

the reds and yellows being slightly exaggerated in all artificial lights. In practice the light is usually reflected by a centrally perforated concave mirror (Figs. 1789 and 1790). The mirror should be about three and a half

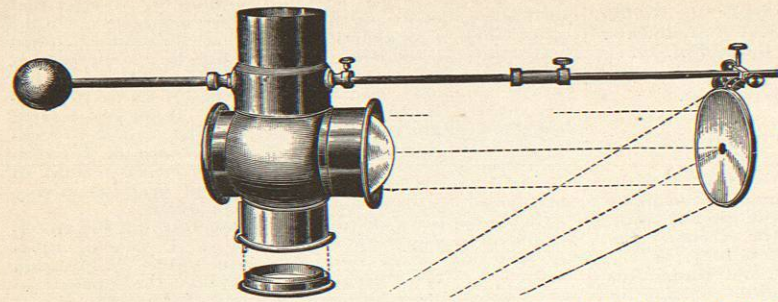


Fig. 1789.—McKenzie Condenser. May be fitted to an adjustable bracket with Argand burner, Welsbach light, or electricity.

inches in diameter and suspended from a head band or a movable bracket attached to the wall. Such a mirror will focus parallel rays at from seven to ten inches. For office work a good combination of light and reflector is that shown in Fig. 1789. In this contrivance the light (Argand, Welsbach, or electric lamp) is condensed by the condenser on the mirror, which in turn focusses the rays upon the point to be examined. The bracket may be raised or lowered by a screw. For bedside work the mirror should be suspended from the headband (Fig. 1790) while the light should occupy a position slightly above the level of the patient's ear and as nearly in the vertical plane that embraces the eye of the observer and the ear to be examined, as is possible without allowing the patient's head to interfere with its rays. The joint that connects the mirror with the head band should be so arranged as to allow the former to be moved in all directions, thus rendering it possible to bring it close to the observer's eye and to turn it in such a direction that it shall throw the rays upon the spot to be examined while yet permitting the examiner's head to remain in a position of ease and comfort. A convenient bedside light is the portable apparatus described by Dench ("Diseases of the Ear," p. 77).

A speculum of some kind is essential for the thorough examination of the fundus. Specula may be made of various shapes and materials, as pictured in the catalogues of the instrument makers; those which have the largest internal calibre with a given external size being the bet-

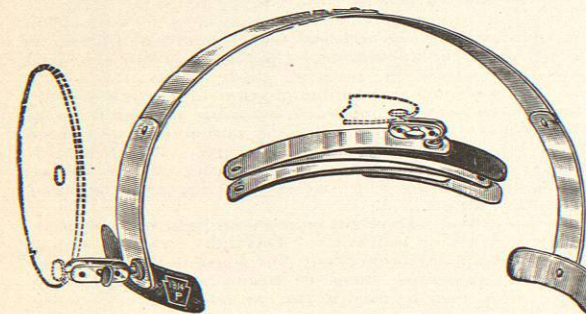


Fig. 1790.—Headband Made of Steel Segments, which fold as in cut or fold over the mirror, thus protecting it.

ter. Gruber's specula made of sterling silver, with the small end oval-shaped and the large end circular and milled to facilitate rotation, are very convenient. They have a double longitudinal curve as indicated in Fig.

1791 and may readily be sterilized. The naked-eye examination having been completed the speculum is introduced into the external auditory canal, which is then examined as well as the tympanic membrane and fundus. The better ear should be examined first, for purposes of comparison.

**Introduction of the Speculum.**—In the case of an adult the auricle should be grasped between the index and middle finger of the left hand (the index finger in front) and drawn gently but firmly upward, backward and outward, so as to straighten the canal. In children, on the other hand, the auricle should be drawn downward, backward, and somewhat outward, in order to open and straighten the meatus. The warmed speculum should then be gently inserted with the thumb and index finger of the right hand by a rotary motion, care being exercised to prevent its turning up scales of epithelium or detritus in the line of vision. It should be

pushed on into the cartilaginous canal as far as possible, but not into the bony part, as this region is exceedingly sensitive to pressure on account of the thinness of its soft parts. In certain cases the presence of the speculum in the canal excites a reflex cough due to irritation of the auricular branch of the vagus (Arnold's nerve) which is transmitted through the superior laryngeal to the muscles of the larynx. Fainting fits or epileptiform convulsions are said to have occurred from the simple introduction of the speculum. The vibrissae having been pressed aside the state of the meatus may be noted as to size, shape, secretion, and blood supply. The state of the cerumen, whether dry or moist, and the presence of such pathological conditions as seborrhea, eczema, traumatism, pustules, furuncles, pus, blood, fungi, exostoses, foreign bodies or polypi, should all be noted. Fungi are apt to be overlooked and furuncle must be differentiated from otitis media or mastoiditis.

The eye should be over the central orifice of the mirror which should be exactly focussed upon the point under observation. The position of the speculum should be changed from time to time so as to bring each part of the canal and membrana tympani into view. In this examination the eye is aided by a probe made of light tapering steel, the tip of which is barely covered with cotton. The probe enables the observer to remove particles of epithelium, detritus, or cerumen from the line of vision and at the same time to judge of distance, which of course could not be estimated by the single unaided eye. For the removal of large masses of detritus forceps should be used (Figs. 1793 and 1794), and of these at least two patterns should be at hand: one with blades that open in the vertical plane, and another with blades that open horizontally. The various shapes of the normal canal must be borne in mind, and especially should it be remembered that on the anterior inferior wall there is often a decided lump which may nearly shut out a view of the anterior portion of the membrana tympani.

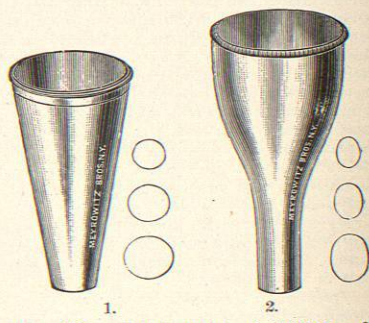


Fig. 1791.—Ear Specula. 1. Wilde's. 2. Gruber's. They are made in nests of three or four, and may be either of metal or of vulcanite.

The appearance of the membrana tympani varies greatly in different subjects, even when the hearing power is normal. The light spot, for example, is blurred in about



Fig. 1792.—Introducing the Speculum and Examining the Parts by Means of a Slender Probe.

eighty-six per cent. (Bezold) of healthy ears; the obliquity of the drum membrane is less evident in wide than in narrow canals and less marked in the living than one would expect after seeing the dissected specimen. In childhood the membrane is usually lustreless and in old age it is often gray normally.

Briefly, then, after the walls of the canal have been surveyed, the eye should be focussed upon the different parts of the membrana tympani in succession: first, the short process and the manubrium mallei should be scrutinized throughout its entire length, and a note should be made of any existing abnormalities; then the peripheral and intervening portions of the mem-

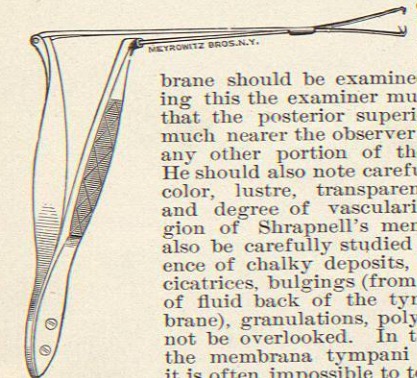


Fig. 1793.—Sexton's Forceps, which may be fitted with various end pieces.

brane should be examined, and in doing this the examiner must not forget that the posterior superior portion is much nearer the observer's eye than is any other portion of the membrane. He should also note carefully its shape, color, lustre, transparency, opacity, and degree of vascularity. The region of Shrapnell's membrane must also be carefully studied and the presence of fluid back of the tympanic membrane, granulations, polypi, etc., must not be overlooked. In the absence of the membrana tympani and ossicles, it is often impossible to tell, by simple inspection, whether one is viewing a congested drum membrane or the mucous membrane of the promontory. This difficulty, which is due to the lack

of perspective which exists when only one eye is used, can be overcome only by the use of a suitable probe.

The Siegle speculum (Fig. 1795) will aid one in clearing up many obscure points. It consists of a speculum, the smaller end of which is surrounded by a piece of soft-rubber tubing by means of which it may be inserted airtight into the external orifice of the auditory canal, while the outer flaring end is closed by a plate of glass set obliquely. It has a nipple which projects from its side,

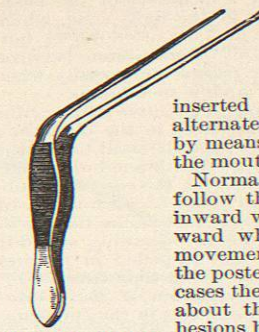


Fig. 1794.—Wilde's Angular Forceps.

and over this is slipped a rubber tube, whose other extremity is attached to a rubber ball or a Delstanche rarefacteur. This instrument should be carefully inserted into the meatus and the air alternately exhausted and condensed by means of the bulb, rarefacteur, or the mouth applied to the tube end.

Normally, the drum membrane should follow the impulse of the air, moving inward when it is condensed and outward when it is rarefied, and such movements would be most apparent in the postero-superior quadrant. In such cases the tip of the malleus is revolved about the folds as an axis unless adhesions happen to be present, in which case their location is made evident by the absence of the normal movement.

Thus, if the tip of the malleus is bound down by intratympanic adhesions, it will evidently not move outward, although there may be bulging of the membrane in front and behind and although the short process may move slightly outward if there is relaxation at that point.

If the ossicular chain and the drum membrane as a whole are drawn inward by extensive adhesions the malleus may be revolved on its long axis.

Frequent observations will acquaint the surgeon with the normal range of these excursions of the various parts of the membrane and the malleus.

The nose and naso-pharynx play a part in the etiology of most diseases of the ear. They should, therefore, be carefully examined according to the rules set down in the proper place in this work.

The naso-pharynx is the vestibule of entry for the middle ear, not only in so-called "colds" but in measles, scarlet fever, diphtheria, influenza, smallpox, pneumonia, and many other diseases. A careful search must therefore be made for stenoses of the nares or naso-pharynx, for hypertrophic or atrophic conditions, and for other abnormalities, such as polypi, exostoses, deflections, etc.; and if irregularities are found to exist they must be corrected before the best results will be obtained in the treatment of ear diseases. Posterior rhinoscopy also furnishes evidence of the condition of the orifices of the Eustachian tubes—whether swollen or atrophied, or whether cicatricial bands are present.

**Examination of the Middle Ear.**—The presence of evidences of disease in the middle ear and the permeability of the Eustachian tube can be ascertained by the aid of various methods of inflation, which are also at the same time important therapeutic procedures. The methods of inflation are: (a) The Valsalva method; (b) catheterization, in which bougieing may be included; and (c) Politzer's method. In each of these methods—but more particularly in the last two—the nose and naso-pharynx should be thoroughly cleansed, and the Eustachian tube orifices should be wiped out with a curved cotton-tipped



Fig. 1795.—Burnett's Modification of Siegle's Speculum.

probe which has been dipped in glycerol of tannin or iodine and introduced through the mouth and up behind the soft palate.

(a) *The Valsalva Method* consists in compressing the air in the naso-pharynx by forcing it up from the lungs when the nostrils are compressed between the thumb and fingers. While easily applied and of some diagnostic value this method is not an entirely safe therapeutic procedure. The entrance of air into the middle ear may be detected by the changes in the appearance of the membrana tympani and especially in the light cone, which may disappear entirely. The malleus often moves outward, and so also does the part of the membrane between it and the periphery. The air passes more easily when there is a perforation in the tympanic membrane.

An *auscultation tube* consisting of a simple rubber tube (Fig. 1796), one end of which is placed in the observer's ear and the other in the patient's ear, may be used to test the passage of air. As the tympanic membrane bulges outward a short blowing sound reaches the ear of the observer.



Fig. 1796.—Auscultation Tube, for Use in Examining the Middle Ear.

In cases of perforation of the tympanic membrane there will be a hissing or whistling sound if the air is not impeded in passing through the Eustachian tube.

(b) *Catheterization of the Eustachian Tube* consists in the introduction of a catheter into the pharyngeal extremity of this tube, an operation which is usually accomplished by way of one of the nasal passages, although it may also be effected by way of the mouth. The Eustachian tube may be regarded as a continuation of the inferior meatus of the nose, although the mouth of the tube is usually distinctly outlined by the fold of mucous membrane and the cartilage which bound it above and on either side. At times, however, catheterization is rendered difficult on account of the presence of cicatricial bands, of excessive lymphoid tissue, of posterior turbinate hypertrophies, or of actual polypi. It is at best a most delicate operation and requires a gentle and highly educated touch. The instrument to be used (Fig. 1797) may be made of any metal or of vulcanite, the latter being necessary in cases in which it is desired to apply electricity through the catheter. For diagnostic purposes the catheter made of pure silver is preferable; its tubal end should be well rounded or somewhat bulbous to protect the soft parts, and the outer end should have a milled head, to facilitate the rotation of the instrument, and an eyelet to indicate the direction of the tip. With a metal catheter a larger calibre is obtained for a given outer diameter, and those made of pure silver are more desirable on account of their greater pliability. The catheter must be thoroughly sterilized before and after use, and an instrument which has been used on a syphilitic patient should never be used on other patients.

A number of methods have been advocated for the introduction of the catheter and of these the ones which I am about to describe are, I believe, the most useful. They are named in the order of their relative merit, although any one of them may be necessary in a given case.

(1) The posterior edge of the vomer is the guiding landmark in Löwenberg's method. The nose and naso-pharynx should be carefully cleansed as above described, the irregularities in them should be noted, and the patient's head should be in a natural vertical position. If the nasal irregularity is great, leaving little room between the inferior turbinate and the septum, or if the patient is nervous and shows a marked aver-

sion to the introduction of the catheter, a cotton-tipped probe bearing a two-per-cent. solution of cocaine may be passed through the inferior meatus to open and anesthetize it; but the cocaine should not be allowed

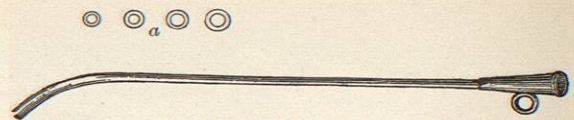


Fig. 1797.—Eustachian Catheter, of Vulcanite or Metal. (About one-half natural size.) Several sizes are available, as shown at a.

to reach the mouth of the tube lest the topography be marred. The tip of the nose should be tilted up by the thumb of the operator's left hand, while the other fingers rest for support on the bridge of the nose, or upon the side of the head, as shown in Fig. 1798. The aseptic catheter, warmed and properly oiled, should then be lightly held like a pen, or between the index and middle fingers, with the flaring end resting against the thumb (as shown in Fig. 1798), at an angle of about sixty degrees; then, under good illumination and with great gentleness, the tubal extremity of the instrument is to be steered along the floor of the nose while the shaft is allowed to rest upon the floor of the vestibule. When the tip reaches the pharyngeal wall, or is felt to glide over the velum, it is to be rotated toward the median line and the catheter drawn out until the point is caught by the septum. Then, without further longitudinal motion, the tip is to be revolved downward and outward, through an angle of somewhat more than 180°, when it will be felt to bring up in the mouth of the tube, at about the same time that the eyelet in the outer extremity points to the outer canthus of the eye. The position of the catheter in the tubal orifice may then be verified by a gentle blast from the Politzer bag or from the compressed-air tank. The milled head of the catheter should then be grasped with the thumb and index finger while the other three fingers rest upon the bridge of the nose to steady it.

(2) In the second method the catheter is introduced in the same way as in the first until the pharyngeal wall is reached, when the tip is turned outward into Rosenmüller's fossa and the instrument gently drawn out until it is felt to slip over the posterior lip of the Eustachian orifice, into which it may then readily be turned. This method is not entirely sure or easy to carry out when the



Fig. 1798.—Introduction of the Catheter.

posterior lip is small or flat, as sometimes results from ulceration or from atrophy, or when the anatomical relations of the nose or pharynx are such as not to allow of the tip of the catheter being drawn along the pharyngeal

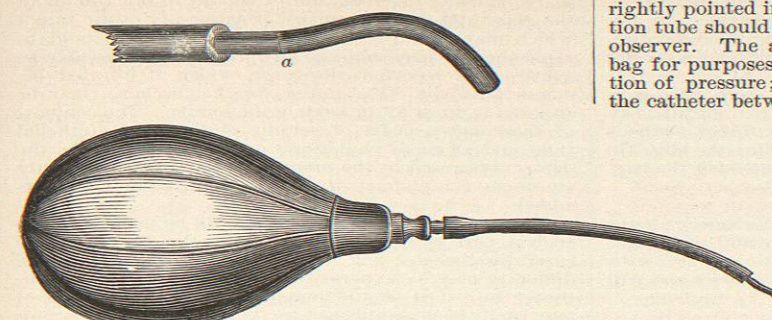


Fig. 1799.—Politzer's Apparatus, complete (one-third natural size). a, Nosepiece (natural size).

wall. This procedure is also difficult to carry out in the presence of edema or when there are adenoids, polypi, or hypertrophies of the posterior turbinates. The posterior lip of the tubal orifice may at times be so prominent that the catheter cannot be slipped over it, and in other cases the beak of the instrument may be drawn too far forward and thus pass in front of the anterior lip.

(3) A third and rather uncertain method consists in introducing the catheter as before until the pharyngeal wall is reached, when the instrument is drawn outward about three-quarters of an inch and the point turned from its downward position through an angle of about 135° until it enters the pharyngeal mouth of the Eustachian tube. It will be readily seen that adenoids, atrophy, or any irregularities of the pharyngeal wall would entirely eliminate accuracy from this method, which is in far too common use.

(4) The expert often introduces the catheter in the manner stated above, gently turning the point outward before the pharynx is reached, and thus lightly guiding it into the tubal orifice by the sense of touch upon the outer wall of the meatus and the pharynx without stopping at any special landmark. This, of course, can be done only with highly educated fingers.

(5) In certain cases, it may be necessary to catheterize through the opposite nostril. For this purpose a more acute angle is given to the tip of the catheter, which is then revolved into Rosenmüller's fossa, drawn over the posterior lip of the tubal orifice, and pressed into the ostium tube.

(6) If both nares are occluded, or in cases in which there is a cleft palate, a catheter with a special bend for the case at hand may be introduced through the mouth into Rosenmüller's fossa and slipped over the posterior lip. A two-per-cent. solution of cocaine wiped over the back of the velum may aid in this little operation, which, fortunately, is rarely necessary.

After the catheter has been successfully introduced, air is sent through it into the middle ear by the aid of a Politzer bag or a tank containing compressed air.

The pear-shaped *Politzer bag* is made of soft rubber and should have a capacity of about eight ounces; it should have no valve, and the outlet should be spherical so that the opening may be brought over the end of the catheter without the nozzle or end-piece slipping into the catheter. Jamming and consequent jarring will thus be avoided. An ingenious attachment has recently been invented for regulating the pressure of the compressed air as it comes from the tank. Owing to this invention the Politzer bag has been superseded to a great extent as a means of forcing air through the catheter. Air, chloroform, or iodine vapor may be forced into the catheter

from the bag or tank. At first this should be done gently, in order to preclude traumatism and consequent emphysema; but afterward several blasts should be given in quick succession. If the Eustachian tube through which the air is thus forced is patulous and the catheter is rightly pointed in the ostium, clear of folds, the auscultation tube should transmit a clear sound to the ear of the observer. The advantages of the tank over the Politzer bag for purposes of catheterization are: nicety of regulation of pressure; the cut-off need not be removed from the catheter between the successive blasts, as is necessary

when the Politzer bag is used, and hence unnecessary jarring is avoided; the air may be heated or medicated when the tank is used; a steady current may be kept up if deemed advisable. The patient's own sensations are not always accurate as to the passage of air into the middle ear. In such cases the auscultation tube or a manometer may be used. To use the auscultation tube intelligently one must be familiar with the blowing sound (*bruit de pluie*) which is transmitted to the observer's ear in normal

cases and its many modifications. (c) *Politzer's Method of Inflation.*—Politzer's method does away with the catheter and has not the disadvantages of Valsalva's method. In fact it may be regarded as the routine method, the use of the catheter being restricted to obstinate cases in which Politzer's is not effective, or to those in which it seems desirable to pass medicaments or the bougie through the instrument. The end-piece originally recommended by Politzer and still preferred by many otologists is that represented in Fig. 1799, a. Other authorities give the preference to a straight or an olive-shaped end-piece. For young children the latter pattern is unquestionably preferable. A rubber tube eight or nine inches in length serves to connect the end-piece and the bag. This method of inflating the ears depends upon the compression of the confined air in the naso-pharynx, which air is forced in the direction of least resistance into the Eustachian tubes. In this method the end-piece or nozzle is entered into one naris and both nasal orifices are then closed anteriorly by compression between the thumb and fingers while the naso-pharynx is shut in by approximating the palate against the pharyngeal wall. The latter is accomplished by the act of swallowing, by pronouncing certain words as "huck" or "hock," or by puffing out the cheeks balloon fashion. When swallowing is the method employed, only a small quantity of water is used and the bag is compressed at the moment the pomum Adami is seen to rise. The soft palate, during the act of swallowing, is closely pressed against the pharyngeal wall and the Eustachian tubes are drawn open by the palatal muscles. Previous to compressing the bag the patient should be warned of the shock to be expected, and, in order that it may be as slight as possible, the Politzerization should be done very gently at first. The air will often enter both ears

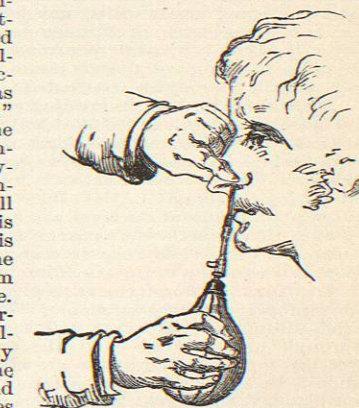


Fig. 1800.—Politzer's Method of Inflating the Middle Ear.