

**Deafness practically illustrated : being an exposition of original views as to the causes and treatment of diseases of the ear / by James Yearsley.**

**Contributors**

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Royal College of Physicians of Edinburgh

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# DEAFNESS

PRACTICALLY ILLUSTRATED:

BEING

*An Exposition of Original Views*

AS TO

THE CAUSES AND TREATMENT

OF

DISEASES OF THE EAR.

BY

JAMES YEARSLEY, M.R.C.S.E.

SURGEON TO THE METROPOLITAN INSTITUTION FOR DISEASES OF THE EAR,  
TO THE ROYAL SOCIETY OF MUSICIANS, ETC.

AUTHOR OF "A TREATISE ON DISEASES OF THE THROAT,"  
ETC. ETC.

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MDCCC XLVII.



## P R E F A C E.

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EIGHT years have passed since the views propounded in the following pages, and the treatment founded thereon, were published to the profession, in the first instance, through the medium of the Medical Gazette, and subsequently in a series of Essays, termed Contributions to Aural Surgery—a work which owed its origin to a laudable desire on the part of the patrons of the Metropolitan Ear Institution, to diffuse widely the benefits of that charity, by giving it all necessary publicity, and, it is submitted, a no less commendable wish on my part to make known opinions and modes of treatment at variance with all that had been previously entertained and practised both in and out of the profession.

More recently, I have over and over again enunciated my views and illustrated my practice before hundreds of my professional brethren, who

have honoured my Practical Demonstrations with their presence. Nevertheless, every day's experience makes it evident to me that much remains to be done for the more effectual subversion of error in the professional and domestic treatment of Deafness. I regret to say, that indiscriminate syringing, and acrid and stimulating drops applied to the outer passages of the ear, still have their advocates, whilst it is evident that by such treatment, in the great majority of cases, harm is done instead of good.


In the following pages, I have endeavoured to show that almost all diseases of the ear originate in a morbid condition of the mucous membrane of the throat, nose, and ear, which becomes affected from a variety of causes, among which, cold, the exanthemata, and stomach derangement stand pre-eminent.

If it be imputed to me that I have failed to notice the opinions of other authors, or to pay that deference to their writings to which they may be thought entitled, I have to say in my defence, that I hold all works on Diseases of the Ear to be of little value, wherein reference to the mucous membrane is not imprinted on almost every page; and up to this moment no such work exists.

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## INTRODUCTION.

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OF all the afflictions incidental to our nature, none is perhaps greater or more grievously felt than the loss of hearing. It is a sense which, more than any other, contributes to the every-day business and the every-day happiness of life. We are, moreover, indebted to it for our most refined and exquisite enjoyments. Without it, we are prevented from holding any but a painful communication with our fellow creatures, and are consequently embarrassed in, if not debarred from, that interchange of ideas which is essential to the cultivation and improvement of our understanding. Deprived of such intercourse, the powers of eloquence, the charms of social converse, and the endearing tones of affection, alike are lost to us.

To the intellectual classes of society, these reflections apply with peculiar force, whilst to persons in the more humble ranks of life, the organ of hearing may be said to be of almost vital importance, for, when deprived of the sense of hearing, they become disqualified to pursue their ordinary occupations, and are, not unfrequently, reduced to a state of destitution; they are cast upon the world without the opportunity of earning a livelihood, as well as depressed by the nature of the disease, and by the gloom it throws over the mind.

While, in its anatomical structure, no part of the human frame has been more thoroughly investigated than the ear, the most distinguished anatomists having examined it with scrupulous precision, and their labours having placed its most complicated mechanism intelligibly and strikingly before us, yet is it remarkable, that, in the whole range of medical literature, no part is so barren of practical information as that which relates to the diseases and treatment of this organ.

On the organ of sight, our libraries teem with scientific works, leaving us little to desire; but its fellow sense, the organ of hearing, certainly not inferior in value, appears, until lately at least, to have been, by universal consent, abandoned to empirics, from whom no advancement could be expected.

The greatest misfortune is, that the almost invariable want of success of such persons, very naturally serves only to strengthen the already too prevalent notion of the incurability of deafness; so that, under such impression, hundreds make up their minds to live and die afflicted with a malady, oftentimes as curable as any other, if submitted to appropriate and scientific treatment. Far otherwise would it be, if the treatment of the malady were undertaken in reasonable time, and if that treatment were suitable to the morbid condition developed.

In relation to this important question of time, it must be observed that nature, generally alert in the removal of disease, acts but feebly in affections of the auditory apparatus. Owing to its peculiar organization, especially to the extreme solidity of its structure, a solidity essential to the firmness of parts, and to the distinctness of vibrations conveying the sense of sound, her powers

are here limited, and therefore is it that cases of deafness rarely get well of themselves. Yet, how often do we find patients flattering themselves with the hope that the reverse will be the case! Their malady, moreover, is generally painless, and, being frequently confined to one ear, or rather, the deafness being much more advanced in one ear than the other, they often suffer little, if any, inconvenience.

A gentleman, in great distress of mind, applied to me, in consequence of a sudden attack of deafness in the left ear. He stated that he had, for many years, been totally deaf in the right ear, but, "not being much inconvenienced," he had never sought medical relief. When, however, the other ear was attacked, he discovered his error. Fortunately for him, the recent affection was remediable; and so, to his infinite surprise and delight, proved the long-existing deafness.

The neglect, indeed, manifested by many patients labouring under deafness, and their procrastination in seeking assistance, are truly surprising. These often fatal errors may, however, in many cases, be traced to the existing prejudice against undergoing any kind of treatment for this malady. Indeed, many patients, with long standing deafness, have thus replied to my censure for not, earlier, seeking assistance:—"Sir, I should have done so; but I was afraid of being made worse."

As a general rule, medical knowledge to unprofessional persons is a dangerous thing; but with regard to individual organs, such as the eye and ear, I am persuaded this is not the case: for were people possessed of a more correct idea of the complicated structure and numerous maladies of these organs, they would not so

easily become the dupes of those who, with brazen front, boldly assert that their many and diversified derangements will rapidly succumb to the *one* remedy of which they boast.

An intelligent author asks, what would be thought of the individual who should profess that he had discovered a something, which, if put within a watch, would rectify all imaginary deficiencies, mend mainsprings, supply broken cogs and lost axles, renew worn-out wheels, and make the hands, on whatever cause their irregularity might depend, keep proper time? He would gain little more than ridicule for his pretended discovery, though, in the abstract, all would agree that such a remedy, were it possible, would be very desirable. We should naturally remark, that what would supply one deficiency could not rectify another of a totally opposite character, and the suggestions of common sense would protect our watches from becoming the victims of unprincipled pretension or stolid ignorance. But what more manifest absurdity would there be in the case of the watchmaker, than there is in the pretending charlatans to whom I have alluded? In the one case, the attempt would have outraged the rational faculties with which Providence has blessed us; while in the other, we become unthinkingly its victims, because it assails our wishes, and is fraught with a hope, the realisation of which is negatived on the very threshold of a rational reflection.

The successful imposition of any empiric arises from the public being unacquainted with the subject he professes to treat. Thus the pretender puts forth by advertisement, that he has discovered a remedy, which, by being used in the passage of the ear, will restore the

function of hearing, whether arising from disease of the external passage, disease of the middle ear or tympanum, obstruction, stricture, or even obliteration of the Eustachian tube, loss of power in the auditory nerve, or even congenital malformation, as frequently present in deaf-dumbness; all are to be cured by a single remedy, which with one consists of acoustic drops; with another, of an ointment to be rubbed into the external passage. How are the public to judge of the rationality and probable truth of these assertions? They are ignorant of the structure and function of the different parts of the body, and of the seat and nature of the great majority of the diseases to which it is liable, of the principles which should regulate their treatment; whether they are capable of cure, or would get well of themselves, or are inevitably fatal. They are conscious of little else than suffering, and the desire of relief; they look around for the remedy; and the most confident and unlimited assurances of cure, however preposterous, are eagerly believed, their reasoning powers being crippled by the preponderating instinct of self-preservation.

Hitherto, assuredly, diseases of the ear have been less under medical control than those to which any other part of the human frame is subject; and our want of method in their treatment has been the natural and inevitable consequence of an imperfect investigation of the affected organ. Happily, of late years, such attention has been paid to this branch of medicine, as cannot fail to be productive of most important results to mankind generally, and must, consequently, be the means of rescuing it from the opprobrium which had previously attached to it. Investigations of diseased conditions of the ear can no longer be

conducted in the same superficial manner. The improvements in aural surgery, of late years introduced, must be put in requisition. By adopting them, we can, in most cases, arrive at a true knowledge of the morbid condition of the organ; and with this advantage, we may be said to have half cured the disease.

The maintenance of this valuable function in health, and its restoration under disease, are indeed worthy of our best efforts; and high honour is due to him who succeeds in adding one iota to the *methodi medendi* of this important branch of medical science.

In the following pages I have attempted to prove that in nine-tenths of the cases which come before the practitioner, deafness will be found to have originated in a morbid affection of the mucous membrane lining the throat, nose, and ear. The latter is reached through the medium of the Eustachian tube, and according as the disease terminates in simple thickening of the mucous membrane, in adhesions, in partial or total loss of the membrana tympani, in disorganization of the whole mucous lining, in loss of the ossicula, or of the inner membranes of the fenestræ, so is the deafness more or less intense and confirmed.

This is the plain and unvarnished explanation of the nature of deafness in its various degrees; and yet, although this view of the subject has been propounded by me, in medical periodicals, and in my published works, for upwards of eight years, how few of those who are called upon to treat diseases of the ear, appear to have adopted it! at least, it may be so inferred, from their irrational persistence in directing their remedies to the external passages of the ear, altogether overlooking the state of the throat and inner passages.

## CHAPTER I.

### BRIEF SKETCH OF THE ANATOMY OF THE EAR.

WITHOUT a general idea of the structure and functions of the various parts of the organ destined for the conveyance of sound to the brain, it would be impossible to understand by what means it becomes impaired, or morbidly affected. A sketch of its anatomy and physiology appears, then, to be an indispensable preliminary to any description of the disorganization, or diseases, to which it is liable. But it would be digressing too far to enter upon an investigation of the philosophy of sound, or the nature of those impressions which, through the medium of the nerves, are made by it on the brain; my observations, therefore, must be limited to the structure of the ear,—to the consideration of the apparatus by which the intensity of vibrations is augmented and carried forward to the seat of the sense; and lastly, to the manner in which the nerve is expanded to receive so delicate an impression.

The most natural division of the ear is into three portions; as well from the relative position, as from the peculiar function which appertains to each. It may, then, be divided into—

1stly. *The external ear*, which includes the auricle and the external auditory passage.

2ndly. *The middle ear*, which comprises the tympanum, or drum of the ear, and its contents; namely, the chain of bones, with their muscles and nerves, and the Eustachian tube.

3rdly. *The internal ear*, or labyrinth, in which are found the vestibule, semicircular canals, cochlea, and the expanded nerve.

*The external ear.*—The *auricle* is divided into a large superior portion, the *pinna*, and a small inferior portion, the *lobus*. The *pinna* presents eminences and depressions, to each of which a separate name has been assigned; thus, its outer margin is denominated the *helix*, whilst that within and opposite to it is the *anti-helix*. Again, the eminence situated immediately before the auditory passage, which assists in forming its margin, bears the name of *tragus*, whilst the opposite projection is the *anti-tragus*. With these various elevations we have corresponding depressions; the groove which necessarily exists between the helix and the anti-helix, has been denominated the *cavitas innominata*; the depression which is caused by the division of the anterior extremity of the *anti-helix* is called the *fossa-navicularis*.

The irregular surfaces of the *pinna* are so arranged, that their sinuosities lead gradually into each other, and finally terminate in the *concha*, or immediate opening of the external auditory passage.

The *lobus* is situated at the inferior part of the *pinna*, and completes the auricle.

The structure of the *pinna* is fibro-cartilaginous, and covered by a fine skin, underneath which may be observed numerous small glands, which secrete an

oily substance, no doubt intended to lubricate the surface of the auricle, and render it less obnoxious to the effects of cold. The *lobus* consists of cellular substance, with a small quantity of fat, and, considering that it is often made subservient to the decorative appendages of females, it is fortunately not endowed with great sensibility.

The *auricle* is supplied with muscles, bloodvessels, and nerves, of which more than a mere notice would be superfluous. In civilized man the former are little developed, owing, in a great measure, to the ear being flattened to the head by the dress; but it is not so among savage tribes, who have recourse to sound in the pursuit of their prey, or for the discovery of their animal food, or as a warning against the approach of an enemy; in them the muscular development is considerable, and its capabilities commensurate.

Bell observes, that "when the more internal mechanism of the ear is injured, and ceases to strengthen the sound, before it conveys it inwards to the labyrinth, the external ear resumes the office to which it was originally adapted, and by a degree of motion and erection assists the hearing."

Mery, a celebrated French surgeon, is said to have possessed the power of moving the auricle in a surprising degree. The same is recorded of Albinus; and I have myself seen many *deaf* persons who have shown a remarkable mobility of the auricle, when endeavouring to distinguish the tick of a watch. A distinguished civilian, in whose case I was some time since consulted, has this power in an extraordinary degree.

The arteries of the auricle are derived from branches of the external carotid, and its nerves principally from the *portia dura*.

The *external auditory passage* forms the second portion of the external ear.

This passage is partly cartilaginous, and partly bony, varying considerably in length as well as in diameter. In some individuals it will be found only three quarters of an inch in length, whilst in others it will reach to an inch and a half. Its diameter is no less variable, and differs in different parts of its course, being generally narrower in the middle than at the extremities, and larger at its external than at its internal extremity. Its perpendicular will exceed its transverse diameter, and owing to the oblique position of the *membrana tympani*, at which the passage terminates, its lower boundary will be found longer than the upper. Its general direction is first forwards, upwards, and inwards, and then downwards and inwards. It is, therefore, always more or less incurvated. It is lined by a thin cuticle, beneath which are deposited the ceruminous glands, and from its surface towards the external extremity, frequently project many small hairs.

The external auditory passage is terminated and closed by a thin semi-transparent membrane, named the *membrana tympani*. In the natural state, it is wholly closed by it, and not partially so, as is supposed by many who can make the smoke of tobacco pass through their ears by stopping the nose and mouth, and forcing their breath into the upper part of the fauces. Such a feat only proves the imperfection of the *membrana tympani*.

*The middle ear comprises the tympanum or drum of the ear and its contents.*

The tympanum is a bony cavity of so irregular a figure as to admit of no exact description.

Towards the external auditory passage is a considerable deficiency in the structure of this bony cavity, and it is across this large circular opening that the *membrana tympani* is extended. On the internal side may be observed a tubercular eminence termed the promontory, with the *fenestra ovalis* and the *fenestra rotunda*, the former communicating with the vestibule or central cavity of the labyrinth, the latter with the *scala* of the cochlea. Both the *fenestræ* are closed by membranes not dissimilar in structure to the *membrana tympani*.

The tympanum, then, may be said to be bounded externally by the *membrana tympani*, and internally by the labyrinth. Posteriorly by a short canal, which leads to the mastoid cells; and, anteriorly, by the opening of the Eustachian tube, which connects the ear with the throat.

Within the tympanum is seen a chain of four small bones, the *malleus*, *incus*, *os orbiculare*, and the *stapes*. They are thus named from their shape. The *malleus*, for instance, from its supposed resemblance to a hammer or mallet; the *incus*, from its resemblance to the blacksmith's anvil; and the *stapes*, from being shaped like a stirrup. It must be allowed that no bones of the skeleton are more appropriately or descriptively named. Ligamentous attachments connect them together so as to form an uninterrupted chain between the *membrana tympani* and the membrane of the *fenestra ovalis*, by means of which the impressions of sound are strengthened and conveyed from the former to the internal ear.

The Eustachian tube, so called after its discoverer Eustachio, commences at the anterior and lower part of the tympanum, and proceeds forwards, downwards,

and inwards, till it terminates at the upper and lateral part of the throat in an oblique and elliptic orifice, sufficiently large to admit the insertion of a quill.

*The internal ear* may well be named the "*labyrinth*," for its complicated structure almost defies description. It consists of the vestibule or middle cavity, of the semicircular canals, and of the cochlea. In these cavities, the auditory nerve is delicately expanded, and is surrounded by an aqueous fluid, termed the *Liquor Cotunnii*. The fenestra ovalis, over which the base of the *stapes* is placed, transmits the vibration it has received by the chain of bones in the tympanum, through the vestibule to the other parts of the labyrinth.

Sufficient of the physiology of the organ, for the comprehension of the subject, may be summed up in very few words.

The vibrations of a sounding body act upon the air, and produce soniferous undulations. These enter the external auditory passage, and cause vibration of the *membrana tympani*. The vibratory motion is successively conveyed to the ossicula, to the fenestra ovalis, and thence to the labyrinthic fluid, which, being set in motion, acts by compression on the auditory nerve. The internal sensation is produced by the nerves conveying the impression to the brain; and it then remains for memory and association to complete the process, and to show the relation which exists between the external agent and the internal impression.

In enumerating the contents of the tympanum, I omitted to mention that which is the most important of all, as without its presence the function of hearing is lost—namely, *atmospheric air*. If the guttural ex-

tremity of the Eustachian tube become obstructed, as in sore throat, (*cynanche tonsillaris*,) and *air* is prevented from reaching the tympanum; if it become closed by adhesions in any part of its course, the effect of inflammation; or if, from the same cause, adhesion of the soft palate to the back of the throat take place, deafness is the result. Deafness also occurs if a polypus in the nose should extend into the fauces and compress the orifice of the Eustachian tube. A superabundant secretion, or a tumefaction of the mucous membrane, not unfrequently forms a complete obstacle to the access of air to the tympanum; and, in a case related by Valsalva, a medicated tent applied to an ulcer situated at the orifice of the Eustachian tube, caused deafness so long only as it was allowed to remain there.

Before the discovery of the guttural passage of the ear, it was known to physiologists, that the tympanum contained *air*, but it was supposed by them to be of a peculiar nature, and to possess properties indispensable to the propagation of sound in the labyrinth. Many discussions arose upon the subject, until Eustachio demonstrated the free communication which existed between the tympanum and throat by means of these passages; and it was then seen, that they served not only as *outlets* for any superabundant secretion, but as *inlets for atmospheric air*.

With this short explanation of the structure and physiology of the organ of hearing, I trust I have prepared the mind of the reader for a proper understanding and appreciation of the various diseases to which it is subject.

## CHAPTER II.

AN OUTLINE OF THE PRINCIPAL DISEASES OF THE EAR  
PRODUCING DEAFNESS, AND THEIR TREATMENT.

It has been remarked by an eminent writer, with not less of propriety than elegance, that, "after reviewing the different parts of the organ of hearing successively, and after inspecting it as a whole, we may not inaptly compare it to an edifice consisting of several apartments, each fashioned after a particular manner, and intended for a distinct purpose. The external part may be likened to the portals of the edifice at which the visitors are collected previously to their entry, and after they have been there assembled and arranged, they are led across the antechamber by certain conductors placed there for that purpose; by these the visitors are ushered into the presence-chamber, inclosed within the winding recesses of the labyrinth, and as they are successively introduced, they register on the tablet of the memory their degrees, their titles, and their properties." In no part of the human economy is there found a nicer adaptation of different parts to each other than in the ear, both as regards the performance of the proper office of each individual structure, and the conjoint action of the whole organ in fulfilling the important office of audition, each division of the complex apparatus not merely performing its own allotted share of duty, but also exerting an important influence on those parts with which it is in apposition or relation.

Like a chain of intricate workmanship, each of whose links is to be considered, not only as acting the part of conductor to an impulse of which it may be susceptible, but as receiving it on the one hand, and afterwards passing it to its fellow. Thus, a soniferous vibration traversing the air, is first concentrated and reflected by the auricle towards the external meatus, where its resonance and force is increased, both by the shape of the canal, and the air it contains. The wave of sound then strikes against the *membrana tympani*, through it the impulse is communicated to the ossicula, or chain of minute bones extended across the tympanum, and from the stapes, the last link of the osseous chain, the vibration is transmitted to the delicate membrane of the *fenestra ovalis*, through which it passes to the perilymph, or fluid of the labyrinth; and by the intervention of this medium, the sonorous oscillation is finally delivered to the expansion of the auditory nerve which encompasses the labyrinthic fluid. However difficult the path we have followed, and which places the human mind in relation with the world of sound, may appear, the science of acoustics proves it, nevertheless, to be adapted, in a beautiful manner, for the reception and conduction of that important agent with rapidity and distinctness.

From this sketch of the healthy exercise of hearing, we may easily deduce that the causes of deafness must be both numerous and varied. In fact, that it may be occasioned by structural alteration or functional derangement, in any of the conductors of sound, or the accessory parts situated between the external ear and the auditory nerve; just in the same manner as, in the case of the eye, blindness is occasioned by alteration of any of the media for the transmission of light. Deaf-

ness is also produced, but with far less frequency, by disease of the auditory nerve itself.

There are certain practical truths relative to deafness, which, to simplify the subject, it may be as well to enumerate; they are proved to us by daily experience, and are sufficient to guide us in the choice and application of the various therapeutic means proposed for its relief. Thus, it is known, that if, from any cause, air cannot reach the membrana tympani through the external auditory passage, the faculty of hearing is nearly or quite extinguished. Again, it is known, that the elasticity of the membrana tympani is essential to hearing, so that, when, by disease of the membrane itself, or by an alteration of the surrounding parts, it becomes thickened, the function of hearing is impaired, and can only be restored by the restoration of the membrane to its normal condition, or by making a passage through it for the transmission of sound. Many persons are altogether deprived of this membranous partition, and yet preserve the function of hearing in tolerable acuteness.

It is also observed, that when the Eustachian passages, which serve as inlets for atmospheric air, and as outlets for the secretion of the lining membrane, are obstructed, deafness is the result; and the lost function is restored only with the re-establishment of these natural passages.

With these fixed principles before us, I will proceed to the more immediate object of this chapter—namely, “An Outline of the Principal Diseases of the Ear, and their Treatment.”

The most natural division of the subject which presents itself, with reference to loss of hearing, is

that arising from the relative situation of the parts affected.

- 1st. *Diseases of the external ear*—The auricle, external auditory passage, and external surface of the membrana tympani.
- 2nd. *Diseases of the middle ear*—The cavity of the tympanum, the internal surface of its membrane, the small bones of the ear with their muscles; and occlusion, stricture, or complete obliteration of the Eustachian tubes.
- 3rd. *Diseases of the internal ear*—The auditory nerve, and contents of the labyrinth.

#### I. DEAFNESS ARISING FROM AFFECTIONS OF THE EXTERNAL EAR.

Impaired hearing, from diseases which attack the auricle, as simple erysipelatous inflammation, abscess, or, more rarely, scirrhus, is comparatively infrequent. The affections seldom occasion entire or permanent deafness, and require to be treated more with reference to their constitutional origin and effects, than to their influence upon the function of hearing alone.

Diseases of the auricle are observed much more frequently in childhood than mature age. At this period of our existence, the supply of fluids to the organ is abundant. We may judge of this by the copious secretion of thin transparent yellow wax in the meatus, which sometimes may be seen almost to trickle over the concha. As we advance in life, the ear is more scantily supplied; and thus it is, that diseases of the auricle and auditory passage appertain more especially to youth; whilst diseases of the tympanum and labyrinth are the attendants on manhood and old age.

Scirrhus degeneration of the auricle is a disease of

extremely rare occurrence. From a statistical table of 1000 cases admitted at the Metropolitan Ear Institution, it appears that only five presented themselves with this disease.

The diseases of the auditory passage are more deserving of consideration, both from their frequent occurrence, and tendency to weaken, by their continuance, the power of hearing. This passage is occasionally much curved, and from this circumstance great difficulty is sometimes experienced in obtaining a view of the membrane of the tympanum. At all times it should be a *sine quâ non* with the practitioner to ascertain the precise condition of this membrane. An instrument, therefore, which will enable us to obtain this desideratum with facility, cannot fail to be duly appreciated; for it is unquestionably owing to the omission of a careful local investigation of the auditory passages, that the greatest confusion and errors in treatment have arisen.

Judging from the shape of the various instruments for the inspection of the auditory passage, which are offered for sale by the surgical-instrument maker, it has appeared to me, that their proper application has been lost sight of or misunderstood. Whoever shaped them must have supposed that the whole extent of the auditory passage was capable of dilatation, whereas, from its construction, it is obvious, it can only be so at its very entrance.

A better view can be obtained by *straightening* the canal than by *dilating* it; and therefore I some time ago proposed the *speculum auris*, as represented in the plate.

Fig. 1. Speculum proposed by Kramer.

Fig. 2. The author's Speculum.

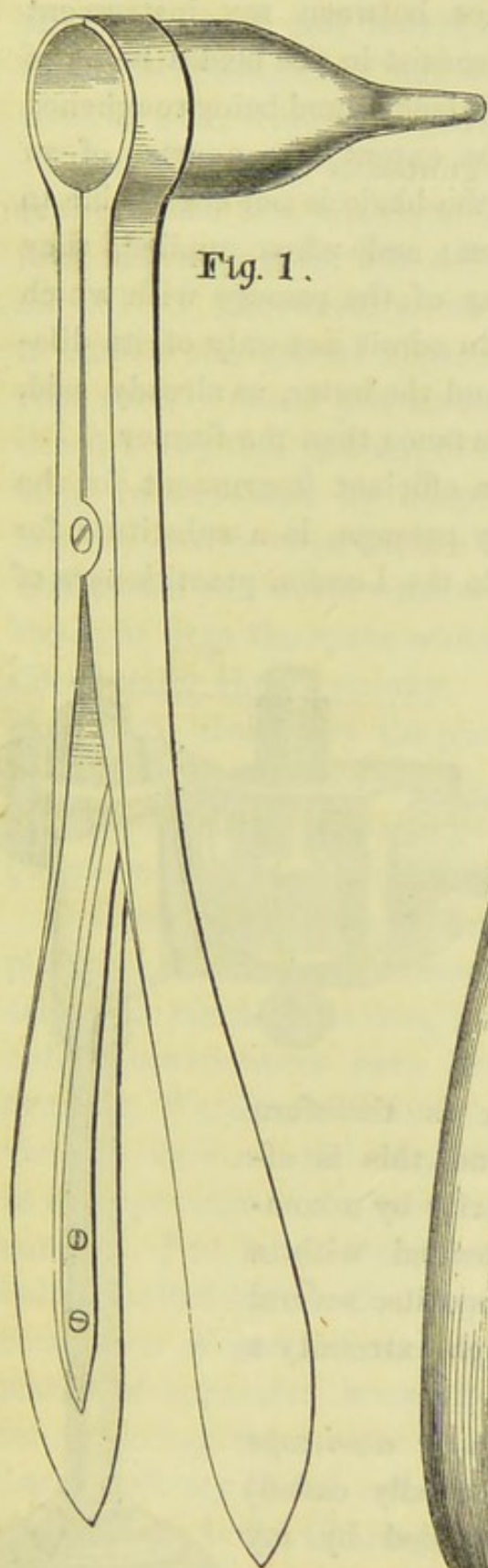


Fig. 1.

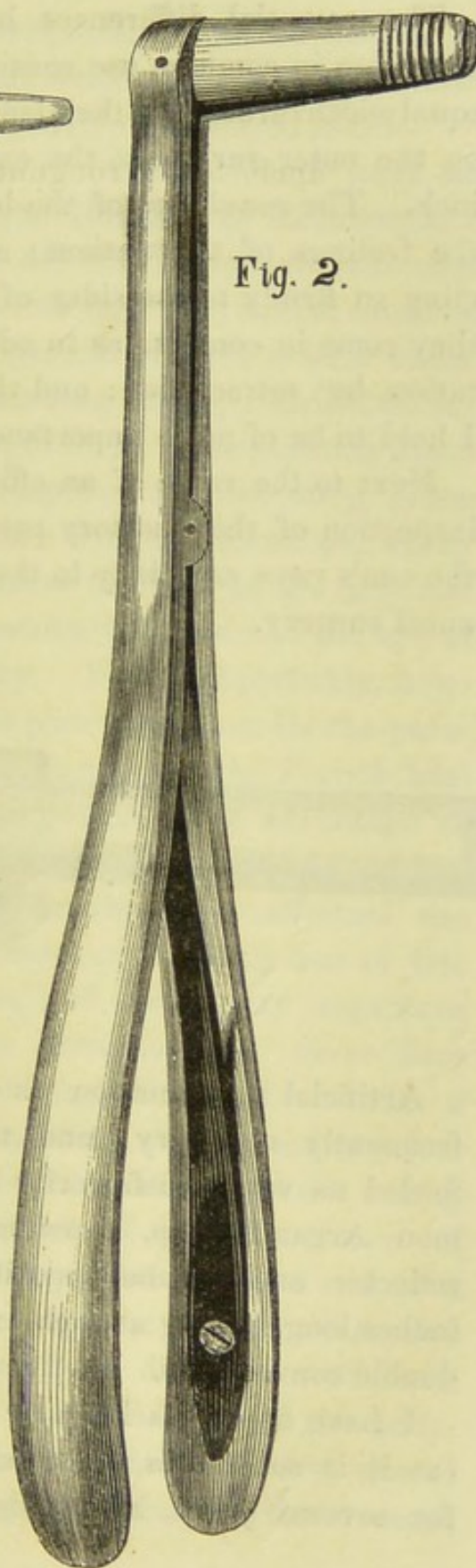
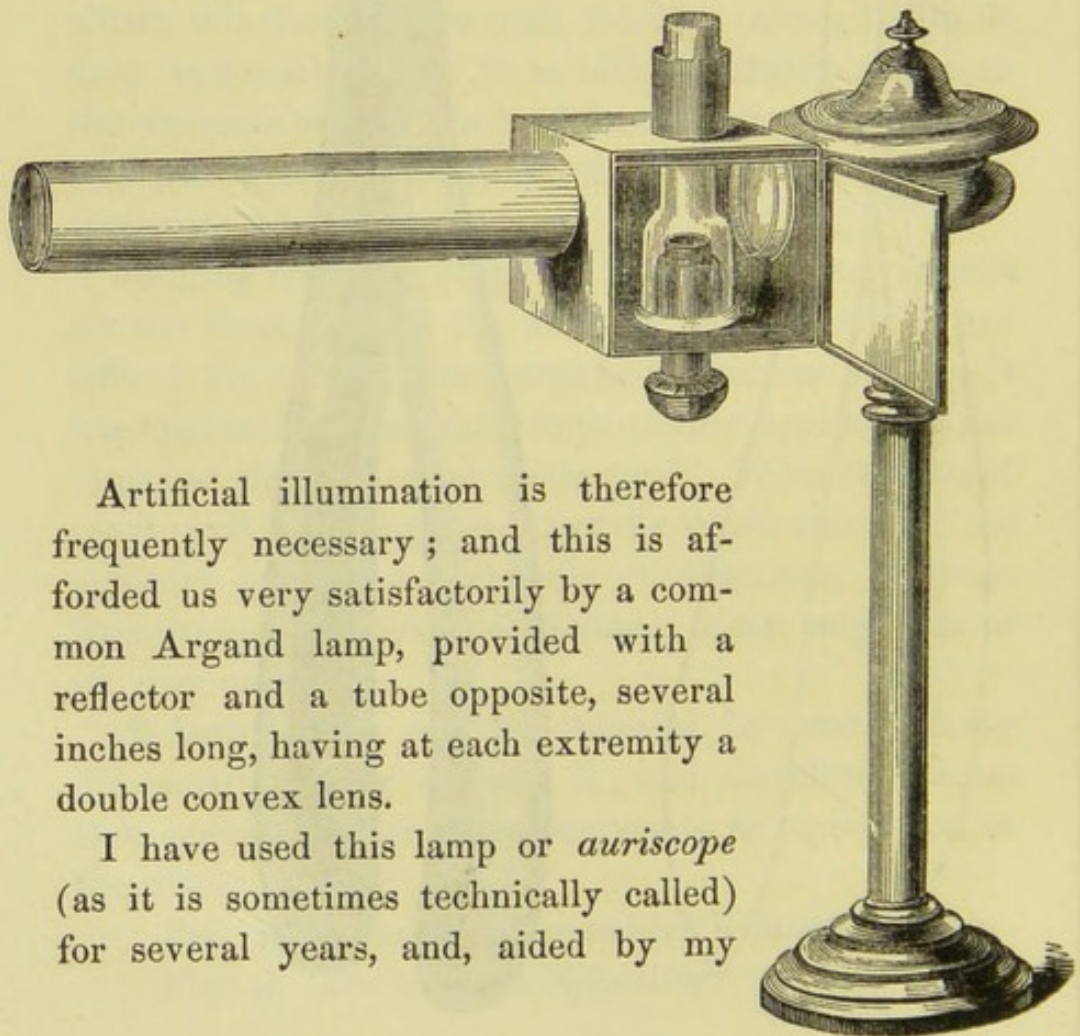


Fig. 2.

The essential differences between my instrument and those in common use consist in the blades being of equal width throughout their length, and being roughened on the outer surface to the extent of a quarter of an inch. The roughness of the blade is not cognizable to the feelings of the patient; and when applied, they cling so firmly to the sides of the passage with which they come in contact, as to admit not only of its dilatation, but retraction; and the latter, as already said, I hold to be of more importance than the former.

Next to the value of an efficient instrument for the inspection of the auditory passage, is a substitute for the sun's rays, especially to the London practitioners of aural surgery.



Artificial illumination is therefore frequently necessary; and this is afforded us very satisfactorily by a common Argand lamp, provided with a reflector and a tube opposite, several inches long, having at each extremity a double convex lens.

I have used this lamp or *auriscope* (as it is sometimes technically called) for several years, and, aided by my

speculum, have not unfrequently detected disease in the outer passage, or membrana tympani, or concretions of wax, which had previously escaped notice.

That this lamp admits of improvement I have no doubt. The late Sir John Robison, of Edinburgh, a most scientific man, who did me the honour to consult me in 1842, afterwards wrote me, "If you still continue to employ the optical apparatus, which, whilst under your care, I found you making use of, I should be inclined to say that you might make its application much more commodious, by adapting the deflecting prism used in zenith observations with the telescope, as by that means you would remove the body of the tube and the light from the space which the head and the eye of the operator should occupy. You may probably, however, have abandoned the plan altogether for the parabolic reflecting tube so much used in the French hospitals, and which seems to possess great advantage *in quaque versus*, applicability and efficiency."

Artificial illumination for the more effectual exploration of the inner recesses of the body has of late attracted much attention, and some very ingenious optical contrivances have been devised. Some time ago, Dr. Warden, of Edinburgh, favoured me with a visit, to show me the adaptation of a reflecting prism as an appendage to the speculum in common use among aurists. Not long afterwards, I had the honour of being invited by the Society of Arts to form one of a committee of gentlemen, to report on the respective merits of apparatus invented by different candidates, for exploring the various inner passages of the body. Later still, my friend and relative, Mr. Avery, one of the surgeons to the Charing-cross Hospital, has invented

a very ingenious lamp for inspecting the inner recesses of the body. Of all the instruments I have seen, this is by far the most efficient, and, moreover, it commends itself by its portability. But, after all, these various instruments are to be prized more for their service in illuminating other passages than those of the ear; to the practised aurist, the light of day is amply sufficient, and it is only when deprived of this auxiliary in the detection of disease, that artificial illumination becomes of any value for his purposes.

The external auditory passage, like the auricle, is subject to an affection characterized by more or less itching, tickling, and burning sensation, accompanied by confusion and sometimes pain in the head, with various kinds of noises in the ears and diminution of hearing. The irritation gives rise to an increased secretion of ear-wax, which, from the unnatural heat of the parts, is rapidly deprived of its moisture, and thus, a dry hardened accumulation takes place, altogether preventing the waves of sound from reaching the tympanum. Deafness is the result. During the continuance of the disorder, the patient not unfrequently experiences sudden loud noises in the ears, followed by an immediate but temporary improvement of hearing. This arises from the breaking away or displacement of portions of the hardened wax; and it not unfrequently happens, that the whole concretion falls out, in which case, the patient is at once most unexpectedly relieved.

In the absence of such result, the accumulation should be removed by careful syringing with warm water, or by a small forceps. In my own practice,

from long experience with the latter, I have seldom occasion to syringe the ears. I am not an advocate for this manipulation, being firmly convinced that it is a most pernicious practice, and when adopted, as it sometimes is, for days and weeks together, is reprehensible in the extreme. Indeed, upon what principle it is so employed, I am at a loss to conceive.

After the removal of the hardened wax, an irritable condition of the walls of the passage, and sometimes of the membrane of the tympanum, may be observed. It is good practice, therefore, to pencil over these parts with a weak solution of alum, sulphate of zinc, or acetate of lead, night and morning, for the two or three following days.

If the hearing be not restored by the removal of the hardened wax, it is fair to infer that the inflammatory affection which gave rise to it extends even to the tympanum and Eustachian passages, and that therein will be found an obstruction from hardened mucus equally obnoxious to hearing. On one side of the membrana tympani wax is secreted; whilst, on the opposite, that is, in the cavity of the tympanum, mucus is secreted. Either secretion, when deprived of its moisture by the unnatural heat of the parts, becomes a hardened mass, and forms an obstruction to sound. It is unreasonable to suppose that the membrana tympani should be the boundary of an inflammatory condition, either of the tympanum and Eustachian tube, on the one side, or of the external auditory passage on the other.

Admitting this to be correct, we have at once an explanation why it is that patients are frequently but partially relieved by the mere removal of wax.

Affections of the external auditory passage produce deafness by altering it in shape and calibre, so as to decrease the impression of sound upon the tympanum, and very frequently by involving the membrana tympani itself in the changes which ensue. It may become contracted by the thickening of the soft parts which line it, the result of inflammation frequently recurring and passing into a chronic form; or it may be obliterated in consequence of wounds or ulcerations, which in cicatrizing have united the sides of the canal, and thus closed the cavity. Mazzoni has remarked an imperforate state of this passage, and Blandin, its total absence. Nevertheless, none of these conditions appear to destroy the hearing altogether, provided the contents of the tympanum and labyrinth are healthy. A case is recorded of a child entirely destitute of all appearance of external ears, and of external auditory passages, these openings being completely covered by the common integuments; yet the child could hear a great deal, though the sense was certainly dull and imperfect.

By far the greater number of cases of discharge from the external ear, or otorrhœa, occur in individuals of the strumous diathesis: this fact should never be forgotten in the treatment, during which the general health should be attended to with quite as much assiduity as the local affection. Discharges from the external passage generally commence as mucous otorrhœa; indeed, frequently nothing more is perceived than simply an increase of the natural ceruminous secretion. The sensation attending the commencement is that of itching, or tingling, rather than pain, which incites the patient to attempt the alleviation of this troublesome symptom, by picking

the ear with pins, and other mechanical means, such means being unfortunately the most certain to perpetuate and increase the incipient disease. The mucous discharge continues, unless great care be taken, and as the follicles of the meatus become more diseased, it at length degenerates into a secretion of puriform matter, (otorrhœa purulenta.) The lining membrane of the passage becomes thickened by the chronic inflammatory action, and fungous growths or polypi arise, which not only impede the hearing, but frequently become so large as to fill up the meatus; and by exerting pressure on the sensitive parts, produce intolerable pain until their removal is effected.

Preparatory to the treatment of these discharges, one circumstance should be invariably attended to, which is the state of the membrane of the tympanum. Previous to the application of injections of any kind, a careful exploration of this membrane should be made by the aid of the speculum and lamp, in the absence of the direct rays of the sun, or by the injection of air through the guttural passage into the tympanum, to discover whether or not the membrane is perforated. There is no doubt that many cases of purulent otorrhœa have terminated fatally from the neglect of these measures, injections of an irritating and astringent nature having been administered, without first discovering whether or not the tympanic cavity was implicated. If an injection of this character be forced into the external meatus, when an opening exists in the membrana tympani, it necessarily enters the cavity; and as in these cases the Eustachian tube, which is the only natural exit from the tympanum, is generally obstructed, the matter injected remains, in great part, within that cavity; for the mem-

brana tympani is so obliquely situated, that an aperture in it allows of the ready entrance of fluid, but the escape is retarded by the anatomical conformation of the part. Under these circumstances, the discharge is sometimes suddenly checked, and inflammation is set up, which extends rapidly to the brain, and seldom fails to destroy the patient, as this form of disease is invariably less amenable to treatment than even ordinary inflammation of that organ. If this result does not occur, the irritant injection, by remaining in the tympanum, greatly increases the danger of caries of the bones of the ear; an occurrence which sometimes leads to a fatal termination.

The proper treatment of Otorrhœa, both mucous and purulent, after it has been proved to be *external*, is, without losing sight of the general health, to exhibit injections at first but very feebly astringent, which may be gradually increased in strength, until the discharge decreases and disappears. When otorrhœa becomes of long continuance, either from neglect or improper treatment, it is seldom that a similar lesion does not exist on the internal surface of the membrana tympani: in such cases, treatment by the external meatus alone will prove inefficient to restore the lost hearing.

## II. DEAFNESS FROM DISEASE OF THE CAVITY OF THE TYMPANUM, AND OF THE EUSTACHIAN TUBE.

Discharges from the tympanic cavity, or internal otorrhœa, is a much more serious disease than the one we have been considering. It is usually the result of acute inflammation occurring in the ear, and is commonly attended by perforation of the membrana tympani, and frequently by closure of the Eustachian tube; as a

natural consequence, a portion of the pus secreted remains constantly in the tympanum, because, from the anatomical position of the membrana tympani, the secretion can only partially escape by the perforation in that membrane. The pus becomes decomposed by contact with the air; and hence arises the fetid properties of the discharge. The decomposed pus acts on the bony structures by which it is surrounded, producing caries and extensive disorganization, accompanied by dull, deep-seated pain in the ear, and loss of memory, and mental vigour. Deafness in this case may depend on the state of the tympanic membrane, or on the morbid changes going on in the diseased structures. It is in this disease of the middle ear that irritating injections are so highly injurious, and productive of such disastrous results. If injections be introduced by the external passage, they should be of the mildest character, especially at the commencement, and used frequently, to remove the secreted matter. By these means, the progress of the disease may be retarded, and the discharge may continue during the patient's lifetime; but undoubtedly the most natural and efficacious mode of introducing the injection is by the Eustachian tube. For this purpose, catheterism should be performed, and the tube cleared of obstruction, if any exist; after which injections may be used by this channel. The advantages of injecting by the Eustachian tube are, that it admits of the whole of the injected fluid, as well as the secretion, being removed, while this can never be entirely done by the usual method; and again, it favours the renovation of the membrana tympani, which can rarely, if ever, be effected, while injections are being frequently forced through the perforation it contains.

Before passing to a consideration of the diseases of the Eustachian tubes, and the deafness thereby occasioned, it will be useful to glance briefly at the physiological action of these tubes, both for the purpose of elucidating the nature of the consequent loss of hearing, and the utility of the treatment recommended.

The Eustachian tube is lined throughout by a delicate prolongation of the mucous membrane covering the pharynx, which connects the cavity of the tympanum with the throat and passages of the nose. A chief characteristic of mucous membranes, and from which they derive their name, is the secretion of a mucous fluid which lubricates their surfaces, and preserves them in a healthy condition. As this secretion, under ordinary circumstances, always proceeds without intermission, it is necessary for the preservation of the normal condition of the membrane, that the superabundant mucus should be continually removed; otherwise, it would become viscid, and constitute a departure from the state of health. This removal of the superfluous mucus is effected in different modes, in different parts of the mucous system. Sometimes by a proper muscular tunic, which occasions movements of the membrane itself in a certain direction; in other organs, by the transit of large quantities of fluid over the secreting surface; or by alternate contractions and dilatations of the mucous tubes, by the ingress and egress of air in respiration. Of these different kinds of motion, only the latter is possessed by the Eustachian canal; and this but in a very limited degree. The contraction and dilatation of the tube in respiration, however slight, is of course favourable to the escape of mucous fluid from the tympanic cavity and Eusta-

chian canal. In addition to the means described, there exists another very delicate and beautiful organism, intended to assist in maintaining the integrity of the passages leading to the ear. These are the innumerable cilia, discovered in the tuba Eustachii, by MM. Valentin and Purkinje. The cilia themselves consist of transparent filaments, situated on the surface of the mucous membrane, and are endued with a power of active motion. They are only visible with the aid of a powerful microscope, being of a diameter not exceeding  $\frac{1}{12307}$  of an English inch. Ciliary motion consists in the regular and continued vibration of these minute filaments; although so exceedingly small, their great number and constant oscillatory movements are sufficient to occasion determinate currents in the fluid on the surface of ciliated membranes, and even to remove by their action fine particles of dust, which may come in contact with them. It will be easily seen, that the ciliary bodies are of great utility in preserving the healthy condition of the mucous membrane of the Eustachian tubes; more especially as these tubes, from their cartilaginous structure, admit in themselves of such limited motion. Such are the chief provisions of nature for the conservation of these canals, to which such frequent reference has been made; provisions that, during the continuance of health, are abundantly sufficient for the fulfilment of their designed purpose. But when from accidental causes, (and these causes are both numerous and important,) as dyspepsia, fevers, catarrhal complaints, dentition, &c., the Eustachian tubes become inflamed, or in a state of irritation, the mucous membrane throws out a larger amount of secretion than usual; and if this secretion be in greater

quantity than can be carried off by the movements of the tubes in respiration, and by ciliary motion, the secreted mucus remains in the tubes and cavities of the tympanum, becomes viscid by the absorption of its fluid particles, and most frequently occasions entire occlusion of the Eustachian canals; a result which is invariably attended by deafness. This state of things may, and frequently does, continue a whole lifetime, without any efficient effort of nature to remove the obstruction; indeed, such must be almost impossible, when the disease has become chronic, from the peculiar structure and endowments of the organ affected. Under these circumstances it is that catheterism of the Eustachian tube becomes of such great and manifest importance, being, in fact, the only means by which a restoration to the normal state can be attempted with rational expectation of success.

In this place, it may be interesting to inquire, in what manner the Eustachian tube contributes to the perfection of hearing; the answer to which will not only simplify some of the most important affections of the ear, but place their treatment by means of this canal in its proper light. As an integrant part of the auditory apparatus, the Eustachian tube affords more indirect than direct assistance to the sense of hearing. Comparative anatomy shows that it is constantly present in all animals possessed of a tympanum, a fact in itself sufficient to prove its importance. The direct uses of the tube are probably to connect the cavity of the tympanum with the external air, and to bring the parts of the internal ear in connexion with the cavities of the nose, and the frontal and other sinuses. In illustration of the first use of the Eustachian canal,

that of connecting the tympanic cavity with the external air, it may be stated,\* that a tuning-fork will give a much louder and clearer sound, when it has a side tube affixed to it after the manner of the canal leading to the tympanum, than when devoid of such an aperture. So likewise, in actual experiment and diseases of the ear, it can be proved, that in temporary imperforation of the Eustachian tube itself, dulness of hearing ensues as a necessary consequence. With regard to the second direct office of this canal, that of maintaining a tubular communication between the cavity of the tympanum and the cavities of the nose and forehead, it is believed that considerable resonance and increase of force are given to the sounds in their transit through the ear by means of the cavernous passages mentioned. Dr. Henle believes this to occur in a mode analogous to the reinforcement afforded by the belly of a violin to the musical sounds emitted from the strings of the instrument, the openings in the sounding board being compared by him to the Eustachian canals.

But it is the indirect utility of the Eustachian tubes which gives them their great and acknowledged importance, both in the consideration of deafness, and the physiology and pathology of the ear. Without them, the cavity of the tympanum would become completely isolated from the external air; there being in the normal state no communication by means of the *membrana tympani* through the external passage. When such perforations do exist, they are strictly malformations, congenital or otherwise. It is necessary to the

\* Müller.

perfection of hearing, that the tympanic cavity should contain atmospheric air. The soniferous vibrations which enter the ear are conducted across the tympanum by two paths; one of them being the osseous chain, whose extremities are connected with the membrana tympani and the fenestra ovalis. Here the vibrations are transmitted by the ossicula themselves, without losing any intensity, by passing off into the air of the tympanum. The other channel for the transmission of sound is the air itself which the tympanum contains. Oscillations are caused in it by the vibratory movements of the membrane under the impulse of sound; and these sonorous undulations are received by a special membrane covering in the fenestra rotundum, which communicates with the labyrinth and acoustic nerve. This latter important auxiliary to the sense of hearing is necessarily lost, when air is wanting to the tympanic cavity.

A still more important office which the air of the tympanum performs, is its influence upon the state of the membrana tympani. When, from any cause, disease or otherwise, the Eustachian passage becomes obstructed, the equilibrium of pressure and temperature can no longer be maintained between the air within and without the tympanum: the air of the tympanum either becomes expanded in volume by the heat of the body, or is partially or entirely absorbed. In either case, an alteration of vital consequence ensues in the membrane of the tympanum. If the air of the cavity be absorbed so as to occasion a vacuum, the ordinary pressure of the atmosphere is sufficient to press the membrane inwards, so as to render it considerably concave on its external

surface. If, on the other hand, the air remains in the tympanum, and becomes expanded beyond the external standard, the membrane is forced outwards, but is prevented from assuming a convex form, by its attachment to the handle of the malleus. In either case, whether the pressure be exerted on the membrane of the tympanum from within or without, imperfection of hearing is the uniform result. This unfortunate contingency admits of a satisfactory elucidation. In the natural and healthy condition of the organ of hearing, the membrana tympani closes in the internal ear, being firmly attached by its margin, but without any degree of tension, and in this state is best fitted for the performance of its allotted function, which becomes impeded, when from any cause the membrane is rendered inordinately tense. M. Savart found by actual experiment upon a preparation of the membrane of the tympanum in the dried state, that when loud sounds were occasioned in its immediate neighbourhood, the vibration of the membrane in a relaxed state was sufficient to throw off from its surface particles of fine sand or minute seeds. M. Savart also found, that when, by means of a small lever, he produced tension of the membrane, sounds of similar intensity occasioned in it more feeble vibrations, and less motion of the dust strewn upon its surface, than when the membrane was suffered to remain in a state of relaxation. The membrana tympani may likewise be made tense by a voluntary effort, and temporary deafness produced by an individual, in whom the sense of hearing is naturally perfect. If the mechanism of blowing be performed forcibly by the cheeks, while the mouth and nostrils are

closed, the Eustachian tubes become dilated, and a sufficient quantity of air passes into the tympanum to force its membrane outwards. On the other hand, if the sucking motion be imitated, the mouth and nostrils remaining closed as before, the air of the tympanum is rarified, and decreased in quantity, the tubes becoming closed by the collapse of their parieties, and the membrane forced inwards by the pressure exerted on its external surface by the atmospheric air. Under either of these circumstances, whether the membrane be affected by excess or deficiency of air, deafness ensues, and continues until both membrane and tube return to the natural condition. The same principle obtains in the deafness generally observed towards the termination of fevers, and always held to be a favourable symptom. Here, the cause lies in the return of the secretions to the mucous membranes, as the disease subsides; and the deafness is occasioned by the temporary obstruction of the tubes with the excess of mucus secreted. The effect of pressure of the atmospheric air in forcing in the tympanum and causing deafness is shown most satisfactorily in a case recorded by Deleau. While operating on a gentleman, in whom catheterism of the tube immediately effected a restoration of the hearing, which had been lost for nine years, Deleau found, that while the catheter remained firmly fixed in the tube, he was able by means of a syringe to exhaust at will the cavity of the tympanum, and so re-establish the deafness, which disappeared the moment air was again admitted, and the equilibrium restored.

There is a peculiar circumstance connected with deafness arising from the state of the *membrana tympani*

I have been attempting to describe—namely, that acute sounds are then appreciated much more readily than sounds emitted in a grave tone. The truth of this can be easily perceived by any one who chooses to produce the temporary deafness I have specified. It will be found, that while deafness from tension of the membrana tympani continues, a conversation in a sharp tone is much more audible, than when the sounds are of a graver character. Hence it arises, that in real deafness of this kind, the patient can maintain a conversation with those who talk in a high, better than with others who speak in a low tone of voice. Such individuals can also hear much more distinctly while riding in a carriage through a crowded city, or when exposed to considerable noises of a continued kind, than in a room from which external noise is excluded; and here, the reason is to be found in the circumstance, that while the grave, rumbling noise of the carriage and the usual turmoil of a street are perceived by the person who hears naturally well, and tend to confuse him, so as to produce dulness of the sense, the deaf person enjoys the advantage of not perceiving the extraneous noises with sufficient distinctness to occasion inconvenience. And besides, a person who hears well, while riding in a carriage, naturally assumes a shriller tone of voice than usual, to separate, in some degree, the sounds he himself utters, from those around him; a circumstance which gives an additional advantage to the deaf individual. The rationale of this singular phenomenon lies in the fact, that thin membranes, as that of the tympanum, emit themselves more acute sounds in a tense than a relaxed state; and the nearer

the tone or "timbre" of the sound approaching the membrane is to the note proper to the membrane itself, the more distinct and perceptible does it become.\*

After this exposition of the direct and indirect offices of the Eustachian tube, of the manner in which obstructions occur in it, and of the principles on which the resulting deafness depends, it must be plainly evident, that the restoration of the natural condition by opening the tubes, will be the most easy and satisfactory method of curing the impaired hearing; especially as this operation, in the hands of a practised operator, with powers of delicate manipulation, and thorough knowledge of the parts, is void of difficulty, and entirely free from pain.

When the occlusion of the Eustachian tube depends simply on an accumulation of inspissated mucus, the introduction of the catheter, by removing the obstruction, and supplying the tympanic cavity with air, occasions so sudden a return of the power of hearing, as to astonish the patient upon whom the operation is performed. The cure of the variety of deafness dependent on this cause, though it has existed for many years, is often performed in an incredibly short space of time. More frequently, the long persistence of the disorder has rendered it in some degree complicated, and it is requisite to syringe the ears through the tube, for the purpose of removing the sordes contained in the tympanum. This plan frequently requires to be adopted in otorrhœa from the external meatus. If often happens, that after the discharge has been cured by applications to the external ear, the deafness remains

\* Müller.

unalleviated. In such cases, the internal surface of the tympanum has become affected by the external disease, and before the cure can be established, or the hearing restored, it becomes necessary to apply remedies to the middle ear by means of the Eustachian tube.

It was the practice of many of the most eminent surgeons, even of the present day, before the value and utility of catheterism were triumphantly established beyond the power of refutation, to puncture the *membrana tympani*, or make an opening into the mastoid cells, in cases of closure of the Eustachian tube, accumulations of blood, mucus, &c., in the cavity of the tympanum. The operation generally proved ineffectual, because the puncture in the membrane soon healed, and, from its returning to its original state, the benefits accruing to the patient were only transitory.

By improved instrumentation, this objection to the operation no longer exists. A few years ago, an Italian surgeon, named Fabrizi, brought over to this country an ingenious instrument, termed a *tympanatoire*, for cutting out a circular portion, or, in other words, for *trephining* the *membrana tympani*. It seemed calculated to realize the fondest hopes of the few remaining advocates for the operation, and I took the earliest opportunity of making frequent trials of it on the dead subject; but I soon found that it was quite unavailable in practice. Without, however, departing from the principle of the instrument, which is excellent, I flatter myself I have made such modifications as render it admirably calculated for the object in view. But I will attempt a description of the original instrument, and the improvements I have made upon it.

Fabrizi's instrument is composed of two pieces—(see Fig. 1.)—1st. A canula (*a a*) three inches and a half in length, and a line in diameter, terminating in a cutting edge or punch (*b*).—2nd. A perforator (*c c*) with a spiral extremity (*d*) similar to a corkscrew, and fixed in a handle (*e*) two inches in length. The spiral rod or perforator is accurately adjusted by means of a female screw within the canula, passes through its whole length, and projects to the extent of a line, this being the extent of the spiral extremity.

The operation is performed—1st, by worming the perforator into the membrana tympani to the necessary extent; and 2ndly, by a rotatory movement of the canula over the spiral rod in an opposite direction. The cutting edge of the canula thus takes out a circular portion of the membrane, and the instrument is then released.

Now in using this instrument, rotatory movements in opposite directions, and a shifting of the hand from the handle to the canula to effect them, are required, and these will be found to be insuperable objections to its use. Besides, it appears to me, that the operator should be sure of the exact spot upon the membrana tympani which he is going to trephine; but this cannot be obtained with Fabrizio's instrument; for in holding it, the hand altogether intercepts the view of the membrane.

To remove these various objections to the instrument, (see Fig. 2,) I have lengthened the handle (*a*) at least two inches, so that it may be steadily grasped by the whole width of the hand of the operator. 2nd. By a ball and socket joint, it is capable of being set at any angle in respect to the forepart of the in-

Fig. 1.

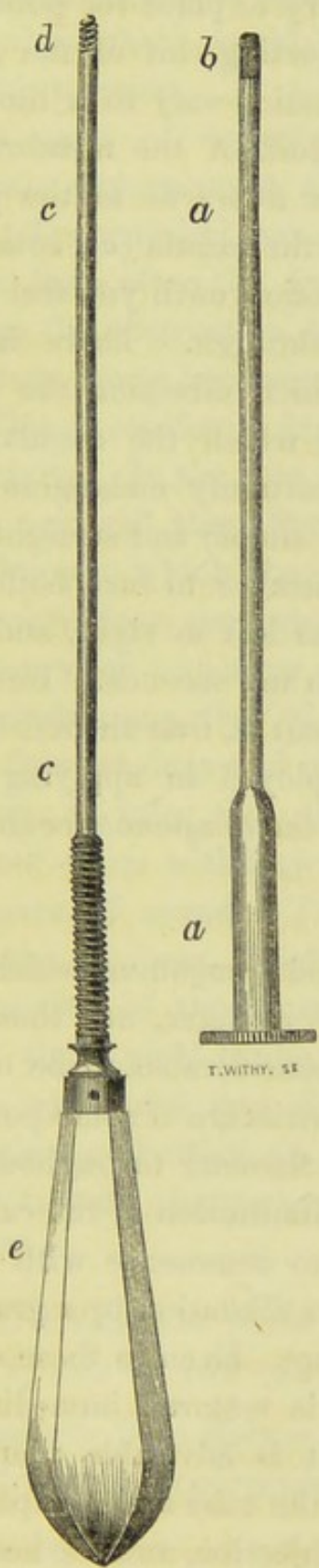
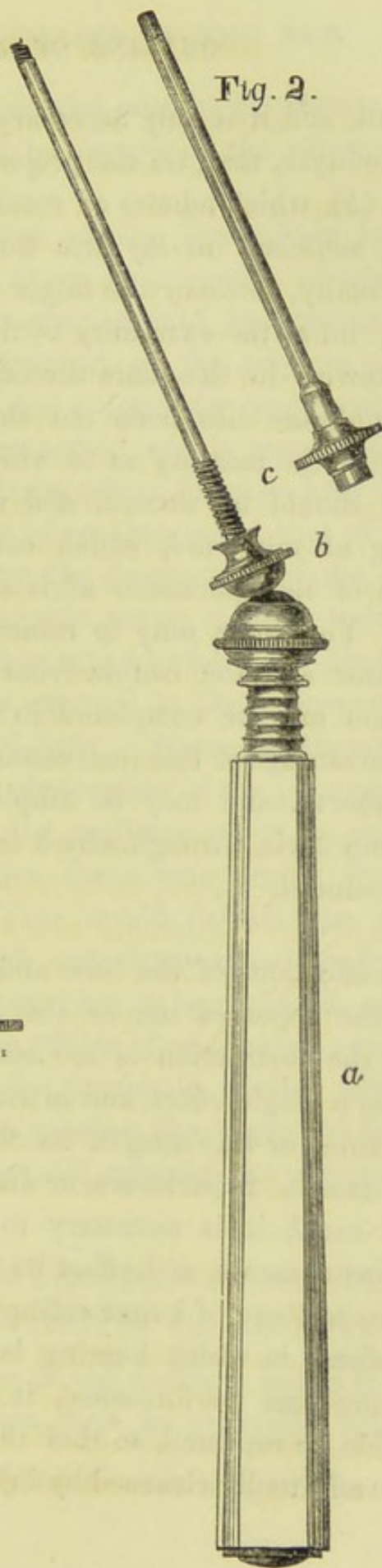


Fig. 2.



T. WITTHY. SC.

strument, and it is only necessary to place the point of the forefinger, first, on the projecting rim of the perforator (*b*), which admits of rotation only to a limited extent, sufficient to lay firm hold of the membrane; and secondly, to carry the finger forwards to the projecting rim at the extremity of the canula (*c*), rotating this likewise in the same direction until you feel that the membrane has been cut through. There is no tasking of the memory as to which direction the perforator should be turned, and which the canula; no shifting of the hand, which certainly endangers the success of the operation: all is simple and straightforward. You have only to remember to turn both the perforator and the canula from left to right, and the operation may be completed in ten seconds. But the great advantage of this instrument is, that the left hand is at liberty, and may be employed in applying the speculum auris, through which the *tympanatoire* should be introduced.

The affections of the tube and tympanum which require the repeated use of the catheter, are those in which the obstruction is too considerable to be overcome by a single effort, and in stricture of some portion of the tube, or lessening of its diameter throughout its entire extent. In stricture, or diminution of the calibre of the canal, it is necessary to commence with very small instruments, and effect its dilatation by a gradual advance to those of larger calibre. Even in those cases of deafness in which hearing is restored immediately upon the first performance, it is advisable that the operation be repeated, so that the tube and tympanum may be effectually cleansed by injection, and the healthy

secretion promoted from the mucous membrane, without which there would be danger of the recurrence of the obstruction.

In cases of occlusion of the Eustachian tube by mucous engorgement, there is frequently another reason why remedial measures should be continued for some time after the freedom of the tube is effected. When the obstruction has existed for many years, the auditory nerve becomes torpid, and in some degree insensible to soniferous impressions, from its long state of inactivity. In the case of another sense, that of vision, it is proved,\* that after the destruction of the eye, or blindness in which the optic nerve remains uninjured, the nerve, from the torpor into which it falls, diminishes in size, when no longer exposed to the influence of its proper stimulus, that of light. There is every reason, both from analogy and observation of the phenomena of disease, to infer that the auditory nerve is similarly affected when withdrawn for a long period from the influence of sound. This would furnish the reason why the deafness, which sometimes remains after de-obstruction of the Eustachian tubes, should, after a short time, yield to the effects of medicated vapour or fluid introduced into the tympanic cavity, with the intention and effect of rousing the nerve of hearing from its state of atrophy, and restoring its original sensibility.

### III. DEAFNESS FROM AFFECTIONS OF THE AUDITORY NERVE, AND OF THE CONTENTS OF THE LABYRINTH.

Deafness from disease of the auditory nerve is of far less frequent occurrence than is generally believed.

\* Majendie.

When it does occur, paralysis of the acoustic nerve may be produced by pressure exerted on it in any part of its course between the sensorium and its expansion in the labyrinth, by tumours within the cranium; or its functions may be suddenly abolished by loud sounds, as thunder, or explosions of artillery, in the same manner as blindness is caused through excessive stimulus of the optic nerve by intense light. Nervous deafness may be merely symptomatic of other diseases, as dyspepsia, or intestinal irritation from worms. Sometimes it remains after an attack of apoplexy; it also arises from the convulsions of infants during dentition, and this latter variety is considered by Itard the least palliable of all kinds; probably, the greater number of cases of deaf-dumbness are of this description. Paralysis of the nerve of hearing, as a primary disease, is very rare, though it sometimes does occur. Itard believes paralysis of the nerve may be caused by the shock, or the effects of the counter-stroke in falling from a considerable height. In some cases of deafness, alterations of structure have been discovered after death in the contents of the labyrinth—the cochlea, vestibule, and semicircular canals.

Until within a comparatively recent period, a greater amount of incertitude has prevailed in the diagnosis of diseases of the ear, than in the diseases of any other organ of similar importance. This arose from the difficulty which the position and complexity of the organ offer to any attempt to connect the symptoms of its diseases with the structural lesions seen in post-mortem examinations, and in part from the diverse opinions which have been promulgated regarding the function of the various parts of the auditory apparatus.

The first who attempted to dispel the obscurity in which affections of the ear was involved, and who brought to the task so large an amount of ability and scientific research as to qualify him for the mastery of this hitherto difficult subject, was Itard, Physician to the Royal Parisian Institution for the Deaf and Dumb. His treatise on the ear is so excellent, as almost to justify the eulogy which has been passed on its author, of having done for the organ of hearing, what the great Laennec did for the organs of respiration. Though later writers have made some important advances upon the labours of Itard, it must not be forgotten that to his industry and research does aural surgery owe the eminence which is accorded to it in the present day. Even with the important aids that can now be brought to bear in the investigation of the subject, still considerable difficulty exists in diagnosing the true nature of deafness arising from affections of the auditory nerve; and this is unfortunate, inasmuch as successful plans of treatment can only be devised with certainty, after a correct knowledge of the cause of disease.

The less informed practitioner of aural surgery directs his chief attention to the state of the external auditory passage; and should there be no manifest sign of disease, if neither malformation of the meatus, nor discharge, vitiated secretion of wax, nor structural alteration in the membrana tympani, &c., exists, he decides the case to be one of nervous deafness, and applies his remedies accordingly. The more accomplished observer goes much farther than this; and before deciding that a nervous affection is the cause of deafness, besides satisfying himself of the non-existence of external disease, he is enabled, by the aids of an im-

proved surgery, to explore the internal ear with as much certainty as the external passage; and assures himself that both the tympanic cavity and the Eustachian tube are free from lesion. This can only be done satisfactorily by means of catheterism, and by applying the principles of auscultation to the ear. After introducing the catheter, and ascertaining the freedom of the Eustachian tube, we may, by the cautious admission of air into the tympanum, and examination of the sounds it produces, by means of the stethoscope, diagnose the condition of the tympanic cavity with as much certainty as that of the lungs or heart. In the words of Kramer—"When the tube and cavity are free, the air strikes against the membrane of the tympanum. When the shock is over, a slight blowing or rustling in the ear of the patient is heard, caused by the streaming of the air." Insomuch as the deviation from these the natural sounds becomes apparent upon the application of the air-douche, are we to compute the alteration of the cavity of the tympanum from the normal state. When an examination conducted on these principles has shown not only the external ear to be in a healthy state, but also that the internal parts, accessible by the Eustachian tubes, are free from diseased action, we may with safety infer that when deafness exists, it must depend on the state of the nerve, or of the labyrinth which contains its expansion. There are other means of diagnosis of more easy application than those described, but which are scarcely less worthy of the attention of the aurist. When deafness arises from imperfection in any of the conductors between the air and the nerve itself, there are certain conditions under which sounds continue to be recognised by the nerve of

hearing. Thus extensive disorganizations of the tympanum and its contents, or of the external meatus, may exist, and yet, so long as the nerve remains uninjured, the ticking of a watch continues to be heard distinctly, when held between the teeth; because, although the ordinary path for the transmission of sound is obstructed, sonorous vibrations are conveyed to the nerves through the medium of the teeth and bones of the cranium.\*

The principle on which this depends is, that sounds emitted from solid bodies are heard better when conducted by solid bodies to the ear than when they reach it through the intervention of the air. This principle, which, when made available to its full extent, enlarges the sphere of the organ of hearing beyond even the limits of vision, is but little used in civilized society, though of great value to man in a state of nature. All the organs of sense are more perfect among the dark than the white races. In the North American Indians, from their dependence on the chase, the senses of sight and hearing are more highly developed and educated than in any other division of the human family; and to them sounds transmitted by solid media are as useful as those which traverse the air. In their war and hunting parties, the scouts prostrate themselves upon the earth, and applying their ears closely to the ground, remain for a time motionless as statues, till they have read plainly in the sounds of the forest all that is transpiring around them; their proximity to an enemy, or the approach of animals of the chase. The disciplined organs of an Indian enable him to distinguish the tread

\* Müller.

of men, the tramp of horses, or the currents of rivers, at distances seemingly immense, and far beyond the ken of vision in the intricacies of the forest. A distant footfall, or a breaking bough, becomes intelligible as language to the ear of the practised savage.

But though the principle here developed be so little used under ordinary circumstances, it becomes available in the auscultation of diseased states. While the nerve of hearing remains sentient, a deaf individual can perceive noises made on the floor upon which he stands; the solid parts of the body generally acting as conductors. He can also distinguish noises in the intestinal canal, arising from flatulence; the conductors of sound being in this case similar.

Another means of assisting the judgment to a conclusion, when inquiring into the cause of deafness, is the manner in which the deaf individual hears his own voice. If the deafness arises from diseased action of the nerve, the patient's own voice is as inaudible to him as any other sound; but if obstruction of the Eustachian tube occasions it, the voice continues to be heard.

These indications, even considered singly, are of great value in establishing the true nature of deafness; but taken collectively, they can hardly fail to lead a diligent observer to right conclusions with regard to the absence or presence of disease in the auditory nerve. Persons affected with deafness as a consequence of torpor of the auditory nerve, generally hear better after they have been exposed for some time to loud voices; probably the loud sounds excite the torpid nerve, and for awhile, until the excitement has subsided, the hearing is perceptibly improved. One symptom, which

has been insisted on by writers upon the ear—namely, tinnitus, is of small value in estimating the causes of deafness, being occasionally present in the most varied affections of the organ of hearing. The same may be remarked of the ticking noise so frequently heard by deaf people, and which has been recently accounted for by attributing it to contractions of the tensor muscle of the tympanum, which is most probably itself a cause of deafness when it occurs.

In cases of true nervous deafness it is rare to find one ear suffering alone, if the hearing has been for a long time impaired. The remarkable sympathy of action, which is observable in health between the optic and auditory nerves of the two sides of the body, and which contributes in an especial manner to the harmonious exercise of their functions, comes into operation in cases of disease, so that a diseased state of the organ on one side of the body rarely fails, when long continued, to impair the energy of its fellow on the opposite side. This is an undoubted fact, and should induce those affected with deafness on one side only, to seek efficient aid before such a result has supervened. The hearing on one side may continue tolerably good for many years, but it is invariably more predisposed to disease from the malady affecting the opposite organ.

It may appear prolix to enter so minutely into the symptomatology of nervous deafness, but the matter is important, both because such great confusion prevails generally on the subject, and because the secret of cure lies so much in a right conception of the cause of the evil. In nervous deafness, catheterism of the Eustachian tube offers an important substitute to the usual

treatment of blistering and stimulating ointments, &c., applied around the ear, and injections introduced within it by the external meatus. It enables the skilful aurist to introduce curative means much nearer the seat of disease than can be effected in any other manner, and thus greatly increases the chances of cure by facilitating the operation of remedies. Through the Eustachian tube, matters may be transmitted readily and painlessly into the cavity of the tympanum; and as medicated fluids or vapours pass rapidly by imbibition through the delicate membranes of the fenestræ into the aqua cotunnii, which fills the labyrinth, they thus, in effect, become applied to the expanded termini of the acoustic nerve itself—rousing its dormant sensibility, and, if possible, restoring the lost energies of the organ. Though the beneficial effects of catheterism are not so striking or immediate here as in occlusion of the Eustachian canal, its agency is scarcely less powerful to produce amelioration of some of the most inveterate cases of nervous deafness; and it is certainly invaluable, as rendering those affections of the ears accessible to remedies which are, and must be, inevitably shut out from the successful application of any other variety of treatment.

From this brief and in some measure necessarily imperfect sketch of the diseases of the ear which produce deafness, the value of catheterism of the Eustachian tube, both as a diagnostic and remedial agent, must be plainly evident to every unprejudiced investigator. It must be apparent, that, in the great majority of these diseases, it constitutes the chief agent of cure; and that there is scarcely one of them in which it is not of paramount importance as an auxiliary to other

remedies. Indeed, catheterism of the Eustachian passages is based on the application of anatomy and physiology to the subjugation of disease; and it has ever been the prime virtue of these sciences, that they lead their cultivators with unerring certainty to the unexhausted channels from whence have flowed some of the noblest and most permanent blessings to the human race.

## CHAPTER III.

HISTORY OF CATHETERISM OF THE EUSTACHIAN  
PASSAGES.

THERE can be little doubt that Guyot, a postmaster of Versailles, was the person to whom the idea first occurred, of acting upon the sense of hearing through the medium of the Eustachian tubes.

It appears that Guyot had laboured under deafness for a great many years, and that his infirmity weighed so heavily on his mind, as to lead him to investigate the anatomical structure of the ear. His attention was particularly drawn to the passages connecting the ear with the throat, which, from the date of their discovery by Eustachio, nearly two hundred years before, appeared, so far as they might be concerned in the maladies of the ear, to have been quite overlooked. It occurred to poor Guyot that, possibly, in his own case, these passages were obstructed, and to this happy idea we trace the introduction of by far the most important method of diagnosing and treating diseases of the ear.

In the year 1724 he brought before the Royal Academy of Medicine at Paris the apparatus he had invented, and which he had himself used, to remedy his own deafness.

Little more than the merit of ingenuity appears to have been accorded to Guyot; still, however inade-

quate to the purpose the apparatus might have been, the idea was good, and it was not altogether lost sight of ; but to one of our own countrymen, Cleland, must be ascribed the first introduction of a Catheter through the nose into the Eustachian tube ; and in the year 1731, he published a paper in the Philosophical Transactions, Vol. xli., P. 2, p. 848, giving an account of instruments “proposed to remedy some kinds of deafness proceeding from obstructions in the external and internal auditory passages.”

After recommending an apparatus for steaming the outer passages and dissolving the wax, he says, “If this has not the desired effect, and the person still remains deaf, the following instruments are made to open the Eustachian tube. If, upon trial, it should be found to be obstructed, the passage is to be lubricated by throwing a little warm water into it by a *syringe*, joined to a flexible silver tube, which is introduced through the nose into the oval opening of the duct, at the posterior opening of the nares towards the arch of the palate. The pipes of the syringe are made small and of silver to admit of bending them as occasion offers, and for the most part resemble small catheters. They are mounted with sheep’s ureter, the other end of which is fixed to an ivory pipe, which is fitted to a syringe, whereby warm water may be injected ; *or they will admit to enter into the Eustachian tube, and to force air into the barrel of the ear, and dilate the tube sufficiently for the discharge of the excrementitious matter that may be lodged there.* The probes, which are of the same size with the pipes, have small notches near the points, which take in some of the hardened

and glutinous matter that is contained in those tubes, which is distinguished by the fetid smell when the probes are withdrawn."

About the same time, Douglas laid claim to some inventions, by which he declared he had obtained the most favourable results; but he was unable to give any proofs of his success. Sabatier, nevertheless, ascribes to him the introduction of the practice of injecting the Eustachian tube through the nostril.

In the year 1755, Wathen, another English surgeon, published a most interesting paper upon the subject in the *Phil. Trans.* Vol. xlix. Part 1, p. 213, in which, for the first time, we find histories of cases of at least partial success, and I am glad that my limits will admit of its entire quotation.

#### WATHEN'S PAPER.

*A Method proposed to restore the Hearing when injured from an Obstruction of the Tuba Eustachiana.*  
By MR. JONATHAN WATHEN, Surgeon, in Devonshire Square, May 29, 1755.

"Whatever obstructs that passage leading from the ear into the nose, called Tuba Eustachiana, so as to hinder the ingress of the air through it into the cavity of the tympanum, is, I believe, universally esteemed destructive to the sense of hearing. Hippocrates observed, that, in a quinsy of the fauces, the patients became deaf by its compressing and closing the tube. Many practical writers assert the same to have happened from adjacent ulcers, &c. Valsalva relates that a certain yeoman had an ulcer above the uvula, on the left side, which communicated with and corroded part

of the orifice of the left Eustachian tube, which, when he stopped with a tent dipped in medicine, he immediately lost his hearing on that side, but recovered it as soon as the tent was taken out; and I have known a swelled tonsil occasion deafness.

“This canal opens into the lateral and interior part of the cavity of the tympanum;—is so shaped, that it first decreases as it descends towards the posterior part of the nose, becoming very narrow; then, suddenly diverging, is much enlarged, opening into the posterior part of the nose by an elliptic orifice, a little prominent, turning inwards or forwards, placed laterally, and just above the velum palati. This canal, then, is composed of two distinct cones, the extremities of which unite together, but their bases diverge differently. It is likewise lined with a porous membrane, full of cryptæ and mucous cells, continued from and like to the membrane of the nares.

“When, therefore, we consider the structure of the Eustachian tube and its free communication with the atmosphere, we may reasonably suppose it subject to inflammation of its membrane, and concretion of its mucus from cold, &c., like the external meatus; and, although its mucus is of a very different nature, it is nevertheless liable to inspissate by heat when its thinner parts are exhaled.\*

“And, from the form of this passage, we may easily

\* Morgagni and others tell us, that they constantly find the cavity of the tympanum in infants much clogged with mucus; and Mr. Douglas has often observed the same in adults, and is of opinion that it is concomitant with an obstructed tube in general, and that the injection is equally as effectual as if the tube only was obstructed.

conceive that an obstruction pretty far advanced is not to be removed without difficulty, and that, in proportion as it is more or less complete, the hearing will be more or less injured. Why, then, may not this be suspected as sometimes the cause of deafness? Perhaps it is not unfrequently so; *e. g.*, when a patient is sometimes deaf from cold, and the outer ear has been examined and found clear of hardened wax, &c., it is, nevertheless, not uncommon to find himself suddenly relieved by a great noise in his ear. This is probably owing to the breaking away of the congealed mucus and the rushing of the air into the tympanum; so that, when this disorder is but slight and recent, nature seems frequently to relieve herself, but when more confirmed, her efforts are ineffectual for its removal. These considerations inclined me strongly to think the hearing might suffer from that cause, and I was much confirmed therein by the following very remarkable case:—

“Richard Evans, aged thirty-five, was exceedingly deaf in both ears, and no visible disorder appeared in the external meatus. It arose from cold, and had existed several years, during which time no art or means could procure him the least relief. In August last he died of the small-pox, at the hospital in Cold Bath Fields. I took that opportunity to examine the Eustachian tube of each ear, and found them both stuffed with congealed mucus, which was observed by two gentlemen of the profession present. This was the one visible cause of the deafness, the other parts appearing in their natural state.

“As all these concurring circumstances strengthened me in my opinion, they likewise led me to make trial

of an operation that was some time ago proposed to the Academy of Sciences by Mons. Guyot; but the author having never practised it, he wanted the recommendation of facts to support and enforce it, and it was therefore rejected by them as impracticable.

“ I first introduced my probe a little bent at the end, *through the nose*, into the tube of several dead subjects; and having thereby acquired a facility, I made an experiment of the operation on a person who was very deaf, and in whose case all other means had proved ineffectual. No sooner had I withdrawn the probe than he said he could hear much better. This success excited my further endeavours, so that I had pipes of different sizes adapted to a syringe, and have since injected the meatus internus in the following manner, with great success:—

“ The pipe is made of silver, about the size and length of a common probe, and a little bent at the end; this being fixed to an ivory syringe full of liquor, (*viz.*, a little mel rosarum, in warm water,) must be introduced between the ala and septum of the nose, with its convexity towards the upper part of the aperture of the nares; and thus continued backwards and a little downwards, till it comes near the elliptic orifice, then its convexity is turned towards the septum, by which the inflected extremity enters the Eustachian tube with ease; the liquor is then impelled through it into the tube, by which the sordes, if any, being diluted, are washed out, and regurgitate through the nose or mouth, or both, with the injection, and, if the quantity be large, may be seen.\*

\* Six cases of success by the treatment recommended are here related.

“I have endeavoured to ascertain the symptoms that indicate an obstructed tube, but have not been able to do it with any degree of certainty; nor can I see the great utility of it, could it be done; for the only disorders of the ear that at present admit of surgical help are those of the external meatus, ulcerated and swelled tonsils, &c., all of which are generally visible; and when they are not the cause of deafness, little or nothing is ever attempted, the patient being left to shift for himself. But now another probable chance at least is given to the unhappy sufferer, and being the only one (the other being either improper or tried before without success), may be made use of without delay or attendance to corroborating symptoms; at least, till they render themselves more conspicuous and certain than I have hitherto been able to find them; and as the operation is not at all dangerous, it neither has nor will be thought painful by those who desire to recover their hearing.”

It appears from the perusal of this paper, that a most important point in reference to Catheterism of the Eustachian tube—namely, as a diagnostic agent, was at that period overlooked. It was proposed to be employed as a remedial agent, and then only when all other means had failed.

The practicability of introducing a catheter into the Eustachian passages through the mouth, appears to have been from the first discredited. Louis, in France, after many ineffectual experiments, declared against its possibility; and Sabatier, after making many trials on an anatomical subject, confirmed the statement of Louis, and all hope of gaining any advantage to the practice

of medicine by means of the Eustachian tube was on the point of being abandoned, when Desault, with that perseverance and judgment for which he was remarkable, determined to try if he could not substitute the passage through the nose for that of the mouth; he was successful, and, together with Sabatier, he established in France the truth which had been originally discovered and inculcated in England. It is somewhat curious, that both Bell and Portal should have questioned the practicability of performing the operation of injecting the Eustachian tube by means either of the mouth or nose; thus, the former says—"In obstruction of the Eustachian tube, it has been proposed to insert a bent and blunted tube into this passage, or even to inject into it, by means of a curved syringe, a little milk and water, or any other bland fluid; but, although those who have a perfect knowledge of the structure of these parts may, after being much exercised in it, execute this operation easily enough on the dead body, there is no room to hope that we can derive any advantage from it in practice, for the irritation produced by the extremity of a stylet, or of a syringe on these parts, even in a state of health, is so considerable, that any attempts to introduce it are very uncertain, and the difficulty must be much augmented when the extremity of the passage is obstructed by any disease."\*

Portal says, in his Summary of Practical Surgery:—"L'on a cru pouvoir injecter la trompe en la sondant par le bouche. Quelque chirurgiens ont cherché le moyen de perfectionner cette découverte, plusieurs ont cru y avoir réussi; mais, malheureusement, les succès

\* Bell's Surgery, vol. iv. p. 345.

n'ont pas répondu à ce qu'ils avaient avancé, et je regarde leur tentative comme inutile. Il n'est pas possible d'injecter la trompe d'Eustache, soit par la bouche, soit par le nez."

Another celebrated surgeon of that period, Tracy, was of the same opinion as Portal, "on account," as he says, "of the conformation and the sensibility of the parts."

Leschevin, in his Prize Essay, published in 1763, in reference to catheterism, says, "there is only one method of carrying remedies directly into the cavity of the tympanum—namely, by using injections through the Eustachian tube. Its large opening at the back of the nostrils will admit the introduction of a catheter without much difficulty. I have repeated this operation many times upon dead bodies of different ages. After some attempts, I have found no more difficulty in it than in sounding the nasal duct."

My limits will not allow of my following further the authors, who, in England, France, and Germany, have alluded to catheterism. As Kramer observes, "their works are for the most part superficial; and, with the exception of Buchanan, not one understood or practised this operation. Rauch, Van Hooven, Beck, Riedel, Vering, afford but little information."

Catheterism of the Eustachian passages is required for a variety of purposes:—

- 1stly. For the exploration of the Eustachian passages and tympana, by which their healthy or diseased condition can be determined.
- 2ndly. For their de-obstruction, when filled with mucus, blood, or pus.

3rdly. For their dilatation, when contracted from the thickening of their sides, or impermeable from adhesion or stricture.

4thly. For the introduction of medicated vapours or fluids to restore the torpid auditory nerve, or to allay its morbid sensibility.

5thly. To improve the condition of the mucous membrane.

From the time of Guyot, catheterism of the Eustachian passages, and injections into the cavities of the *tympana*, have undergone many modifications and improvements, in the methods by which they have been carried into effect.

The proposition of Guyot to arrive at the Eustachian tube *through the mouth*, was no sooner proposed, than rejected as impracticable, and the more natural and direct passage substituted—namely, *through the nostrils*; but the various surgeons who have distinguished themselves in the performance of the operation, although unanimous as to the route, differ widely in their views with regard to the form of the instruments to be employed, as well as the necessary manipulations.

The authors most worthy of quotation are Itard, Saissy, Deleau, and Kramer, to each of whose methods I will briefly refer, before giving a description of that which I myself adopt.

Itard uses a silver catheter, the extremity of which diverges in a curve from the straight part to the extent of about five lines,\* the curvature commencing at about an inch from the extremity; its point is also slightly

\* A *line* is the twelfth part of an inch.

enlarged to prevent it scratching the mucous membrane with which it is to come in contact. He measures the distance between the first incisor teeth of the upper jaw and the base of the uvula, a distance which he had observed to be nearly equal to that which separates the anterior commissure of the nostril from the opening of the Eustachian tube. He then introduces a portion of the catheter, equal to this distance, into the nostril, corresponding to the tube which he wishes to inject, and by gently turning its beak outwards and upwards, he manages by dexterous manœuvres to insert it into the tube.

“When the catheter,” he says, “has entered the nostril to the point previously marked upon the scale, its beak is to be carefully raised towards the external wall of the nostril, and the operator then becomes aware of its being engaged in a cavity which will not permit the instrument to advance or recede so long as it is held in the same direction.”

“This manœuvre, although in appearance so very simple, requires great dexterity, and the most perfect tact, which can be acquired only after repeated attempts upon the dead subject.”

The catheter recommended by Saissy has three curvatures, and in shape is not unlike an italic “*f*.” Like Itard’s catheter, the extremity which is to pass into the Eustachian tube is slightly bulbous, and at the other extremity is a socket to receive the nozzle of a syringe. At the side of the socket is a ring or plate to indicate the direction of the beak of the catheter, when inserted into the nostril. From the peculiar shape of these catheters, the operator requires to have a large assort-

ment of them, especially as those intended for the right side will not suit the left, and vice versâ.

“The patient being seated in a chair, with the head slightly thrown backwards, the operator standing opposite, holds the instrument like a writing-pen in the right hand, provided it is the right Eustachian tube he is about to catheterise; the left hand or only the finger being gently placed on the forehead of the patient. The catheter is then carefully introduced into the nostril, the point being directed downwards: as soon as the first curvature of the instrument has entered the nostril, the wrist should be lowered, and the instrument urged discreetly onwards; when the second curvature has become engaged in the nostril, the rounded extremity of the catheter is near the orifice of the Eustachian tube; it then becomes necessary to raise this part a little, by making a rotatory motion of the wrist inwards, and at the same time to rest the third curvature upon the partition of the nose.

“The operator may be sure of the catheter being in the tube when the ring is directed vertically upwards, when it does not vacillate, and when the fluid which is injected, returns through the mouth-piece of the catheter.”

Deleau disapproves altogether of the inflexible silver catheter, whatever shape it may be made to assume, and proposes, as a substitute, catheters composed of gum-elastic, six inches long, and open at both extremities. In their favour he insists upon their simplicity and their flexibility, qualities which are properly appreciated by patients, and which lead them immediately to submit to their introduction into the nasal fossæ. But

here I must observe, that a little *ruse* is advised by Deleau, quite unworthy of a scientific and candid practitioner—namely, that care should be taken to show these catheters divested of their stylets, and after being well softened in warm water. By heat they acquire a suppleness, which renders their contact with the mucous membrane not only very supportable, but is also of great consequence at one period of the operation. For adults they should be five or six inches long, for some persons shorter; they should be only a line or a line and a half in diameter, and their coats as thin as possible. He says, the material used for anointing the catheter is not an indifferent matter. He prefers thick gum-water to cerate or to oil. “Patients dislike the last-named greasy substances; they say a disagreeable sensation is left in the throat by them, which produces coughing and spitting. Mucilage, having all the properties of the nasal secretion, has not this inconvenience.” In my own practice I never think it necessary to lubricate the catheter at all.

The following directions are given by Kramer for the performance of the operation:—

“Before commencing the catheterism, the frontal bandage is to be placed across the forehead, over the root of the nose, and the straps buckled behind the head. The forceps are to be fixed in the ball and socket joint, and turned upwards for the convenience of the operator. The patient sits on a stool; the operator standing before him, and having previously oiled the catheter, lays hold of it immediately before the funnel-shaped dilatation, with the thumb and two forefingers of his right hand, (whether it be the right or the left ear that is to be catheterised,) so that the concavity of

the instrument is turned downwards. The beak of the catheter is then to be introduced into the *inferior* nasal meatus, and pushed quickly but carefully forward, *gliding over the bottom of the nasal fossa, into the top of the pharynx.* This manœuvre must be executed with a delicate, steady hand, partly in order to spare the patient pain, and partly in order successfully to overcome the impediments to the progress of the instrument, arising from the lateral inclination of the septum narium, and the irregularities of the muscular structure, for avoiding which no definite rule can be laid down. Sneezing need never be feared during the introduction; it has never occurred to me, during the course of a very extensive practice in this department of the medical art.

“The catheter having been passed into the pharynx, the posterior surface of which the beak must be made to touch, (up to which moment the ring, and consequently the beak of the instrument remain directly downwards,) the external extremity of the instrument is to be elevated; the beak thus sinks, and gliding over the posterior round edge of the mouth of the Eustachian tube, (the operator at this moment drawing the instrument towards himself,) touches the posterior surface of the velum palati, which is raised; the catheter is then to be rotated a quarter of an inch on its axis, turning it outwards and upwards, at the same time that, with a certain degree of force, it is conducted into the mouth of the tube. By careful traction, it is found that it is here *held fast* by the anterior cartilaginous edge of the mouth of the canal; which, in conjunction with the perfectly convenient situation of the instrument for the patient, affords, to a practised hand, the surest sign that

the catheter has acquired the proper situation. The ring then stands turned a little upwards, in the direction in which the canal extends from the pharynx to the ear. The operation is much facilitated, if the calibre of the catheter answer exactly to the width of the respective nasal meatus—if it completely fill it; on which account a series of catheters of different calibres should always be at hand.

“The catheter is very conveniently and securely maintained in the position thus given to it, if it be fastened between the blades of the forceps, attached to the frontal bandage, by screwing the blades of these tightly together, as well as the forceps themselves, in their ball and socket joint.”

Before I proceed to describe the operation, as I am daily in the habit of performing it; and in order to show its great practical value, not only in the treatment of deafness, but in affording pretty certain means of detecting the nature of the complaint, I give the following case:—

ELIZABETH DIXON, aged 63, residing at 6, George-street, Picton-street, Camberwell, was induced to apply at the Institution, October 1, 1839, at the strong persuasion of a neighbour, Mary Owen, living at No. 5, Eastern-place, Westmoreland-Place, Camberwell, who, at the age of 65, had herself been relieved of a deafness of fifteen years' duration.

Elizabeth Dixon's deafness commenced *in early childhood*, and had continued to increase through life, so that when she was admitted a patient of the Institution, it was necessary to shout into the ear to make her

understand what was said. To prove further the degree of deafness she laboured under, it may be stated, that "she had not for many years heard the kitchen clock strike," and, of course, could not hear a watch tick even in contact with her ear. She was not able to assign any cause for her deafness, nor did she recollect having heard it accounted for by her parents. Nothing had ever been attempted for her relief; on the contrary, she had hitherto avoided seeking for assistance, from a fear of being made worse. She had enjoyed tolerably good health through life, but there had always been a remarkable predisposition to take colds in the head, and at these times she was always much worse. She was also sensibly worse in wet and damp weather, or when her bodily health was at all suffering; also when vexed or angry, or when depressed in spirits. And at these times, the *tinnitus* or noises in the ears, from which she was never free, were considerably aggravated.

In order to get a distinct view of the membrana tympani, it was necessary to remove an accumulation of dirty, unhealthy-looking wax, but its removal afforded only slight relief. *Catheterism*, used first for exploration, detected a mucous engorgement of both Eustachian passages and tympanic cavities, and three repetitions of this important manipulation entirely restored her to hearing.

This case affords a remarkable exemplification of the truth of Kramer's observation, that "such obstructions may last for years, nay, even during the whole life of the patient, without any effort being made by nature to free herself of the disease; nor does the nature of the disease become in the least changed in the course of

time—it is, and continues to be, an accumulation of mucus, however long it may exist.”

The happy results of such cases, *which are not unfrequent*, justify me in the remark which I made on a former occasion, that *no persons labouring under deafness, however protracted, should abandon hope of relief until their ears have been skilfully explored by catheterism of the Eustachian passages.* I say *skilfully explored* with emphasis, for it is one thing to employ these manipulations with apparently no other purpose but to *astonish* the patient by blowing into him a body of compressed air, as a witty friend has observed, “sufficient to fill the Nassau balloon,” and another to employ them for scientific objects—namely, to ascertain the nature of the disease, and then, if admissible, to use them as remedial agents. I again repeat, that “it is an operation of *tact*, to be acquired only after long experience; but once possessed of that *sine qua non*, it is surprising with what ease and certainty it is effected, and how simple and painless it proves.” So simple and painless, that patients often quarrel with the term *operation*, deeming it, with much reason, quite inapplicable.

“De l’adresse, et des essais souvent répétés, joints à beaucoup de prudence, pourront seul donner assez d’habilité à l’homme qui voudrait se livrer avec quelque fruit au catheterisme du conduit guttural de l’audition.”\* Thus says the distinguished Velpeau, when speaking of this operation.

Deleau on the same point says: “Catheterism is not one of the most difficult operations of Surgery to

\* Velpeau's *Medecine Operatoire*.

execute, and yet it requires that the operator should possess all the qualities of a good operative surgeon, for if he is deficient in the necessary tact and dexterity, how can it be expected that he can reach the guttural passage of the ear without producing sneezing and retching? Will he not be liable to bring on an excessive irritability of the mucous membrane, which will cause involuntary movements of the patient? How can he judge to what depth the catheter has reached, what obstacles it has met with, what local sensation it has produced? Whether the latter is more or less acute in comparison with that which the catheter produces in other persons? How can he determine the first time, whether or not it is necessary to continue catheterism by way of treatment?"\*

It is to be regretted, that the Surgeon in general practice can never expect to derive all the advantages from this operation which it is capable of imparting to the exclusive practitioner of Aural Surgery. With most extensive opportunities of performing it, I still often find myself much puzzled in diagnosing a case, and a repetition of the operation is frequently necessary to enable me to determine to my perfect satisfaction the exact nature of the malady; but once having done so, I can very frequently determine also its curability or incurability.

#### DESCRIPTION OF THE OPERATION.

The patient being seated on a chair, the operator applies the frontlet of Kramer to the head, buckling the straps behind, and taking care so to adjust it, as that

\* *Traité du Catheterisme de la Trompe Eustachie*, p. 119.

the extremities of the blades of the forceps shall reach to about a quarter or half an inch below the *alæ nasi*, so as to admit of their being readily lifted over the catheter when inserted. Attention having been given to this precautionary measure, the forceps, which are held firmly by the ball and socket joint, may be turned on one side out of the way whilst the operator proceeds to introduce the catheter into the Eustachian tube. The catheter, previously warmed, (which may be readily done by running it briskly through the fingers), is laid hold of by the operator with the right hand at its socket extremity, care being taken that its concavity presents downwards. It is then introduced into the nostril corresponding to the tube into which it is to be inserted, and urged carefully and delicately along the inferior meatus and floor of the nostril until the beak strikes against the posterior surface of the pharynx. The tact and dexterity of the operator are now put to the test, to find the orifice of the Eustachian tube; in fact, at this point a dexterity analogous to the *tour de maître* of urethral catheterism is required. Up to this time, the ring of the catheter, which indicates the position of the beak, presents downwards; the operator now makes a rotation of the catheter outwards and upwards, at the same moment withdrawing it slightly towards himself. In the act of doing this, he may, in most cases, detect the beak of the catheter gliding over the rounded margin of the elliptic orifice of the passage, into which, with a gentle force, it should be then guided; with the left hand the blades of the forceps are then lifted over the catheter, and screwed tightly upon it. Through the catheter thus fixed in the Eustachian passage the operator may inject air, water, vapour, or other

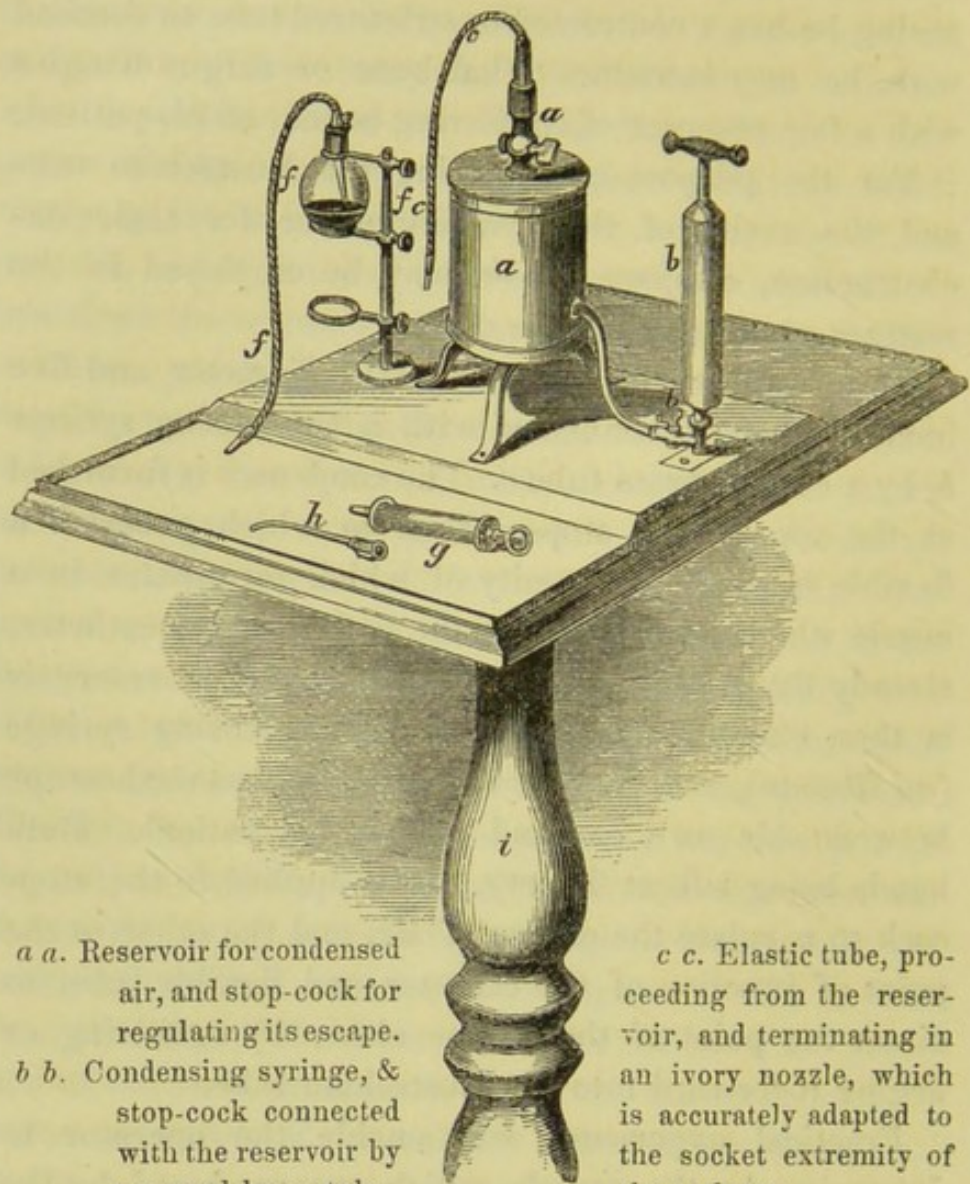
medicaments best suited to the individual case; or, supposing he has a contracted or strictured tube to contend with, he may introduce whalebone or catgut bougies with a fair prospect of conferring benefit on his patient.

For the purpose of exploring the Eustachian tube and the cavity of the tympanum, or for their deobstruction, *compressed air* may be employed in the manner represented in the plate.

*a*, is a reservoir, four inches in diameter and five inches in height, connected with a condensing syringe *b*, by a curved brass tube *c*. The condenser is furnished at the top with a stop-cock, from which *proceeds* a flexible tube, the extremity of which terminates in a nozzle which accurately fits the socket of the catheter, already fixed in the Eustachian tube. The reservoir is then charged by means of the condensing syringe (*ad libitum*), and the operator then places a stethoscope between his own ear and that of his patient. Both hands being left at liberty, one is applied to the stop-cock to regulate the escape of air, and the other to the point of junction of the catheter and flexible tube, to direct the point of the former either by retracting or urging it forward into the Eustachian tube.

Practical experience will enable the operator to determine, by the sounds which are produced by the gradual and carefully regulated escape of air, the precise condition of the Eustachian tube and its investing membrane—its permeability or obstruction; the same of the cavity of the tympanum. His diagnosis and prognosis will thus be materially assisted. In some cases, perhaps, previously deemed incurable, success will follow a repetition of the operation; whilst others, which might otherwise have been subjected to a long

SKETCH OF MR. YEARSLEY'S APPARATUS USED IN THE DIAGNOSIS  
AND TREATMENT OF DISEASES OF THE EAR.



- a a.* Reservoir for condensed air, and stop-cock for regulating its escape.
- b b.* Condensing syringe, & stop-cock connected with the reservoir by a curved brass tube.
- fff.* An apparatus to serve for the conveyance of vapour into the tympanum, described at page 73.
- g.* A syringe, capable of containing about an ounce, and used for injecting water, or medicated fluids, through the Eustachian Tube Catheter, into the tympanum.
- h.* Eustachian Tube Catheter. These Catheters should be of various calibres, lengths, and curves.
- i.* Pedestal of table, provided with a rack, by which it may be raised or lowered at the will of the operator.
- c c.* Elastic tube, proceeding from the reservoir, and terminating in an ivory nozzle, which is accurately adapted to the socket extremity of the catheter.

and harassing treatment, will be at once found by this simple operation to be beyond the reach of hope.

The frontlet bandage recommended by Kramer (a modification of that first proposed by Itard, and infinitely the best thing of the kind for the object in view, namely, fixing the catheter) consists of a middle piece, made of metal, bent so as to fit the arch of the forehead, and slightly padded inside; and to this are attached two straps, which fasten with a buckle. To the centre of this a pair of forceps is attached, which moves in a ball and socket joint, and the blades of which are brought together by means of a screw.

Without such an apparatus as this, the catheter would have to be held in the nostril, after being introduced into the Eustachian tube, either by the patient or the operator, whilst the injection, whatever it may be, is accomplished; thereby entailing great inconvenience and no little risk of the catheter becoming disengaged from its situation, which the slightest movement of the hand of the operator or the head of the patient would effect.

Not only for the convenience of the operator, but for the comfort of the patient, this instrument is indispensable. The catheter being once fastened between the blades of the forceps, the patient feels at his ease; he may not only move his head, but may even speak and hawk, without experiencing thereby any inconvenience.

Of the various catheters recommended by Deleau, Saissy, Itard, and Kramer, those adopted by the last-named practitioner are unquestionably entitled to the preference, not only as the most simple in construction, but as causing the least inconvenience to the patient

on their insertion. They are described as inflexible, made of silver, six inches long, and of a calibre varying from the size of a small crow-quill to that of a large goose-quill. Occasionally the smallest size catheter of Kramer will be found too large. In the case of a nobleman whose *meatus narium* was extremely contracted, I was obliged to have a catheter made purposely, before I could accomplish the operation. Deleau had previously tried and failed.

Their extremity is well rounded, and they are curved only to the distance of five lines from the further extremity, exactly at an angle of  $144^{\circ}$ , so as to correspond with the lateral situation of the mouth of the Eustachian tube. They are of the same calibre throughout their whole length, and provided with a funnel-shaped dilatation at the proximal extremity, six inches in length, in order to admit the pipe of the injecting syringe, &c. To this dilated part there is attached a ring, on the same level with the beak of the catheter, by means of which the situation of the beak may be ascertained, when it is introduced into the nose, and thus out of sight. The catheter is, in addition, graduated according to inches, which is of the greatest convenience in repeated introductions of it.

In withdrawing the stylet from Deleau's gum elastic catheter, the point of the catheter itself is also liable to be withdrawn from the Eustachian tube, and thus the object of the operator becomes at once frustrated. The triple-curved catheter of Saissy cannot be introduced without causing pain to the patient, (unless the *nasal meatus* be unusually commodious,) and, moreover, confers no advantage over the catheter of Kramer. The extremity of Kramer's catheter being well rounded off,

saves the necessity of the bulbous projection in which Itard's catheter is made to terminate.

The small apparatus\* which I employ for the purpose of conveying vapour or air saturated with the moisture of medicated fluids into the tympanum, differs materially from that recommended by either Itard or Kramer. It consists of a small glass globe, two inches and a half in diameter, provided with a wooden stopper, perforated in two places, so as to be capable of receiving the nozzle of the flexible tube of the air-condenser on one side, and the nozzle of another flexible tube on the other; the other extremity of the latter tube being intended to be inserted into the socket of the catheter, when placed in the patient's Eustachian tube. Connected with the nozzle of the flexible tube of the air-condenser is an ivory pipe, which passes through the stopper to within an inch of the bottom of the glass receiver.

To inject ætherous vapour, &c., it is only required to fill the glass globe receiver half-full of water, and add a few drops of æther. The flexible tubes being then adjusted as just described, and the air reservoir charged, the stop-cock is turned just sufficient to cause a few bubbles in the water. The air becomes as it were saturated with æther, and passing through the flexible tube, fitted to the catheter in the patient's nose, must inevitably reach the tympanum, provided there be no obstruction in the Eustachian tube, and the catheter be placed within it. It is, however, clear, that this point should be ascertained before the vapour is attempted to be introduced.

\* See Plate, page 70.

Medicated fluids of various kinds may be injected into the tympanum by means of a small syringe, having a nozzle adapted to the socket of the Eustachian tube catheter.

The apparatus used for the introduction of air into the tympanum varies in shape according to the taste of the operator; but the principle in each must be alike, namely, the compression of air, which, by the assistance of a stop-cock, may be used *ad libitum*. For the important purpose of *exploration*, and indeed where used *remedially*, (for it should not be supposed that a *powerful* stream of air is ever required,) the lungs of the operator are quite sufficient; and were it not that we are constantly meeting with fastidious patients, who do not like air which has been breathed, I should use my own lungs, in preference to any other apparatus; and in that case nothing more is required than a flexible tube, about three-quarters of a yard in length, one extremity of which is retained in the mouth of the operator, whilst the other is loosely attached to the mouth-piece of the catheter already inserted and fixed in the Eustachian tube of the patient.

The apparatus, however, generally consists of a condensing syringe, a reservoir, an elastic tube and stop-cock; and of all the various kinds, including the huge air-press of Kramer, the complicated machine of Deleau, the Macintosh or elastic bag of Gairal, I cannot think any so simple, and at the same time so effective, as my own, represented in the plate, especially as it admits of being fixed on a table narrow enough to allow of leaning over, for the purpose of applying conveniently the stethoscope before turning the stop-cock of the air-condenser.

In conclusion, there are two or three precautionary measures which I would fain impress on the mind of the surgeon who may be disposed to attempt this operation in general practice.

The frontlet bandage of Kramer, or some other apparatus equally effective in fixing and steadying the catheter in the Eustachian tube, should never be omitted.

The ivory nozzle of the flexible tube should be rather loosely inserted in the socket of the catheter.

The escape of air should be gradual, never sudden, or in a forcible stream; nor should it ever be allowed to escape without the operator listening at the patient's ear for its exit from the catheter. For this purpose I invariably use the stethoscope.

The operation should never be proceeded with, if the point of the catheter causes the slightest pain or uneasiness when placed in the Eustachian passage.

Catheterism of the Eustachian passages is *safe*, *painless*, and *efficient*; and it is fortunate that it has such recommendations, inasmuch as, already said, it frequently *cannot be dispensed with* in the diagnosis and treatment of deafness. During the last few years, many thousand cases of deafness have passed under my notice in public and private practice. In the great majority, I have felt the necessity of employing catheterism either for the purpose of ascertaining the nature of the case, or for its relief, and I have never met with the slightest accident; indeed, when employed as herein recommended, I will venture to say none can possibly happen. As a general rule, it is *painless*; the exceptions are, where the *meatus*, or passage of the nostril, is extremely narrow and contracted; but it is

very rare that such is the case in *both* nostrils; and therefore when it exists on one side only, the judicious practitioner will catheterise both Eustachian tubes through the same nostril, and this, by an expert operator, may be done without any difficulty.

Its efficiency, as a *diagnostic* agent, will be at once admitted, when it is stated that we have no other means of ascertaining the permeability of the Eustachian tube, for the patient's own sensations can rarely be relied on; and, as a *remedial* agent, I may refer the reader to many remarkable cases of success related in the Appendix to Kramer's excellent work on the Ear, and to Deleau's equally valuable work, entitled "Traité du Catheterisme de la Trompe Eustachie."

## CHAPTER IV.

DEAFNESS FROM DERANGEMENTS OF THE STOMACH,  
(STOMACH DEAFNESS.)

AURISTS must plead guilty to the charge of having had their attention so concentrated on the ear alone in the study of its diseases, as to have left out of view the important relations these bear to the whole system, and the benefit derivable from a treatment embracing all the vital functions, which are so intimately blended and dependent, that none can afford to be put out of consideration even in the management of the most strictly local disease. Even in the writings of Itard and Kramer, the best writers on the subject, not a page is devoted to the intimate connexion existing between the stomach and the ear. But although aurists have overlooked the fact, deaf persons generally, those at least who are anywise observant, are aware of the sympathy existing between the stomach and auditory organ. There are few afflicted with imperfect hearing who have failed to notice an aggravation of their malady when the stomach and its allied viscera, the liver, &c., have been deranged. The so-called nervous deafness, hitherto a stumbling-block and reproach to contemporary writers, is often nothing else than an injurious influence exerted on the ear by dyspeptic ailments, though commonly pronounced a disease depending primarily on the auditory nerve itself. While I would

not for a moment unjustly depreciate the advantage and efficacy of local investigation and treatment, I maintain that some of the most obstinate cases of deafness yield to the continued application of judicious remedies to renovate the stomach and digestive organs; and this I have seen to happen, after having defied the whole range of local treatment in the most skilful hands.

My preceptor, Abernethy, well observed that the liability of parts to become diseased in consequence of disorder of the digestive organs, would be found to be in proportion to the delicacy, susceptibility, and complication of their structure and function. This sagacious observation, founded as it undoubtedly is in truth, applies with peculiar force to the organ of hearing, and its diseases. Not only is it complex and highly sensitive, but the mucous membrane which lines the middle ear or tympanum, is directly continuous with the mucous coat of the stomach, being in reality developed as a part of the digestive mucous system. Hence, we shall not be surprised that a depraved state of the mucous covering of the stomach should readily affect the same membrane within the ear, and that imperfection of hearing should frequently result from dyspeptic maladies. The first description of deafness from digestive disorder is that in which the disease is strictly confined to the stomach, no perceptible change having occurred in the organ of hearing, except functional torpor of the auditory nerve. This is best seen in acute indigestion, which is often accompanied by disorder of the different senses; and when there exists any tendency to aural disease from hereditary or other causes, if the dyspepsia be suffered to lapse into a

chronic state, it is pretty sure to be accompanied by chronic nervous deafness, which can only be relieved by the removal of the original ailment. It is strange that amaurosis or gutta serena,—the name of the sympathetic blindness occasioned by disorders of the digestive canal and other causes,—should be well understood, and have a place in every book of ophthalmic surgery, while the analogous disorder affecting the ear should never have received more than the most cursory attention. As an illustration of the consent between the stomach and the ear, I have often, in a foul state of the former organ, seen the action of an emetic followed by the recovery of hearing, and this when the remedy could act in no other way, than by cleansing and invigorating the stomach, because no obstructions existed to account for the deafness. Obstruction of the biliary secretion, and an accumulation of morbid bile in the gall ducts, sometimes occasion remarkable dulness of hearing; and when deafness exists from such a disorder, as evident by the fulness and pain in the region of the liver, and symptoms of general depression, an active aperient producing copious evacuations of unhealthy bile, will occasion extraordinary improvement in the weakened sense. The most frequent form of nervous deafness dependent on stomachic disorder is that arising from chronic dyspepsia. Here the deafness is in a great measure caused by the sympathy of the ear with the stomach; but dyspepsia rarely continues long in the chronic form without producing a sub-inflammatory condition of the throat, which extends into the cavity of the ear, and even affects the external meatus. These sequelæ of indigestion will receive due attention, when

I come to treat of the throat and middle ear, as a cause of deafness. In the form of deafness arising from stomach derangement, without any structural disease of the ear itself, the most rational and successful treatment is that which is directed to the stomach as the seat of the evil, and which tends to impart tone to that organ, at the same time giving energy to the whole body, and especially to the nervous system. After having, in such cases, assured myself, by the most minute examination, of the causes of disease, I have followed the indications pointed out by the nature of the case, and effected greater improvement than could be obtained by any other means.

#### TREATMENT.

In the treatment of Stomach Deafness, the most rigid attention must be paid to dietary rule, as the most certain mode of correcting the morbid state of the stomach. Those kinds of food only should be taken which contain the largest amount of nutriment, and at the same time are so easy of digestion as to be readily converted into the chylous fluid from which the constant nutrition of the body is effected. Beef, mutton, poultry, fresh fish, may be selected, avoiding the flesh of young animals, as veal and lamb, together with pork and salted meats, and all highly-seasoned dishes. Fermented liquors, as beer and porter, are injurious. The ordinary beverage should be water, toast and water, or brandy, or white wine, largely diluted.

The quantities and times of taking food are also worthy the consideration of the dyspeptic. With respect to *quantity*, the stomach ought never to be distended by the bulk of the ingesta, because the mere distention

alone interferes with its function, by rendering the proper contractile motion difficult. Abernethy pointed out the mistaken notion, that the body was best nourished by eating large quantities of food; and proved, moreover, that dyspeptics gain flesh sooner on a measured amount of diet, than when it is unrestricted. Animal food once a day is sufficient; and this, the chief meal, ought to consist in addition of a moderate quantity of bread or vegetables, it being well ascertained, that for healthy digestion, the aliment ought not to be in too concentrated a form. The amount of drink should be limited, especially at dinner, and taken in small quantity at each time. It is better to relieve thirst by sipping, than by a free draught, as the reduction in the temperature of the stomach occasioned by a large drink of cold fluid, completely puts a stop to digestion for the time. Dr. Beaumont, in his experiments on the powers of the gastric juice, performed on a youth who had a perforation of the stomach from without, found that a temperature of 90° Fahr. was absolutely necessary to the digestive process, and that when the stomach was by any means cooled below this point, digestion entirely stopped, till the proper warmth was regained. The knowledge of this fact ought to excommunicate iced drinks in enfeebled condition of the digestive organs, at least while the stomach contains food.

Much benefit will accrue from judiciously timing the daily meals. The great diversity of circumstances in which individuals are placed makes it difficult to prescribe rules which shall be wholesome for all, or capable of easy enforcement. However, in the present pages, I have in view the benefit of the whole, and each

will be able to extract from my opinion points for their guidance, by which they may easily bring their habits into the proper train for the maintenance or improvement of health. Dyspeptic patients ought to rise moderately early, but not immediately on awaking from sleep. Some little time ought to elapse after rising before eating the first meal. This is wise for more than one reason. Few persons rise hungry, and delaying the morning meal, increases the appetite and leads to a tolerably substantial breakfast, than which nothing tends more to build up a valetudinarian strongly for the day. Again, if in dyspepsia a meal be swallowed immediately after getting up, it aggravates the disease, because the stomach is at that time invariably in an irritable state. The natural change which takes place in the circulation of the blood on altering the recumbent for the upright position is considerable. There is on rising a determination of blood to the stomach and digestive viscera, which produces a disagreeable feeling of giddiness of the stomach. This escapes the notice of a healthy person, but is always experienced when the sensibility of the gastric nerves has been increased by previous indigestion. The reader will now understand why I have given the caution against springing suddenly from bed after awaking from sleep. In addition to the remarks made before, on the subject of dinner, I consider an early dining hour, followed by a light tea and supper, and an avoidance of late hours, the best regimen to which dyspeptics can subject themselves.

The state of the bowels ought to be carefully regulated, never suffering a day to elapse without their evacuation. Some gentle laxative may be necessary

for the purpose; but in its selection, let me place my veto most emphatically against the use of calomel—the deaf especially are almost invariably rendered worse by its employment, and, according to my experience, never better. The materia medica offers an abundant choice of aperient substances, without recourse being had to the exhibition of this, in the case of deafness, deleterious mineral. I generally prefer a combination of aperients, with tonics, and if alterative medicines are required, a preparation of iodine is infinitely more safe and beneficial than the administration of mercury.

## CHAPTER V.

ON DEAFNESS FROM MORBID CONDITIONS OF THE  
MUCOUS MEMBRANE OF THE THROAT AND EAR,  
(GUTTURAL DEAFNESS.)

To the attentive observer of health and disease, the mucous membranes must always rank among the most interesting and important of the tissues which compose the human fabric. In an anatomical point of view, their distribution betrays evidence of the most exquisite design, the greatest possible diversity of figure and arrangement being resorted to for the purpose of affording a prodigious extent of mucous surface. So perfectly is this object effected, that the mind even of an anatomist would be absorbed with wonder, could it, at a glance, behold spread out, on a plane surface, the space these membranes really occupy, and the immense extent of their ramifications through cells, tubes, canals, reduplications, and convolutions, in an almost infinite variety of arrangement and form. They compose, it may be said, the groundwork on which most of the vital functions of secretion, excretion, and absorption are effected: and besides this, are intimately concerned in the perfection of the senses of sight, hearing, smell, taste, and—ininitely more than has been yet imagined—the faculty of speech.

My subject confines me to the consideration of one division of the great mucous track, ramifying through-

out the respiratory and intestinal organs. Commencing at the mouth, at the junction of the skin with the red tissue of the lips, it passes inwards to line the mouth, and enters into all the mucous and salival glands, giving off, delicate prolongations for lining the different nasal cavities, the cells, and sinuses in the upper jaw, *os frontis*, and the other bones of the cranium and face, which are subservient to the senses of hearing and smell. In the pharynx it becomes continuous with the mucous lining of the Eustachian tubes, and through them enters the tympanum as its investing membrane, covering the small membranes which close in the inner ear, and also the external membrane or drum; finally, this part of the membrane spreads itself out on the surfaces of the mastoid cells behind the organ of hearing.

Passing downwards from the throat, its track admits of two important divisions: the one, entering at the glottis, runs down the trachea and bronchial tubes, dividing and subdividing to an infinite extent, to form those innumerable cells in which the vital properties of the air become imparted to the blood as it flows through the lungs; the other division, or the intestinal mucous membrane, passes down the gullet to the stomach, contributing greatly to the formation of that organ, and becomes the seat of the secretion of the gastric juice, the bile, pancreatic fluid, and the multitude of minor glands with which the intestinal tube is everywhere studded.

Whether in health or in their diseased states, the sympathies of different divisions of the mucous membranes with each other, and of the mucous tissues with structures of an opposite nature, are some of the

most constant and remarkable occurring in the animal economy. No one spot of mucous membrane can be affected without a corresponding manifestation in another, and it may be, some remote organ. The most prominent instance of sympathy between other organs and mucous membranes is that existing between these and the skin. Impressions of cold on the cutaneous surface commonly produce their ill effects on some part of the mucous system. In most persons catarrh of the bronchial membrane is the result, while in others the membrane of the stomach, kidneys, or intestines, becomes morbidly affected. Not less evident is the effect produced by disease of the mucous membranes on the skin. In dyspepsia, where the membrane of the stomach and neighbouring viscera is in a morbid state, the secretion from the skin becomes much altered, and the whole cutaneous surface blanched from its natural colour. Next to the more general relations between the mucous membrane and other organs, I come to the consideration of those bearing more immediately on my subject, namely, the sympathies existing among different parts of the same tissues. I may instance the spread of catarrhal symptoms from the eyes and nose to the bronchial tubes, or the lungs themselves. A still more apposite illustration may be drawn from the common tendency of inflammation of one eye to affect the other in a similar manner. Not less remarkable is the influence exerted by the stomach, in its disordered state, on the senses of sight and hearing, often impairing them to a deplorable extent; indeed, the mucous membrane of the stomach, when in a disordered state, I believe to be the centre from which radiates a large

majority of the chronic ailments to which we are subject.

The integrity of the mucous membrane is of absolute necessity to the healthy exercise of all the senses, except that of touch, to which the skin bears the same relation as mucous membrane to the others. A familiar example of this dependence of the senses is offered by the deterioration, or even entire loss of smell, in common catarrh, while the mucous membrane of the nose is inflamed, and the speedy recovery of the sense on the disappearance of the cold.

Of late years my attention has been much directed to the state of the mucous membrane in deafness; and the result of my investigations has satisfied me that a very considerable majority of deaf persons have the lining mucous membrane of the ear in a diseased condition. The great agent in producing this morbid state is *cold*; sometimes affecting the internal ear through the medium of the external passage, but more frequently producing its first effects on the throat, and extending from thence to the middle ear through the inner or Eustachian passage. The next prolific source of deafness is chronic derangement of the stomach, which affects the ears in all who have any predisposition to disordered hearing. These causes of aural disease thus displaying themselves in morbid conditions of the mucous membranes, I do not hesitate to declare exceed all others in frequency and importance.

The affection of the mucous membrane of the throat, to which I refer, may occur at all ages, but happens most commonly in the periods of youth and middle age, especially to those whose occupations expose them to

inclement weather. It commonly begins with a sense of fulness and increased heat about the fauces, aggravated by taking cold, and constituting in itself a great susceptibility to catarrhal complaints. There is an increased secretion of phlegm from the throat, which is chiefly troublesome in the morning. On looking into the throat it appears congested, and covered with bloodvessels, assuming arborescent shapes, and forming a striking contrast in colour with the pale mucous membrane of the cheeks and palate. When this state has existed some time, it extends to the nasal cavities and the guttural passages, producing a sensation of stuffing up both in the nose and ears, of course caused by the increased secretion of mucus and the thickening of the lining membrane. It is in this, the first or inflammatory stage, that deafness makes its appearance; and by the aid of catheterism the progress of the morbid state can be accurately traced. During the first stage the affection of the throat is the most prominent symptom. The membrane investing the mouth of the Eustachian canal may be felt by the catheter or probe, to be in a tumid state; and the introduction of the catheter gives some pain, owing to the presence of subacute inflammation, and is more difficult than at other times, because of the thickened condition of the mucous membrane. The air-douche is, however, the most valuable aid in continuing the investigation, and leading to a correct diagnosis. In the healthy state of the ear the mucous membrane is of very fine organization, secreting a thin mucus, which is either absorbed or carried off by the Eustachian tubes, so as never to accumulate to an injurious extent. The introduction of air into the tympanum, by the air-press and catheter,

produces, when listened to by the stethoscope, a continued vesicular murmur, very similar to that heard in the chest in puerile respiration. When the disease of the mucous membrane has reached the ear, and during the stage of increased secretion, the application of the air-douche produces a loud mucous rhonchus or gurgle within the ear, the character of which accurately informs the listener of the comparative fluidity or tenacity of the mucous accumulation. It is in this stage of the disorder that catheterism is of the greatest service; the introduction of air breaking down the thick secretion, and occasioning its discharge from the Eustachian tubes, which, by admitting air freely into the tympanum, restores the hearing. But unless the treatment is persevered in, so as to render the mucous membrane healthy, the secretion accumulates again in a few days, and brings a return of the deafness. The patient, also, when the air is thus obstructed, sometimes obtains a temporary relief by a dislodgment of the mucus, accompanied by a cracking sound or pop, which may take place either in yawning, sneezing, vomiting, blowing the nose violently, or some other sudden respiratory effort. After this state of increased secretion in the tympanum, Eustachian canal, and throat, has continued for some months, or it may be years, it gradually diminishes: the deafness, however, continuing, or even advancing in severity. When the throat of a patient, under these circumstances, is examined, nothing more than slight thickening or relaxation is perceptible. There is often an evident coldness of the mucous surface, palpable to the patient, and likewise to the touch of the surgeon. The same feeling of coldness, and even insensibility, extend into the ear. If the organ

is now examined by the air-douche and stethoscope, a low vesicular murmur is alone heard, of a smoother character than the normal sound, without the least evidence of the presence of the natural moisture. Besides the physical proof of a dry, unhealthy state of the inner ear, the mucous membrane of the nasal cavities and of the throat are found comparatively dry, and deprived of the natural secretion. The external meatus also, the lining of which partakes of the nature both of skin and mucous membrane, is in the same arid state, being quite void of the ear-wax, which is either not secreted, or its moisture is so rapidly absorbed that it falls out of the ear like dust, and readily pulverizes when rubbed between the fingers. The membrana tympani is seen shining at the bottom of the meatus like a thin lamina of ivory of an opalline colour, instead of the transparency it possesses in the healthy state.

Sometimes tinnitus is present, but quite as often the patient loses this distressing symptom without any amelioration of the deafness. Singing in the ears may be present in any or all of the changes that take place, from the commencement to the permanently inactive state of the auditory organ; there is, however, I believe, no certain rule for its existence in these or any other forms of deafness.

In dyspeptic deafness a morbid condition of the throat, gradually affecting the ears, is generated, but of a less active kind than the similar affection from cold. It is surprising how large a proportion of the deaf refer to the stomach as the source of the aural malady; but, on a close examination of the early symptoms, they almost invariably remember a troublesome condition of the throat as constituting an intermediate train of

symptoms between the stomach and aural disorders. Unfortunately, these cases rarely apply for assistance till the deafness has become confirmed; but if an opportunity is afforded of watching the progress of the ear affection, the same order in the symptoms is observed, and the same changes in the mucous membranes occur, as when cold is the exciting cause of disease.

Many writers on the Practice of Medicine have pointed out the stomach as the source of deafness, but none of them ever suspected the frequency of its occurrence. Unfortunately, aurists have directed their attention too exclusively to the ear itself, to trace accurately the chain of causation by which the disease approaches the organ of their circumscribed studies. Even Kramer, though often approaching so nearly as to render it surprising that he did not arrive at a clearer comprehension of the subject, never suspected the important part played by the mucous surfaces in the production of deafness: hence many cases are scattered up and down in the pages of his work which might, with perfect propriety, be reduced to the forms of deafness I have been describing.

It is interesting to find how exactly the results of a close study of aural disease accord with the plainest truths of the physiology of hearing. The important offices performed by the proper membranes of the ear are universally allowed. The healthy tension and vibratibility both of the membrana tympani and the inner membranes are absolutely necessary for the acute performance of the auditory function. Now these vibratile membranes, forming as they do the propagators of sound, are all intimately connected with the mucous membranes: the two lesser ones covering in

the foramina leading to the labyrinth are invested with it on one side only; but the proper drum may be said to be enveloped by it on both sides; as, besides the inner covering, the outer layer, formed of the cuticular lining of the auditory passage, resembles mucous membrane much more nearly than true skin, and disease is readily propagated from the membrane on one side of the drum to that on the other. The mucous layers of the vibrating membranes are necessary both for their protection and preservation in the moist state, which fits them to receive the undulations of sound. It has been shown by direct experiment, that moist animal membranes, arranged after the plan of the ear, are considerably more sensitive to sound than the same in a dried state; and this is further proved by the fact, that in many cases where there is a dryness of the membrana tympani without any serious disease of other parts, the deafness is relieved for the time by merely moistening the membrane with a little wet cotton wool.

Seeing then the important functions performed by these parts of the auditory apparatus, it is clear that deafness must be the result of the loss of their elasticity, and it is equally clear that disease of the investing mucous membranes to the extent that destroys this property, or increases or diminishes the natural secretion, must, in a structure of such delicate organization as the ear, seriously interfere with the discharge of its functions. Patients thus affected complain of having a film, as it were, spread over the organs, which is, in reality, the case; the sound seems to them to hang in the ears instead of passing on to impart the natural sensation to the clouded nerve.

I would here record my conviction that the forms of

deafness referrible to the mucous membranes amount to more than two-thirds of all the cases that come before the aural practitioner, though their nature and cause have never been properly appreciated. It includes what authors have considered the symptomatic deafness produced by dyspepsia, while, in fact, though it is the result of dyspepsia, yet a morbid change has been produced in the ear secondarily to the disorder of the same membrane of the stomach, so that it is not enough to treat the stomach solely, as the relief of the dyspeptic symptoms is at least but palliative, instead of curing the deafness, which is certainly the most distressing part of the twin malady.

In the same category may be placed a great number of cases termed *nervous deafness*. This appellation has been a kind of refuge behind which to place any case of deafness that did not present grossly to the eye, or suggest to the imagination, some physical explanation of its cause—a sort of *nominis umbra*, which all aurists have had the sagacity not to define, from the certainty of its destroying their attempts to systematise diseases of the ear. It has been thought quite sufficient for an aurist to assure himself, no matter how, that the Eustachian tubes were free, and the external meatus clear of obstruction, or even devoid of the natural secretion, the ear-wax, to decide at once that deafness, under such circumstances, must be of a *nervous* character.

Sometimes attempts have been made at refinement, and the minute structures of the labyrinth accused of causing deafness, though we have no knowledge whatever of the healthy functions of these delicate parts, and no facts to elucidate, in the least degree, the effects

of any change in their structure, either natural or morbid. The symptoms of the so-called nervous deafness accord with what I have here given, and observed again and again at the Metropolitan Ear Institution and in private practice, as the unerring result of chronic disease of the auditory mucous membrane. I do not mean to proscribe nervous deafness as a non-entity; so far from this, I have myself written on the causes and treatment of cases unequivocally deserving the name; but I most strongly aver, that in the practice of aural medicine my compeers have been pursuing a phantom under this name, when, if they had applied themselves diligently to observation and the comparison of facts, they would long ago have discovered the paramount importance of the mucous surfaces in the production of ear-disease.

If we scrutinize the meaning of the term *nervous deafness*, it can only mean deafness in which paralysis of the auditory nerve is produced by some change in the nerve or the brain; but this is really the case in but a small minority of deaf patients. A simple test will show the fallacy of the usual diagnosis in diseases of the ear. If the ticking of a watch can be heard when applied closely to the auricle, or held between the teeth, it cannot be the auditory nerve that is in fault, but must be some part of the acoustic apparatus serving to transmit sound from the external air to the nerve of hearing. This test is unequivocal; because the nerve being in contact with the temporal bone, and the bones of the head being good conductors of sound emitted by a solid body, as a watch, when in contact with them, it is much the same as though the sonorous impulse was imparted directly to the nerve. If any

deaf readers will try this experiment, very few will find themselves deaf to a watch held between the teeth.

When deafness has existed for many years, of course the nerve of hearing becomes enfeebled from long disuse; but this is no more a valid reason for believing the primary deafness of a nervous character, than for considering cataract a nervous blindness, because the optic nerve loses sensibility to light when it has long been shut out from the eye. The symptoms usually termed nervous are of little importance as a cause of deafness; those of nervous excitable temperament do not often see, taste, or smell, worse than others, and there is no reason whatever why the hearing should be affected in such cases. So far from nervousness being set down as a cause of deafness, the allegation should be completely transposed, and the nervousness considered as the result of the deafness. If the deaf were to examine their own sensations, they would perceive the truth of this. Deafness is so severe a deprivation, that few can endure it without repining, and experiencing the variety of conflicting feelings which go to form nervous excitability, irritability, or nervousness. It is true, that when deafness is fully formed, many of the deaf hear much worse at times of excitement; but this is rarely the case at the onset of the disorder, and is clearly referrible to the state of the brain rather than of the auditory organ. The mistakes made with regard to the assumed nervous deafness are injurious in many respects, and in none more so than as tending to useless and injurious methods of treatment.

The kinds of deafness and disordered states of the ear already noticed, are the most prominent of those arising out of morbid conditions of the mucous mem-

brane, but others of considerable importance in practice remain to be described. Discharge from the ear, of whatever kind, whether acute or chronic, mucous or puriform; from the external meatus, without erosion of the *membrana tympani*; or from the cavity of the drum itself, with loss of the membrane; are often the sequelæ of disease of the lining membrane within the tympanum. When this membrane is in an irritable or congested state, the supervention of a cold occasions an active degree of inflammation, constituting *otitis*. This disease, generally, goes on to suppuration, because of the mechanical pressure exerted on the parts implicated by the surrounding bones. According to the treatment pursued, the nature of the constitution, and various extrinsic causes, it may terminate in any of the grades of ear-discharge specified above; or it may run on to the more dangerous termination of caries of the bone, and abscess opening through the mastoid process. In the simplest form of *otorrhœa*—namely, from the external meatus alone—the disorder is very commonly induced by disease within the drum. In fact, so intimate is the connexion between the *cavitas tympani* and the *meatus externus*, that the former is never deranged without affecting the latter. In the congested state of the mucous membrane of the throat, Eustachian tube, and ear, there is itching and sometimes pain in the meatus, and the secretion of cerumen is either diminished or depraved. I have observed the ceruminous and sebaceous glands of the passage often pass by slow degrees from the natural state to the secretion of mucus, and eventually pus, when there has existed a source of irritation within the tympanum.

It is of great importance to diagnose correctly be-

tween internal and external otorrhœa. The common mode of directing the patient to blow through the ear with the nose and mouth stopped, is uncertain, because many in whom the Eustachian tubes are unobstructed, are unable to blow air up to the ear so as to inflate the membrana tympani. In my own person, I can readily inflate the right tympanum, but never remember to have succeeded on the left side, except by catheterism. In cases of otorrhœa with a perforated membrane, some who are at one time able to force air through so violently as to produce a loud whistle, are quite unable at other times to get air through the Eustachian tubes. The rationale of this is difficult to explain. It may be, that the mouths of the tubes are closed by the effort of blowing the nose, or that they are covered in by the soft palate in a valvular manner during the forcible respiration with the mouth and nose shut; or by the interposition of mucus. Here, as in many other instances, the catheter and air-douche are the only infallible means by which a stream of air may be readily passed through the ear when perforation is present, so as to be heard at a distance of two or three feet.

Many disastrous results have attended the uncertainty about the integrity of the membrana tympani; cases of perforation have been injected with acrid and astringent fluids, and the sudden stoppage of the discharge has produced dangerous cerebral symptoms. I consider syringing to be the great heresy of modern aural surgery, and its practice must certainly have arisen from observing the effects of injections in other and less delicate organs, rather than from any good results which follow its use in ear-disease. If employed where there is discharge with loss of the membrana tympani, it hazards

inflammation of the internal structures of the ear, besides the almost sure aggravation of the deafness; and this latter ill result is occasioned with certainty when astringents are thrown in upon the entire membrane, whether they arrest the discharge or not. I feel certain, that the daily use for a month of an ordinary astringent ear-injection would render the naturally elastic and sensitive membrane of the drum tense, hard, and insensible to such a degree, as to deafen the acutest hearing, and the same evils obtain when injected for the purpose of suppressing a discharge. In practice I need not to make the inquiry, for the touch of the probe will enlighten me as to whether my patient has been subjected to such treatment.

If I were asked to name, in the order of their frequency and importance, the chief causes which give rise to the condition of mucous membrane and subsequent loss of hearing I have described, I should thus place them:—1, cold; 2, the exanthemata; 3, dyspepsia; lastly, *mercurial medicines*. Some of the extreme and most unmitigable cases of deafness I have ever witnessed were produced by severe salivation, and I must confess that I never saw a case of this kind of any standing, which derived decided benefit either from local or constitutional treatment. If there is in the materia medica a medicine which has the power of acting as a poison to the sense of hearing, where there exists predisposition to deafness, I believe it to be *mercury*. Of course my strictures are directed not so much against its exhibition as a purgative or alterative, though even here it is dangerous to the deaf, but when given with a view to its *specific* effect. From watching the progress of many cases, and from the analogy of the symptoms produced

by mercurialization, with those affecting the guttural and aural mucous membrane in influenza, dyspepsia, and the exanthemata, I believe mercury, like them, injures the sense of hearing through the medium of the mucous surfaces. Long after the salivary glands have ceased to be affected, an erythematic state of the throat and fauces remains, often by its persistence affecting the Eustachian tube and tympanum in the manner I have described, when chronic catarrh has been the exciting cause. It may be argued, that when deafness follows a mercurial course directed against syphilis, the syphilitic disease is quite as likely as salivation to be the cause of deafness. Syphilis may, in some cases, be the chief agent in producing deafness; but I believe the great anti-syphilitic given in excess to be ten times more prejudicial, because I have seen so many instances where this medicine was introduced under other circumstances, and even ill-advisedly as a curative agent in incipient deafness, with the same results. I might multiply cases in which this has happened, and where patients themselves confidently referred the aural malady to this cause. One case, of a very decided nature, I some time ago attended. It was a patient who was recommended by Sir Benjamin Brodie to consult a gentleman celebrated for his treatment of a local disease from which he suffered, and which was cured by a mercurial course, but at the expense of producing a deafness which is now altogether irremediable.

#### ENLARGEMENTS OF THE TONSILS.

Among the immediate causes of deafness complicated with, or proceeding from, disease of the guttural mucous membrane, morbid growths of the tonsils demand con-

siderable attention, because, although not invariably productive of impaired hearing, they prove so, I am convinced, in a much larger proportion of cases than has ever yet been supposed. I would premise, that while directing attention to these enlargements, I propose to limit myself, as much as possible, to their consideration in relation to the subject of deafness.

The chronic disease of the tonsils usually met with cannot be termed hypertrophy, inasmuch as the augmented size does not consist of the proper glandular substance (these glands being little more than a follicular arrangement of mucous membrane), but of deposits of fibrin, which become organized, though only to a limited extent as regards the endowment of vessels and nerves.

The tumours are of indolent growth, and from their low degree of vitality would often escape notice but for the train of evils they not unusually excite, especially when their size becomes considerable. If felt by the finger, they are frequently hard and scabrous; but in many instances induration is altogether absent, the diseased part being so soft as to break down repeatedly if laid hold of by a forceps. In others, the mucous cells on the surface of the tonsils are enlarged, and when such is the case, there is a copious secretion of viscid phlegm. More rarely they become filled with solid matter, of a dirty white colour, which, from its calcareous appearance, I have thought similar to the tartar deposited on the teeth, probably originating in the same way as the *crusta petrosa* from the salivary and other secretions of the mouth. Calcareous deposits I have in three or four instances found imbedded in the centre of the excised growth. In the case of a

young lady, the daughter of a surgeon at Woolwich, I found a calculus closely resembling in arrangement a piece of rock coral.

On looking into the throat of a person suffering from such morbid growths, they are seen as tumours on each side of the fauces, protruding from between the palatine arches, and, if drawn towards the mesian line by a tentaculum, are of much greater size than the first view from the mouth would indicate. The symptoms are, deafness, thickness of speech, or difficult deglutition, according to the position of the morbid growth.

The enlargement which is most apt to produce deafness frequently does not project sufficiently from between the pillars of the fauces to be perceived on looking into the throat; it is hidden conjointly by the anterior pillar and soft palate. Thus it is, as I have verified in many instances, that the surgeon has been deceived, for the condition of the parts is rarely examined *with the finger*, which should invariably be done. Were he to do so, he would not infrequently detect the enlarged tonsil stealing upwards, and encroaching on the mouth of the Eustachian passage.

The enlargement which is productive of thickened speech, on the contrary, strikes the eye immediately the mouth is opened, and extends downwards in a contrary direction to that which is calculated to produce deafness. If the upper margin of the morbid growth be defined to the eye, thick speech only is the effect; but if the growth ascend, so as to interfere with the movements of the uvula and soft palate, then we have associated with the thickened speech, *nasal speech*.

The enlarged tonsil which interferes with swallow-

ing, is that which projects into the pharynx, almost or quite meeting its fellow, and each is generally attached to its site by a narrow base. I have removed several of such enlargements from persons who complained that they had never been able to swallow their food until they had two or three times returned it to their mouth to be remasticated. Such persons are twice as long at their meals as those about them.

In those cases where the enlarged glands have an extended base reaching from the vicinity of the Eustachian tubes to the bottom of the pharynx, and such cases I have frequently seen, we may look for defective speech, hearing, swallowing, and breathing altogether associated, more particularly if the uvula enters into the diseased condition of the parts.

With such a state of the throat, too, on getting up in the morning, the sensations are most disagreeable. The vitiated secretion of mucus, collected during the night, and adhering to the throat, produces nausea, or even vomiting, for some time, till the tenacious phlegm can be expelled by hawking or coughing. A patient in this state is often an hour or two, after rising, before he gains his equilibrium, and becomes fit for the active duties of the day. The deposition of coagulable lymph, and increase of size, may arise from any cause capable of keeping up a certain degree of irritation about the throat: the effect of cold on the fauces and nasal mucous membrane is frequently productive of such a state; but I should say, that the exanthemata are the most frequent cause of morbid states of the tonsils. Both the commencement and termination of these disorders are attended by a train of throat-symptoms, which often occasion, as their reliquiae, these disagree-

able growths. Children of strumous constitution are exceedingly liable to tumefied states of the throat. When glandular swellings in the neck are observed externally, a careful examination would seldom fail to discover enlargement of the tonsils. This diseased condition doubtlessly depends, in the first instance, on the constitutional fault which develops the whole strumous disease; but when formed, it proves a not unimportant source of irritation, which, together with the increased and morbid secretion passing into the stomach, re-acts on the system and aggravates the general scrofulous disorder as much, or even more, than the glandular disease. In tonsillary swellings arising in the strumous diathesis, the associated disorder of the mucous membrane generally extends to the mouth and nose, and becomes evident in the tumefied appearance of the lips and nostrils, so much so, that I am often enabled by this sign alone to forejudge the state of the throat and tonsils.

Early childhood is the period in which the mucous membrane of the throat and tonsils is most prone to disease. The development and functions of the glandular system is then in the state of the greatest activity; it is then, also, that scrofulous disease generally manifests itself, and when catarrhal complaints are most common. Children of lymphatic temperament and fair complexion are most often affected with tonsillary disease as the sequel of colds. It would seem as though, when the skin is of fine and delicate organization, the mucous membranes are also possessed of more than their wonted susceptibility.

An analysis of the modes in which the enlarged tonsil interferes with the sense of hearing, offers a new

and as yet an untrodden field for the student of aural disease. By modern writers, the most obvious connexion between deafness and diseased tonsils, that in which the enlargement presses on the guttural extremity of the Eustachian tube, has been overlooked. Kramer entirely denies the existence of deafness from this cause, and Itard scarcely refers to the subject; though it was held to be of much importance by many earlier writers. Among others, Wathen mentions it as one of the sources of deafness most certain to be removed "by chirurgical assistance;" and Valsalva relates a case of ulcerated tonsil, in which the presence of a tent blocked up the Eustachian tube and occasioned deafness, showing most satisfactorily what Kramer seems to deny, that these passages may be obstructed at their guttural extremities. By some it has been denied that the tonsil glands can ever obstruct the tube, on the ground that when the tonsils are enlarged to any extent, they become pendulous, and are removed by their weight from the natural position. This is by no means true, if assumed as the general rule, or indeed in any sense but as a rare exception. I have pointed out that, when it does occur, the functions interfered with are those of deglutition and respiration. In the most frequent kind of enlarged tonsils, where the glands maintain their original position, or at least extend in every direction, the Eustachian tubes are generally compressed. There is another variety of enlargement which I am not aware has ever before been noticed; it is where the diseased growth is confined to the upper margin of the tonsil, and which, from being hidden behind the veil of the palate and the anterior palatine arch, is quite out of sight when the

throat is merely examined by the eye. In numerous cases I have verified this interesting observation, and effected cures by the indications of treatment which the knowledge of it afforded. We never can be certain that the tonsils have no share in producing deafness until these bodies have been examined carefully with the finger. In some instances, where nothing morbid was visible in the throat, the upper part of the tonsils has been of such magnitude as to produce, in addition to deafness, nasal speech, from encroaching on the posterior nares. These novel views have afforded me the most gratifying results, and I feel assured they will exert considerable influence on the future treatment of deafness.

Whether the Eustachian tube be lessened by the general bulk of the morbid growth, or only by the pressure exerted by enlargement of that part of the gland nearest to the guttural opening, the effect is the same, and is easily explained by a reference to the physiology of the ear. The exclusion of atmospheric air from the cavity of the tympanum is universally allowed to cause deafness. This has been accounted for in various ways: by some it was thought that sounds reached the ear through the Eustachian tube more easily than by the external meatus, and the fact that some deaf persons open their mouths when attempting to hear was considered a confirmation of this hypothesis; but it is found that a watch, or any other sound, becomes more indistinct when applied to the vicinity of the tube than when held before the mouth or the auricle. Other physiologists believed the freedom of the Eustachian tube necessary to admit of the motion of the air of the tympanum, when it vibrated

under the influence of the membrane of the drum. But the laws of acoustics do not admit of the motion of the contained air under the influence of sonorous undulations. The idea of Itard, that the tube performed a similar office for the ear which the hole in the drum-head does for that instrument, is equally incorrect. The hole is of use, not in assisting the vibrations of the air of the drum, but as a channel by which the sonorous undulations can reach the ear. Without the hole, the sonorous vibrations and the resonance of sound in the closed cavity would be equally intense, but there would be no means of conducting the sound to the external air and the ear but by the solid walls of the drum; and the sounds excited in the air by membranes as the drum-head, are only transmitted with difficulty and loss of power to solids such as the drum-case. The true explanation of the loss of hearing by closure of the tube, seems to be that the vacuum caused by the loss of air in the tympanum, places the membrane of the tympanum under the influence of the atmospheric pressure. We can easily imagine how a weight of 15lbs. to the square inch must affect such a delicate membrane as the drum of the ear. The membrane of the tympanum, when the cavity is a vacuum, bears an actual pressure of more than 7lbs., as it is more than half an inch square; it becomes preternaturally tense, and its vibrations, on the impulsion of sound, are greatly impeded. Unfortunately there is no *vis conservatrix* to defend the membrane from this condition, as the small muscles and bones of the ear act as pulleys and levers, to make the membrane tense when liable to injuries from loud sounds; and there is

no adaptation of an opposite nature but the free egress and ingress of air to the *cavitas tympani*.

Besides the closure of the Eustachian tubes by the actual pressure of enlarged tonsils, there are other modes in which these glands deteriorate the organ of hearing. They act as a constant source of irritation in the throat, and render persons liable to repeated colds, which affect the whole mucous lining of the pharynx, nasal passages, Eustachian tubes, and tympanal cavities. There is always danger of these catarrhal affections exciting deafness, even when the original enlargement of the tonsils does not prove of itself a cause of loss of hearing. Sometimes when a small amount of tonsillary disease exists, it will occasion thickening of the contiguous mucous membrane of the Eustachian tube, or the engorgement and thickening will extend to the tympanal cavity, causing in either case deafness of a very intractable character. When there is hypertrophy of the tonsil glands, or disease of the uvula, a morbid secretion of the mucous membrane is kept up in the Eustachian tubes, and within the tympanum. The lodgment of mucus, which always tends to become inspissated, is as certain a cause of deafness as occlusion of the tube by thickening of its membrane; but it is not near so difficult of removal, and is occasionally got rid of by a sudden pop, caused by laughing, sneezing, coughing, vomiting, or some other sudden respiratory action.

I have observed some instances in which *otorrhœa* could be traced distinctly to enlargement of the tonsils; they were cases in which the disordered condition of the throat had given rise to irritation within the tym-

panum, which had taken on inflammatory symptoms, and ended in suppuration, the matter discharging itself through the ruptured membrane of the drum. Another very troublesome complication of ear disease, *tinnitus*, often occurs as the sequel of irritation in the throat and hypertrophy of these glands. Tinnitus rarely exists without a marked degree of deafness; but it does sometimes happen when the tonsils are not of sufficient magnitude to occasion deafness, though loss of hearing generally follows, when this distressing symptom has once established itself.

Already I have insisted on the paramount importance of a healthy state of the mucous membrane of the ear to perfect hearing. I have advanced the novel view, that by far the greater number of deaf persons have lost their hearing by a diseased condition of this same mucous membrane. This I have substantiated by facts, and have pointed out the better methods of prevention and cure which must result from such an improved knowledge of the pathology of the ear. The modes in which external agencies can affect the lining membrane of the tympanal cavity are, in the first place, through the external passage and the fibrous membrane of the drum, and in the second, through the Eustachian tubes entering to the ear from the throat and posterior nares. Of the two tracks there can be no shadow of doubt that the latter is by far the most frequent. The external meatus enjoys a comparative protection from cold on account of the presence of wax, and the structure of the *membrana tympani* forms a very efficient protection to the middle ear in this direction. On the other hand, the mucous membrane of the throat, from its extensive sympathies with other parts of the body,

and its exposed situation, is more frequently disordered than any other part of the system of mucous membranes whatever. And it must be borne in mind, that the membrane of the throat is continuous through the medium of the Eustachian tubes; consequently the ear and the hearing are in danger of suffering, whenever there is a morbid state of the guttural mucous membrane.

I trust I shall be excused for any seeming prolixity in dealing with this branch of my subject. I have been purposely diffuse, because I am persuaded that medical men do not sufficiently appreciate the connexion which exists between diseased states of the throat and the production of aural disease.

Having now shown my views of the manner in which deafness occurs, through the intervention of the mucous membranes, when these are brought within the influence of certain injurious causes, I will endeavour from this point to glance briefly at all the most important forms of deafness (as they occur in other authors), for the purpose of showing how many of them may be referred to morbid states of the mucous surface, as the chief exciting cause of deafness.

*Acute and Chronic Otitis.*—In these diseases, the mucous membrane is the first tissue affected, though the continuance of the disease in either form often leads to disease of other structures, especially the osseous and muscular contents of the *cavitas tympani*. Suppuration of the ear, through the *membrana tympani*, may justly be regarded as the termination of inflammation of the mucous membrane, the tumefaction of the membrane having closed up the minute opening of the tympanic extremity of the Eustachian tube; and

the pressure exerted by the closed cavity upon the inflamed membrane occasions pain resembling that which happens when the pulp of a tooth inflames within its osseous envelope. In the chronic form of disease, the same thing happens, but in a less marked degree.

*Internal and External Otorrhœa.*—In the first, the discharge comes from the cavity of the tympanum, with loss of continuity in the membrana tympani; in the second, the discharge is secreted in the external meatus alone. Internal otorrhœa is always the result of inflammation of the mucous membrane or otitis, and generally of the acute form of this disease. External otorrhœa generally comes on in consequence of irritation of the membrane within the tympanum. Sometimes it occurs in cases where there is no sign of disorder on the internal side of the drum, appearing *per se* from the lining of the meatus. But even granting this to occur oftener than I believe to be the case, I consider the pathological characters of disease of the lining of the meatus to be altogether different from those of the skin, and closely resembling, in this respect, mucous membrane. The cuticular lining, as it is termed, and the sebaceous follicles secrete an unctuous matter in sufficient quantity to keep the canal and external surface of the membrana tympani in a moist state. In the progress of otorrhœa, the unctuous matter gradually passes from the natural secretion to the copious discharge of mucus, or even pus, without the intervention of suppuration, circumstances which never occur in the common integument. Moreover, when this has established itself, the secreting surface has the closest similarity to mucous membrane.

*Obstruction of the Eustachian Tube.*—It is scarcely necessary to mention that this state is caused by thickening, increased secretion, or adhesion of the mucous membrane, in all cases where the occlusion is not caused by mechanical pressure, as from nasal polypi, enlarged tonsils, &c.

*Polypous Growths in the Cavity of the Tympanum, or the Ext. Meatus.*—When these arise, it is invariably after the existence of disease of the lining membrane with discharge.

The forms of ear disease I have mentioned far outnumber all others in the frequency of their occurrence. There only remain diseases of the auricle and labyrinth, nervous deafness, and deafness from accidents, such as blows, and the introduction of foreign bodies into the ext. meatus. Of these, diseases of the labyrinth are very infrequent; and I have already shown that the term *nervous deafness* is only deserved when there is paralysis of the auditory nerve, so that it is not at all applicable to the great majority of the cases to which it is given. Disease of the auricle, also, seldom exists, save as an extension of disorder from the meatus in cases of otorrhœa.

#### PROPHYLAXIS.

Before entering on the Treatment of Deafness proceeding from morbid conditions of the mucous surfaces, it will not be out of place to give some attention to the best means of warding off disease in cases where there exists predisposition. Prophylactic measures are of great importance, because, at least, two-thirds of the gross amount of deaf cases are of slow progress, and generally spread over so long a time, that an excellent

field is offered for defensive operations before they become confirmed.

Timely attention, such as the generality of people are able to command, would greatly lessen the number of the deaf. Unfortunately, it is common for those who are threatened with loss of hearing to argue, that from the tardy advance of the evil, the causes which are producing it cannot be very powerful or deeply rooted, and they flatter themselves that time will of itself bring relief rather than aggravation. Thus it is that thousands, by culpable neglect, throw away the invaluable chance of recovery offered by early treatment and prudential self-regard. The tissues of the ear are so solid, and shut out from other organs, that when once a diseased habit has been established within it, it is only with the greatest difficulty the enemy can be dislodged. Nothing more surely proves the slow-stealing advance of deafness (in a general sense) than that very few of the deaf are able to name the precise date of their misfortune. They can generally remember that long before they considered themselves deaf, there were times when conversation in a large room, or in the society of several persons, required unusual attention to be correctly apprehended. That in damp weather, or whilst eating, or when the back was turned to the speaker, the difficulty was increased. That words containing certain consonants, as *l* or *s*, were sometimes mistaken for others, this being the case especially with proper names; that the voice of a stranger, or conversation in a strange room, was less intelligible than one to which the hearer had been accustomed. All these facts are interesting, as being among the first signs of failing

hearing. On their earliest manifestation, it would be wise to place the auditory organ in the best possible state of defence. As the mucous membrane is the chief point affected by injurious influences, all causes that act upon it prejudicially should be held in apprehension, and cold and humidity, being by far the most frequent of these, and affecting the ear in the greatest variety of forms, should be guarded against with the most sedulous care. When deafness has commenced, every fresh catarrh will be sure to add something to its aggravation. Sudden transitions from heated assemblies to the cold air, or *vice versâ*, are much more likely to occasion cold than exposure either to an uniformly high or low temperature, and should therefore be avoided. I have known persons liable to catarrh who guarded against it by never entering a warm room from the open air in cold weather, without lingering a minute or two in the hall or lobby, and on passing out, observing the same precaution. A distinguished member of the House of Commons, who consulted me, gave it as his opinion, that at least one-half of that assembly suffered in a greater or less degree from deafness in one or both ears. This is, perhaps, too much to say of the whole House; but from my own observation, I have no doubt of its correctness if applied to those who are constant in their attendance, and have been many years in Parliament. The late hours, and the incautious habit of many of the members, who prefer a cool walk home after a protracted and exciting debate, to the safety of a carriage, are quite sufficient to account for the prevalence of impaired hearing among our legislators. The same may be said of the habitual frequenters of theatres, or other crowded

assemblies. A stream of cold air upon the head when the rest of the body is heated, is the frequent cause of severe and sudden deafness. Washing and sluicing the head and ears with cold water, pouring cold water into the ear, (as is sometimes done by way of practical joke,) having the hair cut short in cold weather, sleeping with the head uncovered—bathing of any kind—are also among the most prominent causes of deafness.

At the commencement of deafness, when almost everything may be expected from regimen, the most strict attention to dietary rule should be observed: regularity and moderation in eating and drinking, and the avoidance of all causes of indigestion, are as necessary in this as in many of the more serious forms of disease. Besides the ordinary management of the stomach, there are certain things which are especially injurious to the deaf, from producing an unwholesome state of the mucous membrane of the throat. Salted meats, pastry, and greasy substances do this; vegetables in a less degree; the same may be said of malt liquors, and of coffee.

When persons are growing deaf, they naturally feel a great anxiety upon the subject, but very often it is not till the malady is confirmed that they discover the wisdom of seeking serenity of mind, and of giving their care to checking the disorder instead of encouraging a hurtful despondency.

If it were necessary, a great deal might be said about the injury inflicted by the indiscriminate use of the many nostrums in vogue for the relief of deafness. Few persons are decidedly deaf who are not able to refer an increase of their malady to some application of this class. Nearly all of them are placed for their

asserted curative effect in the external passage; and the great majority possess sufficiently irritating properties to cause a degree of inflammation of its lining membrane and of the external surface of the membrana tympani. No application to the external passage can produce any favourable change in the state of the middle ear, which is the usual seat of disease; the most such means can do is to excite the entire auditory organ, and consequently the acoustic nerve, so as to render it for a time morbidly sensitive to sound, which sensitiveness disappears, and falls even below the natural standard, when the stimulus is exhausted.

This fact will account for the temporary advantage in hearing which patients generally experienced who submitted themselves to the rubbing in of an ointment into the external meatus by means of a soft instrument, as practised by a well known physician. Few left his house who did not for the remainder of the day hear noises louder; but, alas! the improvement was deceptive, it was but the effect of the stimulus, and subsided with it.

If attention to the ears be necessary in the commencement of deafness generally, it is especially so in the forms of impaired hearing, combined with otorrhœa of gradual origin. This is of all aural diseases the most difficult to arrest when it has existed a long time, though at the outset, the most simple means would suffice for its removal. It commonly begins with an altered state of the ear-wax, and a sense of dryness and itching in the ears, which impel the sufferer to pick the meatus with pins, &c., and thus provoke instead of ward off the disorder. Protection of the meatus from cold, and the use of a solution of nitrate

of silver, two or three grains to the ounce, carefully applied with a camel-hair pencil, would generally stop an ear-discharge in its incipient stage.

A most essential point for persons threatened with deafness, is the observance of early hours in retiring to rest. Among the higher classes, it is astonishing to observe the amount of evil inflicted upon those with hereditary or acquired tendency to deafness, who, by implicitly becoming the votaries of fashion, are neglected in this respect.

#### TREATMENT.

In the treatment of confirmed deafness, the strictest regard should be had to the cause of the disease, and the stage to which it is applied. When there is a sub-inflammatory condition of the throat, with a sensation of heat in the fauces, or heat and pain in the ear, or when the introduction of a silver catheter occasions pain at the mouths of the Eustachian tubes, local depletion is the great agent in removing the disease of the mucous membrane, and preventing the perpetuation of the deafness. Leeches applied once or twice a week for a considerable period, either behind the ears, or within the nostrils, to the sides of the septum narium, followed, as the disordered state of the throat diminishes, by a succession of small blisters, or the moxa, along the margin of the jaw, or dry cuppings behind or upon the ears, form the best mode of treatment for this the most frequent form of deafness. When the pain is more acute, of a throbbing character, and accompanied by tinnitus of a ringing, or pulsatory kind, recourse should be had to cupping either behind the ears or on the nape of the neck. At the same

time, all the prominent causes of deafness should be avoided: a light nutritious diet adhered to, while tonics, and *non-mercurial* aperients, should be prescribed to give energy to the system. As the progress of ear-disease is generally lingering and slow, so also is its removal usually a work of time, under the most favourable circumstances. More good is effected by the steady pursuance of moderate means than by sudden and violent assaults upon the seat of disease. The depletory treatment should be continued, at least, till the entire disappearance of pain from the ears, or vicinity of the Eustachian tubes, and till the gorged condition of the mucous membrane of the throat and nasal cavities has subsided. During the prosecution of the local anti-phlogistic plan, catheterism should be resorted to, when it can be performed without giving pain, and the air-douche moderately applied to dislodge any inspissated mucus which may have accumulated in the tympanum or Eustachian tube; but as long as depletion is necessary, catheterism can only be used as an adjuvant for the purpose I have mentioned. If the introduction of the catheter causes pain, an occasional emetic will prove the best substitute, though it does not so effectually relieve the tympanic cavities of mucus. The state of the mucous membrane of the throat is sometimes much improved by the action of emetics. These means, judiciously varied or combined according to circumstances, will generally serve to subdue ear-disease of the kind pointed out, or, at all events, ameliorate the deafness to a considerable degree. I should mention, that after hearing has once been seriously impaired, it rarely or never regains its pristine acuteness; the cure can only, in the majority of cases, be considered as

comparative, though often quite sufficient for the purposes of ordinary communication.

In this form of disease, acute otitis is very liable to supervene, requiring a most energetic anti-phlogistic treatment by means of abstinence, purgatives, and local depletion, sufficient, if possible, to alleviate the pain, and prevent its termination by suppuration through the membrane. When this latter accident has happened, the hearing often returns; and the discharge, with perforation of the membrana tympani, may continue a patient's lifetime, by attention and cleanliness, without any considerable deafness. If the discharge disappears, and the membrane cicatrizes after suppurative perforation, which frequently happens, though it has been a subject of doubt, deafness has occurred in every case of the kind I have ever witnessed.

Since the publication in the *Medical Gazette* of my paper on perforation of the membrana tympani, and the proper cases for its performance, I have met with a most interesting case, which singularly confirms my view of the applicability of the operation to certain cases. It occurred in a mechanic who had, many years before his application to the Institution, suffered from otitis, with suppuration through the membrane, which after some time closed, the discharge ceasing at the same time. When he came to me, he had had a second attack of inflammation of the ear; and I found that, from the stoppage of the discharge after the first attack to the commencement of the second, twenty years had elapsed, during which time he had suffered from deafness. When I saw him first (in the second attack), the otitis was so far advanced that suppura-

tion speedily came on; and the moment the membrana tympani ruptured, the hearing was very considerably restored, showing, most satisfactorily, that the cicatrized membrane had been the cause of deafness, and that a fair chance is afforded by puncture, or rather trephining the membrane, in cases where it can be gleaned from their history that there has been discharge from the middle ear, followed by cicatrization. In the case referred to, I took means to maintain the opening through the membrana tympani, and the man has ever since retained an excellent degree of hearing.

In the second stage of deafness from a morbid state of the mucous membrane, where the inflammation, if at all present, is of a purely chronic character, and where the membrane is thickened, and its secretion in the throat, nose, and ear considerably increased, counter-irritation by moxa, blister, or emetic tartar, applied behind the ear and along the margin of the lower jaw, and catheterism, with the air-douche, promise favourable results. These local measures are, however, successful only after the most strict and unremitting perseverance. Many of such cases, especially when complicated with, or arising out of stomach ailments, derive remarkable benefit from the use of the hydriodate of potash, given in *small doses* of one or two grains largely diluted. This preparation exerts a beneficial influence on the mucous membrane of the throat and ear; it will often lessen the secretion of mucus within the ear, reduce the tumefied membrane of the throat, nose, and ear to the healthy condition, and altogether remove tinnitus. When the meatus has been void of wax for months, it will frequently occasion the gradual return of the ceruminous secretion. Certainly no medicine that I am

acquainted with has an equally beneficial effect on the ear with this, when given, as I have specified, *in small doses*, persisted in for a considerable time. Its therapeutic powers accord with the principle of *similia similibus curantur*, the first effect being to excite an inordinate action of the mucous surfaces; generally after three or four doses the patient experiences sneezing, headache, heaviness, and drowsiness, rapidly followed by an increased secretion from the eyes and nose, with all the symptoms of common influenza. Unless prepared for the result, the patient reports himself to have "taken another of the colds to which he is so subject." These catarrhal symptoms, however, soon disappear, and not till then are we to expect improvement; for during the persistence of these first effects of the medicine, the patient will experience an increase of deafness the same as from a genuine cold.

Although I have no great opinion of gargles, I have sometimes fancied that the secretion and disgorging of the mucous membrane have been assisted by the use of astringent gargles. Probably those most calculated to lessen the secretion from the throat, and remove nausea and other unpleasant sensations occasioned by its relaxation, are composed of alum, zinc, myrrh, &c. When the signs obtained by the air-douche and stethoscope show unequivocally that the lining of the cavity of the tympanum is thickened, its resolution is assisted by the daily application of an iodine ointment behind the ears, and along the margin of the lower jaw.

When the state of ear disease now treated of exists, the occurrence of severe catarrh, or an attack of acute indigestion, may convert it at any time into a more active form, requiring to be treated on the principles

laid down when describing the management of deafness from an inflammatory condition of the throat and ear.

During the stage of thickening and increased secretion within the ear, the kind of otorrhœa I have termed spontaneous sometimes occurs, the irritation extending from the middle ear to the external meatus. When this discharge exists it is of no great consequence, as has been supposed, to diagnose between the mucous and purulent varieties; they run one into the other, the purulent being usually subsequent to the mucous. The sudden arrest of such discharge should never be attempted; it generally produces an aggravation of the deafness, besides a liability to otitis and disorganization of the ear, or even still graver forms of disease. Astringent injections always incur the danger of such evils, and therefore should never be used. They offer little temptation to their employment in any case, because they never benefit the patient but by stopping the discharge, which, if done, is at considerable hazard, and is of itself but the relief of a small part of the malady.

In the treatment of otorrhœa, I generally limit myself to the use of a solution of sulphate of zinc and alum, one or two grains of each to the ounce of distilled rose-water, to be increased from time to time, but to a very slight degree. This I direct to be syringed into the meatus once or twice a day. This injection, if perseveringly used for a month or two, will generally lessen or stop the discharge without injuring the sensibility of the membrana tympani. It may seem a tedious process, but there is no great inconvenience attending the treatment; and I know of no other mode of arresting external ear-discharge with-

out still further endangering the organ of hearing. One benefit attending the use of this injection is, that it entirely removes the disagreeable fetor of most chronic ear-discharges: this alone would render it of great value in the treatment of aural disease; but it seldom fails to moderate the discharge, where there are no fungous growths in the canal, or erosion of the membrana tympani.

One of the most striking forms of deafness, and fortunately one most easily remedied, is that in which, after catarrhal inflammation of the Eustachian tubes, the tubes and middle ear are gorged with thickened mucus, which often remains fixed the whole life-time, unless accidentally displaced by a sudden respiratory action, as sneezing, or during the effort of vomiting. The most rational way of cleansing out the obstructed cavities would seem to be the injection of tepid water through an Eustachian catheter, as performed by Wathen. The same end is obtained, and much more agreeably to the patient, by the injection of compressed air, after the manner of Deleau. I adopt the latter, and find that a few operations, or even one, will break down the agglutinated mucus, and admit air to the tympanum, so as to reproduce the hearing in a most remarkable manner. After air has once been admitted, it stimulates the membrane to pour out a fluid secretion (capable of being heard by the stethoscope), which appears to carry off the dissolved fragments of mucus by way of the tuba Eustachii. Such cases are by no means rare, and would alone be sufficient to confer value on Eustachian catheterism, even were there no other uses to which it could be applied in the treatment of deafness.

I now pass to the treatment of the third form of deafness, namely, where it is fully formed, where the active stages of the disorder have entirely disappeared, leaving a thickened state of the mucous membrane, and an almost entire absence of the natural secretion both in the middle ear and the external meatus. The disorder thus marked is by far the most frequent among the cases which come before the aural practitioner. The deafness is here sufficient to debar the patient from much of the ordinary intercourse of life; and until this is actually the case, a great number do not seriously think of seeking any remedy; they live on, flattering themselves that because they hear tolerably well at certain times, a change for the better must, sooner or later, occur.

There is, however, no hope of procuring a sudden change to the healthy state where disease has advanced thus far. Stimuli, such as electricity, galvanism, or irritant external applications, do in some cases produce striking improvement, but when the excitement of the organ has passed over, it invariably falls into a more distressing state of torpidity. For this reason such remedies are worse than useless.

The use of the air or vapour-douche, through the Eustachian tubes, daily for a considerable time, possesses more power over the disorder than any other means with which I am acquainted. It will not often effect the cure, but it will generally afford considerable relief. It has often enabled me to set down an ear-trumpet, and give as great a degree of hearing without the instrument as had been previously enjoyed by its assistance. Patients also experience a great degree of comfort from the use of the air-douche, even where no

actual improvement is perceptible. Disagreeable sensations in the ears generally attend deafness, which the use of the air-douche dispels for several days. I have often had to catheterise for months, at intervals of two or three days, persons whose deafness I had pronounced incurable, but who persevered in the operation from the comfort it afforded. The use of the air-douche simply, is often of much service in promoting the return of the membranes of the middle ear to the natural condition, restoring the mucous secretion to the dry surface, and favouring the secretion of wax in the meatus externus. After a time the stream of compressed air does not produce so good an effect as at first, upon which I omit the air, and commence with medicated vapour, using a few drops of sulphuric ether, which, diluted with water, and having the air passed through it before entering the ear, impregnates the air sufficiently to render it inflammable. Much more may be effected by the alternate use of air and vapour than by the continuance of either; or this plan may be suspended altogether for a short time, and resumed with great effect. If it restores the secretion to the middle and external ear, the hearing is sure to be improved.

The use of the air and vapour-douche may be accompanied by other means to invigorate the constitution when this is required, and for the removal of any local disorder. I usually prescribe a course of sarsaparilla and the hydriodate of potash, in the doses adverted to when treating of another part of my subject. No medicine does so much good as this in the advanced stages of deafness. When the external passage is entirely dry it will often render the canal moist, and call forth the secretion of cerumen. This alone is a great service;

as, when all moisture is absent, the sensations are so troublesome as to give rise to frequent rubbing or picking, which disappear when the meatus contains a due quantity of ear-wax. The promotion of the secretions affords great relief in some cases of tinnitus, though I am as yet uncertain what kind is thus benefited, tinnitus being by no means invariably attendant on a dry state of the meatus. I believe it will generally be found that tinnitus is caused by a morbid sensibility to the circulation of air in the meatus and middle ear, and the variations of atmospheric pressure upon the membrana tympani, caused by different conditions, as occlusion, or constriction, of the Eustachian tubes. I think the resemblance between tinnitus and the sounds heard by listening to a shell or hollow stone is favourable to the opinion I have here advanced.

Counter-irritation will not often be of service in deafness of long standing. Ointments, containing veratria or strychnia, may be worth a trial, applied behind the ears: certainly not to the meatus. Gargles should be used where any relaxation about the throat is complained of; and, in the very chronic cases, I also frequently advise patients to take a pinch or two of snuff morning and evening, so as to produce sneezing. Where, from the circumstances of the patient, frequent catheterism is impossible, this is the best substitute, producing, in a great measure, the refreshing effects of the air-douche.

When the sense of hearing is greatly impaired, the small amount of sensibility is of excessive value; therefore, every conservative measure which I have recommended on the first failure of hearing, should be of additional importance to the confirmed deaf, so that, at

all events, every effort may be made to stay the natural tendency of the decaying sense to arrive at complete extinction.

*Stricture of the Eustachian Tube.*—Where this exists (and it does exist much more frequently than is generally admitted), it does not follow that the recovery of the hearing is impossible. I believe the removal of the stricture ought to be attempted, on the same principles as when present in the urethra. Dilatation, with a bougie, has not only been said to be a hopeless undertaking, but the possibility of passing such an instrument into the tympanum has been denied. I admit the great difficulty of the manipulation; but still I have often succeeded in passing a fine whale-bone bougie, as proposed by Gairal, into the tympanum. When it has been accomplished, the patient has felt as if the point of the instrument actually presented at the external meatus, and the sensation is so deceptive that it is usual to see him put up his finger, thinking to touch it. But to place the matter beyond all doubt, I have, in more than one instance, seen the bougie by means of a speculum and lamp, its black colour showing plainly through the semi-transparent membrane of the drum. When, therefore, from the inability of injecting air, the absence of mucous gurgling, and the deafness supervening on sore-throat, there is reason to believe that stricture of the tube exists, the use of the bougie should certainly be had recourse to, and will, unquestionably, sometimes be of service. Iodine ought also to be administered in the manner, and with the intention proposed by Dr. Manson, of Nottingham.

*Polypi in the Outer Passages and Middle Ear.*— Much has been written concerning this troublesome and frequent accompaniment of ear-discharge. Some have recommended astringent or caustic applications; others the ligature; and some excision by the knife. Their removal is, however, most easily effected by means of a triple-bladed forceps. The blades of the instrument should be insinuated along the sides of the polypus, as near to the point from which it sprouts as possible, so as to embrace its whole length, and then by pulling and slightly twisting, it may generally be brought away altogether. Those who recommend ligatures in such cases can scarcely know much about the matter, for generally the polypi which have grown to such an extent as to appear at the outer orifice of the passage are so impacted within it, as positively to show the indentations and convolutions of the meatus upon their surfaces when extracted. The impossibility of putting a ligature round the neck or root must, in such cases, be evident; the knife cannot be used for the same reason. Besides, after all, it is making much-ado about nothing; for the removal of polypi from the ear is one of the safest, and simplest, operations connected with aural surgery. Every case on which I have operated in this way has done well. A strong solution of zinc or alum, applied with a camel-hair brush, or powdered zinc, blown into the ear through a quill, are the best applications to prevent the re-growth of the polypus. When the diseased growth is in its incipient stage, a careful inspection of the meatus is necessary to make it out exactly, for it either springs from the walls of the tympanum itself, or from the posterior surface of the meatus,

near the margin of the membrana tympani. Surgeons should accustom themselves to look into the external meatus, as considerable practice is necessary to enable them to see any change which may exist at the bottom of this passage.

With respect to tonsillary enlargement inducing deafness, by interfering with the integrity of the Eustachian tubes, and keeping up a morbid condition of these and the tympanal cavities, I have before remarked that the diseased growth, from its position, is often more palpable to the touch than the eye. For this reason the throat should be always explored with the finger when it is supposed to be implicated. When the tonsils are arrived at a state of induration, operative means are indispensable for their removal. Previous to this condition, local bleeding, counter irritation, emetics, and iodine will be found the most successful remedies. In my earlier operations for the removal of these morbid growths, I tried all the means recommended by authors,—ligature, caustic, the guillotine knife, common bistoury, and scalpel, with none of which I could be satisfied. It seemed to me that a strong knife was necessary, which would not bend as the probe-pointed bistoury often does when opposed to an indurated tonsil, nor tear in the scissors-like manner of the guillotine, an instrument which, however specious in its appearance, will be found altogether inapplicable in practice, except in the rare cases where the tonsil is pendulous. The same, I believe, may be said of any apparatus for the application of ligatures. The scalpel I rejected because of the risk of wounding the back of the throat with its point. To avoid these various objections I imagined a

knife with a hawk-billed extremity, strong back, and placed at an angle with its handle. With the assistance of a powerful-springed tenaculum, the surgeon acquires command over the morbid growth he is about to excise. To assure my readers of the perfect adaptation of the instruments, I need only remark that I have now removed upwards of 2000 morbid growths from the throats of more than 1400 patients, variously afflicted with the ailments to which these enlargements mainly contribute, or entirely give rise, such as—imperfect, thick, and nasal speech; difficult deglutition, impeded respiration, throat-cough, throat-deafness, and though last, not least, the imperfect development of health and strength in youth. I have performed this large number of operations with these instruments without one failure or accident. If surgeons generally were aware of the entire safety and simplicity of the operation, its more frequent performance would, I am sure, soon put an end to all debate on the description of instruments to be employed.

I am in the habit of performing the operation thus:—I place my patient opposite a good light, and on the mouth being opened to the greatest possible extent, I introduce the powerful-springed tenaculum over the tongue, and include within its grasp as much of the morbid growth as possible. I then draw out the diseased tonsil from between the pillars of the fauces diagonally across the throat, and over the bridge thus formed I introduce the knife held like a pen. As I cut forwards toward myself, I keep slightly dragging at the tenaculum, so that when the excision is completed, the morbid growth, tenaculum, and knife, are all withdrawn

together at the same moment. The operation takes less time than will the perusal of this brief description of its performance.

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On the obverse page are sketches of the author's tenaculum and knife, for excision of the enlarged tonsil.

Fig. 1. Knife for excision of the enlarged tonsil, characterised by its strong back, hawk-billed shape, and angular position of the blade.

Fig. 2. Tenaculum, a modification of Asellini's, differing only in its greater length of blade and strength of spring, by the latter of which no fear need be entertained of the tonsil becoming disengaged during the operation, unless at the will of the operator.

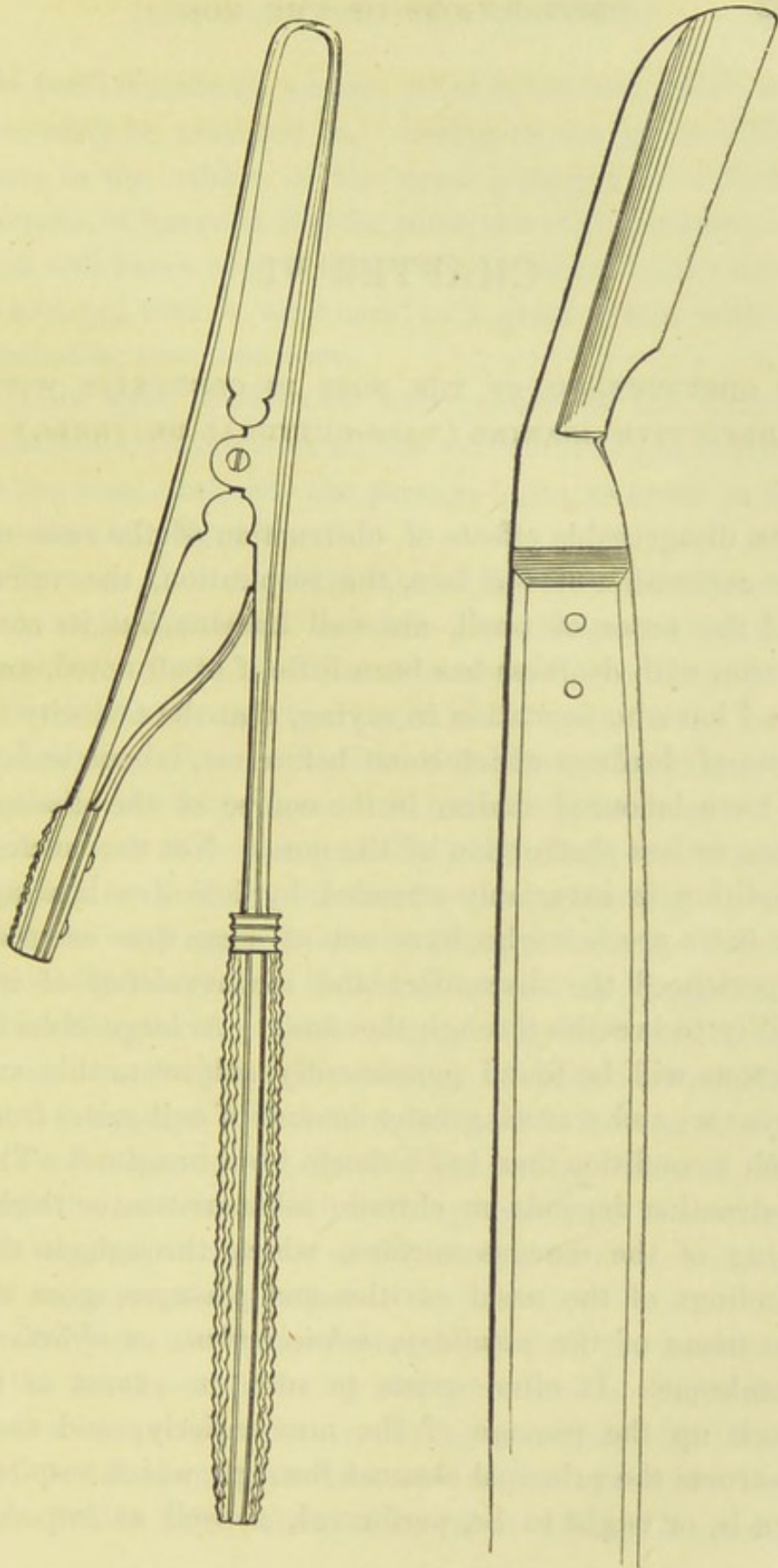


Fig. 2.

Fig. 1.

## CHAPTER VI.

ON OBSTRUCTIONS OF THE NOSE IN CONNEXION WITH  
DEFECTIVE HEARING (NASO-GUTTURAL DEAFNESS.)

THE disagreeable effects of obstruction of the nose on the expression of the face, the respiration, the voice, and the sense of smell, are well known; but its connexion with deafness has been little if at all noted, and yet I have no hesitation in saying, that the majority of cases of deafness which come before me, labour under, or have laboured under, in the course of the disease, more or less obstruction of the nose. Not that such a condition is invariably attended by defective hearing, for there are few who have not at some time or other experienced the discomfort and inconvenience of inability to breathe through the nose. A large class of persons will be found permanently subject to this annoyance; and a much greater amount of evil arises from such a condition than has hitherto been imagined. The obstruction depends on chronic inflammation or thickening of the mucous surface, which throughout the windings of the nasal cavities and passages, goes by the name of the *pituitary, schneiderian, or olfactory* membrane. It often exists to such an extent as to block up the passage of the nose entirely; and thus obstructs the principal channel through which respiration is, or ought to be, performed, as well as impedes

the performance of various other functions, which will presently be adverted to. Owing to the great difference in the calibre of the nasal passages in different persons, it happens that in some the slightest tumefaction will cause obstruction, while in others their calibre is so large that it may exist to a great extent without producing inconvenience.

This kind of diffused enlargement of the mucous membrane, throughout all the convolutions and cavities of the nose, obstructs the passage quite as much as the presence of polypi.

Persons thus troubled are obliged at all times to keep their lips apart, or their mouth open, to enable them to breathe, and in time the features acquire a contracted and vacuitous expression, even in the most intelligent. As the mouth often closes involuntarily in sleep, the impediment to breathing becomes a frequent cause of broken and disturbed sleep, in the same manner as I have described when adverting to the effects of enlarged tonsils in this particular. This is especially the case in children. Cases are frequent in which they have a thickening of the nasal membrane to such an extent, that although it does not produce entire stoppage, yet the impediment is increased so as to render it complete, on the slightest accession of cold. Here the trouble to the breathing, especially in attempts to sleep, becomes quite as distressing as when the tonsils are seriously enlarged.

The voice also becomes much affected, the back part of the nasal passage being converted into a shut chamber, consequently the sounds produced in the throat and mouth acquire a nasal resonance and timbre, which distort the voice even more than enlarged tonsils.

From the want of a passage for the breath behind the soft palate, and through the nose, there is not infrequently a great difficulty in pronouncing letters in the production of which the soft palate is concerned. In short, it is of essential importance to a proper method of speech, that the air should have free ingress and egress through the nose.

For the same reason there is generally experienced a difficulty in hawking mucus from the back of the throat and the posterior nares. Expectoration cannot be properly and freely performed. From the same cause, also, there is frequently a difficulty and even an impossibility of blowing the nose, which is excessively inconvenient and disagreeable.

The effects of this kind of obstruction to the sense of smell are very perceptible. Without the power of inspiring through the nose, we lose in great measure the capability of drawing odorous particles within the sphere of the olfactory nerve. In addition to the difficulty thus occasioned, it is certain that a tolerably healthy state of the mucous membrane is necessary for the proper exercise of the sense. Common catarrh may be taken as an instance, in which the obstruction caused by the swelling of the mucous surface, and the alteration in the secretion from the nasal, or schneiderian membrane, either blunts or temporarily destroys the olfactory sense. Those in whom the nose is permanently obstructed by thickening of the mucous membrane are much in the same situation, as, in addition to the simple obstruction, the secretion of mucus is generally disordered either by excess or deficiency.

But I was led to notice this disagreeable affection more particularly, from an interesting case which came

before me some years ago, in which the other evils I have described were combined with deafness. A well-known stock-broker consulted me for deafness, who for years had never been able to breathe through the nostrils. The mouth was consequently always slightly open, giving a vacant expression to the countenance, and the voice had assumed that peculiar modification and tone vulgarly, but erroneously, called *speaking through the nose*, owing to the closure of the windings and hollows of the nasal cavities. The obstruction in this as in other cases arose from a general thickening (the result of repeated inflammation) of the lining mucous membrane of the throat, nose, and ear. Catheterism of the Eustachian passages was employed with great success in restoring the hearing, but the relief of the deafness was scarcely more apparent and valued than the comfort afforded to my patient by being enabled once more to breathe through the nose, which had been accomplished by the frequent passage of the Eustachian tube catheter along the floor of the nostrils. On the recovery of this patient's hearing, he was supplied with the elastic nasal probe, presently to be described, and has continued to use it ever since with as much regularity as his tooth-brush, the one being, he assures me, as indispensable to his comfort as the other.

I have since seen and treated many cases, in which deafness appeared to depend on the nasal obstruction to a much greater extent than in this case, where the affection of the mucous membrane extended into the ears. This induced me to seek for the cause which could produce such an effect; and I am come to the conclusion, that *a free state of the nasal passages, as well*

*as of the Eustachian tubes, is of great importance to the acuteness and preservation of the hearing.*

It is generally acknowledged that the presence of air is necessary in the tympanum, and also that the air should not differ greatly in temperature from the air on the external surface of the membrane of the drum. The means by which these requirements are provided for, are well known to be the Eustachian tube; but I believe, in addition to this, a free state of the nasal passage is a necessary auxiliary, and that without it the function of the Eustachian canal cannot be properly performed.

This view is supported by the anatomical position of the mouth of the Eustachian tube, which points towards the external nasal aperture, and is directly in the line of the passage of air through the nose both in inspiration and expiration; further, the trumpet-shaped extremity of the tube, and its direction, obliquely backwards to reach the middle ear, favours, and appears to provide for, the entrance of air to the tympanum in inspiration rather than in expiration.

It is not that simple stoppage of the nasal passages can cause deafness, because the nose may be closed without producing the slightest immediate effect on the hearing; but I consider that when it is permanently obstructed, the want of a free circulation of air in the tympanum lessens the sensibility and acuteness of the auditory organ, or favours the accumulation of mucus in the middle ear. By examining my own sensations in ordinary expiration, I believe that air does not enter the tympanum during this act, but passes out from the ear with the expiratory stream of air escaping from the nostrils.

In a sudden and forcible respiration, when a greater quantity of air is attempted to be expelled than can find a ready exit, it happens differently. It then regurgitates, and rushes into the Eustachian tube and tympanum with great force, and can be felt to strike against the drum, or heard to escape through the external meatus in cases where the *membrana tympani* is perforated. The same occurs in yawning, in which, although the expiration is prolonged, it is more forcible than usual. In yawning, the greatest effect of this kind is produced when the act is performed in a subdued manner with the mouth nearly or entirely closed. Air enters the Eustachian tube and middle ear to a still greater extent in sneezing, an act in which the communication between the air tubes and the mouth is sometimes shut off by closure of the palatine arches, so that the breath passes upwards, and escapes by the nostrils alone. There is in sneezing also a violent preliminary inspiration, which generally drives air up the Eustachian tubes with considerable force.

Hence it occurs that yawning and sneezing are occasionally the means of curing deafness, dependent on obstruction of the passages leading from the posterior nares to the ear, the sudden rush of air breaking up and expelling any inspissated mucus that may have accumulated therein. In many cases of deafness also which do not arise from obstruction, it is remarkable that sneezing and yawning frequently occasion temporary benefit, and improve the hearing.

*Treatment of Obstruction of the Nose.*—Before my attention became especially directed to the subject, I was accustomed to depend on medical treatment alone for the removal of nasal obstructions; acting in this, in

accordance with the principles laid down in the medical treatment of enlarged tonsils. This plan was, and is, often of great service in dissipating the tumefied state of the mucous membrane; but from observing the great amount of comfort and benefit which occurred from passing the Eustachian-tube catheter, in cases where the malady was complicated with deafness, I was led to adopt an instrument fitted more particularly for freeing and enlarging the passages of the nose. At first I used the catheter for this purpose, but soon found it advisable to have a new instrument, straight to avoid the curve which exists in the catheter, and flexible to accommodate itself to any sinuosities of the passages. This shape and material fit the elastic probe for passing readily along the floor of the nostrils, without occasioning the slightest inconvenience, and without difficulty.

The effects of this instrument have answered my most sanguine expectations. It has relieved a large number of cases, to whom other kinds of treatment would have been ill-suited and inefficacious. The majority of them were cases of simple obstruction; but it has also proved of essential service in cases of deafness, complicated with thickening of the mucous membrane. The passing of the probe once or twice a day soon dilates the canal to such a size as to permit the passage of air to and fro; and, in addition to this, it appears to exert a salutary influence on the tract of mucous membrane extending to the ear.

I have already developed my views relative to the condition of the mucous membrane in connexion with deafness; and it is in accordance with the principles laid down, that I consider the naso-guttural probe acts

in relieving deafness arising from disorder of the aural mucous surface.

Sternutatory medicines have often been recommended as a remedy for deafness, but for fulfilling the same intention the probe will be found far more efficient. Its effects are somewhat different, though both, in appropriate cases, stimulate the nasal mucous membrane to a healthy action; but the elastic probe is infinitely superior, because it mechanically dilates the contracted passages, and does not rob the mucous surfaces of the natural secretion which is necessary for their healthy condition, but of which sneezing tends to deprive them.

It will not be out of place to remark that the habitual use of errhines, especially the common snuffs, have sometimes the effect of producing chronic engorgement of the mucous membrane of the nose, and thus occasion injury to the hearing and other functions.

In some individuals the *septum narium* is inclined so much to one side, without any external disfigurement, that it is impossible to breathe, or to pass the probe, through the contracted aperture. Where this is the case, the operation should never be attempted; and there is rarely any cause for it in cases of this kind, because of the increased size of the opposite passage. There are other cases, however, in which the nostrils and nasal canals are congenitally of small size, where the elastic probe, or any instrument capable of gradually dilating them, will be very beneficial. Of this kind was the case of a nobleman, whose nares were so small that the passage of the Eustachian catheter, in Paris, by Deleau (a very experienced operator), occasioned much pain; but the careful performance of the

same operation in this country, by means of a catheter of small size which I had made expressly, afforded his lordship considerable relief, as far as the nasal obstruction, from which he suffered, was concerned.

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On the obverse page is a sketch of the author's naso-guttural probe for the removal of obstruction of the nasal passages, and the tube and bottle for cleansing and gargling the posterior nares and nasal passages generally, the upper portions of the throat and the mouths of the Eustachian passages:—

Fig. 1. Patient introducing the naso-guttural probe, showing also the horizontal direction which it takes to the back of the throat.

Fig. 2. Patient washing the throat through the nose, by means of the naso-guttural tube and bottle.

Fig. 3. Naso-guttural probe.

Fig. 4. Naso-guttural tube and bottle.

Fig. 1.

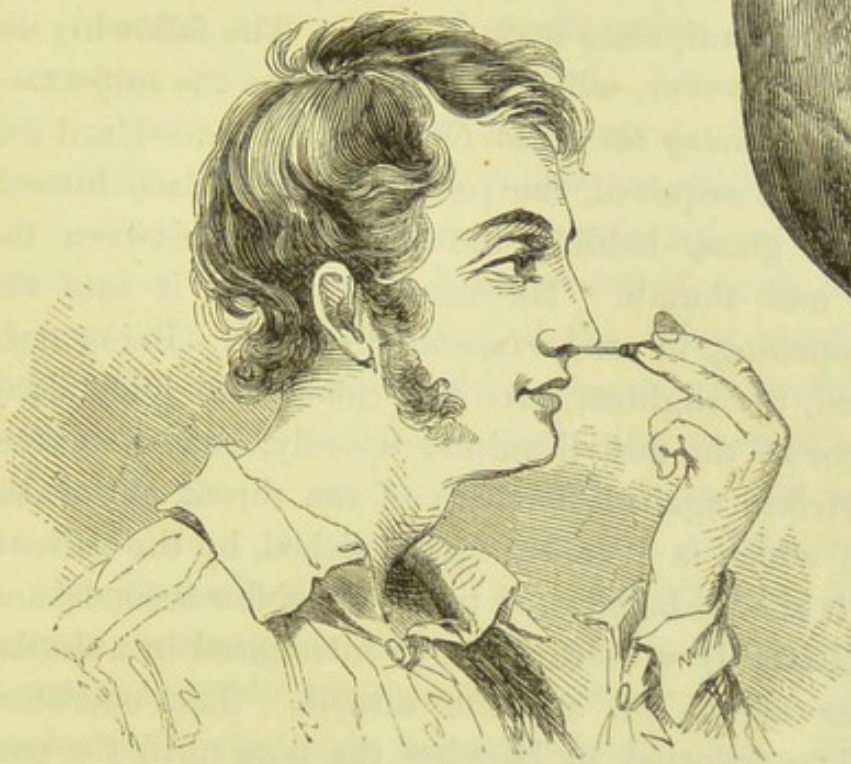


Fig. 2.



Fig. 3.

Fig. 4.



Little, if any, instruction is required to enable a patient to manipulate upon himself. The following directions, however, will serve to elucidate the subject:—

*Mode of using the Naso-Guttural Probe.*—Until expertness is acquired, the patient should place himself before a glass, holding the instrument between the finger and thumb. He then introduces it into the nasal opening, in an *horizontal* direction. Being once inserted, the slightest force will cause it to glide along the floor of the nostril uninterruptedly, until its extremity strikes against the back of the throat, the sensation of which is instantly distinguished by the patient. Here it should be allowed to remain a few seconds, and then gradually withdrawn, to be introduced in a similar manner along the opposite nostril. The operation should be followed by blowing the nose until the passages are free to admit the ingress and egress of air to and from the lungs.

I am extremely unwilling that the instrument should be supposed to be vested with greater powers than it in reality possesses; but I am bound to express my conviction, the result of careful observation and experience, that in many cases of deafness, attended by nasal obstruction, by producing a healthy action in the mucous membrane of the nasal passages, and causing a free circulation of air through them into the Eustachian tubes, it will be found not only the means of warding off an increase of the disorder, but in many cases the means of essential relief or cure.

When it is recollected how many thousands of cases of deafness, proved to be irremediable by ordinary means, are rapidly approaching by almost imperceptible gradations towards total deafness, the importance of

any remedy which affords even a chance of arresting the disorder, still more of ameliorating or curing it altogether, will be duly estimated. One or other of these results will, I have little hesitation in saying, frequently, very frequently, follow the employment of the instrument in question. This is not its only advantage, as it proves, as I have said, of much service, by removing the obstruction to the voice, smell, and respiration, and is beneficial in other minor points.

I am in the habit of recommending an elastic tube and bottle, for the purpose of washing the back part of the nares, the upper part of the throat, and the mouths of the Eustachian tubes. In a tumid state of the mucous membrane in these situations, it is of great importance to apply astringents, or whatever else may be employed, to the parts immediately affected. This is very imperfectly done in the usual method of gargling, especially when the posterior nares and mouths of the Eustachian tubes are intended to be acted upon. The action of the veil of the palate in most cases effectually prevents the gargle from reaching its destination. With the elastic tube and bottle, this can be done with the utmost certainty, and in cases where deafness is occasioned by tumidity of the mouths of the Eustachian canals, with the most satisfactory results, cleansing away the vitiated secretion of mucus, and reducing the membrane to its proper condition, and thus enlarging the calibre of the tubes.

The apparatus is composed of a caoutchouc bottle for the reception of the gargling fluid, and of an elastic tube to convey the fluid across the floor of the nostril to the mouth of the canal.

*Mode of using the Naso-Guttural Tube and Bottle.*  
—The bottle being charged with the injecting fluid, the tube is introduced along the nostril in the same manner as the probe. Before pressure is exercised upon the bottle, it is necessary to withdraw slightly the extremity of the tube from the back of the throat, to admit of the fluid being expelled; or the contents of the bottle may be squeezed out during the act of withdrawing the instrument, whereby not only the throat and adjacent parts, but the nasal passages also, become well washed by the injection.

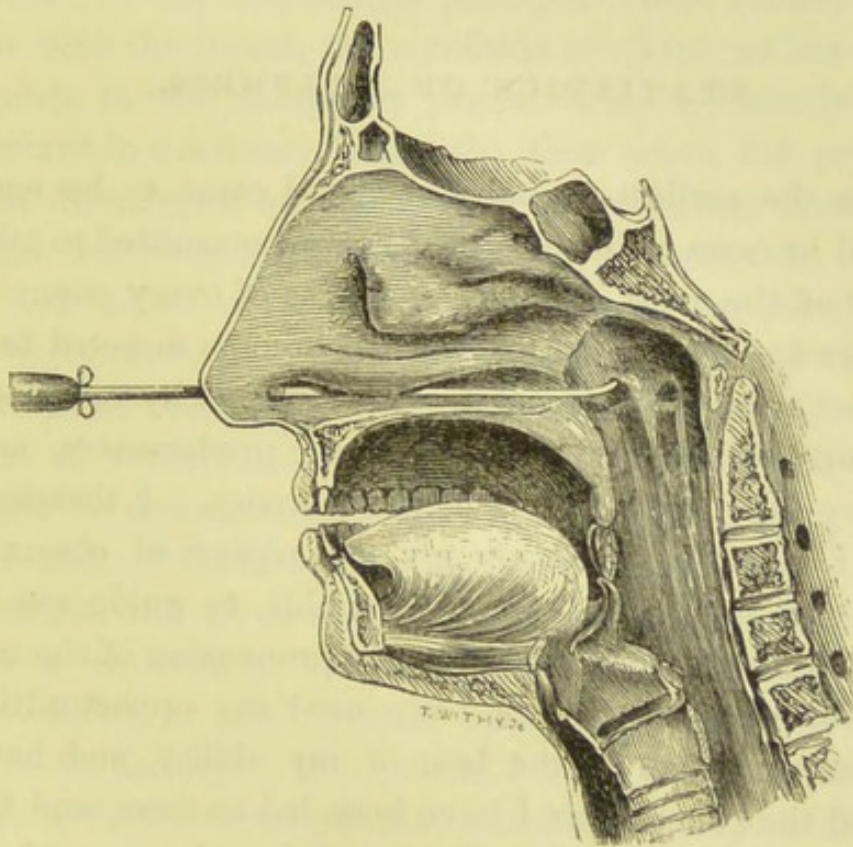
During the first two or three times of passing both the nasal probe and the tube, slight titillation of the nostril is produced, and sometimes the eyes become suffused with water for a few moments, but this is the only inconvenience which the operation (if such it deserves to be called) can occasion.

If the facility of washing the throat through the nose were known, it would not be long before it would become a general practice; for it is very certain that gargling the throat through the mouth, though so frequently recommended, is but rarely accomplished. Owing to the action of the veil of the palate, the gargling fluid is confined to the cavity of the mouth, and rarely enters the throat at all.

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Annexed is a section of the nose, mouth, soft palate, uvula, tonsil pharynx, upper part of the œsophagus, and trachea, showing the route taken by the Eustachian-tube catheter along the inferior meatus and floor of the nostril into the orifice of the Eustachian tube; showing also the perfect facility and safety with which the most

timid patients may introduce the naso-guttural probe to the back of the throat, or inject the throat by the naso-guttural tube and bottle.



## CHAPTER VII.

## STATISTICS OF DEAFNESS.

FROM the earliest period at which I came to be consulted in cases of deafness, I have never omitted to take notes of the most important features of every case. I was aware that my attention had become directed to a subject upon which little could be learned by reference to the opinions and practice of my predecessors, and I may say, even of my contemporaries. I therefore felt I must depend upon my own powers of observation and judgment, however humble, to guide me in the choice of remedies, and a comprehension of the nature of aural disease. I have used the opportunities presented to me to the best of my ability, and have stated the conclusions I have been led to form, and the reasons upon which they are founded. On no subject, in the whole range of medicine, does there, I am persuaded, exist so much misapprehension and error as on diseases of the ear. My highest ambition will be gratified, if in these pages I have contributed to the simplification of the subject, or brought it more within the notice and control of the general practitioner.

At this date (July, 1847), more than five thousand five hundred patients have been entered on the books of the Metropolitan Ear Institution, with memoranda of their age, their residence, their occupation, day of ad-

mission, ear affected, ear most affected, period of their disease, presumed cause, functional changes, hearing distance of a moderately loud-ticking watch, tinnitus aurium, if any, and its character—state of the outer passage of the ear, of the membrane of the drum of the ear, of the throat, of the Eustachian passages which connect the ear with the throat, the condition of which, as has been shown in the foregoing pages, is so eminently important in deafness; lastly, the time when the patient was discharged, and, whenever possible, the result of treatment, whether cured, relieved, or incurable.

The organ of hearing once diseased can rarely be entirely restored to its pristine acuteness, and therefore some standard is required by which to draw the line of demarcation between those cases which may fairly be denominated *cured*, and those which are only *relieved*. I have found, by careful observation, that patients who are brought to hear my watch (which has but a moderately loud tick, owing to its compound movement) at arm's length, suffer but little inconvenience in society. This, then, I have fixed on as the standard of a cured patient; and if my curative efforts reach not this point, the case is entered only as a patient *relieved*.

In 1842, it occurred to me as desirable that patients should write the history of their cases before admission. Accordingly, I drew up a form, which included the following questions,\* and which in every instance have

\* No. ? — Patient's name ? — Age ? — Residence ? — Occupation ? — When admitted ? — Ear affected, right or left, or both ? — Ear most affected ? — Period of disease ? — Presumed cause ? [Cold, influenza, scarlatina, measles, hooping-cough, fever, sore throat, glandular swellings, stomach derangement, bathing, wetting the hair,

been answered. I need scarcely say that, in consequence, I possess a mass of information in respect to deafness, which enables me to advance opinions upon the subject with a confidence in their truth which such advantages only could justify.

I am well aware that the patients' histories of their own cases are not always to be relied on; but although inaccuracies will inevitably creep in, I am satisfied that sufficient data may be gathered from their statements to set at rest facts hitherto uncertain and disputed. The accumulation of many analogous facts sometimes elicits unlooked-for results; and preconceived notions and recorded prior experience are, to our surprise, falsified and upset. Such, I may truly

mercurial medicines, anxiety of mind, are amongst the most common causes of deafness. If not attributable to either of these, state the most probable cause ] — State the distance at which a watch is ordinarily heard to tick opposite each ear. (To ascertain this point, let the watch approach the ear from a distance, and not commence at the ear as is usually done.) — State whether a discharge of matter issues, or at any period of the complaint has issued, from the passage of the ear. — State whether the complaint is attended by noises in the ears, and if so, describe them? — Is there any obstruction of the nose? or difficulty of swallowing? — Are you subject to cough? to sore throat? to fits of sneezing? to hoarseness? or to loss of voice? — If you have ever suffered from illness, state when, and the nature of it, and the medical treatment (as far as you are able) to which you were subjected? — Is there any other member of your family deaf? [Father or mother, sister or brother, uncle or aunt, or any of their children.] — Does the hearing vary in degree? — Is the complaint influenced by the weather—by your state of health or mind? — Have you ever recovered the hearing for a short or long time? — State whether anything, and what, has been previously done—under whose direction, and what has been the result? — Relate any other facts connected with the case with which the surgeon should be acquainted.

affirm, it has fallen to my lot to exemplify in regard to diseases of the ear and their treatment, as these pages will testify.

In the year 1842, 544 patients were admitted, and in regard to these, I drew up the following statistical report, which was published in my Fifth Contribution to Aural Surgery, in 1843. I am pleased to observe, that in 1847, Dr. Kramer, of Berlin, has published some statistics of Diseases of the Ear, adopting pretty nearly the same plan.

STATISTICAL REPORT OF CASES ADMITTED  
IN THE YEAR 1842.

NUMBER.

Number of patients admitted .. .. . 544

SEX.

Males .. .. . 320

Females .. .. . 224

AGE.

Under 10 .. .. . 68

Between 10 and 20 .. .. . 125

„ 20 and 30 .. .. . 140

„ 30 and 40 .. .. . 91

„ 40 and 50 .. .. . 50

„ 50 and 60 .. .. . 37

„ 60 and 70 .. .. . 24

„ 70 and 80 .. .. . 8

„ 80 and 90 .. .. . 1

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544

LOCALITY OF RESIDENCE.

*Divided into London, Suburbs, and Country.*

London .. .. . 363

Suburbs—North of the Thames .. .. . 74

„ South of the Thames .. .. . 63

Country—North, 8; South, 10; East, 13; West, 13 .. .. . 44

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544

It must be understood, that this table is constructed agreeably to the patients' own statements. Doubtless, a considerable number of the 363 came from different parts of the country, and located themselves in town, purposely to seek relief at the Institution.

## SEASON OF ADMISSION.

Spring	..	..	..	..	..	..	..	..	..	186
Summer	..	..	..	..	..	..	..	..	..	123
Autumn	..	..	..	..	..	..	..	..	..	108
Winter	..	..	..	..	..	..	..	..	..	127
										544

## OCCUPATIONS,

*In which the patients were engaged at the time of admission, of course as servants to others, tradesmen not being eligible to the charity.*

Housewives, 97; domestic servants, 67; sempstresses, 23; shoemakers, 22; carpenters, 20; tailors, 18; porters, 12; clerks, 10; laundresses, 8; gardeners, 7; painters, 8; cabinetmakers, 9; butchers, 7; labourers, 7; brassfounders, 8; smiths, 7; nurses, 5; printers, 5; grocers, 5; millwrights, 4; bricklayers, 5; hat-trimmers, 5; bookbinders, 4; druggists' assistants, 3; goldsmiths, 3; watermen, 6; harnessmakers, 3; coachmen, 3; chandlers, 2; bakers, 2; drapers, 2; shopwomen, 2; policemen, 2; lightermen, 2; French-polishers, 2; lodging-housekeepers, 2; turners, 2; sawyers, 2; framemakers, 2; booksellers, 2; basket-makers, 2; furriers, 2; brushmakers, 2; chairmakers, 2; brewers, 2; artists, 2; weavers, 2; hatters, 2.—  
Total, 312.

At least sixty more different trades and occupations contributed one or more patients, and the remainder consisted of children and adults without occupation.

The foregoing table makes it evident that no class of persons is exempt from deafness; and further, that all are alike equally liable to its attack.

The nature of the occupation has apparently little to do with it. All persons are equally susceptible, provided they are subjected to the usual exciting causes of the disease, such as exposure to cold or damp, sudden transitions from heat to cold, neglect of changing wet clothes, sitting or sleeping in damp or ill-ventilated rooms, or in a draught, improper diet, intemperance or excess of any kind, sedentary occupations, mercurial medicines, &c. &c.

#### EAR AFFECTED.

Of the 544 cases admitted, 484 were deaf in both ears, leaving 60 deaf in one ear only: probably the majority of these, upon careful testing, would have exhibited some defect of the supposed sound organ. Deafness of one ear only is either very rare, or patients do not think of applying until both become affected. Fatal procrastination!

Of the 484 cases, 228 were more deaf in the right ear; 206 more deaf in the left ear.

#### VARIETY OF CAUSES,

*Assigned by patients as having originated the deafness.*

Cold, 157; scarlatina, 26; measles, 10; typhus fever, 8; influenza, 5; sitting in a draught, 4; ear-ache, 6; after lying-in, 4; dyspepsia, 2; small-pox, 4; brain-fever, 5; accidents, 7; loud noises, 1; whooping-cough, 5; anxiety of mind, 3; croup, 1; wetting the head, 18; insect in the ear, 1; pea in the ear, 1; vaccination, 1;

poison, 1; irregularity of living, 2; noise of artillery at Waterloo, 1; worms, 1; epilepsy, 2; rheumatism, 1; scald-head, 1; paralysis, 3; mercury, 2; struma, 1; metastasis, 1; abscess, 1; dentition, 1; not assignable, 258.

Of course no great dependence can be placed on the statements of patients as to the cause of their malady; nevertheless, every cause assigned in the table may give rise to deafness.

The 258 cases of deafness for which no cause was assigned, may probably be thus distributed:—Cold, 70; infantile diseases, such as scarlatina, measles, small-pox, hooping-cough, croup, &c., 70; dyspepsia, 40; anxiety of mind, 10; excesses of various kinds, 52; mercurial medicines and medical treatment generally, 18.

#### DURATION OF DISEASE,

##### *Anterior to the patients' admission.*

Under a week .. .. .	7
Under a month .. .. .	19
From one to three months .. .. .	25
From three to twelve months .. .. .	43
From one to three years .. .. .	91
From three to five years .. .. .	71
From five to ten years .. .. .	122
From ten to twenty years .. .. .	94
From twenty to thirty years .. .. .	39
From thirty to forty years, and upwards .. .. .	33

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544

#### TINNITUS.

Number of patients suffering from tinnitus to such a degree as to make it worthy of note in the admission-book, 245.

## VARIETIES OF TINNITUS,

*Noted in the order of their frequency, and in the words of the patients themselves.*

Singing, 46; ringing 14, as of bells, 14, as after a box on the ear, 1-29; humming, 26, as of a sea-shell at the ear, as of a bee at the ear, 2-29; rushing, 9, of a waterfall, 7, as of wind, 8-24; hissing, 10, as of a kettle boiling, 8-18; buzzing, 16; beating, 8, as of machinery, 1, as of bedding, 1-10; ticking, 6, as of a pendulum, 4-10; roaring, as of the sea, cataract, wind, 18; puffing and blowing, 1, as of a railway engine, 7-8; whizzing, 4, as of a squib, 1, as of ginger beer, 1-6; bubbling of water, 4; sawing, 3; grating, 1-4; drumming, 4; frying, 3; rumbling, 3; firing of a gun, 3; rattling, as of carriages over stones, 2; rustling, as of silks, 3; whistling, as of wind through crevices, 3; chirping of grasshoppers, 2; total, 245.

Of the remainder, 299, the great majority were troubled with occasional tinnitus. In fact, tinnitus is rarely altogether absent except in very long-standing cases of deafness, or when the sense of hearing has become altogether obliterated.

But pages might be filled with the descriptions given by patients of the tinnitus which attends their deafness; among the most remarkable were the following, declared to be so precisely similar to the noise specified, as to make it difficult of belief that it did not exist within the range of the hearing:—

“The cawing of rooks,” “chirping of a thousand sparrows,” “opening and shutting of doors,” “smashing of china,” “loud claps of thunder,” “furnace

blast," "ringing of church bells in every direction," "beating of drums," "shower of rain," "like some person breathing near the ear," "hammering, so violent as to cause the head to jump from the pillow," "people walking up stairs," "voices behind the patient, who cannot resist turning round, incredulous of the mental deception," "beating a cracked brass kettle," "music at a distance," "noise as loud, and precisely similar, to that which is heard when standing between two large steam-engines, whilst the steam escapes."

Many of the noises thus described by patients are incessant, and none but the sufferers can estimate the misery they create. I do not remember to have seen more than one patient who did not consider the tinnitus a grievous calamity, generally as much so as the accompanying deafness. It was in a private patient, a lady of rank and fashion, past seventy years of age. She consulted me for deafness, and in describing the tinnitus which accompanied it, she compared it to the band of the Opera; forgetful, perhaps ignorant, of the fact, that the tinnitus was but a symptom, she said, "However, never mind that; relieve me of the deafness; I make the tinnitus a source of pleasure to me, for I can, at any time, go through either of the operas I was accustomed to hear in my younger days, and imagine I hear every instrument in the band, the voice of the singer rising, *comme il faut*, above them all, as distinctly and agreeably as if I were in my opera box, instead of my bed."

STATISTICAL DETAILS collated from Memoranda in my Case Book of 1000 Patients who have come under my observation in private practice.

Estimate of Sex.	MALES.....696				FEMALES.....304					
	Of Age....	Under 5 years, 25	Between 5 and 10, 46	10 and 20, 132	20 and 30, 169	30 and 40, 171	40 and 50, 163	50 and 60, 96	60 and 70, 125	70 and 80, 59
Of Ear affected ..	Left Ear affected.....54		Right Ear affected.....41				Both affected.....905			
Of duration of the Disease ..	Under 1 year, 162	Between 1 and 3, 73	3 and 6, 192	6 and 10, 115	10 and 20, 234	20 and 30, 151	30 and 40, 49	40 and 50, 15	50 and 60, 7	60 and 70, 2
Of presumed Causes.	Dyspepsia.....124		Cold.....365				Scarlatina.....132		Measles.....37	
	Small-pox.....15		Hooping-cough.....5				Fever.....27		Cutaneous Diseases 23	
	Erysipelas.....30		Bathing.....67				Mercurial Medicines 43		Neuralgia.....12	
	Anxiety of mind.....17		Debility.....28				Lying-in.....10		Loud noises and accidents.....65	

STATISTICAL DETAILS arranged from the Entry Book of the Ear Institution—1000 Cases.

Estimate of } Sex . . . . . }	MALES . . . . . 622				FEMALES . . . . . 378					
	Of Age . . . . .	Under 5 years, 26	Between 5 and 10, 70	10 and 20, 222	20 and 30, 264	30 and 40, 157	40 and 50, 127	50 and 60, 76	60 and 70, 40	70 and 80, 15
Of Ear af- } fected . . . }	Deaf in left Ear only . . . . . 48				Deaf in right Ear only . . . . . 23					
Of duration } of the } Disease.. }	Under 1 year, 197	Between 1 and 3 years, 161	3 and 6, 196	6 and 10, 164	10 and 20, 178	20 and 30, 65	40 and 50, 28	50 and upwards, 11		
Of } presumed } Causes. }	Cold . . . . . 446		Scarlatina . . . . . 90		Measles . . . . . 65					
	Causes unassigned . . . . . 210									
Various causes, including Anxiety of Mind, Mercurial Medicines, Fever, Bathing, } Accidents, Lying-in, &c. . . . . } . . . . . 189										

## CHAPTER VIII.

ON THE BEST MEANS OF COMPENSATING FOR  
INCURABLE DEAFNESS.

IN this chapter, I propose to speak upon certain points in reference to *Incurable Deafness*, which will, I believe, be found interesting. I have particularly in view the relief of that very large and unfortunate class of sufferers who are afflicted with chronic deafness; who have submitted to every variety of treatment in vain; and to whom, therefore, palliative and hygienic measures, calculated to retard as much as possible the tendency to the total extinction of the sense, and to support the mind under the threat of this sad calamity, can scarcely fail to prove extremely valuable.

Those who have had opportunities of observing the progress of incurable deafness, as it stealthily but surely advances, through a long series of years, cannot fail to have noted the peculiarly depressing influence the malady exerts on the mind; and they must also have seen that this depression, unless cautiously guarded against, becomes a most formidable ally to the ear-disease, and materially aggravates the miseries of the physical infirmity.

I have already strongly argued the point that deafness, arising primarily from disease of the auditory nerve, is much less common than aurists generally have

believed; but I am equally persuaded that almost all deaf persons suffer from a peculiar kind of nervousness, of a most distressing character, as a consequence or symptom, but certainly not as a cause, of defective hearing, according to the meaning generally understood. In short, actual nervous deafness is a very rare complaint.

I have elsewhere shown the decided influence of dyspepsia in the production of diseases of the ear. In many cases it can be satisfactorily proved that stomachic derangement is the sole cause of that of the ear, and in the majority of cases occurring in middle-aged persons they will be found associated.

It may safely be affirmed, that none can have a better opportunity of examining minutely the different stages of chronic dyspepsia, and its prejudicial effects on distant organs, (particularly those of the brain and senses,) than practitioners extensively engaged in the treatment of deafness. Whether it be entirely attributable to the influence of the dyspeptic disorder, to the depressing effects of impaired hearing, or to both these causes conjointly, is a fit subject for further investigation; but it is very certain that a considerable number of deaf persons suffer from a peculiar form of nervous irritability, by which their existence is often rendered completely miserable.

The incomparable Beethoven was a striking example of this kind of hypochondriacism in its most intense form. During many years of the latter part of the life of this wonderful man, his extreme deafness, together with the nervous affection to which I have alluded, proved the source of the most poignant misery to himself, and of disappointment to his friends. In his case,

the whole current of his feelings and affections was entirely perverted. He looked with the utmost suspicion and distrust on his most intimate friends and relatives, and indulged in the most misanthropic sentiments towards the world in general. This state of morbid sensibility sometimes attained such a mastery as even to verge on insanity. For long periods together he would shut himself up in a state of complete seclusion from all mankind, suffering the while the most excruciating mental agony from his ear disease and its accompanying malady.

The medical treatment in the case of Beethoven, it must be confessed, was of the worst possible kind. I am firmly of opinion that the whole routine to which he was subjected, as well as his peculiar mode of life, tended to aggravate rather than diminish his disorder. Medically and morally speaking, the case of this distinguished man deserves to be known to all deaf persons. It furnishes a salutary warning to avoid cherishing their melancholy emotions, lest (as in his instance) they should acquire a tyrannical mastery over every other feeling; and also that they may be careful not to neglect their state of health, which, under the denomination of nervousness, is but too likely to be treated as a chimera by their friends.

When those deaf persons who have reason to believe themselves incurable, or indeed even those whose cases may be curable, suffer from nervous disorders, they should immediately become the subjects of medical treatment; because, even though their hearing may be lost beyond all hope of recovery, it is of the utmost importance to preserve them from the mental and physical depression which their malady tends to produce.

This cannot be effected unless the bodily health be attended to. The best regulated mind yields to the effects of severe deafness, if combined with other forms of bodily infirmity.

As an example of the high moral tone which even a hopelessly deaf person may attain to, I would instance the case of another distinguished person—Miss Martineau. Her admirable letter of Advice to the Deaf teems throughout with the most cheerful and even buoyant spirit, though it is quite evident that she is well aware of the great mental suffering to which many of her companions in affliction are consigned. When the malady is borne thus calmly, and the general health judiciously managed, the most hopeless state of deafness may exist in combination with the utmost serenity of mind. I might adduce other equally eminent examples, in which the most distressing deafness has been endured with fortitude, and made even the means of attaining to a higher degree of mental and moral excellence than the subjects of it could have hoped for but for such a loss of the means of external enjoyment.

When persons are become hopelessly deaf, not only can they of themselves do much to preserve their minds in a healthy temperament, but they can often assist the delicate and impaired sense when nothing else but self-treatment is of the slightest avail.

I need not here insist on the immense assistance afforded to the ear by the sense of sight. A deaf person endowed with quick eyesight has at his command a powerful means of compensating for the deficiency of the hearing. There are many instances of deaf mutes so perfectly trained in the use of the eye that they can detect every word of a conversation by closely watching

the lips of the speaker, having previously learnt the use of articulate language by the use of the eye alone. There are other persons entirely deaf, but retaining the faculty of speech, who can readily comprehend every word by watching the movements of the lips.

Some time ago a lady was induced to consult me, at the solicitation of friends; for she herself had for years relinquished all hopes of relief. She was in her forty-sixth year; but at the age of six had become affected with scarlatina, which left a total and irremediable deafness;—the loudest sounds from that time were inaudible to her; nevertheless, she held a conversation with her friend and myself on indifferent subjects without difficulty. The articulatory movements of the lips &c. required in speech were quite sufficient without the accompanying sounds. Of course she had acquired the faculty of speech previous to the attack of scarlatina; and she had preserved this by proper care and attention up to the period when she consulted me. Having entirely lost her hearing at so early an age, this fact alone was extraordinary. She spoke distinctly, but like a foreigner.

In ordinary conversation between persons of perfect hearing, the comprehension of all that is said is, to a considerable extent, dependent on the combined use of the eye and the ear, though we seem indebted for it to the ear alone. A few simple experiments will prove this to be true to a greater extent than we could at first imagine. If a person of good hearing be in a large theatre or assembly, at such a distance as to render the words of the speaker indistinct, he may make out distinctly what is said by the use of an opera-glass. Or, if there should be such a noise as to interrupt the

hearing, the use of the glass will assist it to a great extent. It would appear as if the sounds themselves were magnified, instead of the objects before us being so enlarged as to enable us to perceive the action of the lips and expression of the face accompanying the voice. Again, if a moderately deaf person sit by the side of a person endowed with acute hearing, and the former use a good glass, he will ascertain the better of the two what is said. And so it will be if one person with acute vision be a little deaf, and another quick of hearing, but short-sighted. The deaf person will often appear to hear the better of the two, and will catch the meaning of words which are quite lost to the quick hearer. Or, if two persons of equally good hearing are together, one of them having short, and the other long sight, the latter will have infinitely the advantage in comprehending what is said.

These facts, which are easily capable of verification, will show to all deaf persons the immense importance of aiding the ear by means of the eye, so as to obtain as much assistance as possible from the faculty of compensation which the senses of sight and hearing undoubtedly enjoy.

To those deaf persons who have happily acquired the faculty of *seeing* what is *said*, the approach of darkness whilst conversing with their friends is a source of regret, for they are aware how greatly they will be inconvenienced and the disadvantage they must experience. "Pray, ring for lights," will be upon the tongue, and until lights are brought, all participation in the conversation is at an end by persons so painfully circumstanced.

But it is strange that very many deaf people derive

the utmost advantage from sight in conversation, who are utterly unconscious how much they are indebted to it, and relate facts which appear to them to make their cases peculiar. For instance, many a patient has said, "It is strange that I can hear very well what you say to me, a yard or even two or three yards off, but if you speak into my ear it is all confusion." Desire that patient to close his eyes, and he will no longer distinguish what is said. In testing such a patient's hearing, the faculty of anticipation also should be baulked. For instance, such questions as, "Do you hear me now?" "How long have you been deaf?" "What was the cause of your deafness?" &c. &c., will be half anticipated. Rather wander from the subject. Ask him the day of the month? the distance to Liverpool? when the King of the French will visit our shores? &c. The extent of hearing he really possesses will then be correctly ascertained, and the advantage he derives from sight be made manifest.

On the other hand, it is well known that persons entirely blind, but possessed of acute hearing, enjoy a wonderful power of obtaining information through the medium of the ear and other senses, which in ordinary cases reaches the mind entirely through the eye.

The exercise of the faculty of attention is also of considerable importance to the incurably deaf. It is matter of experience that when a deaf person is listening to a speech or conversation, he can perhaps at first scarcely distinguish a single word, but by attention, and by concentrating every faculty upon the subject, he gradually catches the words of the speaker. If he be listening to an oration upon a topic he understands, he is often ready to take up each sentence accurately,

by putting his own mind in the same train of thought with that of the speaker. If there be any words he fails to hear, they often become suggested by those which follow or precede them, for, by a kind of intuition, a well-educated person knows in some degree the words which are to follow by those which immediately precede: just as, in music, a person possessed of a musical ear almost always keeps his ear in thought a note or two, or even a bar, in advance, though he may be listening to a composition which he had never previously heard.

In this way, extraordinary as it may seem, many persons suffering under an imperfect degree of hearing are able to report speeches made at public meetings with remarkable correctness. That this form of intuition or mental hearing really exists, admits of proof in a variety of ways. On the other hand there are certain things (such as figures and proper names) in which this faculty of anticipation cannot possibly be of any use, and in them the deaf person will fail. It is failures such as these that first lead to a suspicion of deafness. It may be observed that persons who can follow a speaker in every other particular are instantly and hopelessly at fault if he enters on an arithmetical calculation, or speaks of the names of persons or places. It is a fact, that many partially deaf persons can hear, and understand, the date of the current year, who cannot without much difficulty catch the date of a year taken at random. So also if the numerals are counted in numerical order, or the alphabet, as 1, 2, 3, 4, A, B, C, D, they are readily comprehended by an attentive deaf person; but if you give a different combination of them, say 2, 4, 1, 3, or B, C, D, A, the

patient will be confused; and many persons will not believe themselves that they are becoming deaf when they only fail of hearing things of this kind, the hearing remaining good as regards other matters. There can be, however, no surer sign than this of the invasion of deafness. If the partially deaf person loses the thread of a discourse by temporary inattention, he is incapable of resuming it immediately; but by a fresh concentration of the attention, and by studying the argument of the speaker, he is gradually able to recover the meaning, and follow it as before.

Though the power of remedying the loss of hearing by calling in the aid of the sight is of much importance, as I have before said, it is possible that this power may prove positively injurious by weakening the faculty of attention. This may be shown in the following manner:—

It unfortunately happens that when persons are deaf only in a moderate degree, they do not merely increase the use of vision as an auxiliary to the hearing, but often take occasion to supersede the ear by the use of the eye on improper occasions. For instance, when any one reads to a deaf person, if he does not exactly comprehend the meaning without trouble, he is apt to be quite inattentive with the ear, and to re-read it for himself. Few things tend more to beget a habit of inattention to external sounds than this. In the first place, it robs the ear of that practice which is of such importance to the deaf, and in the next, it produces a wilful mental deafness to sounds which otherwise might be readily comprehended. This inattention, when indulged in, soon extends itself habitually, from sounds which they really cannot hear to

those which are sufficiently audible when the attention is active. Thus persons who give way to this easily acquired habit are often asked a question several times over, which they hear perfectly from the first, or might have heard if they pleased, without returning any answer, so that many really deaf persons are thought to be merely sluggish, rude, or idle, and are thus accused of inattention when they really do not hear; because, ordinarily, persons are quite unable to distinguish between the obtuseness of attention and the real obtuseness of hearing which often accompanies and produces it.

A deaf person should never suffer himself to lapse into inattention because of his inability to hear every word which may be uttered around him. It is much better to lose a few words, and misapprehend the meaning of others, than to give up the whole either from idleness or in despair. It has often been said that deafness is favourable to profound thought and meditation; and that deaf people generally think more deeply than others, on account of their infirmity. Without doubt, when the sense of hearing is enfeebled or extinguished, the power of thought does "shine inward and illumine" in an increased degree; but the deaf should nevertheless be especially cautious how they suffer themselves to sink into a state of abstraction, and, above all, should avoid the tendency to reverie in society. Many deaf persons, when passing through the streets, labour to shut out the sounds as much as possible, imagining that thereby they encourage reflection, but I do not hesitate to say that such a habit is highly injurious to the failing sense. They should rather try to catch the natural sounds of everything, instead of blunting them-

selves to their perception by a voluntary effort. Deaf persons should even practise listening to external sounds as an important adjunct to whatever degree of hearing they may still possess. I know of no better exercise for inattentive and partially deaf persons than attempting to write down in a condensed form the conversation or reading of another person. Such a practice is better than merely listening to a person reading, because it requires a more than ordinary degree of attention to bring the hand in obedience to the ear. Next to this should be the habit of listening carefully for some time daily to a person while reading aloud. Remarks of this kind are of much value to the deaf; it is strange, therefore, that the subject should hitherto only have been noticed by writers on aural surgery in the most casual manner, if indeed it can be said to have been noticed at all.

As a further inducement to urge the deaf to habits of attention, I may remark that nothing is more painful to them than the gradual but final loss, one by one, of many of the most familiar and agreeable sounds of nature. As the hearing decays, the pattering of the rain, the rustling of the wind among trees, the noise of birds and insects, gradually become indistinct or are altogether lost. To the deaf, the air is always heavy and silent, and the earth as monotonously dull as when their sounds are masked to healthy hearing by the falling of snow. If the deafness be complicated with tinnitus, as is often the case, the external silence is mocked by the continuous and distressing noises produced by the disease itself within the organ of hearing. Few but the deaf themselves can imagine the delight which they experience when, after an interval of years, some

temporary improvement appears for a few hours, and brings back thousands of old familiar sounds which were in course of being utterly forgotten. To a sensitive mind this deprivation is a source of extreme melancholy. The play of expression in the faces of friends may compensate in some degree for the loss of the tones of friendship and affection, and the smiles of Nature appear then more delightful to the eye, because her music is shut out from the ear; but nothing can compensate or make up for the relative insensibility to the external world.

Besides the mental misfortune of this kind, the loss of natural sounds is injurious in another manner; it takes away the standard of sound by which we insensibly tune our own voices; so that, as a consequence, the speech of the deaf is too often harsh and dissonant—either too loud or not loud enough. These are therefore additional reasons why the deaf should attentively treasure up every natural sound; for no sound exists which is not in some measure the interpreter of others. Miss Martineau, herself a sufferer from incurable deafness, details, in the most feeling terms, the care and anxiety with which she hoarded up the sounds of nature, and the intense pleasure it afforded her to hear any common sound anew which she had lost and feared she might never hear again.

From all that has been advanced in the preceding pages, it may naturally be deduced that the faculty of attention and a well trained use of the sense of sight, will greatly ameliorate many severe forms of deafness. I now proceed to the consideration of certain points in which caution may prove serviceable to the deaf; and shall show that, in certain states of the system, a greater

amount of care than usual is required in the constitutional management of deaf persons.

Thus, bleeding among the deaf should be resorted to as seldom as possible; nay, it should never be practised unless under circumstances of the most pressing necessity. The deaf are invariably rendered worse as regards the hearing, except when acute disease of the ear exists, and even then local bleedings are sufficient to subdue inflammatory action. Dr. Marshall Hall has shown that deafness is one of the sequelæ of loss of blood, even when performed on those in the full possession of the auditory sense. It has also been found, in experiments on dogs and other animals, that excessive bleeding is followed by the loss of both sight and hearing.

It is a remarkable fact, that pregnancy, which generally stays the progress of other maladies, very often increases those of the ear. If deaf persons, as is sometimes the case, improve during the period of gestation, it generally happens that they become worse after their confinement. Deaf women frequently become much worse during the period of lying-in, and on this account require more care than usual to recover them from the shock of labour and the consequent debility. With attention, they often recover at least their former state of hearing; but it must be borne in mind by deaf persons, that anything like prolonged lactation deeply injures their already delicate organ. According to much experience on this point, any ground lost during the period of suckling, by the deaf, is with difficulty regained.

Drastic aperients and other depletory measures act in a manner similar to bleeding, and should therefore

be used with proper caution by the deaf. I have so often expressed my opinion of the deleterious effects of calomel and all other mercurial preparations in deafness, and in such decided terms, that I need not now do more than refer to the subject.

I would also caution my medical brethren against the administration of quinine in cases of deafness. I have so frequently seen an increase of the malady follow the use of this powerful tonic, that in my own practice I rarely prescribe it, and then only in very small doses.

I would not be thought to say one word in disparagement of general practitioners in medicine and surgery, but it is often said that those who give much of their attention to one particular subject are apt to fall into error, from taking narrow and restricted views of the cases which come before them, and that their treatment is often confined from not sufficiently taking into account the mutual dependence and connexion between the different organs of the body. But upon this point it may fairly be replied that those engaged in the general treatment of disease are also apt to fall into a contrary error, and in arguing from the general to the particular, are liable to go wrong from treating special organs, such as the ear, upon general principles alone.

It has often been pointed out as a subject of much interest, that there are certain persons with impaired hearing, who hear infinitely better in a loud noise than in a quiet situation. I know many persons intensely deaf who can hear very tolerably during an incessant din, which renders a healthy ear quite insensible to ordinary conversation. Itard is well known to have founded upon this fact a mode of treating the deaf, by

rousing, as he fancied, the torpid auditory nerve by loud noises, continued day after day for a certain time. He was not successful in the experiment, and it is not a practice which I should advise; on the contrary, I think deaf persons should carefully avoid all excessive or long continued noises. They may, it is true, excite the nerve of hearing for the time, but afterwards, according to my experience, it sinks into a deeper state of insensibility.

Late hours are very prejudicial to the hearing. Many deaf persons receive a serious injury, which is not overcome for several days, from the exhaustion of the nervous system consequent on late hours. Those habitually accustomed to occupation during the night lose their hearing from the advance of age much earlier than other persons. I have elsewhere mentioned the fact of the extreme prevalence of impaired hearing among the members of the houses of parliament, attributable, no doubt, in some measure, to the late hours to which their sittings are prolonged during so many months of the year.

Some of the points here treated of may appear minute and not deserving of the attention I have bestowed upon them, but it must be remembered that I have had chiefly in view that class of persons who are shut out from the ordinary means of assistance, and to whom every possible mode of conservating the remaining powers of the sense is invaluable.

I now pass to a consideration of the value of the various acoustic aids which have been proposed for the use of deaf persons.

## CHAPTER IX.

## EAR TRUMPETS.

To many among the deaf, an ear trumpet will be invaluable. It is a mechanical contrivance analogous to the spectacles worn by persons whose sight is too long, too short, or which is become enfeebled by age; but from an unworthy prejudice, or from its drawing upon the wearer so much observation, the description of ear trumpet by which alone assistance can be derived is rarely made use of. Advantage has been taken of this prejudice, and inventions the most absurd have been proposed to obviate the objection. But it may be set down as an axiom, that *the value of an ear trumpet consists in its power of collecting, concentrating, and directing to the outer passage of the ear, a greater quantity of sound than could reach it without such aid.* The inutility of small instruments must therefore be evident.

To give a minute description of the endless variety of instruments proposed for the use of the deaf would be a waste of time, more especially as the great majority of them are utterly useless and inefficient. Ear trumpets of the most varied forms have been constructed, some straight, some bent, some coiled, others conical or parabolical, almost all capable of collecting sound and directing it to the ear; but, unfortunately, this is not the only requirement. Comiers speaks of an

instrument\* which had such power that the noise of two persons walking along the streets sounded like the tramp of an army, and the human voice appeared to issue from a speaking trumpet, but with such confusion that the enunciation could not be recognised. Nuck† describes an instrument of the shape of a hunting horn which increased the intensity of sound, but with the disadvantage of rendering articulate language confused. In fact, the problem is yet to be solved how to accumulate sound, and at the same time preserve the perception of articulate language.

In the construction of an ear trumpet, the important fact should not be lost sight of, that deaf people are annoyed and confused by loud bawling into the ear. That which they want is *distinctness of articulation*. The deaf person can hear one friend remarkably well, whilst another, who speaks with a more powerful voice, cannot be understood at all. The reason is, that the articulation of the former is distinct, the latter muffled and confused. Speak deliberately and distinctly, and the deaf person will thank you; but shout or bawl into his ear, and he will be almost disposed to be offended with you. For my own part I have rarely any difficulty in holding conversation with the deaf, and patients under my treatment have frequently expressed surprise at the facility with which they could converse with me, and the difficulty they experience with others. Some, ignorant of the simple rules I observe, have looked around the consulting room for a reason, expecting to find something peculiar in its construction.

Great attention has been devoted to the construction

\* *Traité de la parole*.—*Liège*, 1691.

† *Operationes et experimenta chirurgicæ*.—*Leyden*, 1692.

and improvement of ear trumpets, but in vain. The first form of ear trumpet probably ever thought of, namely, the simple tin trumpet, is still the best. With its wide mouth, it intercepts, collects, directs, concentrates and transmits sound through its conical canal, and impinges it upon the membrana tympani unaltered and in all its intensity. More than this the most elaborate contrivance probably never will accomplish. But, as I have before observed, intensity of sound is not all that is required, and to many persons with defective hearing it is highly offensive. Besides, if the augmentation of sound be so great as to overwhelm the enunciation, the ear trumpet is useless; hence ear trumpets too large are as inefficient as too small. The happy medium will be found in the tin trumpet I have adverted to, in the ear trumpet which is said to have been introduced into this country from America by Miss Martineau, or in the tubular ear trumpet invented by Dunker, a German.

The common tin trumpet needs no description—centuries, probably, have seen it in use, and the inventive genius of ages has failed in superseding it; and within these few years, the witty and laughter-loving Hood, in his “Tale of a Tin Trumpet,” has immortalized it.\*

The Martineau trumpet is about eighteen inches long, and consists of a bowl-shaped extremity, in which the sound is collected, and a conical tube, through which it is conveyed to the ear. It aims at a more scientific arrangement than the unpretending tin trumpet, but I am not at all sure it is more effective.

The Dunker hearing-tube, or, as it is sometimes called,

\* See New Monthly Magazine, Nos. 248-9 & 50.

the Conversation-tube, is well known, and has many patrons, especially among the ladies.

When not in use, it can be conveniently deposited in the reticule, and there is an elegance about it which the others do not possess, and this is some recommendation. Moreover, it is a most efficient apparatus, and for the very deaf the only instrument which will answer the purpose. Unfortunately, it is only adapted to carry on conversation with a single person, who is required to speak into the funnel-shaped extremity; but this disadvantage is in some measure counterbalanced by the length and flexibility of the tube, by which a person is enabled to hold conversation at a distance of two or three yards, if the tube be so long.

The *Ear-cornets* which are fixed into the ears, and retained there by a metallic spring, which, passing over the head, connects them, have been in use chiefly because they leave the hands at liberty; but as far as I have had opportunities of observation, they are soon laid aside as "more plague than profit;" for unless the nipple is accurately adjusted and retained in the passage of the ear, the instrument fails. The fact is, the hand is necessary to preserve the nice adjustment of the nipple in this or in any other instrument.

The same observations hold good with regard to an instrument made use of by a distinguished judge, one of the kind patrons of the Ear institution. Seeing it to be of such service in his case, I was induced to recommend a trial of it to others, but I am not aware of any one else having adopted it. It is somewhat upon the same principle as the ear cornets; but the receptacle for sound, instead of being situated in front of the ear, opens in the centre of the instrument on the top of the head. In

the judge's case, it admits of being ingeniously adapted to the wig, so as to be scarcely observable.

Itard made many experiments in ear trumpets in the hope of overcoming the difficulty which obtains in transmitting sounds in their original distinctness to the ear, and with this view he constructed a trumpet with a piece of goldbeater's skin, like an artificial membrana tympani, interposed across two places in the cylinder of the instrument. It succeeded, as might naturally have been expected, in diminishing the intensity of the sound, but it failed in adding to the distinctness.

There is another contrivance, termed an Otaphone, which suggested itself to the inventor, Mr. Webster, from his having observed a common practice among deaf people of applying the hollow of the hand to the back of the ear to increase the sound, and he was induced to consider whether the assistance this practice afforded might not be obtained by means less troublesome and unsightly. With this view the Otaphones were first constructed. "They are formed from a correct model of the back of the ear, and by fitting all the irregularities of that very uneven and elastic surface, gently press forward the parts so as to produce a more perfect orbit and fuller recipient of sound, and being self-supported, occasion no inconvenience to the wearer, nor any alteration in the appearance." Mr. Webster claims other advantages for this instrument, which I have not space to discuss.

My desire would be to speak only of those instruments which, founded on correct principles, fairly promise assistance to the deaf; but I should not be doing my duty to my readers, if I did not caution them against the trash grandiloquently named "the Invisible

Voice Conductor, not larger than a seven shilling piece, and yet so powerful as to enable the deafest person to hear the faintest whisper in a public assembly." Need I say one word in refutation of so monstrous an absurdity? It is painful to think how many poor creatures, placing reliance on such gross falsehoods, have thrown away their hard earnings in purchasing them, reaping only disappointment. The inutility of so small an instrument must be apparent; and indeed I have no hesitation in saying, that the voice conductor not only is of no assistance, but positively impedes the hearing. Mr. Weiss, the highly respectable surgical instrument maker in the Strand, assures me that the original intention of the contrivance was to dilate the external passage of the ear when contracted from disease; but even for this purpose it is unsuited.

It may be expected of me to give an opinion as to the propriety of using an ear trumpet at all. Arguing from analogy it ought to do good; for the principle that the more a faculty or organ is exercised (in moderation of course) the more it is strengthened, is invariably admitted. But the patient's sensations are the best criterion. If a pain or a disagreeable straining within the ear, after a prolonged use of the trumpet, is experienced, the propriety of its further use might fairly be questioned. Whilst disease is going on within the ear, trumpets are decidedly inappropriate, but when the disease has subsided, leaving deafness as the effect, then they may be used with impunity.

Whether in health or debilitated by disease, the ear requires exercise to preserve, in the former case, its pristine powers, in the latter, its remaining powers, and it is for this reason that deaf persons should never

suffer themselves to be scared away from social intercourse because they cannot participate in conversation with that facility which their more fortunate brethren enjoy. If the deafness has reached that degree which entirely precludes them from hearing what is said, then a well selected trumpet, of just sufficient power to give the necessary degree of tension to the ear, for the appreciation of articulate speech, may be resorted to with propriety, unquestionable advantage, and comfort. Care, however, should be taken not to use an instrument of greater power than is actually required, lest the membrane of the tympanum should be overstrained, and its elasticity permanently impaired. It would perhaps be judicious in all deaf persons to take the opinion of an experienced practitioner, before resorting to the use of an ear trumpet, for there are some cases in which it might be attended with serious effects. I have observed, for instance, that for the successful employment of an ear trumpet, it is essential that the membrane of the drum of the ear should be present, or at all events, not entirely disorganized or absent. I have frequently tried the experiment of an ear trumpet in patients in whose cases the disease of the ear had destroyed the membrane of the drum, and in almost every case the trumpet has been either of no service, or communicated so painful a sensation, without appearing to benefit the hearing, as to be quite unbearable. Under such circumstances, persistence in the use of an ear trumpet, in the hope that it might eventually become of service, might set up an irritation or extension of disease difficult to subdue.

## CHAPTER X.

## CONCLUDING REMARKS.

IN bringing these remarks to a close, my readers must permit me to revert to the motives by which I have been actuated, and to the objects I have had in view, in their publication. When, some years since, I first devoted my attention to the subject of aural disease, strange as it may appear, there was not a single regularly educated practitioner in the metropolis specially engaged in this department of medicine and surgery. The improvements made by our countrymen, Cleland and Wathen, had long become obsolete or forgotten in England, though they had been made the basis of the practice of Itard, Deleau, and Saissy, in France, and of Kramer and others in Germany. Sir Astley Cooper, with whom diseases of the ear had been a favourite study in the early part of his career, gradually withdrew from the prosecution of the subject, as it is said, on account of the illiterate pretenders who were preying on the deaf by the most disreputable practices. In fact, such an odium had attached itself to the name, that Sir Astley was afraid to be thought *an aurist*. From that time the subject had been almost entirely resigned to the hands of empirics, who wrote upon the subject, and practised in its diseases, with the most unblushing ignorance and effrontery. As regards treat-

ment, they were in a state of the most miserable poverty, nay, their most vaunted remedies could not be applied to the ear without inflicting positive injury. I trust I have said enough to show the absurdity of the indiscriminate syringing and the application of acrid ear-drops, irritating acoustic oils and ointments, which were almost the sole local means of treatment among the race of aurists previous to the first promulgation of my views. If I had only done this I should rest satisfied that I had not written in vain.

It is lamentable to think that a legitimate branch of medical science should have been thus left to unqualified pretenders, whose sole hold upon the public consisted, not in the benefits they could confer, but in reiterated advertisement and self-laudation.

Altogether to put down aural or any other quackery, seems an impossibility, but I believe I have assisted in changing the modes of practice formerly in vogue, and in rendering it impossible for any man by ordinary or extraordinary means to gain in future a reputation in aural medicine and surgery, or to acquire in any degree the confidence of the medical profession, without the possession of a competent knowledge of the subject. Some, there are, who object to the division and subdivision of the profession, but as long as subdivisions are made, no one can doubt but that the ear and its diseases are pre-eminently deserving of special attention. It is not improbable that at some future day when the subject has been improved by increased knowledge of its pathology and increased power over the diseases of the ear, and when medical and surgical science generally has advanced nearer to perfection, all the subjects which have now separated themselves into

different branches of the profession, will again unite, so as to form one comprehensive science, and it appears to me that those will do most to advance this end, who in the present state of things most zealously devote themselves to the perfection of its individual parts.

THE END.

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