

The endoscope as an aid in the diagnosis and treatment of disease / by Francis Richard Cruise.

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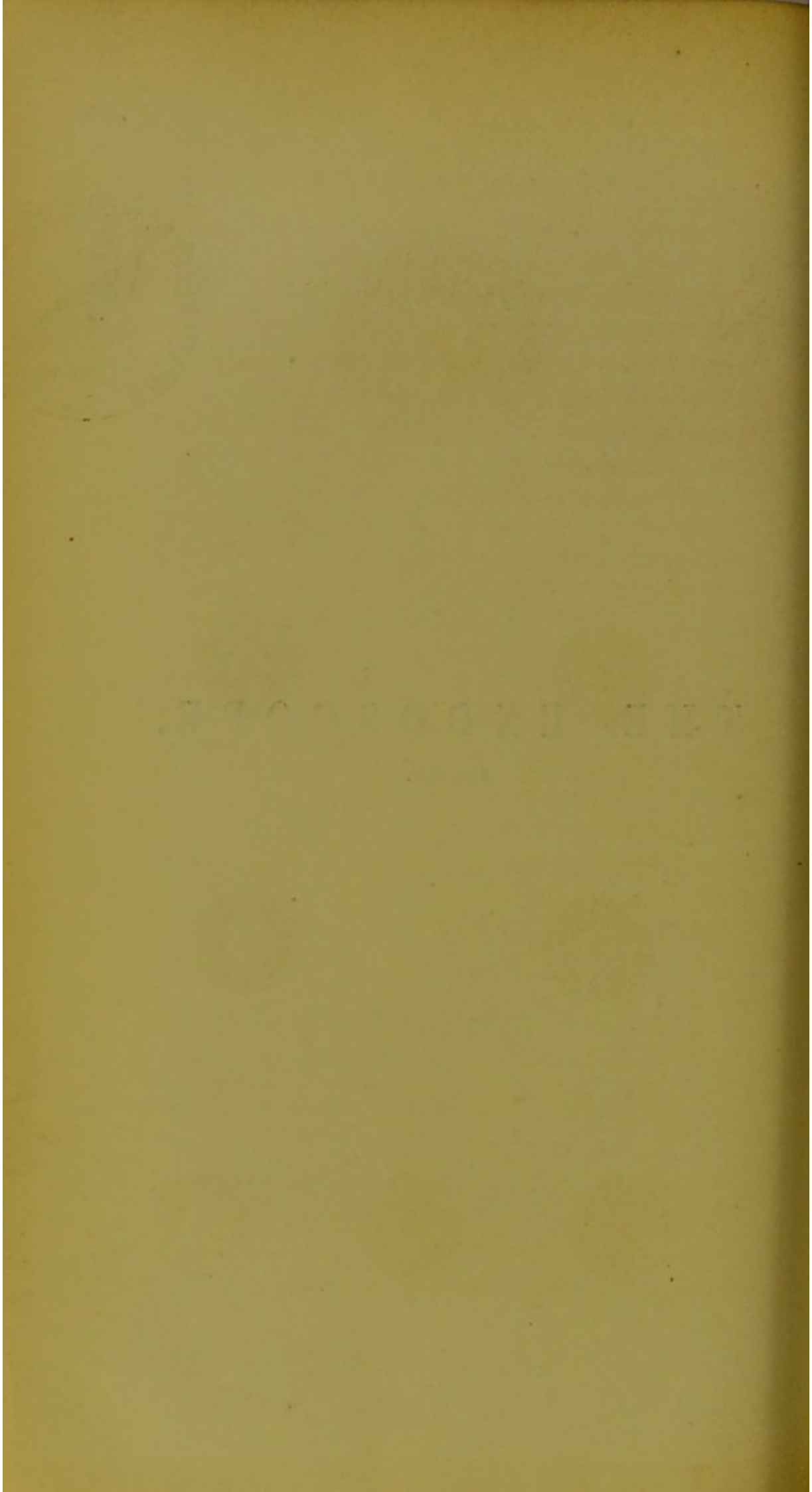
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Surgery



THE ENDOSCOPE,
&c., &c.





Case of M.W.

Fig 1



Case of J. N.

Fig II



Fig III



Fig IV



Fig V



Case of E.B.

Fig VI



Fig VII



Fig VIII



THE ENDOSCOPE
AS AN AID
IN THE
DIAGNOSIS AND TREATMENT
OF DISEASE.



BY

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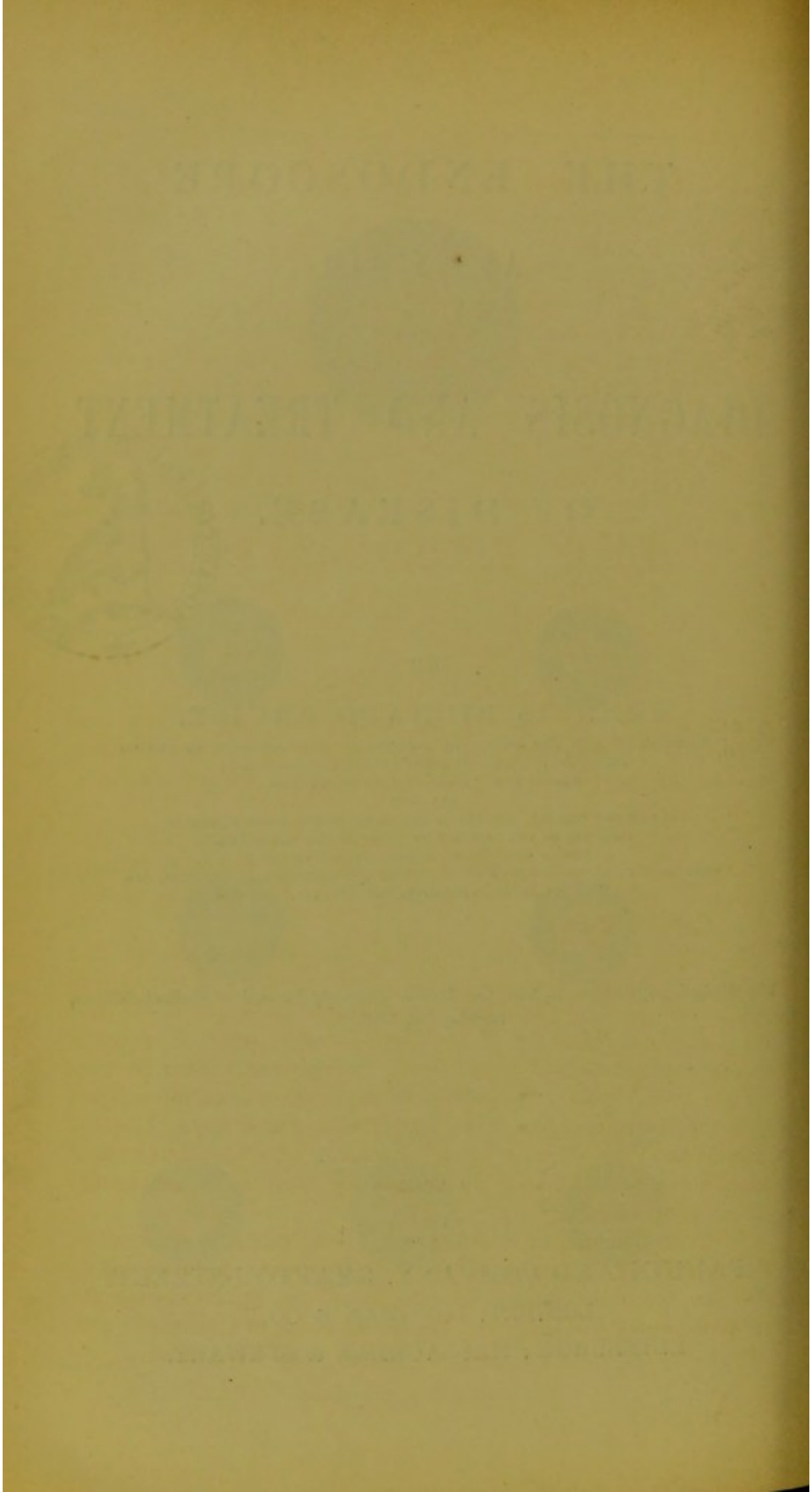
1865

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THE ENDOSCOPE,

&c., &c.

I BELIEVE it will scarcely be denied that one of the most important characteristics and improvements of modern medicine consists in the *direct exploration of organs* for the elucidation of their physiology and pathology.

This tendency to rest our knowledge upon physical rather than rational signs is by no means of recent date, although latterly, especially within the last half century, it has become more obvious and better appreciated.

Glancing back over the history of the profession during that period, we notice how percussion, methodized by Avenbrugger, and popularized by Corvisart, seems but to have paved the way for Laennec's discovery of the immeasurable practical value of auscultation in diseases of the chest. Subsequently other portions of the body, lending themselves to exploration even more freely than the thoracic organs, have come in due course to be objects of interest and research with special observers, who from time to time have devised means and implements for their more satisfactory examination and study.

Without delaying upon this point, I may quote, in illustration, the revival by Recamier of the long-forgotten speculum uteri; also the speculum auris, originated, I believe, by Newburg; the ophthalmoscope of Helmholtz; the laryngoscope of Czermack; and, though last certainly not least, the endoscope of Desormeaux.

Upon a recent occasion (March 15th) I had the honour of exhibiting to the Medical Society of the King and Queen's College of Physicians a modification of the endoscope which I have used for some time past, and of reading a short paper, explaining its construction and use in the study and treatment of disease.

Being the first in Ireland, so far as I can discover, to use or exhibit such an instrument, I felt much diffidence as to the views which others might primarily entertain respecting it, although I had fully satisfied myself of its real utility and probable general adoption when understood. However, the very flattering reception which the instrument as well as the communication met with, the notice it received in the London medical journals,^a and the interest which it appeared to excite, have induced me to embody in the present brief sketch my experiences of it.

Agreeably to the old adage that "Naught is new under the sun," as each addition to our means of diagnosis has been brought under the notice of the profession, claimants have sprung up to dispute the honour and credit of invention. Doubtless it would be very unprofitable at the present time to discuss at length the precise merits of the competitors in each case; therefore I shall pass by that question, merely observing, in order to justify the quotation of the above-mentioned names, that I have endeavoured to associate with each method and instrument the name of that individual who has done most to demonstrate and extend its practical utility.

With respect to the endoscope in particular, I may observe that M. Desormeaux, in the introductory chapter of his recent valuable memoir, candidly acknowledges that the idea of an instrument capable of throwing light into deep cavities, such as the bladder and urinary passages, was not original with him. He accords to M. Segalas the merit of originating the thought, and alludes to his unsuccessful attempt, as well as to the fruitless labours in the same direction of the late Mr. Avery of London, and Dr. Hacken of Riga.

Considering the ability and industry with which M. Desormeaux has prosecuted the subject, it is a matter of surprise to me that important labours of others have escaped his cognizance. At any rate it is quite certain that M. Segalas was not the originator of endoscopy. Barrini of Frankfort invented his "light conductor" about the year 1806; and in 1824 (two years before Segalas'

^a See *Lancet*, *Medical Times and Gazette*, and *British Medical Journal* for March, 25th, '65.

proposal) the celebrated Dr. J. D. Fisher of Boston devised and actually used an instrument identical in principle and similar in construction with that at present recommended by Desormeaux. An ingenious *variscope*, which has been in use for many years past, resembles it also. Bombalini, too, subsequent to Segalas, paid great attention to endoscopy. I would refer those interested in this matter to an article in the fourteenth volume of Chapman's *Philadelphia Journal of Medical and Physical Science*, for 1827, which was pointed out to me by my friend, Dr. E. S. O'Grady, Lecturer on Surgical Anatomy in the Carmichael School of Medicine, Dublin.

Despite the occasional attention paid to the subject during the last half century, for the most part no practical result appears to have followed, and the fate of the endoscope has heretofore been general neglect and oblivion. So far as I can discover, M. Desormeaux alone has been a marked exception. He has most indefatigably worked at endoscopy; and to him, undoubtedly, is due the credit of patiently toiling for more than thirteen years, until at last he has accumulated a mass of facts so important and interesting that it is impossible for the profession any longer to ignore his labours and the value of this method of investigating and treating disease. It would be difficult for me adequately to laud his recent beautiful memoir,^a which may be taken as the model of a scientific essay—full of learning, research, and modesty, and bearing on every page the impress of genuine truthfulness.

Apropos to the slight shown towards the endoscope, a long and amusing history might be written of the opposition which has greeted every improvement in the science and art of medicine from its earliest date;—such a history would, I conceive, be out of place here. Frivolous objections avail nothing at the time they are advanced, and only afford material for merriment and ridicule in the future. The practical commentary upon all such opposition lies in the contrast between medicine as we now see it, and medicine as our fathers knew it little better than half-a-century ago.

I shall not dwell on the history of my own efforts at endoscopy;—suffice it to say that it has been a dream with me since I became a student of medicine, and a pursuit after which I have continually hankered. Years ago I tried to work with an apparatus similar to

^a De l'Endoscope et de ses Applications au Diagnostic et au Traitement des Affections de l'Urèthre et de la Vessie. Par A. J. Desormeaux. Paris: J. B. Baillière et Fils.

M. Desormeaux's, but, finding the light insufficient, I gave it up in despair, and only of late resumed the study. Comparatively recently a modification of the illuminating portion of the instrument occurred to me; I forthwith carried it out, and thereby obtained as much light as I required for all practical purposes. Since then I have used the endoscope constantly, and have neglected no opportunity of extending my knowledge of it. Rendered distrustful of success by repeated failures, for months I worked in silence and in private, until I became familiar with its use and manipulation. Then, for the first time, I exhibited it to others. Early in March I showed it to Dr. Fleming, of the Richmond Hospital, and demonstrated to him and Professor R. W. Smith an organic stricture of the urethra. Subsequently, by the kind invitation of medical friends, I examined a variety of cases at many of the Dublin hospitals, and also in private. It is my pleasing duty to acknowledge gratefully the kindness and liberality with which my *confrères* have placed their cases at my disposal, and have thus multiplied the field of my experiences in endoscopy. For myself I must say I am quite satisfied that it is an unquestionable success, and I feel justified in stating that I believe the field of its practical utility is almost illimitable. I venture even to hope that in the course of time it may work as complete a revolution in our knowledge of many obscure diseases as the stethoscope has wrought in the diagnosis of affections of the lungs and heart.

The endoscope, at its birth, met with but little favour, and for many years was absolutely slighted and passed by. Barrini's instrument was condemned by the medical faculty of Vienna, early in the present century, most especially upon the ground of its deficient illuminating power. Fisher, Segalas, and others who attempted to follow up the study, found no better encouragement awaiting their labours. In fine, M. Desormeaux tells us how one of his teachers, unable to deny the reality of the instrument, merely asked him the question—"What use is it?" Yet, the answer to that query conveys its whole worth, namely—"It enables us to see parts which, without its aid, are wholly beyond the reach of vision."

Were it needful to illustrate the usefulness of our senses in the diagnosis of disease, I might aptly quote here the apologue of a witty physician of the olden time, alluded to by D'Alembert. He describes Nature and Disease engaged in mortal combat; a blind man armed with a club—the Physician—comes in to settle the difference. At first he tries to make peace; failing in this he lays

about him at random. If he hits Disease he slays it; if he hits Nature he kills the patient. Now, I would ask whether the Genius of modern medicine, which in so many instances has stricken the scales from off the eyes of the physician, and bestowed upon him the mighty gift of vision, has not wrought the miracle of making the blind to see, by enabling him to strike to the point, and no longer at random?

Let us for a moment contrast the predicament of the physician called upon to treat a malady which it is possible for him to see, and one hidden from his view. For example, let us take a case of diseased eye, and one of diseased urethra. He will not content himself by calling the former an *ophthalmia* without ascertaining what structure is engaged, and wherefore. He will examine the lids, the conjunctiva, the cornea, sclerotic, anterior chamber, lens, and, if need be, will take his ophthalmoscope and investigate the vitreous humour and retina. It is needless to say how much information he may obtain from this simple inspection, both as to the seat of the disease and as to its nature—whether traumatic, catarrhal, arthritic, syphilitic, scrofulous, or other. His correct diagnosis lays the foundation for a truthful prognosis and rational treatment. What, in contrast, is his position with respect to an ordinary case of gleet? In many, perhaps in most, instances, he can only guess out by uncertain symptoms and unreliable antecedent history, whether the discharge arises from simple catarrh, from chronic inflammation, from relaxed mucous membrane, from syphilitic ulceration, from herpetic excoriations, from a granular condition of a segment of the canal, from disease of the prostate, and so on. In his uncertainty his treatment must of necessity be empirical and his prognosis unreliable, because he can neither tell the nature of the disease, whether it be communicable or not, nor can he foresee whether it will be harmless in its results or likely to lay the foundation of organic constriction. The endoscope, however, alters the case materially, and for the better. By its aid the urethra can be seen and minutely examined from its orifice to the neck of the bladder, each single spec of disease ocularly demonstrated, and, if need be, subjected to precise local treatment.

The utility of the endoscope is not, however, confined to the diagnosis and treatment of diseases of the urethra—far otherwise. There is no portion of the human body into which a straight tube can be introduced in which it will not be found of service. With it the interior of the bladder may be thoroughly investigated;

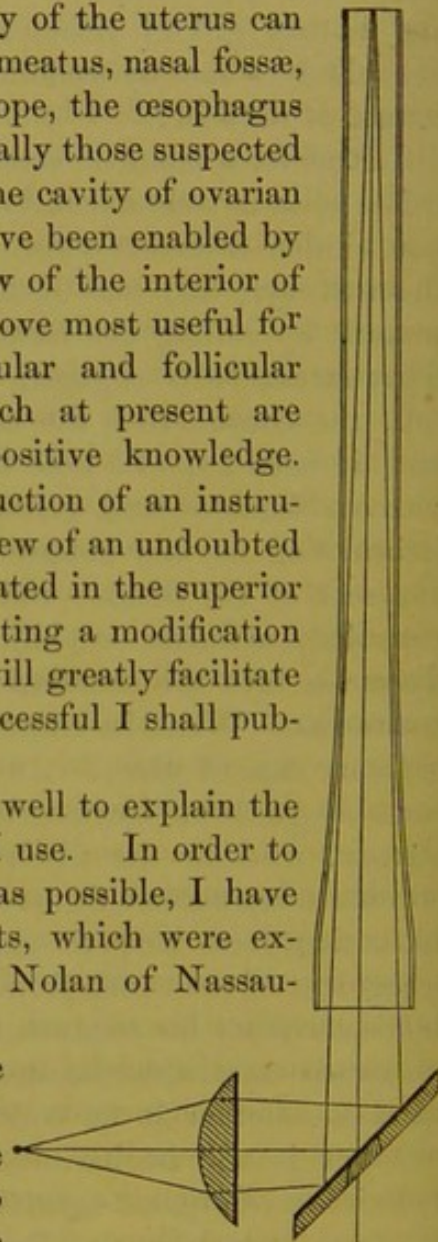
tumours, ulcerations, and sacculi recognized; calculi examined, and information gained as to their size, figure, number, position, whether encysted or loose, and so on. The rectum, beyond the reach of the finger and speculum, can be searched for ulcerations, constrictions, tumours, &c. The cavity of the uterus can be demonstrated; so also the auditory meatus, nasal fossæ, pharynx, larynx, and, I should even hope, the œsophagus and stomach. Likewise wounds, especially those suspected to contain foreign bodies, abscesses, the cavity of ovarian cysts after tapping, and so on. I have been enabled by the endoscope to obtain so clear a view of the interior of the uterus that I am satisfied it will prove most useful for the diagnosis of small polypi, granular and follicular ulcerations, and other affections, which at present are subjects of conjecture rather than positive knowledge. Just now I am engaged in the construction of an instrument, with which I hope to obtain a view of an undoubted case of disease of the œsophagus, situated in the superior third of that tube, and also in perfecting a modification of my endoscope, which, I anticipate, will greatly facilitate laryngoscopy. If my efforts prove successful I shall publish an account of these contrivances.

Before proceeding further it may be well to explain the construction of the instrument which I use. In order to render the description as intelligible as possible, I have introduced some explanatory wood-cuts, which were executed for me by Messrs. Browne and Nolan of Nassau-street.

Fig. 1 will assist in rendering the theory of my endoscope intelligible.

In the first place, there is a tube or speculum, which is introduced into the cavity to be examined; and at one extremity of this a mirror of polished silver, perforated in the centre, is placed at an angle of 45° . The function of the mirror is to reflect the light, which is placed laterally, into the tube, so as to illuminate it to the end. As the calibre of the tube is very small, a most brilliant light is required, and, in order to obtain the best effects, it should be made to converge slightly upon the mirror. This convergence is attained by interposing between the light and mirror a plano-convex lens of suitable focal length.

Fig. 1.



The light being sufficient, the lens properly adjusted, the mirror bright and correctly placed with respect to the tube, it becomes a matter of facility for the eye of the observer, looking through the perforation in the mirror, to see clearly to the bottom of the speculum.

Such is the endoscope I have adopted, in principle identical with that used in 1824 by Fisher of Boston, and of late years by M. Desormeaux of Paris.

To obtain a suitable light is *the grand difficulty* in the construction of the instrument, and it has cost me no inconsiderable labour to overcome this obstacle. Even at the end of my prolonged experiments I am compelled to acknowledge that the discovery of the illuminating power I have selected was to a great extent fortuitous.

Experiments which I need not recall here, but which are familiar to those who have made investigations with polarized light, led me to the knowledge that one of the brightest illuminations which can be obtained by any means is that given off by the *thin edge of the flat flame* of an ordinary petroleum lamp. Moreover, the steadiness and intensity of the light are manifestly increased by using an extra tall chimney; by enclosing the lamp in a lantern so constructed that atmospheric air *enters* from below only, thus causing an even draught; and by dissolving camphor in the petroleum, in the proportion of ten grains or more, to each fluid ounce. The camphor increases the quantity of carbon in the petroleum, while the arrangements directed to procure a good draught secure its complete combustion. I may further observe, that this light possesses the advantages of cheapness, freedom from danger, and total independence of such care in operation as to demand the aid of an assistant specially devoted to it. Similar attractions do not exist for the magnesium wire, oxycalcium or Drummond lights, or for that produced by electricity, which latter was proposed forty years ago for Fisher's apparatus by Professor Patterson.

Such then is the light I use and recommend, and I believe it will be found applicable to many other instruments. It is open, undoubtedly, to two objections. First, that it produces considerable heat; and secondly, the pencil of rays being extremely narrow, a very perfect adjusting apparatus is required to facilitate the movements of the lens and inclined mirror, so as to take advantage of it under all circumstances. I shall presently explain the means by which these disadvantages are obviated, and perfect facility attained in the use of my endoscope.

Fig. 2 shows it in sectional view. It consists of a lantern, in the interior of which the lamp is suspended by means of a diaphragm, which slides in grooves and holds it perfectly steady. The lamp is so placed when in the lantern that the *edge* of the flame is opposite the aperture of the tube, *a*. This tube rotates freely in the socket which receives it, and carries the condensing lens. It is attached at right angles to another tube, *b*, which, in the woodcut, for clearness sake is represented in the vertical position. This latter tube holds the perforated mirror, and terminates at one end in a socket, which, by means of a thumb-screw, can be fitted to the various exploring specula, while at the other extremity is placed an eye-piece through which the observer looks. Although represented in Fig. 2 in the vertical position in order to show a section of its interior, in use it is kept as nearly as possible horizontal, as delineated in Fig. 3. In order to protect the observer's eye from glare, as much as possible, a conical diaphragm with a very minute aperture is placed directly behind the perforated mirror, and the interior of the apparatus and specula is carefully blackened. To suit myopic and presbyopic eyes, adjusting glasses are provided, and, when required, take the place of the eye-piece.

To prevent inconvenience from the great heat evolved by this powerful light, the lantern is made of mahogany, and consequently never becomes so warm as to inconvenience the hand; were it of metal it would soon be impossible even to touch it. This end is further carried out by having the top open, and air-holes perforated in the lower part of its sides (*vide* Fig. 3) and in the diaphragm. These arrangements produce a constant draught of cool air through the apparatus which has the additional good effect of steadying and intensifying the flame.

The mode of adjustment of the condensing lens and mirror to the pencil of light given off by the edge of the flame is the next point to be explained. The tube, *a*, (Fig. 2), is received into a socket, wherein it freely rotates; this socket is mounted on a doubly shifting stage, the mechanism of which will be best understood by reference to

Fig. 2.

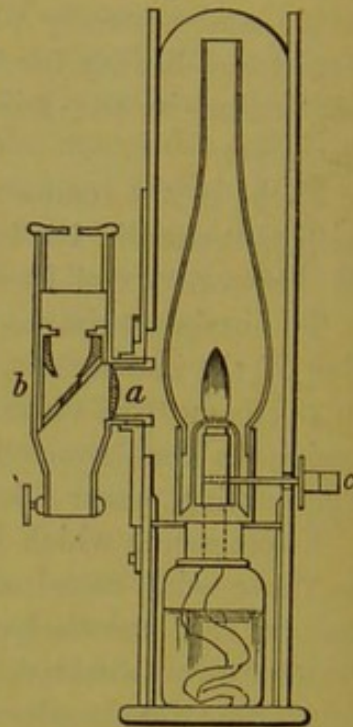
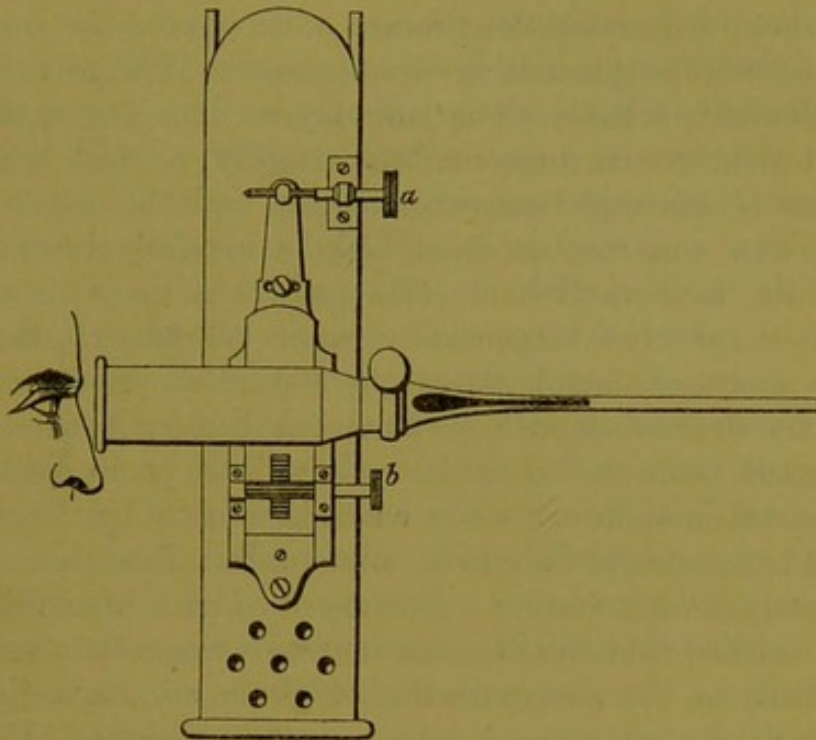


Fig. 3. It admits, as may easily be seen, of two motions, right and left, governed by the tangent screw, *a*; up and down, regulated by the rack and pinion, *b*.



left, governed by the tangent screw, *a*; up and down, regulated by the rack and pinion, *b*. By this contrivance the lens can be easily shifted about as required. The height of the flame itself is regulated by the button, *c*, (Fig. 2), and requires special attention. It must be so arranged that no smoking takes place, as the least imperfection in combustion at once causes deterioration in the quality of the light. As I mentioned before the light evolved in the way described is amazingly intense, so much so that if the observer looks *directly* at it, even for a few seconds, his eye will be dazzled and rendered unfit for making an endoscopic examination for some time after. Hence it is advisable to acquire the habit of adjusting the instrument for use with a test object, or with the interposition of smoked glasses. Habit has rendered it easy for me to adjust with a test object. I ordinarily use for the purpose a plate such as the accompanying chromo-lithograph; I pin this against the wall, and, having lighted the lamp and duly regulated the flame, I hold the endoscope with the left hand in the position represented in Fig. 3, and place the end of the speculum over one of the coloured figures. Then, looking through the aperture of the eye-piece, with the right hand I move the lower milled head, *b*, until I get the brightest light, and then rotate the upper screw, *a*, until the definition becomes perfect. By slight changes effected in this manner I can regulate

the light so as to obtain the clearest possible view of whatever I am examining. All this, moreover, can be done in fewer seconds than it takes to describe the process. To obtain the best effect from the light a few precautions are requisite. The room in which the examination is made, so far as may be convenient, should be darkened; the lantern must be held steadily vertical, whatsoever the position of the exploring tube may be, and the whole interior of the lantern and specula must be kept carefully blackened. I find that the best varnish for this purpose is made by adding a few drops of spirits of turpentine to some lampblack, procured by holding a piece of metal plate over a candle. Thus made, the varnish may be laid on with a camel hair brush; it dries rapidly, leaving a dull black surface which reflects little or no light.

All who are familiar with the endoscope used by Desormeaux will notice the points in which mine differs from his, and the advantages peculiar to mine. For my own part, after full trial, I am quite satisfied that the illumination in Desormeaux's instrument is insufficient for the discrimination of those minute variations of colour which denote various pathological conditions. Mr. Dick, in his valuable Essay on Gleet,^a speaks in terms which lead me to believe that he also has not obtained more satisfaction with it than I have myself. Undoubtedly, M. Desormeaux's vast experience may compensate for deficiency in his apparatus; but, I believe, I may venture to assert that, with my endoscope, any one, however unpractised, can *at once* see whatever lies at the bottom of the exploring specula with as much clearness as though it were on the surface of the body. Desormeaux's light is that of a small round gazogene flame, without even a draught chimney. The illumination it produces is lurid, unsteady, and, despite the reflecting condenser, quite deficient. I think it no more comparable to that which I have described than twilight to daylight.

I have not been able to discover any published allusion to the greater brilliancy of the *thin edge* over other portions of a flat flame, although I am aware that M. Arago has noticed that the light proceeding therefrom is the best polarized. On showing my endoscope to the Rev. Mr. Jellet, Professor of Natural Philosophy in the University of Dublin, whose præeminent authority upon the subject is universally acknowledged, I learned that he too had discovered the fact some time since; he attributes it to the circumstance that the illumination given off from the thin edge of a flat

^a Dick on Gleet. London, 1857. Page 7.

flame, partakes of the luminosity of the *whole depth* of the flame, inasmuch as light permits the passage of light through itself without loss. It may be possible, too, that the more perfect combustion of the edge, due to freer contact with the air, augments its brilliancy.

In my instrument I usually dispense with the reflector, because it is rarely, if ever, required. For such cases as may

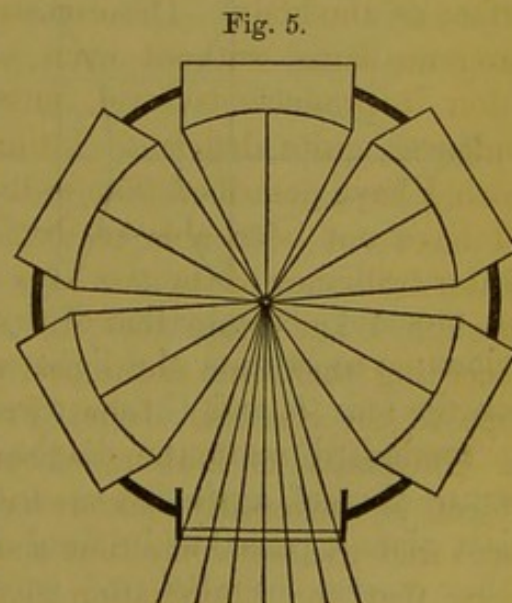
need it I have had a special reflecting chimney constructed, which is represented, in section, by Fig. 4. It consists of a copper tube, shaped like an ordinary draught chimney, having, at one side, at the level of the flame, a small window of parallel plate glass (represented on the right hand in the woodcut), and on the side opposite thereto, a flat silver reflector so arranged that when the flame is lighting it can be pushed close up to it. While in use, the chimney is so placed that the window destined to transmit the light is opposite to one edge of the flame, while the reflector lies close up to the other.



Two good effects are obtained by this apparatus. In the first place the light is reduplicated by the mirror; and, moreover, the rays do not suffer in passing through the plate glass window the dispersion which is inevitable with the common round glass chimney.

The precise amount of increase of light depends on circumstances; at best, it does not exceed one half with a single mirror, as fully that quantity is lost by absorption in reflection. Were it needful, the illumination might be increased almost indefinitely by surrounding the flame with a series of concave reflectors, as represented in Fig. 5, having their foci

in a point in the flame; however, in my endoscope, as at present used, I think there is ample light, and it is very desirable to avoid complexity as much as possible. One serious objection to reflectors is the difficulty of keeping them clean enough to be effective. The best material of which to make them is silver, somewhat hardened by alloy; it is easily polished, bears heat well, and when tarnished may be readily



brightened with a bit of soft chamois leather. I avoid smutching

of the reflector in the chimney represented in Fig. 4 by not pushing it up near to the flame until the latter is adjusted to the proper size, and has become steady. The best shape for the flame is the triangular, the apex being above and the base inferiorly. This form is easily obtained by cutting the top of the wick to the form of a semicircle, and by keeping it, while lighting, well below the diaphragm of the lamp. If these precautions be neglected the flame is apt to become bifid and to spread out, and the light will be seriously depreciated.

It will be noticed that with the instrument which I use (*vide* Fig. 1) the light is disposed in converging rays. These suit best provided the specula are of moderate and definite length, and the luminous rays so arranged as to converge at their extremities, where invariably are situated the objects we seek to examine. However, if in the prosecution of endoscopic studies it should become desirable to use specula of considerable length, it will then be necessary to obtain rays of light at least sensibly parallel.

Practically speaking this is a difficult matter in the construction of optical instruments; nevertheless it may be attained approximately, if not absolutely, by the excellent combination used by the Rev. Professor Jellet, in his saccharometer, and delineated in Fig. 6. This combination is fundamentally identical with that originally proposed by Huyghens.

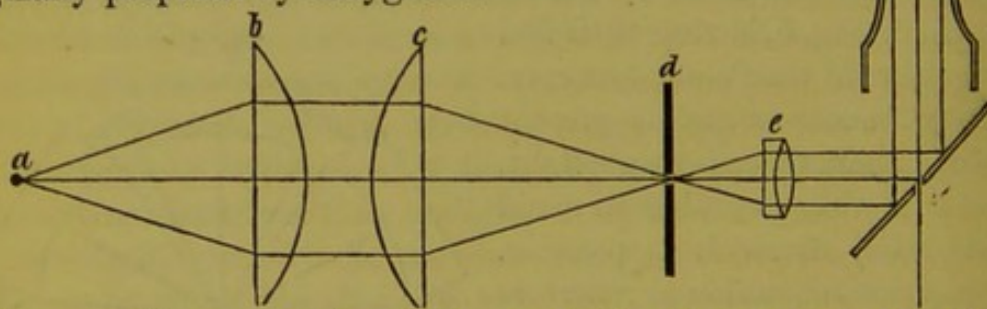


Fig. 6.

A moment's examination of the woodcut will render its principle obvious: *a* represents the light whose diverging rays are received upon the lens *b*, and thence transmitted parallel to *c*. By *c* they are condensed upon the diaphragm *d*, and, passing through the aperture thereof, again diverge and are received upon an achromatic object glass *e*, placed at its focal distance from *d*. Having traversed *e*, they emerge *parallel*, and may be deflected at right angles into the speculum by means of a diagonal light-piece, as in Fig. 1. By

such an arrangement a very long speculum might be well illuminated to its extremity. To simplify matters we might use a single double convex condenser, placing the light and diaphragm in its conjugate foci; however, by adopting the two plano convex lenses, as represented in Fig. 6, we avoid the amount of spherical aberration inevitable with a single glass.

It is scarcely needful to observe that such a combination is troublesome to manipulate, and keep in good working order, and therefore undesirable for the endoscope; nevertheless, under circumstances requiring the illumination of a very long speculum, it might be adopted with advantage. Just at present I am engaged in a series of experiments to ascertain its powers and adaptability.

It is unnecessary to observe that all artificial light is vastly inferior to a solar ray, but the practical difficulty of obtaining the latter is an insurmountable obstacle to its general adoption. Occasionally, however, it may be used; latterly I have succeeded, by means of a very simple device, in obtaining solar light for the endoscope whenever the day is unclouded.

I have a small concave mirror, mounted with a universal joint, which I can place in any window receiving direct sunlight, and easily adjust so as to throw a reflected ray into the room in any direction that may be convenient. If it were requisite to keep the room dark, the ray of sunlight might be received through a hole in the shutter, which should then be kept closed. Having placed the patient in a suitable position, and introduced the requisite speculum (in the manner which we shall later describe in detail), I attach thereto the tube *b*, Fig. 2, having first withdrawn the condensing lens, and proceed to manipulate the solar mirror until I get a converging pencil of light to fall upon the inclined reflector.

The illumination thus obtained is manifestly superior to any other, and serves well as a standard wherewith to correct and estimate appearances noticed with artificial light. In all cases of difficulty, which might admit of delay, I should prefer to use solar light. For prolonged examinations it might be desirable to have a mirror constructed to move by clock work, so as to keep pace with the sun's course. Practically speaking, I have not found this requisite, although I admit there is no small difficulty in the manipulation of the solar mirror. Practice will, doubtless, remedy this; and later I hope to succeed in greatly improving the appliances for endoscopy with sunlight.

Besides a good illuminating power we require for the endoscope

a variety of specula, adapted to the exploration of different regions of the body.

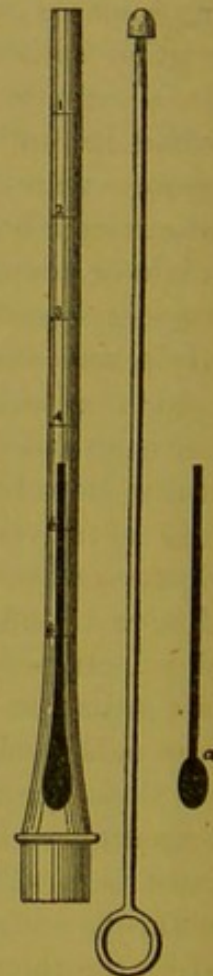
For general use the urethral tube, represented in Fig. 7, can hardly be excelled. It consists of a narrow portion, the size of a large catheter, which is just six inches in length; the remainder gradually dilates to form the part which fits into the receiving socket, wherein it is secured by means of a thumb-screw.

A wire stilette surmounted by a plug is provided, which can be inserted into the tube in order to facilitate its introduction into narrow canals such as the urethra. At one side there is an opening, wide above and narrow below, intended to admit probes, carrying either cotton wadding or sponge to wipe the parts under examination, or caustic or other applications for the purposes of treatment. I think the shape designated in the tube represented in the woodcut the most convenient. Desormeaux prefers an orifice such as is represented alongside of it at *a*; but, in practice finding the angular shoulder inconvenient, I have had it rounded off in mine. It is useful, moreover, to have the tube graduated in inches, in order to show at once the exact depth to which it has penetrated.

Three or four sizes of these urethral tubes are required. They answer remarkably well for other situations, such as the uterine cavity, nasal fossæ, &c. By the aid of one I was lately enabled to ascertain, in a patient of my own, the precise attachment of a huge nasal polypus. In another case of obstructed nostrils, which Dr. Stokes requested me to examine, I was able with such a tube to exhibit a quantity of small gelatinous polypi situated high up and far back out of sight, which produced all the annoyance.

For the exploration of the rectum a tube eight or nine inches long and more than half-an-inch in diameter may be provided. With such an instrument Mr. Connolly was able to make a drawing (case of M. W., Fig. I. chromo-lithograph) of a stricture of the rectum in a patient now under my care. For the examination of the external meatus of the ear and membrana tympani, and for the

Fig. 7.



performance of operations thereon, I have had an auriscope made, which is represented by Fig. 8. Already I have found it most useful. Although not comparable to a direct ray of sunlight, yet, in its absence it makes a reasonably good substitute, and the oblong lateral aperture allows of the introduction of suitable implements, which can be manipulated under the eye of the examiner. I am disposed to think that it would be still more convenient if made upon a skeleton pattern, as thus greater facility in the management of instruments would be obtained. During the early part of the past winter I was baffled from day to day by the darkness of the weather in my efforts to obtain a view of the membrana tympani in a lady whom I attended for a sudden attack of deafness. At last I used a rude ear speculum, fashioned at the time to suit my endoscope, and at once obtained an excellent view of the parts. Since then I have frequently used my auriscope with the most satisfactory results.

Fig. 8.



So far as my experience goes to carry out that of Desormeaux, the most useful field for the operation of the endoscope is the urethra. By its aid diseases of this part, otherwise merely subjects of conjecture and empiricism, are rendered as clear as to diagnosis and as satisfactory respecting treatment, as affections of the eye, or of any other external portion of the body patent to view. Before entering upon the study of the diseases of the urethra, I may premise a few words upon the operation of examining it endoscopically.

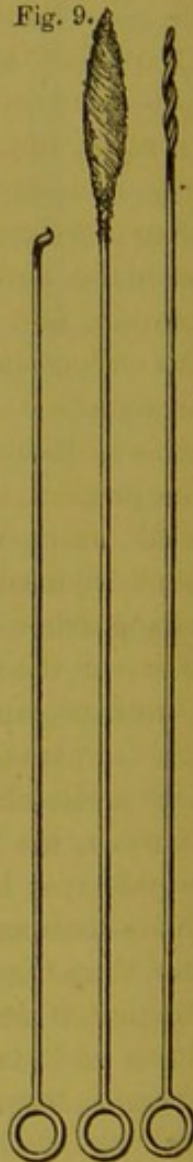
If the urethra is free from constriction, which can easily be ascertained with a bougie, the best course is to examine it from the neck of the bladder to the glans penis. To do so we should place the patient in a suitable position. In default of a proper couch, such as Heurteloup's, specially made for the purpose, I place him reclining in an easy arm-chair, with the buttocks near the edge of the seat, and with the thighs well separated. Kneeling between the latter I introduce the tube with plug well oiled, until, by its direction, I know that it has passed the triangular ligament of the perineum. I then introduce the index finger of the left hand (previously well greased) into the rectum, and guide the passage of the tube through the membranous portion of the urethra into the prostatic region. So soon as it has traversed the latter, I withdraw the finger from the rectum, extract the plug from the tube, and attach the endoscope, which should previously be lighted and adjusted. Now,

holding the endoscope in the left hand, I proceed gradually to withdraw it at the same time that I keep my eye closely applied to the eye-piece of the instrument. In order thoroughly to investigate the canal it is well, while withdrawing the endoscope, occasionally to re-introduce it a line or two, and to increase or diminish the light; thus views are obtained which may clear up points otherwise somewhat obscure.

As the tube traverses each portion of the canal, the lining membrane comes into full view bit by bit. If a difficulty occur in seeing any portion it will generally be found to arise from oil, blood, mucus, or some other fluid, obscuring the surface. This impediment is easily remedied.

Before proceeding to the examination a number of rods, with screw ends, such as represented in Fig 9, should be prepared by winding the extremities with cotton wadding, and some should be provided with portions of fine moist sponge securely tied on.

When any obscurity of vision arises, one of the rods should be taken in the right hand, introduced into the lateral slit in the tube, and passed down to its extremity; a little pressure and a rotation or two suffice usually to take up the fluid, and the rod may then be withdrawn. Sometimes it will happen that the wadding or sponge is left behind, and to meet this emergency a little blunt hook, such as represented alongside of the rods in Fig 9, should be at hand; this may be passed down to the sponge or wadding and rotated once or twice; though blunt it immediately becomes engaged therein, and by its aid the substance can be withdrawn. I prefer this hook to Desormeaux's miniature cork screw, as being much safer and less liable to do mischief. During an endoscopic examination this wiping of the part may frequently need repetition. The screw end on the rods facilitates the removal of the cotton when soiled. It is hardly necessary to observe that the strictest care is required in the cleansing of the endoscope and its appurtenances, lest it ever should become a medium for the transmission of infection from case to case.



In the introduction of the endoscope catheter it is necessary to be careful not to enter the bladder lest a rush of urine fill it up and embarrass the examination. This is no needless precaution, for habit will teach that a straight instrument enters the bladder with almost as much facility as a curved one. This fact is well known to the continental surgeons, who mostly use catheters, either straight or nearly so.

I may also observe that the index finger of the right hand, well oiled, may, from time to time, be slipped into the rectum during the examination of the deeper portions of the urethra, as by its aid we are able to ascertain the position of the extremity of the tube, and to identify the portion which may be diseased. Thus I have frequently been able to ascertain, with positive certainty, morbid conditions of the prostatic, membranous, and bulbar sections of the canal. In cases of stricture or disease anterior to the bulb it is not requisite to place the patient reclining on a couch—he may simply stand with his back against the wall, the operator kneeling in front of him. I should here mention that the optical portion of my endoscope has been made for me by Messrs. Spencer of Aungier-street, Dublin, while the specula and other fittings were made partly by Charrière of Paris, and partly by Messrs. Thompson and O'Neill of this city. Messrs. Fannin have given me to understand that they intend to supply the instrument perfect in all details.

Before attempting to form opinions respecting morbid conditions of the urethra, our first task must be to learn its appearance in the natural state. Hence we should take as many opportunities as present themselves of studying its aspect apart from all changes resulting from disease. A little experience shows how imperfect an idea of the colour and appearance of the mucous membrane of the urethra during life, can be obtained by its inspection after death. In place of the various hues of yellowish-white, red, and violet, which mechanical anemia or congestion give to the part in the dead-room, we find it in health, in the living subject, throughout of a pale rose tint, its surface smooth and polished, and glistening with its coating of mucus. One portion is usually of much deeper colour than the remainder, namely, the region of the glans. This, I imagine, is due to the extraordinary vascularity of that part.

In an endoscopic examination we cannot see (at least I have not seen, nor has Desormeaux) the orifices of lacunæ, nor of the ejaculatory ducts, nor the verumontanum; the catheter seems to

efface these parts in its transit; but we can observe the colour and state of the lining mucous membrane, and notice how, disposed in longitudinal folds, it closes centripetally upon the opening of the tube, giving to the portion in view the outline of the cloaca of a bird, or, in miniature, the appearance of the vagina during withdrawal of the speculum (*vide* Fig. V., chromo-lithograph). This fashion in which the urethra closes upon the tube is important to notice, because it is peculiar to the elastic and supple condition of health.

No more fascinating temptation could present itself to my mind, at the present time, than the wish to enter into a full analysis of M. Desormeaux's beautiful and philosophical discussion of the subject of urethritis, occupying from page 26 to page 83 of his memoir; but I feel that the suitable limits of an article such as the present would render the attempt impossible. I shall, therefore, make but a few remarks on the subject, and hope I may thereby enlist the interest of others in this most important investigation.

Physicians are well aware that inflammation of the urethra, accompanied by discharge, may arise from many different causes; and, inasmuch as the course and consequences of such affections vary with their origin, a positive diagnosis, especially in the chronic stages, is needful both for the satisfaction of the practitioner and the advantage of the patient.

Urethritis, for the most part arising from *specific contagion*, may nevertheless, be produced by the passage of a catheter, by contact with nonspecific vaginal discharges or with chancrous pus, by venereal excesses, errors of diet, ingestion of irritant articles of food and drink, the use of cantharides, the influence of teething, intestinal worms, herpetic, rheumatic, and gouty affections, and other causes needless to enumerate.

Under all these various circumstances its course and consequences vary materially.

The *leading distinction* consists in the fact, that while all other varieties incline more or less certainly and rapidly to a natural cure, that which arises from specific contagion, or blennorrhagia, tends to run a regular and lengthened course, and to merge into a chronic form, characterized by slight colourless discharge, or blennorrhœa as it is termed, uneasiness in the perineal region, and an insidiously increasing difficulty in micturition, which finally, if neglected, terminates in organic urethral stricture. Such being the case, it is a matter of vital importance to study with the endoscope the clinical

history of this malady, to watch its course, and to ascertain whether there be any signs by which it can be recognized without fail, or any mode of treatment by which the above mentioned untoward results may be prevented.

The earlier stages of blennorrhagia are characterized by inflammation of so painful a description that the use of the endoscope is wholly impossible. However, when the more acute irritation subsides, we are able to notice that the inflammation of the passage *spreads gradually backwards* until finally it reaches the prostatic region. From this period out it selects, usually, one of two courses. It either gradually abates completely and leaves the parts as they were before, or it settles in the posterior part of the canal, from the bulbar to the prostatic portion, and there brings about changes which we shall proceed to consider.

Having once seized upon the deeper portion of the canal, the bulbar region appearing to be its place of selection beyond all others, the inflammatory action assumes a new type. In place of the simple redness of the mucous membrane, and unevenness from stripping of the epithelium, hitherto observed, the part assumes the appearance of the conjunctiva of a chronically inflamed eyelid, and, in fact, becomes *granular*.

This granular condition, once fully established, appears to have no natural tendency whatever to cure, but rather goes on to the production of submucous effusion, which causes more or less coarctation of the canal and distress in micturition. This form of constriction of the urethra, as well as that from tumefaction of the mucous membrane occurring in the earlier stages of the complaint, differs essentially from the true organic stricture, wherein the granular stage, now under consideration, is certain to end sooner or later if neglected.

The pathological condition just described constitutes a stage in the course of the disease at which the patient is very likely to seek advice. The symptoms are sufficiently characteristic. He complains of a slight discharge, especially noticeable in the morning, often but not always, colourless; of some little trouble in passing the urine, which, if examined, is found to contain lymphic floculæ; of some tenderness in the perineal region; and, in addition, details the history of an antecedent blennorrhagia of date more or less remote. If a bougie be introduced it will discover a painful spot in some portion of the urethra, and will, most probably, when withdrawn, be found tinged with blood.

In such cases the endoscope clears up all doubt, and in the great majority of instances enables us to recognize the granular condition in some portions of the canal. This once ascertained, treatment is a matter of facility. Cauterization which cures granular conditions of mucous membranes elsewhere—in the eyelids, uterus, &c.—will cure it here; and, thanks to the endoscope, can easily be applied to the exact spot diseased. Some caution is needed in the application of caustic for the cure of granular urethritis. The method which I prefer is as follows:—Having brought the anterior portion of the granulating surface into view I first carefully wipe it dry with a portion of wadding carried down by a suitable rod. I next take a second rod, armed also with cotton wadding, and, having moistened it with a solution of nitrate of silver or sulphate of copper (xv.—xxx. gr.—ʒi), pass it down to the diseased part and hold it in contact therewith for a few seconds. I then withdraw the rod and endoscope catheter. This operation causes very bearable pain, which may be removed by a warm bath and moderate anodyne. In the milder cases when next we proceed to use the caustic—perhaps in the course of four or five days—we find that the portion last touched is healed, and that the endoscope catheter penetrates further than before without causing pain. Another portion may now be cauterized, and in like manner, by degrees, the whole diseased surface cured. Under the influence of the caustic the granulations are removed—certainly, though rarely quickly—submucous effusion is absorbed—constriction disappears—and finally, the parts return to a condition of health from which they are not liable to relapse spontaneously.

For illustration sake I may here give brief notes of a case of chronic granular urethritis which lately came under my notice and care. J. N., a gentleman aged twenty-four years, of strumous and delicate constitution, contracted blennorrhagia fifteen months ago. When almost entirely well of it he caught a second infection some months later. Now the disease showed itself obstinate, and, despite a vast amount of treatment he retained a chronic discharge, with some scalding, some uneasiness in the perineum, and latterly he was annoyed by slight dysuria, and by a swelled and tender testicle. About the close of last February he placed himself under my charge.

I at once carefully examined the urethra with the endoscope, from the neck of the bladder to the orifice. The condition of parts which I discovered was as follows:—The prostatic portion of the

urethra was injected and slightly inflamed; the membranous portion was quite healthy; the bulbous portion was *ulcerated and granular*, exquisitely tender, and bleeding on the most gentle touch. Its appearance is well represented by Figures II. and III. of the accompanying chromo-lithograph, which has been admirably executed for me by Mr. Lewis, of Dame-street, from a drawing taken from nature by the accomplished artist, Mr. Connolly. Fig. II. shows the granular condition well marked, and Fig. III. exhibits it smeared over with blood which has just exuded from its surface. Fig. V. represents the healthy appearance of the anterior portion of the urethra in the same patient. Having made a precise and satisfactory diagnosis, I proceeded, with the help of the endoscope, to cauterize the granular ulceration, commencing from before, and passing backwards. Fig. IV. shows the appearance immediately after each cauterization. The case rapidly got well, and after six cauterizations, extending over a period of five weeks, the granulations were removed, and the endoscope catheter could be passed into the bladder without causing the slightest pain. The discharge and perineal uneasiness also disappeared, and the swelling of the testicle—which I attribute to engorgement of the prostatic portion of the urethra, caused by the slight obstruction in micturition—having yielded to strapping, has not shown the least tendency to return. Of the utility of the endoscope in this case I shall only remark that, in the first place, it enabled me to make a precise diagnosis at once, and subsequently greatly facilitated treatment. I do not know how I could have cured this case without its aid, because strong caustic solutions were required to conquer the granular ulceration of the bulbar region, and I could not have used injections of adequate potency without seriously damaging the anterior part of the canal, which was sound.

From this and other cases which I have examined and treated, as well as from M. Desormeaux's more extensive experience, I am strongly disposed to believe that the chronic granular urethritis which I have just described, is the pathological condition most frequently associated with gleet, and constitutes the transition stage between the acute inflammatory constriction produced by blennorrhagia, and its final issue in organic stricture.

I think it scarcely needful to speak of the importance of diagnosis in this affection, or to urge the utility of the endoscope respecting it. To this instrument our knowledge of the disease is entirely due, as well as our present ability to treat and control it. The absolute

necessity of efficient treatment is urged upon us by two serious considerations. In the first place, the discharge from the granular surface is undoubtedly contagious, as M. Thiry of Brussels has proved experimentally, and retains this quality in every stage of its existence. M. Desormeaux^a mentions a case which clearly proves its infectious nature, even when the disease had become so chronic that it actually escaped the notice of the patient. Moreover, if left uncured, granular urethritis is certain, sooner or later, to produce organic stricture. The submucous effusion becomes organized, the inflammation spreads to the fibrous structures of the urethra, and the whole morbid mass terminates by undergoing a cicatricial shrinking, which produces contraction notoriously difficult to remedy. The time occupied in the process is uncertain, but the final result none the less sure in the vast majority of cases. A few years generally suffice, although there are marked exceptions. Desormeaux^b mentions one case in which chronic granular urethritis existed for eleven years without producing organic stricture, and another^c of over forty years' standing, in which that stage had not been reached. I have good reason to believe that the disease has existed nine or ten years in a patient lately brought to me by my friend Dr. James Brady, and yet in that instance no stricture exists.

There is one circumstance connected with chronic granular urethritis of great significance, namely, that during its entire duration it is liable under the stimulus of erotic excitement to assume an acute form, with muco-purulent discharge. Herein, I believe, lies the explanation of the supposed proclivity of individuals to infection, which is familiar enough to the practitioner.

Desormeaux makes the highly interesting and important observation that, for the most part, whenever we find a chronic and intractable inflammation of the testicle, an endoscopic examination will exhibit granular disease in some deep portion of the urethra. This fact, if discoverable, will always give a valuable hint relative to the origin and treatment of this complication, and the absence of the urethral affection may, perhaps, even be looked on as presumptively diagnostic of a disease of the testicle, arising from some other cause, such as tuberculosis, not directly connected with the urino-genital organs. It will probably occur to many that Desormeaux's observation is but a confirmation of an opinion held long ago by Mr. Ramsden of St. Bartholomew's Hospital, whereby he

^a Op cit, page 69.

^b Op. cit., p. 48.

^c Op. cit., p. 55.

connected many chronic affections of the testicle with disease of the deeper portion of the urethra.

The length to which the foregoing observations have extended forbids any attempt to enter upon the description of the endoscopic appearances presented by other urethral inflammations, as well as any allusion to the complications and treatment of each. I may however observe in brief that in no disease, blennorrhœa alone excepted, do we find a *persistent* granular condition of one portion of the passage, with submucous effusion and consequent chronic inflammatory constriction of the canal. In a future paper, I hope to discuss at greater length the subject of urethritis and its varieties.

Heretofore we have discussed the value of the endoscope principally in reference to the study of blennorrhœa. Now we shall consider the light which it is capable of throwing upon that disastrous and frequent sequel of blennorrhœa—urethral stricture. Without entering into any exhaustive discussion upon stricture, we may here call to mind the three varieties which are immediately connected with specific urethritis:—

First.—The acute inflammatory form, due to tumefaction of the mucous membrane, and seen during the height of the ailment.

Secondly.—The chronic inflammatory constriction produced by the granular state of the canal already described. And

Thirdly.—The true organic stricture, due to the cicatrization of parts long the subject of the granular condition.

These varieties, it is plain enough, are merely different stages of the same disease. Of the first we have little to remark in connexion with endoscopy; the tenderness of the parts forbids the use of the instrument, and the urgent symptoms subside naturally with the abatement of the acute stage of the blennorrhœa. The second variety, though but little understood hitherto, is of great importance. The existence of this transition stage between the acute inflammatory and organic stricture was first, I believe, pointed out by M. Robert, but our knowledge of its etiology, and our powers of rational treatment, as we have seen, are solely the work of the endoscope.

The third variety, or organic stricture, remains to be considered.

We shall not delay long upon the anatomy of organic stricture; suffice it to say that in the vast majority of cases it is neither more nor less than a cicatricial condition of parts long diseased, and is itself actually the result of the cure of the preceding stage, or

chronic granular urethritis; just as contraction of the fingers is often the result of the healing of ulceration following a burn or injury of the palm of the hand. Traumatic stricture, too, although different as to its mode of origin, is very similar in its organization. Like other cicatrices organic stricture is indurated, sparingly vascular, contractile, and little susceptible of vital processes. Hence we find it difficult to dilate, and when dilated speedy to re-contract; difficult, in fact, to get rid of by any process natural to highly organized structures. Its treatment necessitates far more than the chronic inflammatory or granular constriction already considered, and to obtain even a temporary success we must either cut or burst through it; in fact treat it as we would a cicatrix in any other situation which produced untoward effects by its tightness.

For these reasons it is manifest that a precise diagnosis is absolutely necessary; and inasmuch as the selection of the mode of treatment depends upon that diagnosis, the sooner it is made the better. The endoscope alone, I believe, can enable us in all cases to arrive immediately at a positive conclusion on the subject.

An experienced hand, armed with the instruments in common use, especially the bougie terminating in a bulbous extremity, or "bougie à boule" of the French writers, can, in many instances, ascertain, without further aid, a great deal about a stricture; but certain points, nevertheless, are left in obscurity. With the help of such a bougie the existence and seat of obstructions can be learned with tolerable accuracy, also their number, length, calibre, elasticity, retractility, and consistence, yet, much experience and habit is required on the part of the examiner, and skilful practitioners will differ from time to time regarding the nature of a particular case, thereby proving the doubtfulness of the matter.

The endoscope, however, clears up all uncertainty, enabling us, upon the moment, to see the constriction and make a positive diagnosis of its nature. Furthermore, it shows us the form of its anterior extremity, the exact position of the orifice, and the colour and state of the mucous membrane in its neighbourhood.

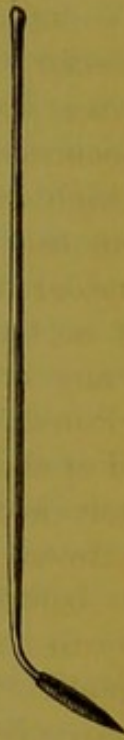
Nothing in medicine can be more certain than the diagnosis of organic stricture with the aid of the endoscope. On bringing the part into view we find it to present either the dull whitish aspect with which we are familiar in cicatrices in other situations, and in *post mortem* examinations of strictured urethræ; or we discover its

investing mucous membrane injected, red, or even granular, and ulcerated.

On proceeding to examine the parts with a probe, such as is represented by Fig. 10, introduced through the aperture in the exploring tube, we obtain information of a perfectly conclusive nature. When the constriction is organic, the parts touched with the probe, whatsoever their appearance may be, give a most characteristic sensation of induration, and move *en masse* before it. The actual amount of hardness is thus easily felt and recognized.

On proceeding to withdraw slightly the instrument, we observe the manner in which the consolidated and inelastic parts refuse to follow and close up after it; and on re-introducing the tube, the eye of the observer remaining undisturbed, we notice the fashion in which the immovable face of the stricture abruptly comes again into view. Nothing can be more characteristic than the signs just described. Written descriptions fail often to convey sensations easily understood when experienced, but I am quite positive that any one who has once examined endoscopically an organic stricture of the urethra, will acknowledge the impossibility of confounding it with a fold of mucous membrane, with a deviation in the canal, with the obstruction sometimes offered by the triangular ligament of the perineum, or, in fact, with any other condition of the part.

Besides aiding in the diagnosis of stricture the endoscope shows us many interesting points connected with it. It enables us easily to recognize the configuration of its anterior extremity, and a little experience shows us how this varies. Sometimes it is infundibuliform, sometimes shelf-like, sometimes presenting a number of minute projections which surround more or less regularly the orifice. On the whole, I think the latter disposition is most commonly met with, and corresponds to what Desormeaux terms "la forme mamelonnée." The orifice of the stricture can in most cases be easily made out, and we notice how much it varies in position. For the most part I have found it situate in the lower segment of the urethral tube, as if the deposit of indurated tissue were principally confined to its pubic aspect; but in this respect it varies much; occasionally it is very difficult to make it out, even after careful examination with the probe. I have noticed one circumstance in a great number of cases which I believe to be



worth recording, namely, that the parts *immediately surrounding the orifice* are more prone to bleed when probed than other portions. This fact has often given me a valuable hint, and induced me to persevere in my endeavours to penetrate the opening.

I need hardly observe that the variation in the form of the anterior aspects of strictures, and in the position of their orifices, such as I now mention, satisfactorily explains the facility or difficulty which cases present in the introduction of an instrument into the bladder. Many of my *confrères* in Dublin, who have done me the honour of inviting me to examine their cases, and of inspecting some of mine, will call to mind the applicability of the foregoing remarks upon urethral strictures to instances in which I have demonstrated all that I now put forward.

After what I have already stated of the use of the endoscope in the examination of strictures, it is hardly necessary for me to insist upon its manifest utility in their treatment.

As we have seen, it lends itself to the discovery of the orifice and to the introduction of a probe, and this first step in treatment paves the way to cure; nay more, under circumstances of great difficulty, in retention of urine, it may enable the practitioner to penetrate the obstruction, and thus save him from the serious alternative of puncturing the bladder, or of cutting down upon the stricture in the perineum without the aid of a director. M. Desormeaux mentions such a case which occurred in his practice,^a and a somewhat analogous one has happened in mine.

M. Desormeaux's case was that of a man named M., aged thirty-six years, who laboured under stricture of traumatic origin for five years. At the end of this time, being in great suffering, he entered the Hôpital Necker in December, 1862, under the care of M. Civiale. This eminent and accomplished catheterist tried, during twenty-eight days, to pass an instrument into the stricture, but without success. He then called upon M. Desormeaux to try what he could do with the endoscope. M. Desormeaux, at the second endoscopic *séance*, January 11th, 1863, succeeded in passing a fine bougie through the constriction, and from that time treatment was carried out with facility and good results.

My own case was that of a man named E. B., aged seventy-three, who is still under my care in the Mater Misericordiæ Hospital. He entered early in March, 1865, suffering much from a tight stricture

of old standing, and originating in blennorrhagia. I long tried in vain all description of bougies, but could not succeed in introducing one until, on the 15th of March, at the third endoscopic *séance*, I passed a probe through the constriction. Having left it in place for a short time, on withdrawing it I was able to get in a small bougie, and since then the case has progressed so favourably under treatment by gradual dilatation, that I am now able to pass a fair-sized instrument. The extreme age of this patient forbade the adoption of any more decisive method of treating the stricture than progressive dilatation, so I have taken the opportunity of watching endoscopically the appearance presented by the parts during that process. The local results, thus seen, appear to me very interesting. In brief, I may observe that the effect of instrumental dilatation upon the stricture was to *inflame* it in a very decided manner, and in fact to a great extent to bring it into a condition resembling granular urethritis—differing, however, from the latter affection in the existence of a surrounding *callous* ring. On several occasions, when for a few days treatment was suspended in consequence of vesical irritation and other causes, the inflammation subsided, but the stricture again recontracted, giving me the impression that the temporary cure was consequent only upon the temporary inflammation and partial absorption caused by the use of the bougie. In a case of stricture treated by gradual dilatation, which Dr. P. C. Smyly kindly gave me an opportunity of examining at the Meath Hospital, a very similar condition existed; so also in two cases of organic stricture under Dr. Quinlan's care in St. Vincent's Hospital, which I examined for him both before and after treatment. Should further experience confirm this observation, I think we may be considered to have arrived at a satisfactory explanation of the reason why progressive dilatation of organic stricture produces no permanent benefit—and also to have acquired the power of judging, from the endoscopic appearances in any case in point, whether treatment by dilatation is likely to be followed by immediate relapse or not. Figures VI., VII., and VIII., of chromo-lithograph plate, represent the stricture at different stages, as seen in the case of E. B. Fig. VI. shows it before treatment was commenced, pale and cicatrix-like in aspect, mammillated in form, with the opening in the centre. Fig. VII. exhibits it moderately inflamed during the earlier periods of treatment. Fig. VIII. is intended to illustrate its appearance as seen in the endoscope with a bougie introduced.

During later periods it became of deeper colour, approximating to the hues in Figs. II. and III.; but, even then, although a good-sized bougie (No. 9 or 10) slipped with the greatest ease through it, I could, with the endoscope and probe, most distinctly feel the surrounding ring of indurated tissue.

However, to return to the question of the utility of the endoscope, I think it may be looked on as proven that in certain instances it is capable of giving valuable assistance in the introduction of an instrument through strictures impregnable to other modes of attack. I can easily imagine its triumphant success in a case of tight and otherwise impassable stricture, wherein, having by its aid got a fine conductor into the bladder, Dr. Hutton's railroad catheter might be slid over it, and retention of urine relieved. For my own part, I am confident that time and opportunity are alone wanting to develop the resources of the instrument under these and similar circumstances of difficulty.

Useful as progressive dilatation may be as a preliminary step in the treatment of stricture, we are but too often compelled to adopt more decisive methods in order to obtain lasting relief. Of these methods rupture, and division by cutting, appear to be the most eligible, and our choice mostly lies between them. Of the employment of destructive caustics I shall say nothing, as I am convinced it is worse than useless.

Rupture, by Holt's method, has already been proved experimentally a useful mode of treatment, but it is now a matter of certainty that it is not, as was at first supposed, free from all immediate danger, or liability to relapse. This might be expected *a priori*, because, from the eccentric position of the canal of the stricture occasionally noticed, we can understand that the laceration must sometimes extend into sound rather than callous parts, and consequently immediate danger of hemorrhage and infiltration be incurred, and of recontraction of the constriction so soon as healing ensues.

If, on the other hand, the laceration opens up the callous parts alone, permanent relief may be anticipated. I lately examined endoscopically, with great interest, a patient sent to me by Dr. P. C. Smyly, who had performed this operation on him more than a year ago. The case was one of undoubted organic stricture, of remarkable closeness, and of twenty years duration. Gradual dilatation had been repeatedly used, but was invariably followed by immediate relapse. However, since being ruptured, the stricture

never closed sufficiently to cause distress, or to prevent the introduction of a catheter of No. 9 or 10 size. On inspection, I found in the site of the constriction an open vertical slit, about three-sixteenths of an inch in length, and all the surrounding parts indurated and cartilaginous. The mucous membrane was, moreover, chronically inflamed. In a case operated upon last October by Dr. R. M'Donnell, a similar condition of parts existed, with the exception that the slit was crescentic and somewhat transverse, and the state of the mucous membrane was less unhealthy. In fine, the mode of cure by Holt's method appears to be laceration of the indurated tissues, which should be prevented from reuniting by the careful after-use of dilatation.

In the hands of many practitioners division of the constriction has been found eminently successful, and upon theoretical grounds this might be expected.

The division of external cicatrices, followed by moderate care to maintain parts in the desired position, on the whole, is a mode of treatment generally successful, yet, as now-a-day practised, urethrotomy is liable to great objections.

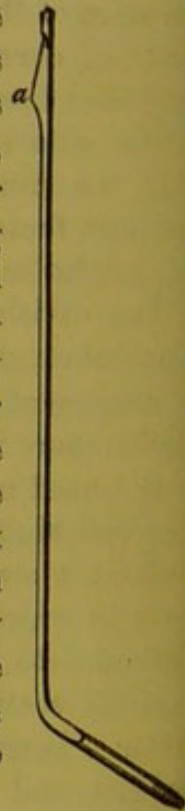
We need not enter into minute details of the various methods of accomplishing division of organic stricture. External urethrotomy without a staff is a formidable proceeding, eligible only in those cases in which acute retention obliges us, after the failure of other methods, to choose between it and puncture of the bladder. Perineal section with staff, after the method of Syme, is but little better. Internal urethrotomy by the methods of Stafford, Civiale, Sedillot, and Maisonneuve, are open to the same serious objection as Holt's method of dilatation, namely, that although by any of them we can open up the constriction, we cannot tell whether in so doing we divide the sound or the indurated parts. If, perchance, we touch the diseased parts alone, all is well; but if, from the impossibility, heretofore unremedied, of knowing and following the exact disposition of the canal of the stricture, we cut into the healthy parts, then, as in the method by rupture, we incur immediate risk of hemorrhage and infiltration; and so soon as these parts heal up the case is in the same position as before. In a word, the operation is a failure, and by no means devoid of risk.

Now to clear up the difficulties of those embarrassing cases in which division of a stricture becomes necessary, the endoscope comes to our aid and gives invaluable assistance. When the stricture is brought fairly into view, and its orifice ascertained by means of the

probe, the operator can see the exact disposition of the indurated parts, and can easily, under his sight, divide the stricture, confining his incisions to the indurated and callous parts. M. Desormeaux uses for the purpose a miniature button bistoury, with a handle similar to that of the probe represented by Fig. 10. I would venture to propose instead a blade somewhat different, which is represented by Fig. 11. It will be noticed that it has a long probe point and a short cutting edge, which is blunted

Fig. 11.

towards its posterior extremity, *a*, so as to limit the incisions to the contracted parts, as in Maisonneuve's urethrotome. Such precaution is hardly necessary, as the stricture can be incised under the eye of the operator, but it is an additional safeguard against an over extensive division of the parts. The stricture being in view, and the orifice discovered, this knife should be introduced carefully into the catheter of the endoscope, so as to avoid injury to its cutting edge by contact with the interior of the tube. The catheter may then be rotated, so as to bring its slit into the requisite position to enable the operator to turn the edge of the urethrotome in any direction he may think desirable. Now its probe point may be engaged in the orifice of the stricture, and the instrument gently pressed onwards until the constricted parts yield. The after treatment consists in the use of quinine and opium to prevent urinary fever, and careful dilatation to maintain the incision patent.



The extreme simplicity of this proceeding renders further details unnecessary, and I may observe that M. Desormeaux, who has performed it a great many times, has found it easy of execution, free from risk of considerable pain, hemorrhage, infiltration, or serious shock to the constitution, and moreover very efficacious in its results. One of its greatest advantages consists in its applicability to cases of acute retention of urine; and there is no doubt it will often obviate the necessity of perineal section without staff, or puncture of the bladder.

Its performance is a matter of facility in all instances wherein the endoscope enables us to pass a probe into the orifice of the constriction, and, as we have seen, this has been accomplished in strictures which defied all other manœuvres.

There is a frequent and distressing complication of urethral

stricture, in the treatment of which it seems probable that the endoscope may prove a useful help to the practitioner. I allude to urethral fistulæ.

Although these frequently heal up on the removal of the stricture, unfortunately it is not always so. The continuous wearing of a catheter for some time, with pressure by compresses, and cauterization of the tract with a probe dipped in melted caustic, have from time to time been found successful; nevertheless, in many instances these and the like measures fail, and free division of the fistulæ becomes requisite. This is a severe operation, and one to be avoided if possible.

There is one point respecting urinary fistula, hertofore neglected, which, doubtless, is of great importance, namely—the condition of the *internal orifice*, and this the endoscope allows us to investigate. If this opening permits the urine to enter the fistula it is futile to hope that external pressure, cauterization, or other measures can succeed. On the other hand, if the portion of the false passage nearest to the urethra can be rendered healthy and closed up, the obliteration of the remainder follows as a matter of course. Now, the endoscope enables us to examine the internal orifice of the fistula—to ascertain whether it presents the characteristic papilla and surrounding boggy ulceration which the external orifice always presents; and, in case we think requisite, it enables us to apply caustic directly to the spot, so as to favour the healing process.

The nitrate of silver may be applied either with a miniature porte-caustique, or with the endoscope probe, its point having been dipped in the melted lunar caustic. I much prefer the latter device whenever the solid nitrate of silver is required, as there is no danger of a portion becoming detached and remaining in the urethra, where it might give rise to serious inconvenience. After the application of the caustic, injections of a weak solution of common salt and water may be used to limit its action and prevent undue irritation. Should this treatment fail, more decisive measures remain in reserve, and the endoscope even now is of service, exhibiting the course taken by the probe, and thus helping us to ascertain the point at which the fistulæ enter the urethra, and so guiding us while planning the operation best suited to the exigencies of the case.

A few words, before we leave the endoscopic study of the urethra, on the use of direct exploration in affections of its prostatic portion. We have seen how frequent are granular ulcerations of the bulbous

portion; and how injurious from their tendency to produce constriction. Granular ulceration of the prostatic portion, although by no means as common, is a very serious disease. Among its evil consequences we observe chronic enlargement of the gland, which is liable, on slight provocation, to merge into the acute form, painful irritation of the neck of the bladder and of the rectum, and forms of spermatorrhea most rebellious to treatment. The prostate is also liable to calcareous depositions—to excavating ulcers of strumous origin—to cancerous disease, and to chronic enlargements, often affecting the middle lobe in such a manner as to produce great difficulty in micturition.

With the endoscope the differential diagnosis of these and other prostatic affections is a matter of facility and positive certainty, and topical treatment can be efficiently directed to such as are likely to derive benefit therefrom. In my own practice I have found it most useful in the diagnosis and treatment of certain forms of spermatorrhea.

This latter subject, if fairly discussed, would occupy much larger space than the present article; therefore I shall confine myself for the present to a few practical observations, reserving for a future communication a more thorough and exhaustive analysis of this important affection. I think one of the nicest points to determine in a case of seminal incontinence, is, whether the malady is directly connected with a morbid state of the genital organs, or referable to a far more general pathological condition. Even granting it to be clear that it is really dependent on some lesion of the generative apparatus, it is occasionally difficult to ascertain whether its origin and cause entitle it to be classified as *irritative* or *atonic* in its nature. Of the *sthenic* variety I make no mention here, as its diagnosis hardly admits of uncertainty; neither do I mean to imply that well-marked cases of the irritative and atonic forms are liable to be confounded; but the difficulty, I believe, rests in this, that, whatever its origin may be, the ailment tends finally to the atonic phase. Withal, it is absolutely necessary for success in treatment that a correct diagnosis be made in the first instance, because no amount of remedies directed to the constitution alone will suffice to cure a case of irritative spermatorrhea; and, on the other hand, no amount of topical medication will even benefit one purely atonic in character.

Without delaying upon this subject, the pathological complexity of which is, I believe, far greater than is ordinarily admitted, I

would observe that it is of the utmost importance to discover the exact condition of the prostate, and especially of the prostatic portion of the urethra, in all cases of obstinate seminal emissions. If the mucous membrane thereabouts be inflamed and ulcerated, and the gland engorged, local treatment is of primary consideration. Nothing short of the cure of the local disease will appease the irritation of the orifices of the ejaculatory ducts which reacts so prejudicially upon the testicles, keeping them in a state of continual activity, in consonance with the well-known law that glands are stimulated by irritation of their excretory canals.

In our uncertainty the endoscope gives invaluable aid, shows us the condition of the prostatic portion of the urethra, and enables us to cauterize and heal it if need be. The application of caustic to the prostatic urethra was lauded years ago by Lallemand as a specific in all cases of spermatorrhea. A little experience, however, demonstrated that it did not universally succeed—in fact, that it acted like a charm in some instances, while in others it totally failed. Additional knowledge has led to the opinion that its successful operation is confined to those cases wherein the prostatic urethra is *highly irritable*. This I fully believe to be the truth, but, until I used the endoscope, I remained always in uncertainty relative to diagnosis.

The commonly accepted test of *pain* caused by the passage of a bougie through that region of the urethra, is exceedingly fallacious, because at best the part is exceedingly sensitive, and patients who are not used to such explorations are certain to wince and complain when the instrument reaches the vicinity of the neck of the bladder. The only satisfactory proof of disease thereabouts is ocular demonstration, and this the endoscope gives us. Some time ago I cured a bad case of spermatorrhea, caused by ulceration of the mucous membrane of the prostate, by two thorough cauterizations effected with the endoscope, and at the present time I have another under treatment.

Many years ago I devised an instrument (Fig. 12) for the application of caustic solutions to the urethra in these cases; and, in the absence of more precise means, I, and several medical friends who tested it, found it most useful.

Solid caustics, I think, are objectionable, except when applied with the aid of the endoscope, for all instruments made with a slide to project are apt to lacerate the urethra and do mischief. Those intended for liquid applications, for the most part are faulty, because

they do not confine them to the spot where they are required. My instrument, however, meets these difficulties most satisfactorily. It consists, as may be seen by reference to the woodcut, Fig. 12, of a

Fig. 12.



catheter, which terminates in two balls connected by a narrow shank; this shank is perforated by several small apertures, and communicates with the tube of the catheter; the latter is surmounted by a small gum-elastic bottle, which holds the solution intended to be applied.

For use, the instrument is first charged. This is easily effected by compressing the Indian rubber bottle, then immersing the end of the instrument in the solution, and withdrawing the pressure, when the weight of the atmosphere drives the fluid into the elastic bottle. The instrument, having been wiped dry and oiled, is introduced; so soon as it arrives at the tender region, slight pressure is made on the gum-elastic bag, and thus the fluid is squeezed out through the perforations in the narrow shank. The balls prevent the liquid from spreading to the parts beyond, while, at the same time, they distend the portion of the urethra corresponding to the narrow shank, and thus ensure its thorough contact therewith. As soon as the operator wishes to remove the instrument, he relaxes the pressure on the bottle—the fluid then re-enters the catheter, which may be withdrawn. In cases where I have made the diagnosis of granular ulceration from an endoscopic examination, I frequently use this instrument for subsequent cauterizations, as it is quick in operation, and unlikely to frighten a timid patient.

The solution I prefer in most cases is ten or fifteen grains of sulphate of copper dissolved in an ounce of distilled water; I find it less irritating than nitrate of silver, and equally efficient. For an unpractised hand it is a wise precaution to operate when there is some urine in the bladder, as thus any of the fluid which might perchance enter it is at once decomposed and rendered innocuous. Latterly I prefer this instrument made with a straight shaft in place of the curved one represented in the woodcut, and I find it convenient to have it graduated in inches. The straight form, moreover, renders it as useful for cauterization of the cavity of the uterus as for urethral applications.

Diseases of the female urethra are rare, contrasted with those in the male subject, nevertheless they do occur from time to time, and give rise to frightful suffering. The endoscope appears likely to be a useful assistant in their diagnosis and treatment. I may here allude to a case of this nature, which Dr. Aquilla Smith has kindly asked me to see and treat in conjunction with him.

The case is that of Miss H., a young female, who, for the past two years, has suffered atrocious pain during and after passing water. The urine is healthy, and nothing can be detected, by an ordinary examination of the parts, to explain the distressing symptoms. Latterly her general health has given way to a certain extent from the excess and continuity of the pain. Having, in vain, undergone an endless variety of treatment, she lately placed herself under Dr. Smith's care, and by his request I saw her. An endoscopic examination, which was made with difficulty, owing to the nervousness of the patient, and the pain which it produced, revealed a morbid condition of the urethra, near to the neck of the bladder. In this situation the passage, for about half an inch in length, was highly vascular, granular, and of the colour of a mulberry.

The special treatment which naturally suggested itself, and was determined upon by Dr. Smith and myself, was thorough cauterization of the diseased part with nitrate of silver. On the 31st of March I performed this operation, with the assistance of the endoscope; it caused sharp pain, which lasted for some hours. However, the patient told me to-day (April 4th) that since the cauterization she has obtained more relief from suffering than she has known since the commencement of her disease. Encouraged by this success I repeated the application, and hope, at some future time, with Dr. Smith's permission, to record the termination of the case. It reminds me forcibly of an instance mentioned by Desormeaux, in which horrible pain at the neck of the bladder, in a gentleman under his care, was caused by a small fissure-like ulcer, situated thereabouts—which, moreover, was easily cured by a few cauterizations.^a

Before concluding I shall make a few observations on the utility of the endoscope for the examination of the interior of the bladder.

With respect to the practicability of the operation, I may remark that in a large proportion of cases it is quite possible to obtain a satisfactory view of the interior of that viscus, and to acquire by

^a Op. Cit., p. 155.

that method of investigation information otherwise wholly unattainable.

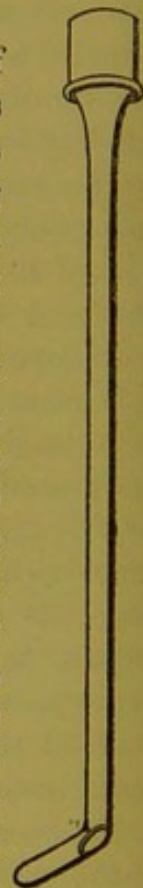
For the performance of vesical endoscopy certain conditions must be fulfilled. In the first place, the bladder must be distended somewhat, in order to give the exploring implement space to move about; and moreover, the fluid distending it must be transparent. Clear tepid water is the most suitable and convenient fluid, and should be injected with a double-current catheter until the interior of the bladder is thoroughly washed out, and the returning fluid appears perfectly limpid. Next, an instrument must be provided to convey light, and permit the observer to look into the viscus, and inasmuch as the latter is full of liquid, the extremity of the exploring tube must be closed with a piece of transparent glass. The instrument which Desormeaux uses is represented by Fig. 13, and in shape resembles the catheter recommended by Fig. 13. Mercier in certain affections of the prostate gland.

At the extremity of the long shaft a little window of glass is let in to permit the transmission of light, and is carefully cemented round, so as to render the instrument water-tight. The glass is set in a somewhat slanting direction, so as to obviate the reflection of the light from the perforated mirror, which might greatly embarrass the observer.

This form of catheter is easily introduced into the bladder, and then the endoscope may be attached thereto.

As the instrument is moved about, the eye of the examiner can see, bit by bit, the whole surface near to which its glazed extremity can be brought, namely, the border of the prostate, the trigone, the fundus, and greater portion of the posterior surface. The endoscope being held in the left hand, and manipulated therewith, the index finger of the right hand introduced into the rectum can give much assistance in the investigation, by raising the fundus and bringing it into proximity with the exploring tube. The anterior surface of the bladder has heretofore eluded ocular examination, but I am sanguine of being able to remedy this disability; fortunately, it is rarely the seat of disease.

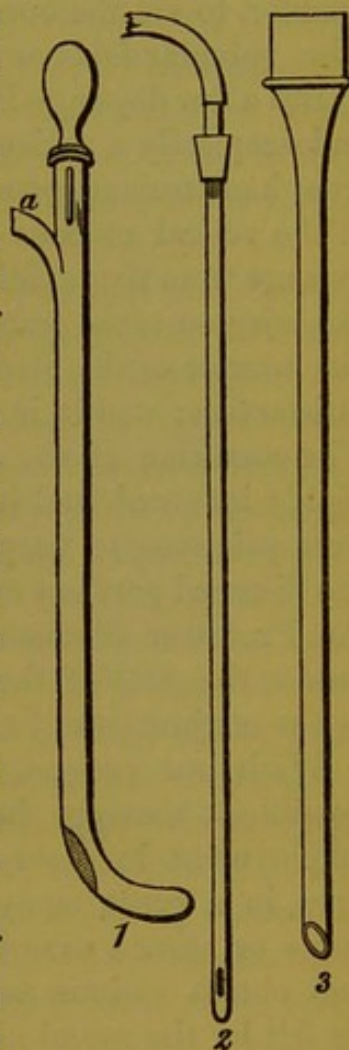
This cystoscope of Desormeaux is liable to certain practical disadvantages. In the first place, the glass is rendered dull by the oil and urethral mucus which it comes in contact with during



introduction, and cleaning of it is impracticable. Moreover, if, during an examination, the water in the bladder becomes turbid, from slight bleeding or any other cause, it is requisite to withdraw the cystoscope, resort to the double current catheter, and then re-introduce it. To avoid these faults I have had an instrument made after my own designs, by Messrs. Thompson and O'Neill, of Henry-street; its various parts are represented in Fig. 14.

It consists of a full sized catheter, 1, with a very short curve, and on the curve is an opening, made, as it were, in continuity with the shaft. To facilitate introduction there is a wooden plug, which is represented as being in the instrument. After introduction the plug is withdrawn, and the small flexible catheter, 2, inserted; the latter is connected with an enema pump, which, for sake of clearness, is omitted from the woodcut. By its means tepid water is pumped into the bladder until, after distending same, it returns alongside of the small catheter, and delivers itself externally at *a*. The pumping is continued until the water returns perfectly limpid, when the flexible catheter may be withdrawn, and the tube, 3, with glass window at its extremity, introduced in its stead. The latter is made of such a size as to fill accurately the catheter, 1. By this arrangement it will be perceived that the glass window is not smeared with oil or mucus, and thereby rendered dull. Moreover, if perchance it should become so, or the contents of the bladder become turbid, the tube, 3, can

Fig. 14.



be withdrawn and cleaned, the catheter, 2, introduced, and fresh tepid water pumped in until it returns limpid. All this done, the tube, 3, may be re-introduced, and the examination proceeded with. For the examination of the female bladder a somewhat shorter but much larger tube may be used with facility and advantage.

So much for the details of the operation; now we may consider how far the endoscope can serve us in the investigation of the bladder. It enables us to see the mucous membrane lining the portions already named, to recognize its pale whitish rose colour

and smooth surface in health; its various deeper shades in cystitis, acute, subacute, and chronic—varicose vessels coursing beneath it—mammillated projections—roughening and stripping of its epithelium—ecchymoses here and there—thick tenacious muco-purulent matter adhering to it—columnar bands forming a network beneath it—saccular offsets from the cavity of the bladder—malignant tumours projecting into it, and so forth. Moreover, it allows us, while in the act of withdrawing it, to investigate the orifice of the neck of the bladder, to see the border of the prostate, prominences of its middle lobe, valvular folds or bars, and so on.

But a few days ago Professor Macnamara requested me to examine endoscopically a patient of his in the Meath Hospital, who suffered from hematuria, depending, in his opinion, upon a diseased condition of the vesical mucous membrane. The case was rather difficult to manage from the rapidity with which blood exuded, rendering turbid the injected tepid water. Nevertheless I was able to demonstrate the interior of the bladder to my own and to Professor Macnamara's satisfaction; and it is with his permission that I mention the case. The condition of the mucous membrane was, as he had suspected, highly inflamed, and in points ulcerated; every gradation of colour, from pale rose to deep purple and almost black, could be seen, and the diseased portions recognized and distinguished from the healthy. As Professor Macnamara observed at the time, I was enabled to render the state of the mucous membrane of the bladder as visible as the conjunctiva of an inflamed eye.

With our present knowledge of the endoscope it is scarcely possible to measure the advantages which may be expected from its employment in cases of calculous disorder. Undoubtedly, by its help, in a great many instances, it will be practicable to see the stone or stones, examine the surface, colour, form, and dimension, and obtain various practical hints. Thus, a calculus too small to be felt by the sound may be seen by the eye, and conditions of the bladder likely to be mistaken for stone—such, for example, as phosphatic incrustations—may be recognized, and patients thereby saved from needless and often fatal operations. One of the most important uses of the endoscope in such cases is the diagnosis of an encysted condition of the stone, which, with our former means, too often was discovered only during the operation.^a

I have not chanced to meet with a case of stone since I have

^a *Vide* Desormeaux. *Op. cit.*, page 175, &c.

succeeded in making the endoscope practically available, therefore I have no positive results to show. However, my friend and colleague, Dr. Robert M'Donnell, submitted my instrument to a test upon the dead body, which I think may fairly be considered an "*experimentum crucis*," and, in illustration of its capacity, I record the trial, for the veracity of which Dr. M'Donnell is as responsible as I am myself:—He first prepared a subject by opening the bladder and introducing into it three substances of a nature the most unlikely to be thought of, and respecting which I was in total ignorance. He then brought me to the body, and challenged me to tell with my endoscope what the articles in the bladder were. In a few minutes I was able to do so, and to demonstrate them to him. The articles were—a brass screw with a milled head, a short Minié bullet, and a mass of plaster of Paris.

In conclusion, I have to apologize to the readers of the Journal for the length—far exceeding what I originally purposed—to which this communication has extended, and to ask their indulgence for the too obvious haste with which the materials at my disposal were thrown together. I feel that I must depend on their consideration, and kind allowances for the fact that I am myself but a neophyte in the unexplored study of endoscopy, and for the difficulties which I have experienced in stealing a few hurried moments from other engagements to record briefly my experiences in this somewhat new, but I hope not uninteresting, field of inquiry. If I have made it clear that with the endoscope it is easy to see portions of the body supposed to be wholly invisible, and thereby added even the smallest new facility towards accurate diagnosis, I shall be perfectly satisfied. If, however, I have succeeded in aiding, directly or indirectly, in the relief of one iota of human suffering, and in inducing others to work with the endoscope and labour to extend its usefulness, then indeed the object of my ambition shall have been most fully realized.

