the tube. On its exterior there is a metal block, upon which a ring is firmly adjusted by means of a screw. The slit of a bayonet-joint is situated between this block and the other end of the tube. The inner tube is a hollow piston, round at the point, with a lateral opening (Fig. c). On the surface, a little stop is placed, which moves in the slit on the outer tube. At the other extremity, there is a grooved metallic boss, by which the sliding movements are readily performed. The India-rubber case and tube are continuous, and are made of thin material. An opening at the end allows the case to be drawn over the trocar by its own elasticity, and it is then securely closed between the block and metal ring. The block, moreover, serves for a handle to the instrument.

The complete trocar, ready for introduction, is represented at Fig. A.

The pen-shaped point makes only a semilunar cut in the punctured part, by which the cannula is held more firmly in the tissues than by the triangular cut of the old trocar. All the movements within the India-rubber case are done by the hand unassisted by the eye, and these are very readily performed by any one after a little attention to the construction of the instrument. By the sliding action of the piston, the point can be easily exposed or protected, and, by slight lateral movements, the trocar can be alternately opened, half opened, or shut. The India-rubber case can be filled with water or some deodorising fluid as an additional protection. Air will not, however, readily run up the tube and cannula; for, the instant the instrument is introduced into a cavity, fluid rushes into the tube and drives the air before it. It is always well to carry out every detail by filling the case with water, and by keeping the end of the tube carefully under the fluid towards the end of the operation; for, without these simple precautions, air may accidentally find an entrance during some movement of the body or change of posture. The antiseptic trocar is made in five sizes, and is thus adapted for every kind of operation. The smallest instrument is a capillary trocar, evacuating at the rate of about fifteen to thirty ounces per hour, and is extremely serviceable in cases of cardiac dropsy.

No. 2 I use for ordinary ascites. The discharge amounts to three

ounces of fluid per minute; so that an ordinary effusion of fifty pints would require a period of about five hours for its removal. This is abdominal tapping by slow evacuation. The patient need not be discomforted by compressing the body with bandages to hasten the expulsion of the fluid. The drain is so slow, and the subsidence of pressure so gradual, that the blood-vessels are not subjected to sudden dilatation, and the circulation through the organs has time to maintain its proper balance. The operation causes no faintness or distress, but, on the other hand, imparts a gradual and increasing sensation of comfort and relief. No. 3 is a special instrument for tapping operations in renal and hepatic cases; No. 4 is the size I prefer for all effusions in the chest; and No. 5 is a large instrument especially adapted for cystic dropsy whenever the palliative operation of paracentesis is considered the right procedure.

A New Aspirator.—The antiseptic trocar can be instantly converted into a simple and efficient aspirator. For this purpose, the two-way India-rubber cork, Fig. D, must be securely fitted into a convenient glass-bottle, and the end of the trocar-tube connected to it. In place of the ordinary piston air-pump, I have introduced a very simple and handy exhaustor. It consists of an India-rubber ball, fitted with small valves and a central recoil-spring, Fig. E. The direction of the discharge is marked on the outside of the ball. The instrument has no joints or stop-cocks to get out of order, and the opening and closing of the tube is regulated by the pressure of the finger and thumb. The operator requires no assistance, for, while controlling the flow with one hand, he can work the exhaustor with the other. Gentle compression of the ball is often sufficient to sustain a steady evacuation.

New Method of Performing Incision of the Chest.—The antiseptic trocar can be easily converted into a blunt-pointed bistoury, for the treatment by incision of empyema, and other deep-seated abscesses. The knife is represented by Fig. F; the cutting edge is two inches in length, and is fixed at the end of a long stem, which permits it to be projected completely beyond the point of the trocar. The handle on one side only is ridged, and this is on the side corresponding to the edge of the knife. When this application of the instrument is required, the trocar must not be withdrawn, but only the India-rubber case and inner tube removed, so that the outer tube can be utilised as a sheath for the knife during its introduction. By this contrivance, the operation of incision of the chest can be very easily and rapidly performed, and the conversion of the exploring instrument into a bistoury is also serviceable in many other minor operations.

In many cases, the cutting from within outwards, after the insertion of the knife into the cavity, is more readily and safely accomplished than the usual method of direct incision. The operation can be rapidly performed in the following way. At the region of the chest selected, an exploratory tapping is made with the antiseptic trocar, No. 2 or No. 4—the former is a very convenient instrument for all cases occurring in children. If incision be now determined upon, the skin and superficial fascia are to be divided with a sharp-pointed knife, commencing at the point of penetration of the trocar, and extending in the direction of the intercostal space for about an inch and a half. The India-rubber cover and the cannula are then removed, the empyema-knife is slipped along the tube, and the incision of the deep structures completed by cutting from within outwards. I now introduce one of my self-adjusting drainage-tubes, and cover the wound with an antiseptic dressing and pad.

ON THE USE OF THE CAUTERY IN EYE-PRACTICE.

Read in the Section of Ophthalmology.

By EDWYN ANDREW, M.D.,

Surgeon to the Shrewsbury Eye, Ear, and Throat Hospital.

ALTHOUGH the therapeutic advantages of the actual cautery, simple or galvanic, are acknowledged and made use of in general practice, it appears hitherto to have been little employed in the special department of the eye; as, judging by English writings, rarely an allusion is even made to it, except in the treatment of nævus of the lid.

When we remember in this agent, by varying the degrees of heat, black, red, and white, by short or prolonged application, we have the power of producing solution of continuity, rapid or slow, with or without bleeding, with a small or a large slough, with little tendency to suppuration, and with a later power of producing more or less contraction; further, when it is mentioned that it is an antiseptic, a powerful counter-irritant, a good stimulant, and, that at a high temperature it produces little or no pain, but rather tends to induce local anaesthesia, it seems to deserve greater attention on the part of ophthalmic surgeons.

In my own practice, not forgetting the fallacy of the motto, *Post hoc propter hoc*, the value of its application to numerous cases seems undoubted.

In chronic ectropium, slight singeing of the whole surface of the relaxed mucous membrane, by restoring it to a more normal state, will often draw the lid into its proper position; whilst, in more severe cases, the application of a red heat to the edges of an incision, made for its cure, will generally render the operation more effective, by the contractile power given to the wound during healing.

In Meibomian cysts (chalazions), common and of no serious import, but sufficiently disfiguring to be of annoyance, especially to the female sex, crucial incision through the tarsal cartilage, scooping out the contents, and irritation of the interior, are usually effective in the larger proportion of cases. In the remainder, these small tumours are apt to recur; for although they do not possess a distinct cyst-wall, they have a lining membrane sufficiently secretive for reproduction, if this membrane be not destroyed by the inflammation induced by the several steps of the operation. To secure this necessary inflammation, and prevent recurrence, is easily obtained by the introduction of the cauter, at a white heat, into the cavity of the cyst—a proceeding almost painless.

To warty growths, which have resisted the action of nitrate of silver, chloro-acetic acid, and other caustics, one or two applications are generally curative. In pterygium, the destruction of the larger vessels, and production of minute sloughs, have a tendency to arrest and diminish the growth.

In prolapse of the iris, snipping or cutting off a portion, in those cases where the projection does not disappear of itself, or yield to mild applications, is usually a safe procedure; but the result of this operation is occasionally very disastrous. About two years since, in a patient on whom extraction had been performed without iridectomy, a moderate prolapse of iris took place, which remained stationary, causing very little irritation, and not preventing fair vision. Unfortunately, about three weeks after the prolapse had occurred, I was induced to remove the projecting portion with a scissor, when this trivial operation, without the slightest hitch during its performance, set up such intense irido-cyclitis as not only to necessitate extirpation of the ball, but to cause serious injury to the other eye through sympathetic inflammation. Such a calamity could not be forgotten; and in a similar case, which occurred shortly afterwards, the cautery was applied with such satisfactory results as to induce one to continue the treatment in other patients with prolapse, varying from a pin's point to partial staphyloma of cornea and iris.

In these cases, a dull red heat should be employed, so as to produce a slough, which, whilst apparently allowing transudation of fluid, is sufficiently tough to permit the formation of new tissue, and its subsequent contraction, whilst being itself slowly thrown off.

In other cases, where the iris is grasped tightly, as in a wound of the cornea, a high heat should be employed; so that, whilst it completely destroys the projecting iris, the influence should extend to the tissue grasped, so as to kill or lessen its vitality, and thus diminish, as far as possible, the deleterious tendency of anterior synechia. That this effect does occur, seems indicated by the following case.

A child, aged 3, was admitted with a wound at the corneo-sclerotic junction, apparently extending through the ciliary region, with prolapse of iris and choroid, and sympathetic irritation in the other eye. After consultation with another eye-surgeon, it was considered the safest plan to remove the ball; but, merely as an experiment, I cut off the prolapsed part, and applied a highly heated finely pointed cauter to the cut part between the edges of the wound, followed by the frequent application of castor-oil and atropine. Both eyes were kept bandaged, when, to my surprise, the wound healed kindly; good sight was restored, the lens not being implicated; and with the cessation of all sympathetic irritation. Even if mistaken as to the ciliary region being involved, although a careful examination was made with this object, it will at least prove the non-irritant effect of heat properly applied.

The well known value of the cautery as a counterirritant in joint and spinal disease has induced me to apply it to the site of the ciliary region in old painful eyes, where patients would not allow extirpation; and the effect has been sufficiently good to encourage me to continue the use in future suitable cases.

In slowly healing and serpiginous ulcer, the cautious application of the cautery will prove a stimulant, lighting up fresh action, and will often take the place of Saemisch's incision, far too often followed by general synechia. Again, when ulcer conjoined with tension is benefited by paracentesis, the same means may be used, as mentioned afterwards, to render the paracentesis opening more lasting.

By watching the means employed by nature, when successful in her efforts to cure disease, valuable indications are often obtained for future treatment; and I have thus been led to employ and suggest two new operations.

In sloughing ulceration of the cornea with hypopyon, the ulceration generally continues until a minute opening is made into the anterior chamber, permitting the contents to escape, without suffering air to enter, and allowing drainage to continue for a sufficient time to rest the weakened cornea and repair its damaged tissue. Again, in severe cases of conical cornea, the apex of the cone becomes opaque; then a minute ulcer forms, followed by an opening into the anterior chamber, allowing very slow drainage of the aqueous humour, inducing contraction and partial return of the cornea to its normal curve.

My first operation for severe cases of corneal ulcer and hypopyon, or with tension, is to make an opening into the anterior chamber with a needle, and to cauterise the aperture made, so as to prevent immediate union until sufficient drainage and rest has been obtained to promote the healing process.

My second operation is for conical cornea, by at once burning a minute opening through the apex of the cone, with the finest pointed cauter that can be obtained. The present operations chiefly in use are iridodesis (which I think should never be employed from its doubtful good, but, more important, its latent dangers); cutting off a minute flap from the apex, with the after-application of nitrate of silver; incising the apex, so as to form an opening into the anterior chamber at the same time, or obtaining the same result by trephining. All who have had much to do with the treatment of conical cornea, I believe, will acknowledge the difficulty and dangers attending any operation on such diseased eyes. The condition generally indicates a weak unhealthy patient, and a cornea in a state more or less of atrophy, and liable from the slightest irritation, to suppurate and produce general ophthalmitis, putting aside the lesser evils of iritis, deposit of lymph on the lens, and anterior synechia.

In the present cutting operations, the most dexterous operator will often make an opening larger than he intended; and if it be large, a corresponding size opacity will be the result, lessening the value of the operation, if not producing greater evils.

The new operation I have been studying some time, and which I suggest, lessens greatly these difficulties and dangers. With a very fine needle-pointed cauter, highly heated, a minute opening is easily made through the apex of the cone, which only allows a partial escape of the aqueous humour, and permits sufficient after-drainage to allow rest and contraction of the cornea. The burning in the passage of the instrument not only causes slight sloughing and ulceration, but, by the well known contractile power of a burn, it aids in restoring the natural curve of the cornea; at the same time, it may be said to render the wound antiseptic, as heat destroys infection, and even anæsthetic, for a feeling of comfort is generally produced.

To obtain the best results, certain points should be remembered: a weak person should, if possible, be strengthened; any irritation of the eye should be relieved; the pupil should be previously dilated by a strong solution of atropin (eight grains to the ounce); all pressure on the ball during operation should be avoided; the lids should be kept open without a speculum, best by a carbolised thread, as suggested by me at the Worcester meeting. The heated cauter should be allowed to gently burn its way through; no force should be used, lest the point should be plunged into the lens. As soon as it reaches the anterior chamber, a hissing noise will be heard from contact with the aqueous humour, when the cauter should be at once removed. Castor-oil and atropine should be dropped in and rubbed over the lid, a strong compress binder applied, and not removed for three days, unless pain be complained of. On removal of the bandage, if comfortable, the lids are not opened, but vaseline and atropine are smeared over them, and the compress bandage reapplied.

The following case, recently operated on, is now in the Shrewsbury Eye Hospital. T. A., aged 28, a cook, a weak pale unhealthy-looking woman, had conical cornea. The right was slightly curved, but the left cone was very prominent. Vision with the right eye was Jäger 1 four inches off and 48. With the left eye, which she said she had not used for nine years, she counted fingers with the greatest difficulty. She complained that this eye always had a dull aching feeling, which weakened the other, and for which she would like relief, if no sight could be obtained. Neither atropine or eserin caused any improvement, but rather lessened the little vision which existed. The operation having been performed without the slightest difficulty, in the manner mentioned before, the result three weeks afterwards, as now entered in the hospital-book, was as follows. The right eye was stronger; she could now read Jäger 1 six inches off, and vision was J. 8. The left eye was quite free from pain; she read Jäger 1 two inches and a

quarter off, and $\frac{3}{8}$ with great difficulty; the central corneal opacity was small, with a delicate haze around which was diminishing. There was little or no injection, and the patient stated she was more comfortable than she had been for years. An artificial pupil may be required at a later date.

The cauteries, which I have used and recommend, are of different shapes. Those for conical cornea are modifications of Wordsworth's needle, with the end like a stop-needle used in the division of cataract, the stop varying from one-twelfth to one-eighth of an inch from the point, so as to prevent a sudden thrust in any sudden movement of the patient; others, for pushing into cavities, or forming different sized sloughs, are rounded at the end, like shot of different sizes at the end of a piece of wire; whilst, for touching large surfaces, a pyriform or fusiform end seems more useful.

The galvanic cautery I have tried; and, aided with the rheostat, the batteries, from the power of producing instantaneous heat, seem indicated; but my experience, thus far, has shown that most batteries are too variable in their action, that the wire connection with the instruments renders the free use of the latter more difficult in such delicate operations. Hence I have fallen back on the ordinary instrument, heated with a spirit-lamp, which may be aided by a blow-pipe.

Objections, I know, may be easily urged to many of the propositions in this paper. It may be said that ordinary burns cause severe pain, suppuration, and ulcers difficult to heal; that patients, especially women, in spite of the assurance of their medical man, will dread a red hot instrument applied to their eyes, unless aided by an anæsthetic; that the exact heat required is not easily obtained; that its application to the cornea must be limited, from the opacity which follows.

But I would answer, that the bad effects of ordinary burns are due to extensive destruction of the cuticle, and exposure of the sensitive true cutis to the air; that such effects are not seen after the actual cautery; that ease rather than pain, and a healing slough, if I may use such a term, rather than suppuration, are more the rule; that many patients object to any operation; that the heat may be easily regulated, by simply testing with a piece of moist leather; that a slowly healing ulcer will generally leave a worse scar than that produced by the cautery; and, most important, if the experience of others corresponds with mine, a burnt wound rarely produces sympathetic inflammation.

A CASE OF ATROPHY OF THE OPTIC NERVES TREATED BY HYPODERMIC INJECTIONS OF NITRATE OF PILOCARPINE.

Read in the Section of Ophthalmology.

By DAVID MCKEOWN, B.A., M.D., MANCHESTER.

THE case to which these notes refer is interesting from two points of view—the treatment and its results.

On May 30th, 1882, I was consulted at the Ulster Eye, Ear, and Throat Hospital, by a well built, well developed man, A. H., aged 26, a marine engineer. He stated that his general health was good, and that the only complaint he had to make was in regard to his sight.

He required a guide; with difficulty, he could, with either eye, see fingers at the distance of a few inches. The vision was very peripheral; the eyes were always rotated upwards for objects straight before them. The ophthalmoscope revealed an atrophic condition (almost complete) of both discs. There was no history of syphilis, rheumatism, excessive smoking, or sexual excesses; the patellar tendon-reflex was present, and there was nothing pointing to a tabetic condition.

I made minute inquiries with the object of ascertaining the cause (which appears to be rather obscure), and elicited the following. In July 1880, the patient sailed from Hong Kong for Sydney, in a steamer which primed; that is, water passed from the boiler into the cylinder, whence (accompanied by steam) it was carried by a pipe into the "bilge." The "bilge" (the lowest part of the vessel) was separated from the engine-room by an iron floor, which, however, allowed the entrance of a large quantity of moisture. The vessel had been built for the home trade, and her ventilating arrangements were insufficient for such a voyage as the one mentioned. The patient spent eight out of the twenty-four hours in the engine-room (charged with vapour), whose temperature ranged from 110° to 120° . During the voyage, he felt a disinclination for work, took no interest in anything, and ate but little. He had no pain in the head, no diplopia, was not sick, did not

vomit, and did not experience loss of power or sensation in any part of the body. Three days after landing at Sydney, he observed a dimness coming over his sight, and consulted an oculist, but without benefit. His sight gradually failed to such a degree that, in about six weeks, he could not go about alone. In Sydney, an iridectomy was performed on the left eye. The patient came to England in the summer of 1881, and was under the care of three distinguished ophthalmic surgeons in London, one of whom prescribed tincture of the perchloride of iron, and tincture of nux vomica; and the other two a mixture of tincture of nux vomica, dilute phosphoric acid, and compound infusion of gentian, and friction on the forehead, with compound camphor-liniment.

On my recommending strychnine hypodermically, he told me that he had had an extensive experience of the strychnine treatment, in Sydney, hypodermically, and in Belfast, for about six months, both hypodermically and by the mouth. I did not think much more could be done; and, rather to avoid discouraging the patient than from any expected good, I ordered phosphorus and nux vomica pills. The patient reported that he was not conscious of any improvement during the twenty-one months of treatment.

At this time, I was treating by hypodermic injections of pilocarpine some cases of neuritis, and of atrophy of the optic nerve following neuritis, and the satisfactory results obtained led me to think of using it in the present instance. It is true there was no evidence of, and no reason for supposing, an antecedent neuritis; but I thought that there might be a pathological condition capable of amelioration, or that the nutrition of the parts involved might be improved, by the action of this powerful medicine on the intracranial circulation. Accordingly, on July 15th, 1882, $\frac{1}{8}$ of a grain of the nitrate of pilocarpine were injected hypodermically, and the injections were continued daily (the dose being gradually increased to double the first) for nearly three months, a steady and very marked improvement being reported as taking place. Iodide of potassium was taken for some weeks in five-grain doses, thrice daily, but without benefit. Strychnine, hydrochloric acid, and iron were also prescribed.

The patient had frequently told me that pilocarpine was the first and only medicine which had been of any service to him since he took ill; that, by its use, he had soon made such an improvement as enabled him to go about without assistance; that, when it was commenced, a dense thick fog prevented him seeing anything at which he looked straight; that this fog had been gradually diminishing, both as regards the extent and the degree; and he requested that I would resume the hypodermic injection of pilocarpine, for which purpose he would come to town.

During the months of October, November, and December, 1883, hypodermic injections (ranging from $\frac{1}{8}$ to $\frac{1}{2}$ a grain) of the nitrate of pilocarpine were given almost daily; and, during the latter six weeks, strychnine was also administered hypodermically, at the same time, the dose being gradually increased from the $\frac{1}{8}$ to the $\frac{1}{2}$ of a grain of the acetate. When the latter dose (which was continued for several weeks) was reached, the drug began to manifest its physiological effects. The patient reported a diminution in the extent and degree of the fog. I cannot say whether the strychnine in any way contributed to this result. The pilocarpine and strychnine have been continued, in diminished doses, during five months of the present year. After the first few months' treatment by pilocarpine, the patient was able to dispense with his guide, and has, since then, been able to, as he says himself, "go alone anywhere." He can now, with either eye, spell words of No. 3 at a distance of several inches; indeed, sometimes, even words of 1.75. His acuteness of vision varies with the brightness of the day and his state of health. The left eye has recently been making marked progress, but not so the right. On several occasions, I tested the colour-perception, but found it extremely defective, but now it is very fair; blunders with well defined colours are seldom made. There is no marked change in the ophthalmoscopic appearances.

In March, I took the field of the left eye for blue, red, green, and yellow. Blue, red, and green were perceived in a small central part of the field, and also in a peripheral zone (complete for blue, but defective in about the upper quarter for green, and in the upper and outer third for red), but not in the rest of the field. Yellow was perceived in a peripheral zone merely; the boundaries varied for the different colours.

Very free salivation and perspiration were produced by the pilocarpine, without the least injurious influence upon the general health. When the large dose of strychnine was reached, the patient thought the effect of the pilocarpine was increased.

It is useless to speculate upon the future of this patient. A sufficient time, however, has elapsed to warrant me in exhibiting him to