Five or ten drops of this solution—to be placed in the ear twice a day at first, then later once a day, and finally, as the need for stimulation diminishes, only every second day—will be found to act admirably, not only as a stimulant, on account of its alcoholic properties, but also as an antiseptic, on account of the boric acid and the bichloride solution which the mixture contains.

There are two effective methods of bringing such a solution into contact with the diseased mucous membrane. Either a dropper can be used, or the requisite number of drops can be placed in a small spoon and then poured—after first warming the fluid, if this be thought best—into the auditory canal; in each instance the head being held well over toward the opposide side. If any residue remains after one or two minutes, it can be removed by turning the head in an opposite direction, thus allowing the liquid to escape.

When the discharge is markedly persistent and the applications mentioned above fail to bring about a satisfactory result, the writer has found of benefit the so-called Powell's method of treatment, which consists of the application, to the diseased surface, of a solution of pure carbolic acid (ninety-five per cent.). This is allowed to run into the canal, the head being held well over toward the opposite side, until the auditory canal is nearly filled. It is retained in this position for from thirty to sixty seconds, and then the canal is quickly syringed with a solution of absolute alcohol. In this way the alcohol counteracts any escharotic action which the carbolic acid would exert upon the normal tissues, and yet at the same time the diseased parts are stimulated and thoroughly cleansed. By this form of treatment excellent results are obtained in many cases that would not yield to the ordinary methods in vogue.

The question will naturally be asked as to how great is the amount of pain involved in this procedure. It is very slight, for the carbolic acid exerts an anæsthetic effect superficially; and then, upon the quick application of the alcohol afterward, the patient simply complains of the ordinary stinging sensation which is usually experienced, in a mild degree, upon the application of this liquid.

In all cases under treatment we should, after thoroughly cleansing the canal and before applying the remedy, direct the patient to perform inflation by the Valsalva method, so as to drive out from the middle ear any retained secretion that may be present. Should he be unable to do this, then gentle inflation by means of the catheter should be practised, and the secretion thus displaced should be removed before our final application is made to the surface to be stimulated.

The practice of instilling oil of any kind into the auditory canal should not be countenanced, as it affords a medium which is favorable for the development of vegetable fungi of various kinds; and when once these conditions are established in the canal they prove exceedingly irritating and difficult to get rid of. As to the use of hydrogen peroxide in the auditory canal of a patient suffering from chronic purulent otitis, there is a wide diversity of opinion. Some authorities report most brilliant results from its use, both by syringing the canal freely with it and also by simply instilling it into the canal. They claim that, when so used, it cleans out the small cavities by displacing retained secretions, which otherwise would not appear without the use of this agent. I believe, however, that we have other means at our command that will do the work quite as well, without exposing the patient to the risk of our displacing and driving backward into the mastoid antrum, through the aditus, this retained secretion, and thus exciting an inflammation of this cavity by the infection contained in the secretion so displaced. It must be admitted that such secretion, when it is displaced, can travel this path quite as easily as any other, and the writer has seen several cases of purulent otitis in which, under the employment of hydrogen peroxide, a distinct mastoiditis developed; in fact, in four of them the mastoid had to be opened. In all of these cases there had been no sign of mastoid involvement until after the peroxide was employed, and in a general way the ear affection had been progressing favorably up to the time mentioned;—therefore, from observation and personal experience, I am opposed to the use of this remedy in this form of ear disease.

Under no circumstances or conditions should we in this disease, either early or late, put a large quantity of powder in the canal and allow it to remain, for it becomes moistened and later forms a crust, thus favoring what we wish to avoid, namely, a damming backward of the secretion. Furthermore, the practice of supplying a patient with a quantity of powder to use by himself cannot be too strongly condemned, for in many instances he will cause the secretion to be driven backward,—a result which is brought about by the formation, at the point of perforation, of such a crust as has just been mentioned, and which subjects the patient to the danger of mastoid and other intracranial involvement.

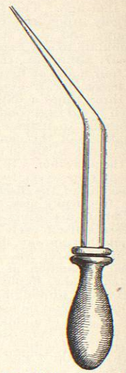

Fig. 1778.—Glass Pipette. Model used by author.

After the discharge has been reduced to a minimum amount, so that it only moistens the parts, then we can use with much advantage some of the many antiseptic and astringent powders, by insufflating a small quantity over the moistened area. The powders more commonly used under such circumstances are: boric acid, aristol, acetanilide, nosophen, zinc oxide, iodol, and alum. Iodoform was formerly used extensively, but owing to its disagreeable odor it has been largely discontinued. This drug is certainly very unpleasant for both the patient and the surgeon, on account of its peculiar odor, and, besides, it often gives rise to a most distressing dermatitis. Dermatol has also been used, but it possesses no particular curative effects. In many cases in which the discharge is intractable and comes from the attic region, the use of the intratympanic syringe is of the greatest value, as by its use we can introduce solutions of various strengths, upward and backward, beyond the point of vision. The writer has used a small glass instrument of various sizes, with short or long tip and broad end, fitted closely with a rubber cap similar to that of the pipette. These little glass pipettes are made in almost any size, and the tip can be made at any angle one wishes. They are easily handled, neat, clean, and inexpensive, and contain, for use in treatment, all the way from one to twenty drops of the remedial fluid, which is usually a solution of silver nitrate.

In cases in which we find a large amount of granulation tissue present, we proceed to destroy this after first cleansing the canal and the area to be destroyed. If the granulations are only moderately large, we can easily destroy them by means of chemical agents. The two agents of this character most used are silver nitrate and chromic acid. The surface to be cauterized is first dried, and then upon a metal probe a bead of either of the above agents is fused and applied carefully to the granulating area. Care should be taken not to smear these agents over adjacent parts, and all excess or residue should be mopped up with a cotton pledget. The actual cautery has been recommended as admirable for the destruction of these granulations, but its use here is altogether too difficult of application; and besides, we have other means at hand, equally as good, and much easier to use.

After cleansing the area to be cauterized, we should apply to the granulating surface about to be destroyed a solution of cocaine hydrochlorate of a strength of from five to ten per cent. This application can be made by soaking a small pledget of cotton in the cocaine and carrying it with the forceps directly against the surface we wish to anæsthetize, or we can apply it by means of a cotton-tipped probe, which we are to hold against the surface for a moment or two until the anæsthetic effect has been produced. If this preliminary step is taken in these cases, the patient will experience little or no pain during the destruction of this exuberant tissue; and this in itself is a factor to be taken into consideration, for no one likes to suffer pain when it can be so easily avoided. When the granulations are larger and polypoid in character, then their removal is best effected by means of the wire snare. The loop of the wire is passed over the growth and carried backward and inward to its point of attachment, and then the growth is cut off by the successive turning or screwing of the thumb-piece of the snare, thus tightening at each turn the loop of wire surrounding the growth.

As a more rapid means of removing these growths a sharp curette is preferred by some operators. This instrument can be passed quickly into the canal, at the side of or beneath the growth, and carried backward to its point of attachment, which is usually a rather firm peduncle. When this point is reached, the curette is raised and manipulated so as partially to twist the stalk around the shank of the instrument, care being taken that the sharp curve of the instrument shall rest upon the superior or upper surface of the peduncle. The curette is then pressed inward against the surface from which the growth springs, the peduncle is severed close to its attachment, and the growth is removed at the same time that the instrument is withdrawn. Cocaine should always be used previous to the removal of such growths, in order to relieve the patient of as much pain as possible. As an adjunct of great value in the removal of these growths, we may mention the local use of a solution of suprarenal capsule. The following is the formula used by the writer:

℞ Adrenals (Armour desic.) ..... ʒ i.
Boric acid ..... gr. xvi.
Cinnamon water ..... ♏ iv.
Camphor water (hot) ..... ʒ i.
Distilled water (hot)—enough to make a two-ounce mixure.
M. Macerate for four hours and filter.

The use of this solution, which should be applied particularly to the base of the growth, renders it easy to remove quite large polypi; and furthermore, what would otherwise be a bloody operation is converted, by the aid of this fluid, into one that is practically bloodless. The solution should remain in contact with the tissue to be removed for at least five or ten minutes prior to the operation. The after-treatment is also greatly facilitated by the use of the remedy, for by its aid we can cauterize the base left after the removal of the growth without continually going over the surface for several minutes with cotton pledgets trying to stanch the oozing of blood before we apply our cauterizing agent. Formerly, when the removal of a polypus had to be done without the aid of the suprarenal extract, it was very frequently found necessary to carry out the cauterization of the base at a second sitting on account of the free hemorrhage existing.

For the first twenty-four hours after the removal of such a growth, it is well to pack the canal loosely with a strip of plain sterilized gauze. This acts in a twofold manner. First, its prevents any marked secondary hemorrhage taking place, as sometimes occurs after the use of the suprarenal extract; and, secondly, it acts as a protection; but it should always be removed on the following day. If the patient is not to be seen for a few days, then under no condition should the canal be packed; but if much discharge is present, the patient should be directed to use the irrigation method for a few days until the discharge diminishes sufficiently, or until the patient again comes under the observation of the surgeon for further treatment. In all cases in which exuberant granulations or polypi have been removed from the auditory canal and middle ear, the subsequent treatment is to be carried out on exactly the same lines as those already stated, *i.e.*, the parts are to be kept sterile and clean, they are to be stimulated from time to time as may be needed, and later, when the discharge diminishes, the drops referred to in a previous paragraph are to be used twice a day.

If, after an ear has been treated in this way for a period of ten days or two weeks, the discharge is still present, and there is a marked tendency to a re-formation of the granulation tissue, then it may be said with a degree of certainty that we have to deal with dead bone situated farther back, and no time should be lost in its removal. The technique of this procedure will be found in the article on *Mastoid Operations*, in a later volume.

Aspergillus is quite frequently found just within the meatus, on the canal wall, on the remains of the drum membrane, or on the exposed internal tympanic wall, in cases in which the ear has previously been the seat of a purulent inflammation. Its presence may mislead us into thinking that the ear has begun to discharge again. This new discharge is caused by the presence of this fungus at one or more of the points just mentioned. It develops slowly in the beginning when it lodges upon the surface, owing to a lack of moisture, but later, when even a slight amount of moisture comes in contact with it, the growth is a rapid one, and the discharge given out from it is often offensive and accumulates around the meatus. The treatment required is simply to cleanse the parts by the ordinary method, and then to scrub the surface all over with a cotton-tipped probe dipped in the alcoholic solution previously mentioned. Afterward it is well to insufflate just enough finely powdered acetanilid or boric acid to cover the surface from which the fungus grows. A few treatments like this will suffice to clear up the condition as well as to relieve any excoriations at the meatus which may have been caused by the discharge.

In all cases of purulent disease of the middle ear, in which, upon examination, we find the drainage insufficient, we should lose no time in enlarging the opening through which the discharge is passing; and oftentimes it is desirable, instead of enlarging the old perforation, to make a free incision through the drum membrane at some other point, to facilitate more rapid drainage. This is particularly imperative when the discharge emanates from the lining membrane of the middle ear, and we find it being inadequately drained. It is in these cases that the subsequent use of the middle-ear syringe is of the utmost value, as after a thorough cleansing of the tympanic cavity we can introduce the stimulating or astringent solutions, and a sufficient quantity should be used each time to fill completely the tympanic cavity. The fluid will oftentimes pass into and down through the Eustachian tube, but this will do no harm, provided the solutions used are not too strong, and rarely should we use for the first time in this manner a solution of silver that is stronger than one per cent. If the case is one of a persistent character, this intratympanic syringing should be practised each day until the discharge is perceptibly lessened; then every second day; and later less frequently—for example, twice a week.

When a small amount of discharge continues despite all treatment, and the parts upon inspection look indolent, the method suggested and practised by Blake—viz., that of fitting a small sterilized piece of very thin paper over the existing opening—will oftentimes heal these perforations. It is not improbable that this effect is produced by the mechanical irritation set up by the contact of the disc with the indolent surface of the membrane. In applying these paper discs, after they are approximated closely to the drum membrane, they should be gently pressed around their edges so as to compel the paper to adhere firmly. After the disc has been satisfactorily applied, a small amount of powdered acetanilide or boric acid is to be dusted over its surface. Such a dressing will remain in place for from two to eight days, and when the parts are again inspected, we shall find that the disc, though still adherent to the drum membrane,

has gradually worked its way toward the edge of the membrane, exposing a part or the whole of the perforation, while little or no moisture is present. A second disc, sterilized in the same manner, should now be placed over the opening, leaving the primary one undisturbed, and partially overlapping it. Usually two or three such applications serve, in a large proportion of the cases, completely to stop the discharge and close the opening. The protection given by the disc no doubt hastens the favorable changes which take place in the pathological mucous membrane of the middle ear.

To improve the hearing, after we have cured the discharge, is the next step in the treatment of this disease. When a large part of the tympanic membrane has been destroyed and the ossicles are bound down by adhesions, we usually find that the hearing is markedly diminished. However, by dividing the existing adhesions—a procedure which can be quite easily carried out after the discharge has ceased—we often succeed in effecting a decided improvement in the hearing. On the other hand, some of the cases thus operated upon show no improvement. Nevertheless, as those whose hearing is improved by the operation constitute a majority, we should not fail to give this part of the treatment a fair trial. Personally, I have seen only two cases out of a total of twenty-four that did not improve under this procedure.

It is usual, in an ordinary case, in which the greater part of the tympanic membrane remains, for the hearing to improve slightly when the discharge ceases, and under these circumstances we may use, as an aid to restoring the function of hearing, the ordinary method of inflation and vaporization of the middle ear, as it prevents the excessive formation of adhesions, and tends, furthermore, when these adhesions have already taken place, to stretch them, as well as to stretch and make more pliable that portion of the drum membrane which is still intact. This method of treatment should, if possible, be carried out three times a week at first, and as improvement begins to take place, the frequency should be diminished, according to the indications present in each case. In many of these cases, during convalescence, and after the discharge has ceased, complaint will be made of a most distressing tinnitus, one which does not yield even though the frequent inflations spoken of have been practised. In these cases the internal administration of small and gradually increasing doses of the potassium iodide will be followed by a marked relief in a large number of instances. At the beginning the dose should be five grains three times a day, but afterward it should gradually be increased until the desired relief is secured. Usually, when the patient has taken about ten grains three times a day for several days, this symptom will gradually diminish, and, in a fair number of cases, will disappear altogether. This effect, no doubt, is due to the stimulating properties of the remedy, which causes an absorption of a small amount of exudate or recently formed deposit within the middle ear.

If any decided labyrinthine involvement is already present, then, of course, the severing of the adhesions mentioned above is contraindicated, for the operation is not likely to be followed by any improvement.

Excision of the ossicles, and operative procedures for the relief of intratympanic caries will receive full consideration in another article of this series.

In all cases that come under our observation for treatment, we should never lose sight of the fact that we are practitioners of medicine first, and specialists second; and all cases, in which the indications demand it, should have general building-up and tonic treatment in order that the local condition may improve the more rapidly, as it must when the patients receive a surplus of nutrition through the medium of the general system. There are many chronic cases which, if they had been subjected to the building-up process when they were first attacked by the local disease, would never have reached the chronic stage at which they afterward presented themselves for treatment.

James F. McKernon.

EAR DISEASES: FOREIGN BODIES IN THE EXTERNAL AUDITORY CANAL AND MIDDLE EAR.—I. Auditory Canal.—Although the position of the ear is not such as to favor the entrance of foreign bodies into the external auditory canal, it not unfrequently happens that they find lodgment there. Children are much given to thrusting into their ears such bodies as glass beads, pebbles, coffee grains, and the like; adults "lose" plugs of cotton in their ears or break off in the canal part of a match or toothpick with which they have been scratching an itching meatus or endeavoring to remove cerumen; while insects occasionally enter the ear by accident, and sometimes by design, being attracted, perhaps, by the odor of an offensive discharge. Flies, attracted in this way, now and then deposit their eggs in the ear; and, unless the discharge be sufficiently profuse to wash them out, they quickly develop into maggots, which soon make their presence known by the great irritation they create. Foreign substances are sometimes put into the ear with criminal intent; but, popular belief to the contrary, the auditory canal furnishes a most indifferent avenue for the introduction of poisons into the system, since its dermal lining does not permit of their ready absorption.

The presence of a foreign body in the ear does not necessarily give rise to serious consequences. If the substance introduced possess irritant or caustic properties, inflammation will quickly supervene, the drumhead may be destroyed, and not only the integrity of the hearing, but life itself, may be jeopardized. And, also, when living insects invade the ear, they usually cause—especially when their wings or claws come in contact with the tympanic membrane—great suffering, and, perhaps, severe inflammation of the membrane and the cutaneous lining of the meatus. But, on the other hand, such innocuous bodies as beads, cherry stones, coffee beans, etc., unless they be tightly wedged in the canal, or be so placed as to press rudely upon the drumhead, may scarcely make their presence felt, or induce even a transient earache.

The prevalent belief is that the entrance of a foreign body into the auditory canal is a serious accident, and that, however harmless in itself the foreign substance may be, dire consequences will ensue unless it be quickly gotten out. As a rule, it is doubtless judicious to remove without unnecessary delay any body which has found its way into the external ear, because its presence *may* excite inflammation, or, as sometimes happens, troublesome reflex irritation,* and because, moreover, we shall scarcely be able, without doing so, to allay the alarm of the patient or the anxiety of his friends. But, on the other hand, as in most instances no immediate ill consequences need be apprehended, we should not be too eager to undertake this oftentimes delicate operation, imperfectly equipped, perhaps, for its performance, and under conditions which render doubtful its successful completion; for, if the operation fail of its purpose, the injury resulting from the repeated efforts to extract the foreign body will probably leave the auditory canal inflamed and swollen, and the ear in much worse condition than before. Indeed, the difficult cases which the specialist has to deal with are almost always those in which, through previous unskilful manipulation, the delicate walls of the meatus have been lacerated and bruised, and the foreign body tightly impacted in the bottom of the canal.

Before attempting to remove a foreign body from the ear the operator, by careful inspection, should first assure himself that one is present. This it is not always possible to do without the aid of an ear mirror and speculum. If these are not at command, and there be doubt as to the presence of a foreign body (for it is to be borne in mind that patients frequently imagine that something has entered the ear when such is not the case), it is permissible to attempt to solve the doubt by the use of warm water and the syringe; but, under such circumstances, to grope blindly in the ear, with any sort of instrument, is a practice fraught with great danger and utterly unjustifiable. It may be well to mention that the glistening surface of the tympanic membrane is sometimes mistaken for a foreign body by those unaccustomed to examining the ear; and, as such a mistake is apt to lead to serious consequences, the possibility of it should be borne in mind in order that it may be avoided.

Treatment.—The question of how to deal with a foreign body lodged in the ear depends upon a variety of circumstances: In the first place, upon the nature of the intruding body, whether it be an animate or an inanimate object; and, if the latter, whether it be an irritant or an innocuous substance, and what its shape and size. In the second place, upon the manner of its lodgment, whether it be tightly wedged or lying loose in the canal, and whether resting near its orifice or beyond its constricted middle third, in the neighborhood of the tympanic membrane. In the third place, upon the skill and experience of the operator; for what would be a judicious and safe method of procedure for one accustomed to operating upon the ear, might be an extremely unwise and hazardous one for a tyro in this department of surgery to undertake. Generally speaking, it may be said that unless the foreign body be near the external orifice of the ear, and be of such shape that it may be readily grasped by suitable forceps, in the absence of special skill upon the part of the operator, the syringe is the safest and best instrument with which to undertake its removal. In most cases this plan will prove successful, and, when it does not, at least no harm will have been done by the attempt. If it cannot be removed in this way, resort must be had to the forceps, or to the blunt hook devised for this purpose. Neither of these instruments, however, can be used with safety, or to good purpose, unless the meatus be illuminated, so that the foreign body may be kept in view and every movement of the instrument watched. If the intruding body be lying near the external orifice of the canal, it is possible to obtain a satisfactory illumination by turning the ear toward a window or a bright artificial light; but, if it be lodged near its inner extremity, a concave ear mirror attached to a head band, by means of which either diffuse sunlight or artificial light may be concentrated and reflected into the ear, and in most instances an aural speculum, must be employed. Unless, however, the operator be used to this method of examining the ear, he will find that he cannot accomplish much in this way; and, under such circumstances, supposing that the syringe has been tried without avail, he will serve his own interest and his patient's welfare, if without more ado he refer the case (if it be in his power to do so) to some one having more skill in this particular direction than himself; for farther instrumental effort upon his part is little likely to be successful, and may result in serious damage to the ear.

In skilful hands a traction hook, such as is represented in the woodcut, is the most generally useful instrument for the removal of foreign bodies from the ear.* It is especially useful when the foreign body is spheroidal in shape, or is so large as to be wedged tightly in the canal. Under such circumstances forceps are worse than useless; for it is almost impossible to open them wide enough to grasp the foreign body, and each unsuccessful attempt to catch hold of it tends to force it more deeply into the meatus. With the hook, however, which can be gently insinuated between the foreign body and the walls of the canal, and, when it has been gotten beyond it, can be turned so as to catch the body, and, upon its withdrawal, either roll or drag it toward the external orifice of the meatus, any body which has found its way into the ear may be extracted—unless, indeed, it has become greatly enlarged (as sometimes happens from the imbibition of moisture), or the calibre of the canal has been considerably lessened by inflammatory swelling. When such an instrument is not at command, a silver probe suitably bent near its extremity may be used in its stead; or an excellent substitute for it may be fashioned out of an English steel hairpin, by separating the prongs until they form with each other an obtuse or right angle, as may be preferred, bending one into a loop for a handle, and, after filing the extremity of the other prong somewhat flat, bending it over very close to the end and serrating its under surface with a file or knife, that it may more readily catch hold of the foreign body. With such a contrivance the writer has extracted many foreign bodies from the ear. Indeed, it has become quite a favorite instrument with him, and several of these improvised hooks, their extremities differently shaped, form a useful part of his armamentarium. The wire loop of an aural snare, which may be passed around the foreign body, is recommended especially for the extraction of spherical bodies which fill the lumen of the canal, and, it would seem, should answer an excellent purpose. In the case of peas or beans or other softish bodies a sharp hook, which may be made to penetrate and in this way to catch hold of them, is useful. If the body be so impacted that it cannot be drawn out in this way, it may be cut in pieces with the hook or with a narrow-bladed knife and removed piecemeal with the angular forceps or syringe.

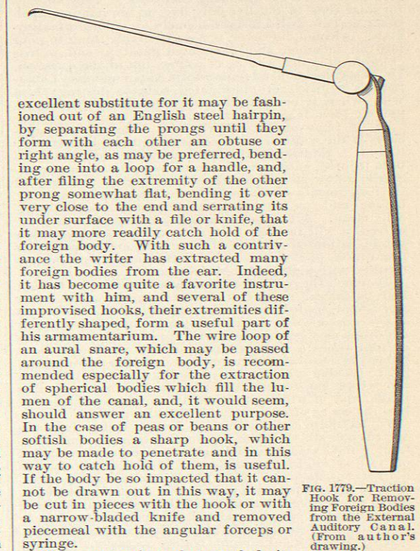

Fig. 1779.—Traction Hook for Removing Foreign Bodies from the External Auditory Canal. (From author's drawing.)

When a corrosive substance finds its way into the ear, it should be syringed out as quickly as possible with tepid water, without loss of time in searching for something which may neutralize it chemically. If such an agent be at hand—as for instance a weak acid, such as vinegar, in the case of an alkaline caustic, or carbonate of soda or potassa, if the corrosive substance be acid,—it should be added to the water with which the ear is syringed.

When animate objects invade the ear they usually cause much suffering. Insects, by the rapid movements of their wings and feet, not only excite severe pain, but create an uproar which renders nearly frantic the unfortunate individual into whose ear they have penetrated. Their movements may be arrested, and their lives put an end to, by pouring into the meatus any bland oil, such as olive or almond oil, or melted lard when these are not obtainable. Their bodies may then be removed by means of the syringe or forceps. The writer met with a case some years since in which a physician, possessed of some originality, succeeded in arresting very promptly the distressing movements of a small insect which had entered the ear, by pouring into the meatus a quantity of melted cerate. Unfortunately, however, upon parting with its heat the cerate became hard, and moulded itself firmly in the canal. The remedy, as may be imagined, was worse than the disease, for the discomfort it caused was almost as great, and the difficulty of getting rid of it ten times greater.

* Among the reflex phenomena which have been observed in consequence of the irritation produced by the presence of a foreign body in the ear may be mentioned, cough, vomiting, excessive salivary secretion, hemicrania, facial paralysis, and epileptic convulsions (Poulet). The writer also has reported a case (Trans. Am. Otological Society, vol. v., p. 508) in which inability to swallow food was caused by the presence of a plug of cerumen in the ear.

* The writer employs a hook, the shank of which is 6.5 cm. in length and forms an angle of about 100° with the handle. The hook at the extremity of the shank, as represented in the cut, is bent over not too abruptly, and is serrated upon its under surface. In his opinion the angular form is preferable to the straight traction hook which some aurists employ, as with it the operator's hands are less likely to interfere with the illumination of the meatus.