has in view. The patient may prefer to screw up the instrument himself, taking perhaps half an hour to perform the operation.¹ The pain, which may be at first quite severe, becomes as a rule sensibly modified as soon as the stricture begins to rupture and blood shows itself at the meatus. The stricture may be nearly always felt, sometimes almost heard to tear. After blood begins to flow, further separation of the blades rarely increases the pain to any extent. It is always a pleasant thing to see blood, as this indicates that the operation is being successful. Some strictures are so elastic (resilient), that, although the instrument is screwed up to its highest dimensions, they still refuse to rupture; no blood flows, or there is only a slight staining; and, after the divulsor is withdrawn, instead of a

¹ As actually happened in one of the authors' cases.

No. 20 passing with comparative ease, as the surgeon and patient had expected, both are surprised to find that, perhaps, only a 7 or 8 will go, and that with difficulty and pain.

CASE XV.—A striking case, illustrating this point, occurred January, 1872, at the Charity Hospital. The patient had an old stricture about four inches down the canal, which admitted 7 with difficulty. Thompson's divulsor was passed without a guide, and screwed up to 20—its fullest extent. After withdrawal of the divulsor it was found that 18 would not pass; 12 and 9 also failed, consequently the divulsor was reintroduced, accurately adjusted, and again screwed up to its fullest extent. Again No. 9 steel was tried, then 7; finally, No. 3 soft French conical bougie, which entered the stricture, but was arrested and would not pass on. On attempting to withdraw this bougie, it was "grasped" powerfully by the stricture.

Here was an instrument smaller than the shaft of the divulsor used, but yet grasped more tightly than was the divulsor itself when first introduced. Six hours after divulsion the patient had partial retention. On the following day every thing returned to the same condition as before the operation. No trouble followed the attempt at divulsion. The condition of the stricture was absolutely unaffected.

Such cases must be subjected to the use of a divulsor which separates sufficiently to rupture them, or must be cut. They are rarely amenable to ordinary dilatation afterward, if the divulsion fail. Traumatic strictures and those caused by nitrate of silver are sometimes, but not invariably, of this variety.

A caution is necessary in withdrawing the divulsor. As the instrument is being unscrewed, so as to bring the blades together, after they have done their work, it is proper to push the whole instrument on still farther into the bladder—which should always contain about three ounces of urine, if possible. In this way the accident, during withdrawal, of catching a fold of mucous membrane in the closing blades at their point of junction, may be avoided, an accident very liable to happen if this precaution is neglected. If the instrument is properly made, this is less apt to occur; the blades, where they come together at the angle of junction, should be decidedly rounded off, not coming flatly together. If a small flap of mucous membrane should be caught, it can never be detected until traction shows the instrument to be retained. It is now too late to attempt to dislodge the fold which has been pinched into the angle of the blades. It cannot be done. The little piece of membrane must be torn off. This tearing is hardly noticed by the patient, as the mucous membrane is not sensitive. The accident seems to have no effect in producing urethral fever, nor does it seem to influence in any way the success of the operation; but it is decidedly more agreeable to the surgeon that it should not happen.

Hæmorrhage, after the operation, is trifling. The callous tissues do not tend to bleed much when they have been torn. A full-sized conical steel sound, as large as the meatus will admit (the latter may be incised, if unnaturally small or strictured), should be introduced at once into the bladder, for the sake of testing whether or not the stricture has been thoroughly divulsed. Sometimes the stricture is so torn that an angle

or pocket is formed at the previously strictured point in the floor of the urethra, in which the point of the sound engages. A knowledge of this fact suggests the means of overcoming it—by keeping the point of the sound well up against the roof of the urethra. If the stricture has been thoroughly ruptured, though it may be still felt by the sound, yet, upon the withdrawal of the latter, there will be no "biting." It requires more force than is usually supposed, to rupture a stricture thoroughly. After the operation it is expedient to keep the patient in bed for from twenty-four to forty-eight hours, and this especially if the urine is highly alkaline or decomposed, or the bladder very sensitive and irritable. In the latter condition it is always prudent to administer, before or immediately after the operation, ten grains of quinine with a quarter of a grain of morphine, to keep off, if possible, or moderate, the chill and urethral fever which may ensue. Contact of urine with the cut surface cannot be avoided; a little urine usually flows away as the instrument is being screwed up.

Accidents may, of course, happen with this operation, but they are rare. Especially if the urine is healthy, the patient may pass water at once over the wound, and go about his business without feeling any appreciable discomfort. It is prudent, however, to retain him in bed for a while, if possible, as severe urethral fever sometimes follows the operation, and abscess and infiltration are not beyond the range of possibility. Epididymitis may also come on. It is not very uncommon for a certain amount of blood to escape during the operation, under the skin around the urethra; this frightens the patient, but is of no importance: if let alone, it will be reabsorbed in a few days. No after-dressing is required, if the patient remains in bed. If he goes about, a little collodion over the meatus will be sufficient to keep his clothes from getting soiled by blood. The treatment after divulsion consists in the introduction of a full-sized conical steel sound on the seventh day after the operation (unless urethral fever should occur, and run particularly high), and, finally, in the continued use of the sound, as after cure by dilatation.

The operation of divulsion, blind and rough and brutal as it appears at first sight, has proved itself exceedingly mild in its immediate, and satisfactory in its ultimate results. In cases where the bladder and urethra are very irritable, it seems sometimes as if less urethral fever followed divulsion than the simple use of an ordinary small dilating instrument (Case XI., p. 49); true, there may be a good deal of constitutional disturbance, as indeed after any operation in the urethra, but this is exceptional where the urine is not too alkaline, and where the kidneys are not diseased. Death may follow divulsion in exceptional cases, as it may the use of any instrument in the urethra.

CASE XVI.—In January, 1872, a robust, middle-aged man, with an old tight stricture at the bulbo-membranous junction, some hypertrophy of the bladder, and mild chronic cystitis, appeared at the Charity Hospital. The patient was a vagabond, had been a hard

drinker, and, some time before, in the workhouse, had had a light attack of what was considered delirium tremens. Divulsion was performed upon this patient. He had a chill during and at the close of the operation, before the instrument could be removed from the urethra. A little morphine was thrown into his arm, and gr. x quinine given. He went on rapidly into a low state of fever, with mild, rambling delirium (resembling mild delirium tremens somewhat), and died on the ninth day. He had no chills, except the slight one at the moment of operation. The *post mortem* proved that pyæmia was the cause of death. The stricture was found ruptured longitudinally along the floor of the urethra. There was a small, diffuse, half-formed abscess in the scrotum, communicating with the urethra through the incision. This had appeared on the fourth day after the operation, and grown very slowly. Several abscesses were found in the prostate, and another, of the size of a nut, in the left lung (none in the liver, spleen, or kidneys). There was slight pleuritic effusion on both sides, and a good deal of fluid, and recent plastic lymph in the pericardial sac. On both arms, around the points of puncture made for subcutaneous injection of morphine, there was a patch of diffuse subcutaneous suppuration.

This patient was evidently ripe for suppuration at any point injured.

When Thompson's divulsor is used upon a guide, it is a very safe instrument in treating even the tightest strictures. It is preferable to the instruments of Holt or Voilemier, both because there is in the operation no sudden shock of driving home a shaft, and because all the force is brought to bear upon the spot which it is desired to rupture, while the rest of the urethra is spared; furthermore, the amount of separation of the blades may be regulated at will, and the surgeon may cease turning the handle as soon as he feels assured that the stricture has been sufficiently ruptured.

HOLT'S DIVULSOR.

This instrument is preferred by many for the rupture of stricture. A few words will suffice to describe it. It consists essentially of two parallel blades, inclosing a hollow central shaft, through which a drop of urine escapes when the beak of the instrument enters the bladder. When

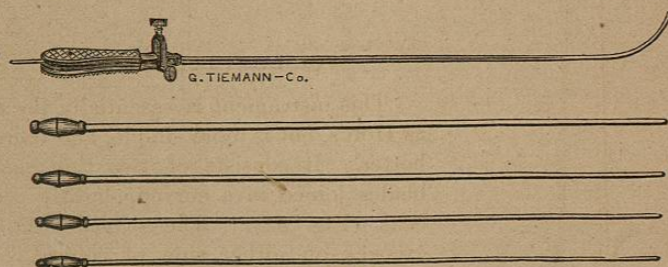


FIG. 41.

closed, the instrument resembles a slightly conical, curved sound, of small size, with a broad handle for convenience of manipulation. Conical, hollow metallic tubes of different sizes accompany the instrument.

After the beak has entered the bladder, a tube of suitable size is selected, and fitted over the central conducting shaft between the two

blades. This tube is driven forcibly home by a single stroke, the penis and handle of the instrument being held immovably by the surgeon's disengaged hand. The two parallel blades are forcibly separated by the

passage of the large conical shaft between them, and the stricture, unless too resilient, is ruptured. The operation is not very painful, and no anæsthetic is required. Holt performs it with the patient standing up against a wall, supported on either side by an assistant. The whole instrument is withdrawn together, being partially rotated from side to side, to disentangle any shreds of mucous membrane which might be caught. The results and necessity for subsequent use of the sound are the same as after all other operations.

Holt's instrument may be tipped with a screw, for the adaptation of a soft filiform bougie guide, in case the stricture is tight. An adjustable metallic tip covers the screw when no guide is to be used. Bumstead has enlarged its sphere of action, by having the dilating tubes made much larger than those of the original instrument. Where many strictures are to be dealt with at once, Holt's instrument may be useful, but for general application it is much inferior to the American modification of Thompson's instrument.

VOILLEMIE'S DIVULSOR.

This instrument is essentially the same as Holt's, but is more simple, and therefore better. It consists of two thin parallel blades joined in a curved, slightly conical beak (Fig. 42). These blades fit into grooves on either side of conical, cylindrical, solid shafts of different sizes up to 20. It may be used with a whalebone guide, or screw-tipped, with a soft bougie.

The blades are introduced closed; a shaft of suitable size is well oiled, and into its external grooves are fitted the thin parallel blades, which, filling the grooves, make the instrument cylindrical. The shaft is driven forcibly

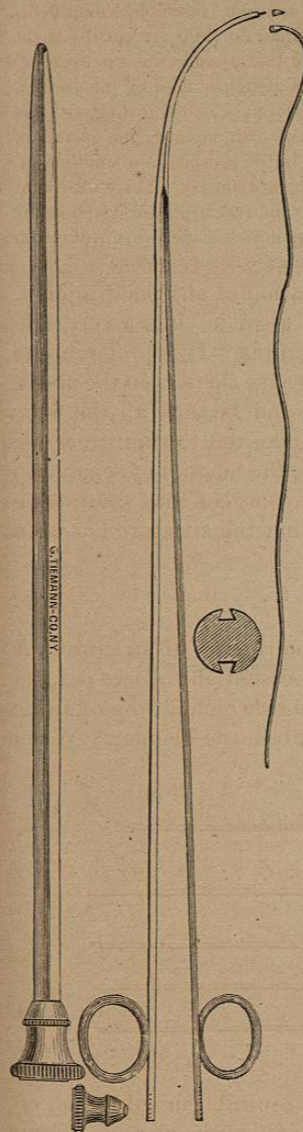


FIG. 42.

home, as in the manœuvre with Holt's instrument. The blades of Voillemier's instrument separate laterally, those of Holt's vertically. Subsequent use of sounds is necessary for permanent cure.

INSTRUMENTS FOR INTERNAL URETHROTOMY.

Four instruments only need be described, suitable for the treatment of strictures in different portions of the canal.

THE CONCEALED BISTOURY.—Civiale's "bistouri-caché" (Fig. 43) serves to enlarge the meatus, or to cut strictures within about the first inch of the canal from the meatus. It consists of a small concealed blade, which may be disclosed by pressing upon the handle, after the instrument is introduced. A screw arrangement in the handle regulates the extent to which the blade may be made to cut.

This instrument is introduced closed, the blade is protruded to the desired extent, and the instrument is suddenly withdrawn, cutting its way out. If other strictures are to be forcibly dealt with at the same sitting as that in which the orifice is to be enlarged or a stricture near by cut, the deeper strictures should, if possible, be attended to first, to avoid the confusion which the bleeding from the cut orifice might occasion.

A full-sized steel conical sound is introduced at once to control hæmorrhage, which is usually trifling in amount, but sometimes considerable. On withdrawing the sound after a few moments, if there is only



Fig. 43.

a slight oozing of blood, the cut is best dressed by the insertion into the meatus of a shred of lint or cotton-wool to prevent union. If the bleeding be considerable, a shred of lint is introduced into the cut, and the meatus is plentifully painted over with collodion. The meatus must be pressed laterally, while the collodion is being applied; otherwise a little blood will ooze up, and the collodion will not adhere. With this dressing, hæmorrhage and oozing become impossible. With no other dressing is the patient's linen safe from the possibility of being soiled. At the next urination the dressing is removed, and it is rarely that any considerable hæmorrhage follows. A full-sized conical steel sound is to be introduced into the meatus daily for a few days, and then at longer intervals, to prevent too much contraction during cicatrization; or, more simply, the patient may keep the cut open with a hair-pin, visiting his surgeon twice during the week.

CIVIALE'S URETHROTOME.

This instrument consists of a straight, small shaft, terminated by a flattened bulb, which conceals a small semicircular blade (Fig. 44). By means of a mechanism at the handle this blade may be protruded to a greater or less extent, as desired, a register in the handle indicating the degree of protrusion. The bulb is to be passed through the stricture, and then pulled forward until it meets resistance. The blade is now protruded and the whole instrument drawn out, until the stricture has been divided, when the blade is sheathed and the instrument withdrawn. This is the safest urethrotome which can be employed. It is applicable to strictures within four inches from the meatus, but, before it can be used, the stricture must be large enough to admit the bulb. If it is



Fig. 44.

desired to use it upon a very tight stricture, the contraction must be first stretched somewhat by Thompson's divulsor upon a guide. No urethrotome cutting from before backward is safe without a guide. Hæmorrhage after internal urethrotomy is, as a rule, greater than after divulsion. If it becomes alarming, it may be arrested, after collodion over the orifice has failed, by injections of persulphate of iron; or, as a last resource, by perineal section, with plugging of both ends of the urethra. Otis and Banks, of New York, have each recently produced modifications of Civiale's urethrotome, the main difference in each case being that there are bulbs of many sizes which may be screwed upon the same shaft; the instruments may be used with conductors. The principle of action and method of cutting are the same. The after-treatment of internal urethrotomy is the use of the steel sound, as after all other methods of cure.

MAISONNEUVE'S URETHROTOME.

This instrument is serviceable where it becomes necessary to incise stricture situated deeper in the urethra than four inches. It consists of a hollow wire with a linear opening on that side which corresponds to the roof of the urethra. The knife, of different sizes, cutting from before backward, and from behind forward, with its exposed obtuse angle always blunted, is attached to the end of a long stylet which fits into the groove of the instrument. The blade is prevented from slipping out by a projecting shoulder on either side, which runs inside the hollow wire. Bumstead has advantageously modified the original instrument by making the knife run only to the beginning of the curve, instead of up to the point, and by making the tube a little more solid.

The instruments, as now made, have the blade on the lower side (Fig. 45). This urethrotome is to be used with a screw-tipped filiform bougie.

It is introduced, following its guide, and depressed until the straight portion of the tube has passed the stricture. Then the blade is entered, pushed rapidly down, as far as it will go, and immediately retracted, the instrument being twisted a little, if desired, so as to nick the stricture again during withdrawal.

The objection to this instrument is, that if a large blade is used the healthy urethra is incised longitudinally, often for its whole length anteriorly to the stricture; an accident perhaps of no very great moment, but entirely unnecessary, while, if a small blade is used, the whole thickness of the stricture is not cut through. Voillemier has attempted to overcome this objection by

adapting a shield to the blade from which the latter may be protruded when the stricture has been reached, but the modification is complicated and unsatisfactory (Fig. 46). Another objection applicable to all instruments for incising the deep urethra is, the liability to hæmorrhage, if the incision is sufficiently deep to be effective. Such hæmorrhage at the bulbous portion of the canal may be very difficult to control. The after-treatment is the same as after all other operations.

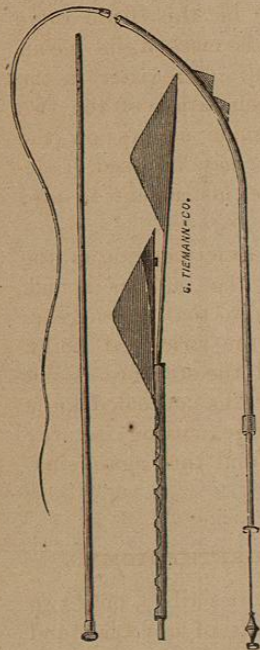


FIG. 46.

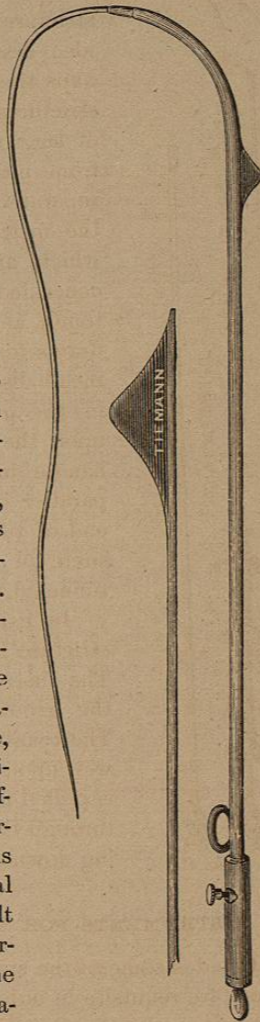


FIG. 45.

DILATING URETHROTOMES.

Several instruments have been recently devised to cut strictures of large calibre, such, for instance, as have been dilated but are somewhat resilient, and cannot be further effaced by dilating instruments, or, indeed, to cut any stricture after first having put it upon the stretch, an idea first successfully carried out by Reybard. Perhaps the most useful of these is Otis's urethrotome for strictures of large calibre (Fig. 47). The instrument is of large size (No. 10), consists of a straight round staff, from near the end of which a parallel bar may be separated by a screw in the handle. Along the top of the instrument runs a groove concealing a fine blade, which, at a certain part of the groove, runs over a concealed ridge (after the manner of Peters's urethrotome), and then again sinks into the groove, by being drawn forward, and, cutting for about one and a half inch, disappears. The distance of this little ridge in the groove from the handle is marked in inches upon the shaft of the instrument. A register in the handle indicates the extent of separation of the two parallel blades. A soft large guide screws on the end of the instrument, so that it may be used, if desired, in the deep urethra. The instrument is also tunneled.

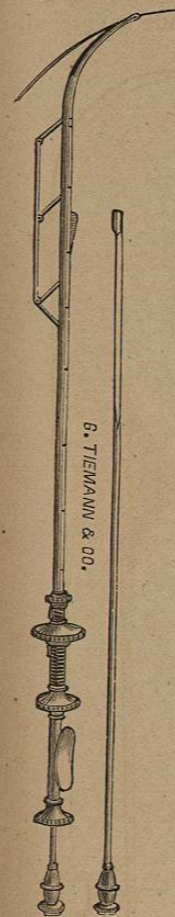


FIG. 47.

In using this instrument, the exact position of the stricture is first ascertained with the bulbous sound. The instrument is now introduced so that the ridge in the groove shall lie exactly at the strictured point. The two blades are separated until the stricture is put well upon the stretch; and, finally, the concealed knife is pulled forward over the little ridge, cutting its way through the stricture in its course, and then again sinking down out of sight.

INSTRUMENTS FOR EXTERNAL PERINEAL URETHROTOMY.

Besides some of the special instruments already described, only two others are requisite in order to meet the requirements of any case (and there are few of them) calling for external section.

1. A simple staff, broadly grooved on its convexity, the groove running off at the end, and the instrument not conical (Fig. 48). This instrument is introduced as far as the stricture, when the latter is impervious, and is cut upon in the operation of perineal urethrotomy without a guide.

It may be used with a guide, the latter being a whalebone bougie, introduced through the stricture (Fig. 49). In this case it is practically the same instrument as the staff of Syme¹ (see note, page 127), the eminent

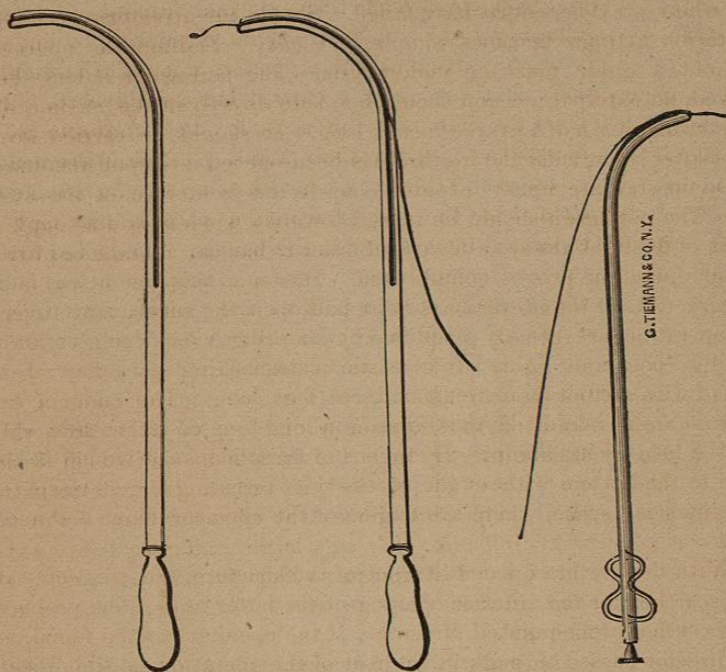


FIG. 48.

FIG. 49.

FIG. 50.

surgeon who gave this operation its reputation. Syme's staff is unsafe compared with the means now at our command, and is rarely used.

2. The catheter-staff of Gouley (Fig. 50). This most excellent instrument is a metallic catheter (they are made of various sizes), grooved on its convexity, the groove being bridged over at its end, forming a loop to receive its guide—a filiform whalebone bougie.

Scalpels, probes, and a long, slender, probe-pointed director, are required for the operation.

EXTERNAL PERINEAL URETHROTOMY, WITHOUT A GUIDE.

Few operations in surgery are more formidable than this one of external perineal urethrotomy, *without a guide*. The surgeon who approaches it should be thoroughly at home in the anatomy of the perinæum, and even then should be prepared for possible failure. The patient

¹ "Stricture of the Urethra," Edinburgh, 1849.

is tied or held in the lithotomy position, after he has been anæsthetized. The scrotum is held up out of the way by the assistant who manages the grooved staff. Ether relaxes spasm, and a last attempt to pass a filiform bougie, after the patient has become unconscious, may be successful, where previous efforts have failed. Should the attempt succeed, the operation at once becomes simple and easy. Failing, the operation without a guide must be undertaken. The perinæum having been shaved, an external incision should be made directly in the median line, from two and a half to three inches long. It should be carried down, layer after layer, until the urethra has been opened into upon the end of the blunt staff previously introduced up to the front face of the stricture. The perinæum should be turned toward a window, and a couple of hours of daylight always allowed, in order to have an abundance of time, if the operation proves complicated. Haste, in this operation, is bad surgery. After the urethra has been laid open, the subsequent steps of the operation are greatly simplified by adopting Avery's suggestion for getting room and light. It consists in transfixing each flap of the wound with a stout ligature about three feet long. The ends of each ligature are now knotted, thus forming a long loop on either side, which may be held by assistants. By means of these loops the wound is kept open to the bottom without the necessity of thrusting fingers or spatulæ into the small space, where the fingers of the operator alone are necessary.

With the urethra opened in front of the stricture, the surgeon carefully searches for the anterior opening of the latter with a fine probe, or, better, a fine probe-pointed director. If the opening can be found, and the director passed through it, the rest of the operation is simplified at once: but this fortunate result is rare. Having failed to find the orifice of the stricture, after a patient search, the surgeon feels for the hole in the triangular ligament, below the depression lying above the sub-pubic ligament, and cuts into it through the fibrous mass by successive strokes of the scalpel, always in the median line. At short intervals during the operation, the surgeon gently endeavors to coax his fine director, properly curved, through any opening he may think he sees, into the dilated urethra beyond. After each failure he resumes the cutting in the median line, guiding his knife by frequently taking the bearings of the tubera ischii, and with his finger in the rectum. In this way he continues, feeling his way as he goes, until finally his director finds some orifice through which it passes onward into the bladder. When this has been effected, a probe is passed in the groove of the director, also into the bladder; and now, by separating the two, a gush of urine is seen to mingle with the blood, announcing that the bladder has been reached.

The director, once in the bladder, should not be removed until after the opening has been increased, and a large instrument (nothing is better than the little finger), can pass into the bladder. A mistake often made