The escape of the gas along the sides of the catheter, with a sputtering sound, announces the successful application of the gas to the entire mucous surface of the canal. The tonic and sedative effect of this procedure is prompt and curative in many case of abnormal sensitiveness of the urethra, following chronic inflammation.

CHAPTER II.

RETROSPECT.

IN a careful perusal of the foregoing chapter it will be seen, 1st. That the subject of Gleet was entered upon with a general, if not a complete, appreciation of the causes which might be supposed capable of establishing and perpetuating it.

2d. That an essential *virus* for its establishment was denied, and that its continuance was considered to depend upon pathological conditions, the result in every case of simple inflammatory changes, complicated more or less by the anatomical peculiarities of the parts.

3d. That the diagnosis, in every case, was sought to be established through an acceptance of all the then recognized pathological processes associated with disease of mucous membranes, and by all the mechanical aids then in use, or which a critical study of the subject could suggest.

4th. That the treatment of Gleet was, at first, based upon the popularly accepted value of known remedial agents, general and local.

5th. That failure of treatment addressed to assumed pathological conditions, independent of mechanical interference with the functional integrity of the urethra, became gradually more and more apparent, until, on page 21 the mechanical obstacle was made to assume the *first* rank as a cause of gleet.

6th. That the slightest contraction of the normal calibre of the urethra was sufficient, not only to prolong a gleet in spite of treatment addressed to the inflammatory state, but "to establish it *de novo* without venereal contact."

7th. That the value of the bulbous sound was more and more highly appreciated and an improved form was presented, page 23.

8th. That the meatus urinarius was accepted as a guide to the calibre of the urethra when free from apparent contractions, and even at that time the frequency of congenital and pathological contractions was beginning to be recognized.

9th. That a distinct individuality was claimed for every urethra, "irrespective of standards or even of general physical proportions" (p. 25).

These positions, reinforced by the experience and earnest study of nearly two more years, were again brought to the notice of the profession in another paper read before the New York Journal Association, Nov. 24, 1871, and published in the N. Y. Medical Journal of Feb., 1872, entitled

Remarks on Strictures of the Urethra of extreme Calibre, with cases, and a Description of New Instruments for their treatment, as follows:

In a paper, which I had the honor to read before the N. Y. Medical Journal Association nearly two years since, I called especial attention to the influence of Strictures of large calibre in perpetuating a purulent urethral secretion, concluding in the following terms: "*We may, then, affirm as a most important axiom, that the slightest abnormal encroachment upon the calibre of the urethral canal, at any point in its course, is sufficient to perpetuate a urethral discharge, or even, under favoring circumstances, to establish it, de novo, without venereal contact.*"

Since the foregoing aphorism was enunciated, my experience has resulted in a daily-increasing respect for slight and usually unsuspected narrowings of the urethral calibre, as a cause of establishing local points of irritation along the course of the urinary tract.

The following case presents a common phase of the difficulty alluded to:

Mr. J. W. R., a surgeon, aged forty-eight years, came to me in June last, complaining of soreness and persistent aching in the prostatic portion of the urethra, accompanied by a slight purulent discharge from the meatus. He had been a

subject of gonorrhœal inflammation several months previously, and felt confident that this had resulted in the establishment of a low grade of inflammatory action in the prostate gland. With occasional suspicions of Stricture, he had attempted to verify them by the use of sounds. At one time No. 25, of the French scale, was passed into the bladder without obstruction, but, on other occasions, no larger than 20 could be introduced. He was, however, very positive that no organic Stricture existed, but that the irritation, caused by the passage of the instrument, excited a spasmodic contraction of the membranous portion of the urethra, which arrested its progress. Attempting the introduction of a bulbous sound of as large a size as the urethral orifice would admit, viz., 27 F., I ascertained, that there was a Stricture near the meatus. The bulb fitted the opening, but refused to enter. After steady, gentle pressure, continued for three or four minutes, it suddenly slipped through a narrow Stricture about a quarter of an inch in depth. The bulb was then easily advanced for two inches, when another obstruction was encountered; this gradually yielded for about an inch, after which the passage of the sound, onward into the bladder, was easy and natural.

On the *withdrawal* of the instrument its bulb was arrested at a point $3\frac{1}{4}$ inches from the meatus by a Stricture which presented a nearly uniform resistance for one inch, when it again glided smoothly outward until arrested by the previously mentioned obstruction at the meatus. The handle of the exploring instrument was now permitted to fall, and dangled from the extremity of the penis, its bulb so firmly held by the Stricture that not a little traction was required to withdraw it.

Here, then, we had a urethra, readily admitting the passage throughout its whole length of a No. 25 sound, of the French scale, and yet the presence of two decided Strictures in its course was positively demonstrated.

The Stricture at the meatus was freely divided with the urethrotome of M. Civiale, and a No. 28 F. sound was passed

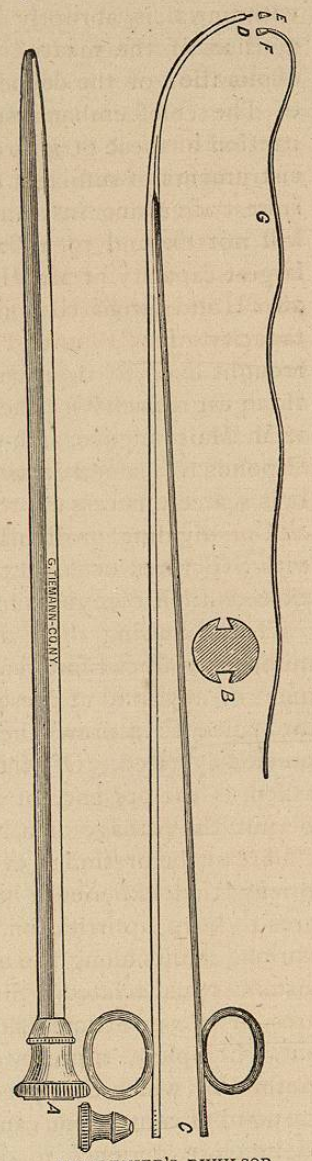
through into the bladder. This operation was repeated, with increasing sizes, every third or fourth day, until a No. 30 F. sound was passed through the urethral canal, and was repeated at stated intervals for a fortnight. Still the purulent oozing, though slight, did not cease. Believing that the full size of the urethra had been reached, and that the continuance of the discharge was due to the long-continued engorgement of the mucous membrane adjacent to the Strictures, the use of the sandal-oil capsules was advised, under the influence of which it was hoped the trouble would soon disappear. The patient continued to take the capsules for a week, at the end of which time the discharge had quite ceased, but he still complained of uneasiness in the prostatic region, and still found shreds of mucus in his urine. Sound No. 30 F., of the Béniqué curve, passes quite readily, but the patient complained of unusual tenderness on its passage through the prostatic portion of the canal. From the locality and character of his sensations, he was confident that his whole trouble was in the prostate. On the withdrawal of the sound, a little of a grey secretion was observed at its extremity, and which, under the microscope, was found to be largely purulent. This secretion, it seemed to me, had been brought from the prostatic portion of the canal. Examination *per rectum* revealed slight prostatic tenderness, but no hypertrophy. Endoscopic examination, half an hour after urinating, revealed nothing except a slightly congested condition of the mucous membrane in the vicinity of the previously mentioned points of Stricture, and the presence within the prostatic portion of the canal of the secretion previously examined. With these evidences of the existence of a chronic prostatitis, I injected five drops of a solution of nitrate of silver (grs. xxiv. to the ounce of distilled water) by means of Dr. Bigelow's prostatic syringe. Shortly following the injection, and for five or six succeeding days, the patient expressed himself as having felt a decided improvement; he also reported perceptibly less flocculi in the urine. Three injections, of the character previously used, were administered at intervals

of eight days, but no further improvement resulted; on the contrary, a slight reappearance of the discharge at the meatus, with an increase of the prostatic discomfort, had occurred about the seventh day after the first application of the nitrate of silver. These symptoms again ceased upon the second application, but only to return at about the same time as on the previous occasion; a like repetition of the advance and retrograde movement occurred upon the use of the third and last injection. Suggesting the possibility of a Stricture of large calibre still remaining, I introduced bulbous sound No. 28 F., and found that it accurately measured a Stricture, the posterior boundary of which was $3\frac{1}{4}$ inches from the meatus, and which had been previously dilated to No. 30 F., three degrees above the supposed normal size of the urethra as indicated by the size of the meatus. I then introduced the shaft of Voillemier and passed upon it the largest dilating cylinder, measuring *thirty-two* millimetres in circumference, and corresponding with about No. 20 of the so called American scale. Under this distention the doctor recognized distinctly the sensation of rupture at the point of constriction. But little pain was experienced during the operation, and only slight temporary discomfort followed it. This occurred at 8 P. M., November 10th. Since that time the patient has been entirely free from the old unpleasant sensations in the prostate, and also from any sign of discharge from the urethra; the only evidence of any trouble continuing, is the slight mucous flocculi that still appear in the urine.

I have now under my care another case, Mr. A., aged twenty-eight, in whose urethra some half-dozen bands of Stricture from one-eighth to one-fourth of an inch in breadth are present, anterior to the bulb. These have been dilated so that conical sounds from No. 28 to No. 30 F. have been passed with more or less difficulty, at intervals of from four to eight days, for nearly two months. A few days since I introduced Voillemier's divulsor with shaft thirty-two millimetres in circumference (the largest attainable), and with but little more discomfort to the patient than that which had

followed the use of the 30 F. sound—yet bulbous sound No. 26 F. still defines the bands of Stricture very distinctly. Such a degree of resiliency, in my own experience, is uncommon, although I have seen repeated instances where it was almost as great.

On a former occasion, the importance of recognizing a distinct individuality, in every urethra, was insisted on, and likewise, the measurement of the calibre of each, not by any popular standard, but by the introduction of the largest-sized bulbous sound that would pass the uncontracted meatus. With this as a guide, the discovery of urethras presenting a calibre freely admitting a 30 F. sound will not prove of so rare occurrence as at present supposed. Contractions at the meatus are a fruitful source of failure to appreciate abnormal narrowings of the urethra; the complete suppleness and resiliency of the tissues of the normal meatus is a good test of its freedom from organic Stricture, but congenital contractions, to a greater or less extent, are not unfrequent. Here, both the natural suppleness and resiliency may be present, and the deformity may escape notice, unless carefully sought. Wherever a bulbous sound can, by a gentle pressure of three or four minutes' dura-



VOILLEMIER'S DIVULSOR.

tion, be made to slip into the fossæ navicularis, and in the withdrawal is abruptly arrested, the indication for the free division of the meatus is positive; without it no efficient exploration of the deeper parts can be effected.

The chief embarrassment which arises, after the demonstration of these Strictures of large calibre, is from the lack of instruments of sufficient size to divide or rupture them. The largest divulsing instrument of Mr. Thompson, of London, will not expand to a size equal to more than 28 F. The largest capacity of Mr. Holt's instrument is not greater. My own Holt, purchased some years since, had only a divulsing capacity of 25 F. until I had a larger cylinder made, which brought it up to twenty-eight millimetres. The instrument of largest capacity for the internal division of Stricture is that of M. Maisonneuve, and, with the widest blade, this only corresponds to a sound *twenty-eight* millimetres in circumference. It is scarcely necessary to call attention to the *entire incapacity* of dividing or divulsing instruments to deal efficiently with Strictures occurring in urethras whose normal calibre exceeds their own measurement.

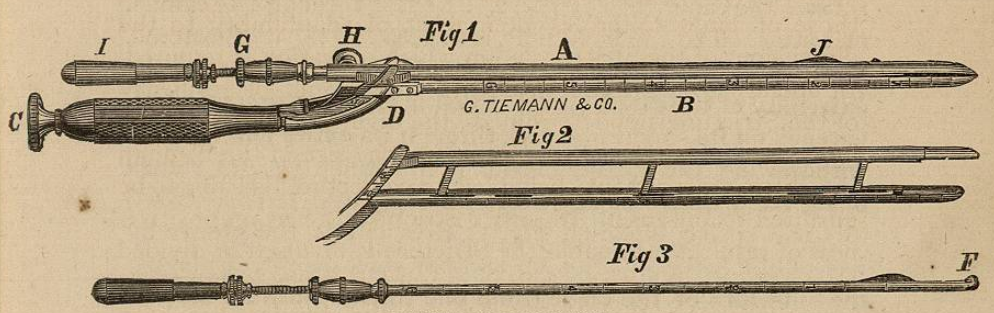
The divulsing shaft of Voillemier, measuring thirty-two millimetres in circumference, and which is the largest instrument of any kind at present in use for operations on Stricture, failed to rupture the Strictures in the case of Mr. A., previously cited. Of what possible consequence, it may be asked, is the presence of a Stricture, of a calibre sufficient to permit the passage of a No. 32 F. sound, where the normal calibre of the urethra is evidently several millimetres smaller? Briefly, that experience has shown the power of such Strictures to keep up irritation, and even a purulent secretion, at various points along the urinary tract, as was the case in the instances just related. Simple over-distention of such Strictures, or of *any* Strictures, is at best but a temporary expedient. Complete rupture or complete division is the only method by which the speedy return of a Stricture to its original point of contraction can be prevented. Every practitioner of much experience in operations for Stricture must have

been struck with the lack of uniformity in results by any and every method, as shown by the return of patients for treatment, after variable intervals from the date of operation. Taking into consideration the difference in the regularity with which patients continue the use of dilating instruments after an operation, it is evident that data on this point must of necessity be very imperfect; but I have noticed, in cases *where no after dilatation was practised*, more permanent results in operations upon *tight Strictures* than upon those of *large calibre*. This, it has seemed to me, was because the tight Stricture was more thoroughly ruptured or divided, and that the Stricture of large calibre was more likely to be simply over-distended or imperfectly divided, on account of its inferior density and greater dilatability, as well as from insufficiency in size of the instruments employed.

The great defect in all the means now in use for operations upon the variety of Stricture under present consideration, viz., those of large calibre, is their want of adaptability to the dimensions of the Stricture upon which operation is required. In operating on the flaccid urethra the amount of resiliency of the Stricture is undetermined; the divulsing shaft is, therefore, selected without exact data, and the size of the blade in the cutting instruments being left to conjecture, is liable to be unsuited to the case. In small Strictures a certain positiveness of result is attainable, the Stricture is divulsed or divided to an extent sufficient to relieve present emergency, but there is no assurance that the rupture or the division has been complete, and, unless this result is attained, the return of the Stricture to its former dimensions is certain, and likely to be speedy, unless combated by the regular and frequent use of suitable dilating instruments. I would not be understood as at all undervaluing the great advantages, nay, blessings, that have resulted, and must continue to result, from the intelligent use of the admirable instruments of Maisonneuve, Holt, and others. In their prompt and ready relief of close Strictures they leave little to be desired, and must always occupy a prominent place in cases of emergency, when the chief consideration

is to relieve a threatened or actual retention of urine. I simply hold that there is an uncertainty in the extent of their action; uncertainty as to whether or not the Stricture has been completely divided, or whether other tissue, besides that involved in the contraction, has not also been divided or otherwise injured; and that, in Strictures of large calibre, they are, as at present constructed, often entirely insufficient. With the view of supplementing these important defects, I have designed the accompanying instrument, which was manufactured very perfectly by Messrs. Tiemann & Co., 67 Chatham St., under my direction, and especially intended for operating upon the Strictures of Mr. A., in whose case the 32 F. shaft of Voillemier was used without effecting their rupture.

The instrument, which I term *the Dilating Urethrotome*, consists of a pair of steel shafts (A & B, Fig. 1), connected together by short pivotal bars, on the plan of the ordinary



DILATING URETHROTOME.

parallel ruler, as shown in the expanded instrument, at Fig. 2. Its expansion and contraction are effected by means of a screw which traverses the handle connected with the lower shaft and is moved by means of the finger-button (C). Attached to the distal end of the screw is a pair of short, curved, registering arms, seen at D, Fig. 1, which ride through grooves on either side of the shafts (A & B), and are marked, on one side, with the divisions and corresponding figures of the American scale, on the other with those of the French, in millimetres. Connected with the screw in the handle, the

rise and fall of this register indicate exactly the degree of separation of the shafts, and consequently the precise progress of the dilatation. Upon the inferior shaft (B) is engraved a scale of inches and quarter inches, by which the depth of its introduction into the urethral canal may be noted. Up to this point the instrument is simply a *divulsor*, and may thus be used by introducing it into the urethra until its distal extremity is beyond the supposed point of Stricture; the finger-button (C) is now turned, dilating the instrument, until, if considered desirable, the Stricture is completely ruptured.

The upper bar of the instrument, which is hollowed out, is traversed by a urethrotome (Fig. 3),* the distal extremity of which terminates in a little metallic knob or indicator, (F, Fig. 3); by the metallic handle (G, Fig. 1) of the canula of the urethrotome, it is moved, at will, through the entire length of the shaft (A) of the divulsor; a small button-screw (H), secures the canula at any point. Running through the canula, and attached to the handle (I), is the staff of the urethrotome, terminating in a thin, narrow, spring blade, which, when at the extremity of the canula, is concealed in the deep groove which extends on its superior aspect through its entire length. On withdrawing the handle of the urethrotome (I), (its canula being fixed firmly at any given point by the button-screw,) (H), the spring blade (J, Fig. 1) rises out of the groove by means of a little elevation on its floor, rides over it, displaying the full width of the blade (from one to two lines) for half an inch, when it again drops down, and is concealed in the groove of the canula.

The instrument, with its contained urethrotome, having then been passed down beyond the supposed or known point of Stricture and dilated until the Stricture is made tense, the button-screw (H), is turned, releasing the canula, which may then be drawn carefully outward until the knob or indicator at its extremity is arrested by the Stricture. The canula is then advanced about half an inch and secured by a turn of

* This form of urethrotome, with concealed spring blade, was invented by M. Ricord, of Paris, and presented to the profession some years since.

the button-screw (H); a rapid movement of the handle (I), of the urethrotome *outward* brings its blade up through the Stricture from behind forward, incising it almost instantaneously, and passing down again into its concealment. The finger-button at the extremity of the handle of the divulsor is then turned, and the instrument again dilated sufficiently to ascertain whether or not the Stricture is completely divided: if not, the knife may be passed down, *from before backward*, completing the operation. Should other Strictures be present, the use of the indicator, the urethra being kept tense, will reveal the exact locality of each, and the blade may be applied as required. The especial advantages claimed for this instrument are, that it first makes the Stricture *tense*, thereby establishing it as a fixed point; that it is capable of being adapted to Strictures of any size within its compass; that it accurately defines their locality and extent; that it attacks a tense instead of a flaccid Stricture, and hence, that its work is approached with confidence; that its incisions are made with ease, at a predetermined point, depth, and extent, instantaneously, and with the slightest possible discomfort to the patient; and, lastly, that it combines great strength with ease and simplicity of manipulation. Since the completion of the instrument, four weeks ago (May, 1870), I have operated with it on six cases of Stricture in the ante-bulbous portion of the urethra, with complete success and satisfaction in every particular. Its compass is from 23 F. to 34 F., corresponding to 13 and 21 of the English scale. Messrs. Tiemann & Co. are confident of their ability to make one of similar pattern which shall range from 23 F. down to 18 F., corresponding to 13 and 9 of the English scale, and so curved that it may be readily applied to the deeper portions of the urethra. But it is for operating upon Strictures of large calibre that this instrument has been designed, and, except in such cases, especial superiority over others in use is not claimed.* It will, how-

* The only dilating urethrotome of which I find any record is that of M. Reybard (Traitè Pratique des Rétrécissements Du canal de l'Urètre, par M. le Dr Reybard, Paris, 1843, p. 205). The principles on which the instrument of M

ever, I think, prove a valuable aid in completely restoring the natural calibre of urethræ that have been imperfectly operated on by other instruments.

Reybard was constructed required long and deep incisions of the urethral canal, in consequence of which "the instrument, never extensively used, has fallen into disuse" (Thompson on Stricture of the Urethra. Third edition. London, 1869. p. 235).

CHAPTER III.

RETROSPECT.

THROUGHOUT the period covered by the preceding chapter, it will be seen, 1st. That there was a steady progress of the mechanical views in regard to the nature and continuance of gleet.

2d. That the meatus was practically rejected as a guide to the normal urethral calibre (p. 32).

3d. That the incapacity of all the then known instruments for dividing or divulsing urethral Strictures was demonstrated (p. 33).

4th. That complete sundering of Stricture was necessary to prevent speedy re-contraction (p. 34). And hence, that an instrument of wider scope and more certainty in action was required.

5th. That to fill these indications my first dilating urethrotome was invented, and presented to the profession as theoretically capable of completely dividing Strictures of large calibre.

The apparently successful practical application of the instrument in six reported cases was not deemed sufficient to warrant more than a casual mention, and this but as an incentive to a more extended trial of its qualities.

During the succeeding year (1870–'71) my experience in the use of the dilating urethrotome had extended to the division of fifty-seven bands of Stricture in twenty-seven patients. In every case the presence of long standing gleet was associated with the Strictures. In every case, cure of the gleet followed rapidly on the removal of the Strictures and in five cases complete absorption of the Stricture tissue was found to have occurred, a fact verified by the distinguished surgeons mentioned on pages 48, 49. These results, so remarkable and