it is very much better that the law should be distinct and certain, and that this quasi-legislative authority should not be left in the hands of the judges."

The law of murder, then, is declared to be such that the judges contradict each other; and yet they make it themselves, and maintain it in its present discreditable state, because it enables them to occupy a position, as its authoritative exponents, which is agreeable to them, and from which they do not like to be ousted. I think you will conclude that Mr. Fitzjames Stephen is not only learned and skilful, as the Committee declare him to be, but very outspoken. With regard to our great judges, I hope you will also think that he has been a little hard-spoken and too severe.

ON THE APPLICATION OF THE GALVANIC CAUTERY TO GYNÆCOLOGY.*

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THE galvanic cautery having been now for some time in use, and the assistance it has afforded to those engaged in gynæcological practice having been fully recognised, I have thought it may be useful to this meeting if I were to state my experience of it, gathered from hospital and private practice; and I am emboldened for a short time to occupy your attention, because, so far as I am aware, no one else has, in England, yet spoken on the subject, and also because I have employed it frequently, especially in Guy's Hospital, having had for some years the advantage of its apparatus.

I have no intention of entering in this paper into a complete discussion as to the advantage of cautery over other modes of operations, though, of course, incidentally remarks will be made on the subject; nor shall I occupy any time in the narration of a series of cases in illustration.

I may state, first of all, that I have principally employed the arrangement known as Dr. Middeldorp's, with some modifications suggested by myself and others. It may be susceptible of further adaptation to the requirements of our department; yet, on the whole, it is a very efficient collection of instruments. I have asked Messrs. Krohne and Sesemann to be present to exhibit the apparatus in action.

The battery for our purposes should be composed of not less than the following power.

1. Grove's combination of four elements, each of not less than 8 by 6 inches of platinum sheet;
2. Or Bunsen's, with carbon plates not less than 14 inches by 8; with the zincs in due proportion.
3. A bichromate battery of larger size may also be employed; but, unless the action can be made more constant than at present, I cannot recommend it. It has the advantage of being free from the strong acids required by the other.

The full power of the above named batteries is required only in the removal of the broad-based parts within the vagina, as, for instance, a broad-based fibroid; because, from the amount of fluids surrounding the wire loop, a large amount of current is carried off by the tubes which hold the wire, which, as now made, are not perfectly insulated; also because, the length of the wire being great, the heating power is lessened thereby. For the lesser work, two cells, or even one cell, are sufficient. In no case should the wire be made white-hot; while, on the other hand, the operations within should not be too long in progress, lest the heat affect the adjacent parts too severely, as is the case when the battery is of too low power. Perhaps it is better to employ three cells at first; and, should this not be powerful enough, the fourth can be added. I may further remark that, of course, the size of the wire influences the heating power of the battery; but the large wire is generally the best. An excellent plan is to coil two smaller wires into a rope, it being less liable to break than a single wire of the same weight, and is more flexible.

The galvanic cautery, by the varied character of the form into which the platinum conducting wire is shaped, is a very different thing from either the old red-hot irons or the more recent gas-cautery. We can, however, imitate the red-hot iron by spirally coiling the wire round a porcelain cone, or on the flat base of porcelain cone, returning it through the centre of the cone. The whole can be made of a white heat; the advantage of the cone being, that it retains a body of heat

not so readily extinguished by the coolness of the tissues as is the wire alone. But it has the advantage over the red-hot iron in that its action is continuous. After a time, it becomes clogged with the inspissated and charred fluids, which can be scraped off easily. As is well known, in ordinary surgery, the cones are adapted to the destruction of sessile growths—surface-burning—where the wire cannot be passed beneath, so as to completely remove them. It is also adapted to such growths where the surface is very irregular and the inequalities have to be carefully followed. By the loop, we can imitate the scalpel, with this advantage over it, that no bleeding follows, at least generally; and, if there be a vessel not well closed, we can, by applying the cone to it, effectually control the loss. At the same time, it will also be perceived that there is no chance of plastic union. The surfaces thus treated must be healed by granulations.

I think all will agree that there is a great advantage in some cases in the searing of the surfaces. A shield is thus made against the ready absorption of unhealthy fluids; and in the case of cavernous structures, such as the penis and uterine tissue, this is very important. The *éraseur* to some extent effects the same closure of the vacuities as of the lymph-spaces, vessels, etc.; but, where the surface is not pedunculated, there is a very great tendency in the surface to crumple up under the grip of the chain, wire, or rope, thus rendering the action imperfect; or, as in the case of a sessile malignant disease of the os uteri, where hard and soft are intermingled, the *éraseur* is pretty sure to glide off, scraping off, as it were, only the softer portions.

The wire loop of the cautery is arranged so that it is screwed up like the *éraseur*, and, indeed, it should be used slightly in this manner at first, so as to indent the pedicles a little; and then, as the red-hot wire cuts through, the screw should be used in such manner as that the two actions proceed *pari passu*; and thus there is made a remarkably precise division, as with a knife, without any tendency to crumple up.

However, we can, on the outer part of the body, dispense with the machinery of the loop, and, holding the wire between binding screws at the end of the conducting wire, draw it alternately from one side to the other. This is a more rapid method, and is adapted to batteries of low power. When the part to be removed has a canal passing through it, as the penis or cervix uteri, the galvanic cautery is much better than the *éraseur*, because the latter tends very much to obliterate the canal by the severe compression which the tissues undergo; while the cautery acts very slightly so.

Where narrow pedicles contain large vessels, as in some pendulous tumours—ovarian, for instance—the red-hot wire only is not sufficient. A simple line of searing fails to weld together, by the kind of fusion necessary in the process, the walls of the vessels. It requires a much more protracted action; and this can only be accomplished by employing the largest cones, acting upon half an inch of the pedicle. When this half-inch is fused into one mass, then the patient is safe from hæmorrhage, seldom before. During this action, the peduncle should be held firmly constricted by some plan, as a clamp, ligature, etc., so as to prevent any bleeding from interfering with the efficacy of this process of welding.

The capability of placing either the needle, cone, or rope *in situ*, before heating, is the peculiarity of the galvanic cautery, and the advantage will be at once recognised by all. In small fistulae, we can insert the nævus-needle belonging to the apparatus; and, when carefully placed, it can be heated. This would be practically impossible with a simple red-hot wire. Where, also, we desire to pass it into the cervix uteri, or into the centre of a fibroid, it is clear that it affords us an almost unique opportunity. Again, in division of sphincter in fistula ani, the wire being passed up the fistula into the rectum and brought out at the anus, the section is made very quickly, with little or no bleeding.

I must ask permission to give a short account of the application of the galvanic cautery to the several diseases for which it has been employed.

Epithelioma of Vulva and External Genitals.—The application to this class of disease in this position varies little from that of the rest of the body generally, except that the surfaces are more irregular. Where they can be wholly removed by passing the wire beneath it, it is much the best plan to do so, assisted by the usual needles; otherwise the disease must be attacked from the surface, and followed up by a second or even third application, till the whole is removed. The depth to which cautery-action extends is not so great as we might at first sight expect; so that it is well, in order to avoid frequent repetitions, to be thorough at first. However, in thin and important parts, it would be better to repeat than to destroy too deeply.

Where the clitoris has to be removed, we should be prepared for hæmorrhage, if we sever too quickly in this case. We must be slow in division, and be prepared with the cone; and, if this fail, then employ a

* Read before the Obstetric Medicine Section at the Annual Meeting of the British Medical Association at Norwich, August 1874.

ligature, which perhaps it would be best to apply before division, loosening it as soon as division is complete, to see if bleeding threaten.

We may, in the smaller and more easily lifted growths, only pass the wire beneath, while the diseased portion is held up by a forceps. We should, however, make sure that the disease is well lifted, and none left.

Condylomata may be treated in the same manner; generally the larger part may be removed by the wire, and the remainder by the cones from the surface. Where the disease is accompanied by ulceration within and up the urethra, the cautery may be lightly employed as the potential caustics are to produce a healthy surface.

Vascular Growths of the Meatus are readily destroyed by the red-hot wire; the small wire does well. One cell is sufficient for these.

Malignant Disease of Os Uteri and Cervix.—In attacking malignant disease of the vagina and os uteri by the galvanic cautery, we are guided in our selection of the kind of instrument according to the amount of projection the disease has attained. If it be sessile, then, of course, the base must be reached through the surface; and the porcelain cones are best suited. Yet, one objection against this mode is found in the cloud of smoke which obscures our vision through the speculum. To overcome this, we can cut off the current, and blow out the smoke. This, however, detains us, though not long. If the disease be sessile and small, and can be brought straight before us, then we can use the flat porcelain spiral, which can be pressed flat on to the surface. When we wish to destroy epithelioma of the cervical canal, the small cone is well adapted; which, being passed up into position, can be heated by establishing the current.

Where the diseased part projects well into the vagina like a mushroom, which is very common in epithelioma of the os, then nothing answers better than to employ the loop, which should be adjusted as near the roof of the vagina as possible, without drawing down the uterus. If the cervix be very large and the current feeble, the parts adjacent may become much heated. It is well to intermit the current, and even to throw up cold water, after which the current may be re-established. When the disease threatens to run on to the vagina, and the cervix is but short, then the adaptation of the loop should be carried out very carefully, and the screw be used very carefully so as to cut as cleanly as possible. Generally, the finger can be allowed to remain during the severance, because the indentation produced by the tightening of the loop sufficiently protects it from contact with the wire. The conducting tubes should be placed anterior to the mass. Sometimes, owing to the small vulva or large size of the disease, it is difficult to carry a ready-made loop round the part to be removed. I have, therefore, got Messrs. Krohne and Sesemann to make an arrangement similar to Gooch's cannula, employing the platinum wire-rope for the twine, and substituting ivory for the metal rings which hold the cannulae together. It is not difficult to surround the mass in the same way as we do by the older instrument. The rope I have used is composed of two strands of small wire. This plan I have found very useful.

Polypi.—These can be removed by the ordinary loop, or the arrangement just mentioned. This cautery is especially suitable to those cases where the polypus is broad based, as is sometimes found in those of the cervix. In cases of polypi springing out of the anterior cervix, much danger is run in the use of the *craseur*, for, as it tends somewhat to glide off the rotundity of the polypus, it approaches the bladder, and is very liable to involve the posterior wall within its grip, or, if not so much as that, yet, to include a great portion of the anterior cervical wall. If, to avoid this, we employ scissors, we may have severe bleeding, as I have myself seen. The wire cautery will avoid this trouble. Where the polypus is broad based, or a part of a fibroid still remaining in the uterus, if we consider it necessary to remove it, which we may do if it cannot descend further down in consequence of the small size of the vulva, then the wire cautery is the best means of removal.

Where the polypous form is scarcely completed, as in the extrusion of a fibroid before it has descended through the os, the double cannula can be brought into use with much advantage, especially if the growth project from the side rather than the fundus.

Fibroid Tumours.—The centre of a fibroid tumour can be readily cauterised by the galvanic cautery. Supposing the os be open, the capsule incised, and with it the lower portion of the tumour, one of the cones can be inserted into the opening and burnt in as far as the centre of the growth; or, instead of the cone, the *navus-needle* may be employed. The effect of this action may be to totally destroy the tumour, which will be extruded by the uterine action in a sloughing state, or more safely to cause it to slowly disintegrate. I have found this an operation easy of management. Where it is doubtful how much of true uterine tissue may be dragged down by a tumour, as in a case of suspected

inversion with fibroid attached, this form of cautery is excellently adapted.

Amputation of the Cervix for elongation is readily managed by the loop. Although it is a safe procedure, it may be open to question whether the scissors first and two stitches afterwards to join the mucous membrane over the stump is not the best plan. To discuss this question, hardly falls in with the intention of this paper.

Vesical and Rectal Fistule of very small size, too small for plastic operation, may be effectually treated by passing the *navus-needle* carefully through them, and then establishing the current. The bladder and rectum should be as empty as possible, though care must be taken lest it pass in so far as to touch the healthy parts.

The Uterine Cavity may also be cauterised without difficulty, though, of course, very great care should be employed. Although I have not done it myself, I have heard that it has been done.

I have endeavoured in the foregoing remarks to avoid length; any one accustomed to operations on these parts will, I think, at once perceive the points of advantage afforded by the galvanic cautery. Some operations cannot be done by other means; some can be done more safely by this cautery; others equally well by other plans. I consider that it forms a valuable addition to our *armamenta*.

ON CERTAIN COMPOUNDS OF ALBUMEN WITH THE ACIDS.*

By GEORGE STILLINGFLEET JOHNSON,
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IN testing albuminous liquids, much reliance is usually placed upon coagulation by nitric acid, which is added in excess, and in the concentrated form; if, however, the acid be very dilute, or added in small quantity, the precipitate which first falls is redissolved on shaking, and the acid liquid thus formed is not coagulated by heat, though the albumen is immediately precipitated by a few more drops of the strong nitric acid. This reaction has long been observed in testing albuminous urine. It was with a view to its explanation that the following experiments were conducted. The whites of four eggs were placed in a hoop dialyser of parchment-paper, which was floated upon the surface of some dilute nitric acid (sp. gr. 1.0025). After twenty-four hours, the albumen on the dialyser had become a clear semitransparent jelly, soluble in boiling water, yielding a strongly acid solution, in which nitric acid could be detected by the formation of a brown ring on the addition of protosulphate of iron and strong sulphuric acid. The solution of this jelly was not precipitated by corrosive sublimate, silver nitrate, lead subacetate, or alcohol.

When the acid was neutralised by an alkali, the albumen was precipitated. Excess of alkali redissolved the precipitated albumen in the cold, but not if the solution were previously heated above the coagulating point of albumen.

Excess of nitric acid, sulphuric or hydrochloric acids immediately coagulated the solution of albumen nitrate. Dried *in vacuo* over sulphuric acid, the compound became a hard, brittle, transparent mass, resembling gum; and in this form it was hygroscopic, but not deliquescent.

To determine the amount of acid in the compound, the dry nitrate (having ceased to lose weight *in vacuo*) was weighed and dissolved in boiling water. To the acid liquid thus obtained, and coloured by a solution of litmus, a solution of soda of known strength was added from a burette until the acid was exactly neutralised, the point of neutralisation being determined by the restoration of its blue colour to the litmus. The acid was then determined by calculation.

Analyses of two samples of the compound, prepared by dialysis over acids of specific gravities 1.002 and 1.001, yielded concordant results, which showed the presence of 6.7 per cent. by weight of nitric acid in the dry nitrate.

Hence it appears that there is a distinct compound of nitric acid with albumen: and it is the formation of this compound which explains the absence of any precipitate on heating albuminous urine to which a small quantity of nitric acid has been added. Similar compounds were obtained by dialysing white of egg over the other mineral, and some of the best known vegetable, acids. Each acid, however, imparts some characteristic reaction to the albumen by which its compound may be distinguished from all the others; and the proportions of acids in the different compounds vary according to their several combining weights.

* Abstract of a paper read before the Chemical Society.