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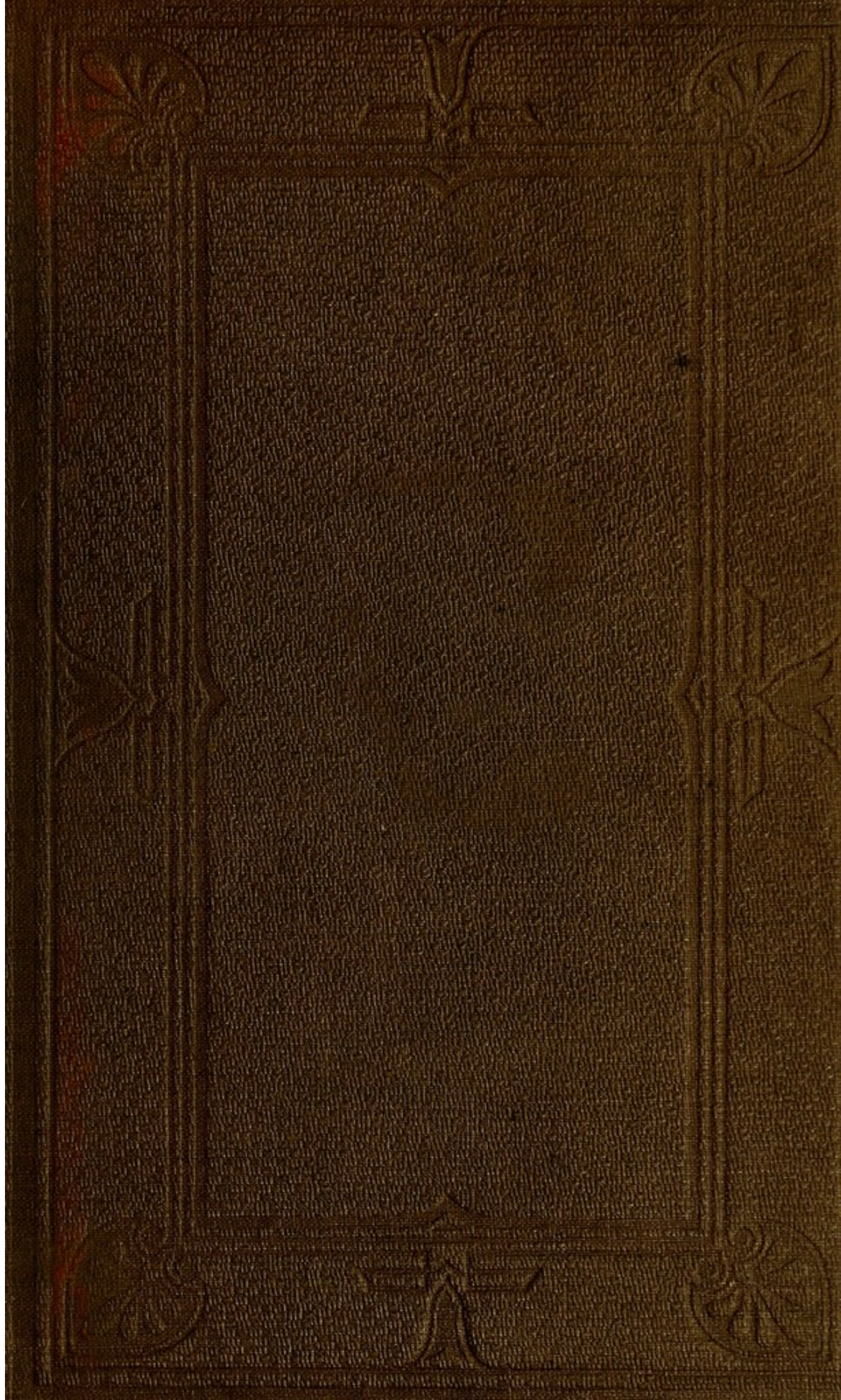
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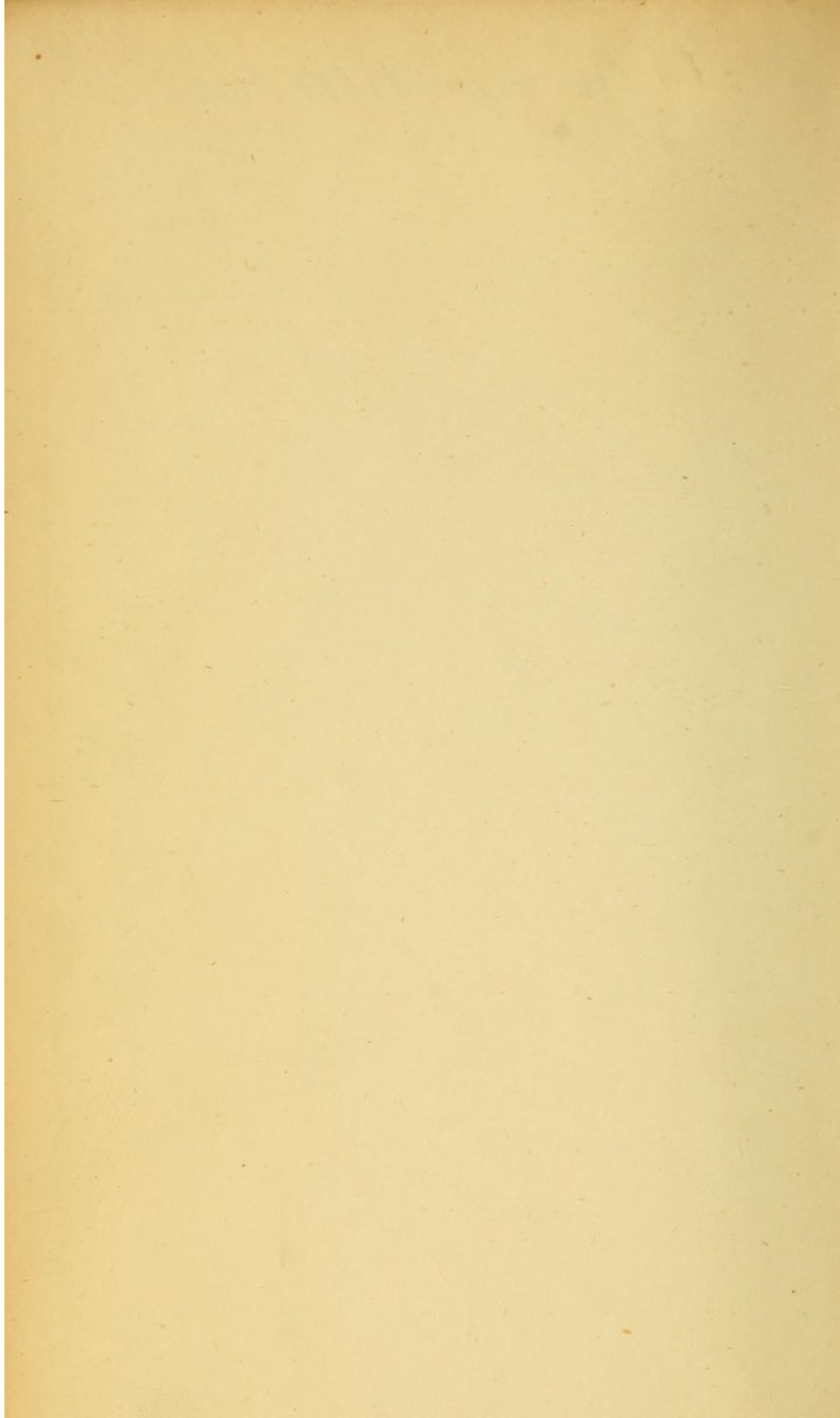


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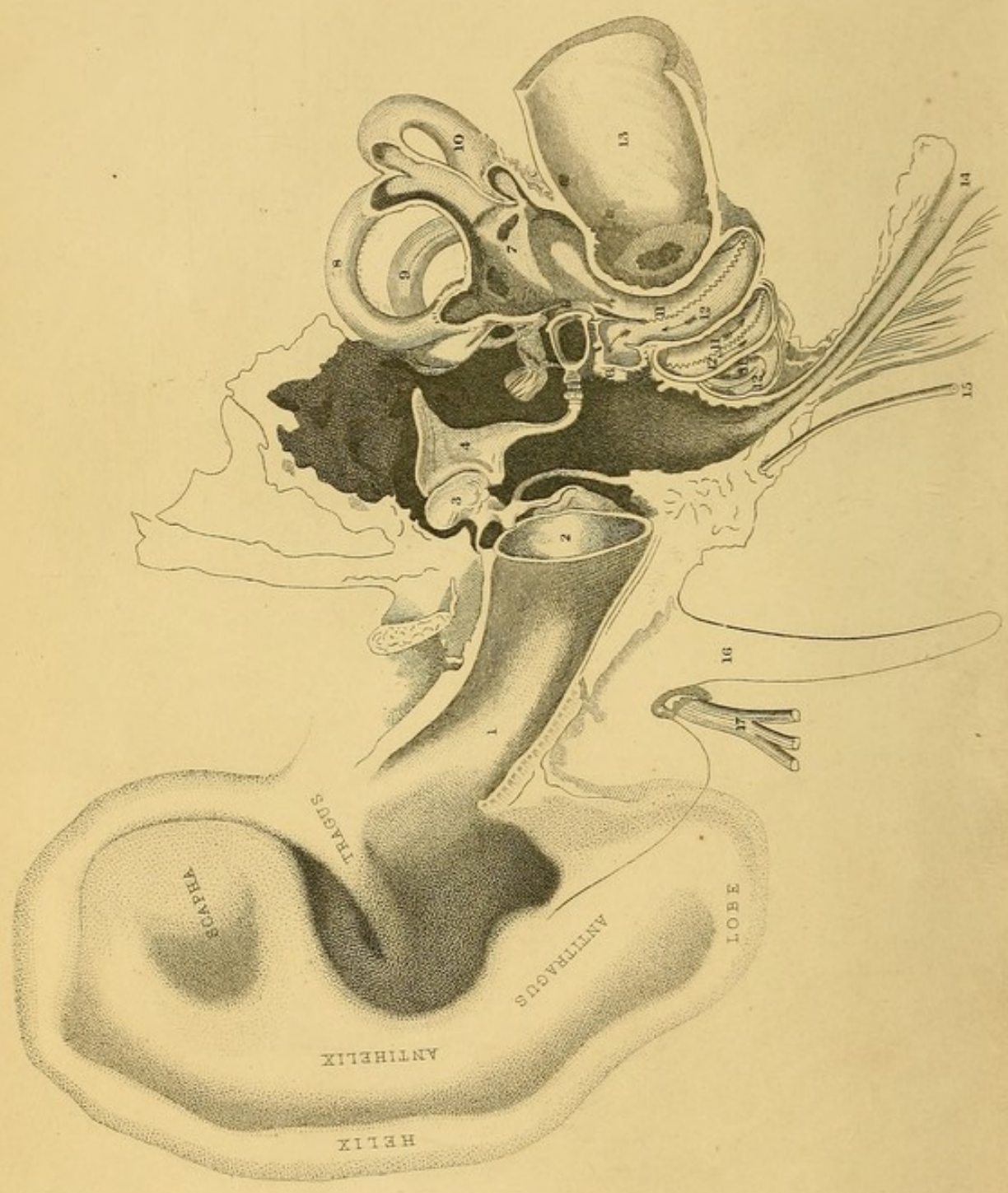
DEAFNESS

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D E A F N E S S
P R A C T I C A L L Y I L L U S T R A T E D ;
BEING AN EXPOSITION OF THE
NATURE, CAUSES, AND TREATMENT
OF
D I S E A S E S O F T H E E A R .

BY

JAMES YEARSLEY, M.D.,

LICENTIATE OF THE ROYAL COLLEGE OF PHYSICIANS, EDINBURGH; MEMBER OF THE
ROYAL COLLEGE OF SURGEONS OF ENGLAND
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SURGEON TO THE EAR INFIRMARY AND ORTHOPHONIC INSTITUTION, SACKVILLE STREET;
SURGEON TO THE ROYAL SOCIETY OF MUSICIANS, AND TO THE ROYAL SOCIETY OF FEMALE
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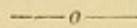
NEW YORK

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P R E F A C E.



THE present Edition has been revised with much care, and is so enlarged as almost to be entitled to be considered a new work on the subject. Methods of treatment which, in earlier Editions, were criticised and even denounced, have since been confirmed by the experience of others. Such were Catheterism of the Eustachian passages and excision of Enlarged Tonsils ; even the value of my discovery of the principle of applying substances to the passage of the ear in cases of Perforate Membrana Tympani, at one time questioned, is now admitted by every recent writer on Diseases of the Ear as "one of the most important discoveries of the present century." The new treatment of Otorrhœa, which is intended to supersede that by astringent injections, has not

been sufficiently long before the profession to have won general approval, but I am confident that it will soon be acknowledged as a great advance in the treatment of this obstinate and distressing complaint. Cases of Otorrhœa, which astringent injections would not cure in weeks, months, or even years, and then only with an aggravation of the deafness, readily yield to the new method in a few days, and *always with improved hearing*.

Twenty-two years ago I published a series of papers on "Deafness from Morbid Conditions of the Mucous Membrane," in the *Medical Times and Gazette*, then known as the *Medical Gazette*.

The following quotations from that periodical will substantiate my claim to priority in ascribing to the mucous membrane the unhappy consequences of its deranged conditions when these latter extend to the Eustachian passages and the organ of hearing. Piracy and plagiarism, I regret to say, are not unknown in the ranks of the profession, and having myself experienced this failure in honourable dealing, I shall be excused for identifying, by indisputable evidence, my claim to original views upon the question of the true

nature and cause of deafness, by the enunciation of which I believe I have mainly contributed to revolutionise the practice of aural medicine in this country. Thus I quote from the *Medical Gazette* of December 3 and 10, 1841.

“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 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 blood-vessels, 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."

"I would here record my conviction that the forms of deafness referrible to the mucous membranes, amount to at least 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 it would destroy their attempts to systematize 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 Institution for Diseases of the Ear and in private practice, as the unerring result of chronic disease of the mucous membrane. I do not mean to proscribe nervous deafness as a nonentity ; 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.”

Nothing so strongly points to the mucous membrane as the tissue most affected in deafness, than that the malady is at the outset so generally associated with symptoms of throat and nose disorder, *simulating*, if not originating in, an ordinary cold. Obstruction of the nose is so common that I have devoted a chapter to its consideration. These early symptoms subside, and are forgotten by the patient before he is much inconvenienced by the effect of deafness. For this affliction he seeks advice, and the inexpe-

rienced practitioner looks anywhere but to the mucous membrane as the *fons et origo mali*. Hence it is that his treatment is too apt to be directed to the outer passages of the ear, and mainly consists of repeated syringing for the removal of accumulations which do not exist, blistering behind the ear, ear-drops and ointments to the passage of the ear, sometimes acrid like ammonia and veratrine, sometimes innocuous like glycerine,—but all alike unsuited, and consequently unsuccessful.

If in the following pages I have paid little heed to the opinions of aural surgeons who have preceded me, or even of my contemporaries, it is from no disrespect that I ignore them; but we are really antagonistic on so many points of practice, that I had but the alternatives of filling my pages with arguments in refutation of their opinions, or to write a plain, practical work on Diseases of the Ear. It will be seen that I have adopted the latter alternative.

I attach minor importance to pathological conditions which others appear to regard as the

one thing to be amended. For instance, "thickening of the membrane" I find to be a common phrase among patients who have consulted other practitioners. I ask myself what membrane could have been meant? If the membrana tympani, the cause of the deafness was certainly not there. It could not be the mucous membrane that was meant, for in nine cases out of ten the throat, where the mischief at least commenced, was never examined. "Thickening of the membrane," therefore, is a phrase which I regard as a misunderstanding, or cloak for ignorance, of the true cause.

There may be chronic inflammation of the mucous membrane of the throat extending up the Eustachian tube to the tympanum, causing obstruction to the admission of air; there may be enlarged tonsils, keeping up an irritation of the adjacent mucous membrane, preventing the descent of the mucous secretions of the nose and upper part of the pharynx; the patient may be prevented from breathing with freedom through the nose; there may be various other indications of a disordered mucous membrane; but all such

conditions are overlooked, and the ear with its "thickened membrane" is alone thought of in the treatment, which generally consists of interminable blistering, or the production of crops of pustules behind the ear, thus subjecting the patient to great torture, and almost always ending in failure and disappointment. It will be seen that I abjure all such *tinkering* of the ear—as an unfortunate sufferer called it—such *grid-iron* treatment!

If I have succeeded in cases where my contemporaries have failed, I believe it has arisen mainly from my stricter attention to the condition of the mucous membrane, neither tormenting my patients with useless blistering on the one hand, nor rejecting catheterism of the Eustachian passages, by which alone the mucous membrane of the tympanum can be reached by local applications on the other. Notwithstanding the prejudice against operations in Aural Surgery, most imprudently fostered by one, if not more, of my contemporaries, I have always upheld such proceedings as indispensable. Often has a patient said to me, "I should have con-

sulted you years ago, but I heard that you performed operations, whilst Mr. —— did not, so I went to him !”

I have outlived the outcry against catheterism of the Eustachian passages, a mode of practice first introduced into this country by myself in a paper entitled “Deafness Successfully Treated through the Passages leading from the Throat to the Ear.” I have also outlived the outcry against excision of enlarged tonsils, an operation which I was the first to popularise in this country, in a work published eighteen years ago, entitled, “On the Enlarged Tonsil and Elongated Uvula,” which work has now reached its Seventh edition.

It would create some merriment were I to quote the opinions and arguments of my contemporaries levelled against operations, on their first introduction, now so generally recognised and practised.

After twenty-five years' experience, I emphatically say to the aural surgeon and to the aural writer, “Look to the mucous membrane, for on your restoring that membrane to a healthy con-

dition by local and constitutional treatment will mainly depend your success in restoring the impaired sense of hearing to your patient ; and I repeat, as the theme for your practice and writings :”

“In nine-tenths of the cases which come before the aural practitioner, deafness will be found to have originated in a morbid affection of the mucous membrane lining the throat, nose, and ear ; and according as the disease terminates in simple thickening of the membrane, in adhesions, in partial or total loss of the membrana tympani, in disorganization of the whole mucous lining, in loss or anchylosis of the ossicula, or destruction of the inner membranes of the fenestræ, so is the deafness more or less intense and confirmed.”

In the following pages, I have not been unmindful of those of my readers to whom the technicalities of the schools would be as so many barriers to a proper understanding of the subject. Whenever possible I have avoided them. Indeed, it has been my study to express myself in plain intelligible language, avoiding all reiteration and unnecessary verbiage. Whether or not I have succeeded, it will be for the reader to determine.

THE AUTHOR.

15 SAVILE ROW,
January, 1863.

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INTRODUCTION.

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 the last few years, to have been, by universal consent, abandoned to empirics, from whom no advancement could have been 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 diseases, 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 realization 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 functions of the different parts of the body, of the seat and nature of the great majority of the diseases to which it is liable, and 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.

Investigation 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 means of cure 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. And according as the disease terminates in simple thickening of the 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 cause 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 more than twenty 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.

DEAFNESS PRACTICALLY ILLUSTRATED.

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 muscles 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 judge, in whose case I was once consulted, had 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 exceeds 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 scale 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 a 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 Cotunii*. 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 a 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 sense of hearing is lost, namely, *atmospheric air*. If the guttural extremity 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 ante-chamber 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 the links of which 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 are 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 *peri-lymph*, 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. Deafness 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 or vibratibility 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 the 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 DISEASES OF THE EXTERNAL EAR.

Auricle.—Impaired hearing, from diseases which attack the auricle, as simple erysipelatous inflammation, eczema, abscess, or, more rarely, scirrhous, is comparatively infrequent. These 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 in 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 pertain 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 1,000 cases admitted at the Metropolitan Ear Infirmary, it appears that only five presented themselves with this disease.

Auditory Passage.—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. Approximation of the sides of the passage is another cause of difficulty. 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 were formerly offered for sale by the surgical-instrument maker, it has appeared to me, that their proper application was 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 *dilatating* it ; and therefore I some time ago proposed a *speculum auris*, differing from those in common use, 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 retractation ; and the latter, as already said, I hold to be of more importance than the former. (See plate.)

As an aid to manipulations within the passage of the ear, such as the extraction of wax or foreign bodies, I find this instrument the best of any ; but for the inspection of the membrana tympani, the little funnel-shaped instrument introduced by Gruber, of Vienna, is undoubtedly the best and most convenient to use. A nest of these, of three or four sizes, should be in the hands of every aural practitioner.

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 very satisfactorily by a

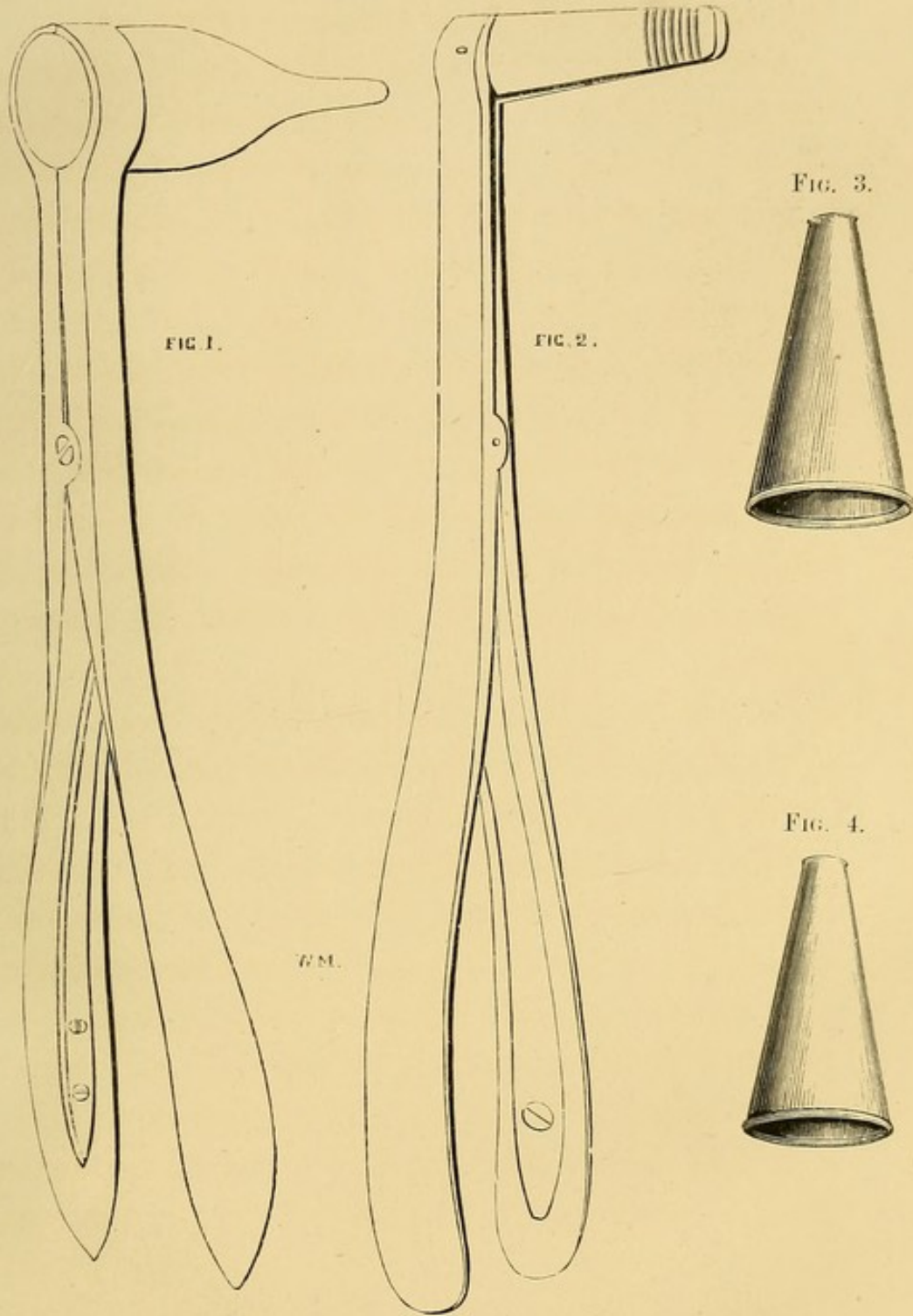
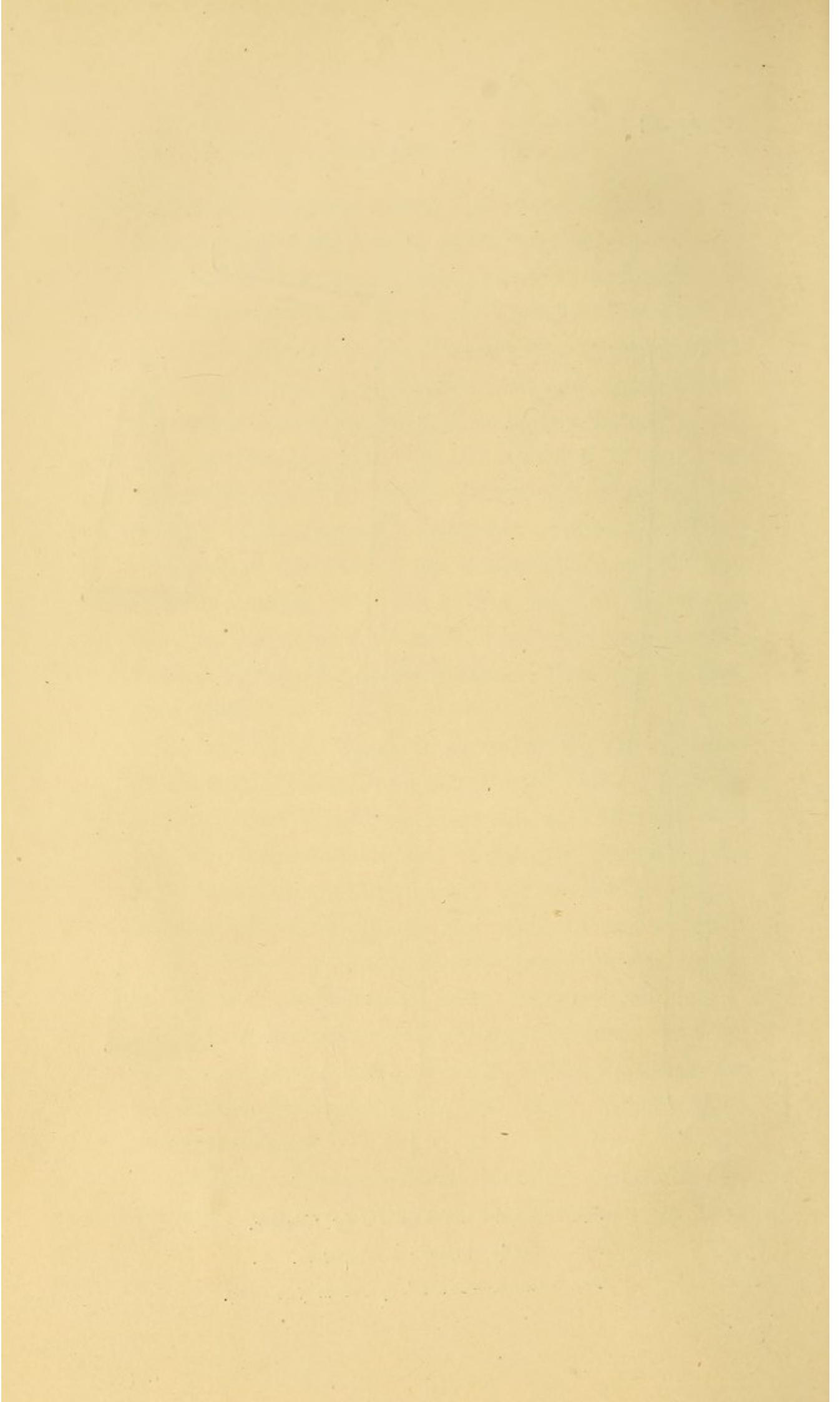


Fig. 1.—Speculum proposed by Kramer.

Fig. 2.—The Author's modification.

Fig. 3 and 4.—Gruber's speculum (two sizes).



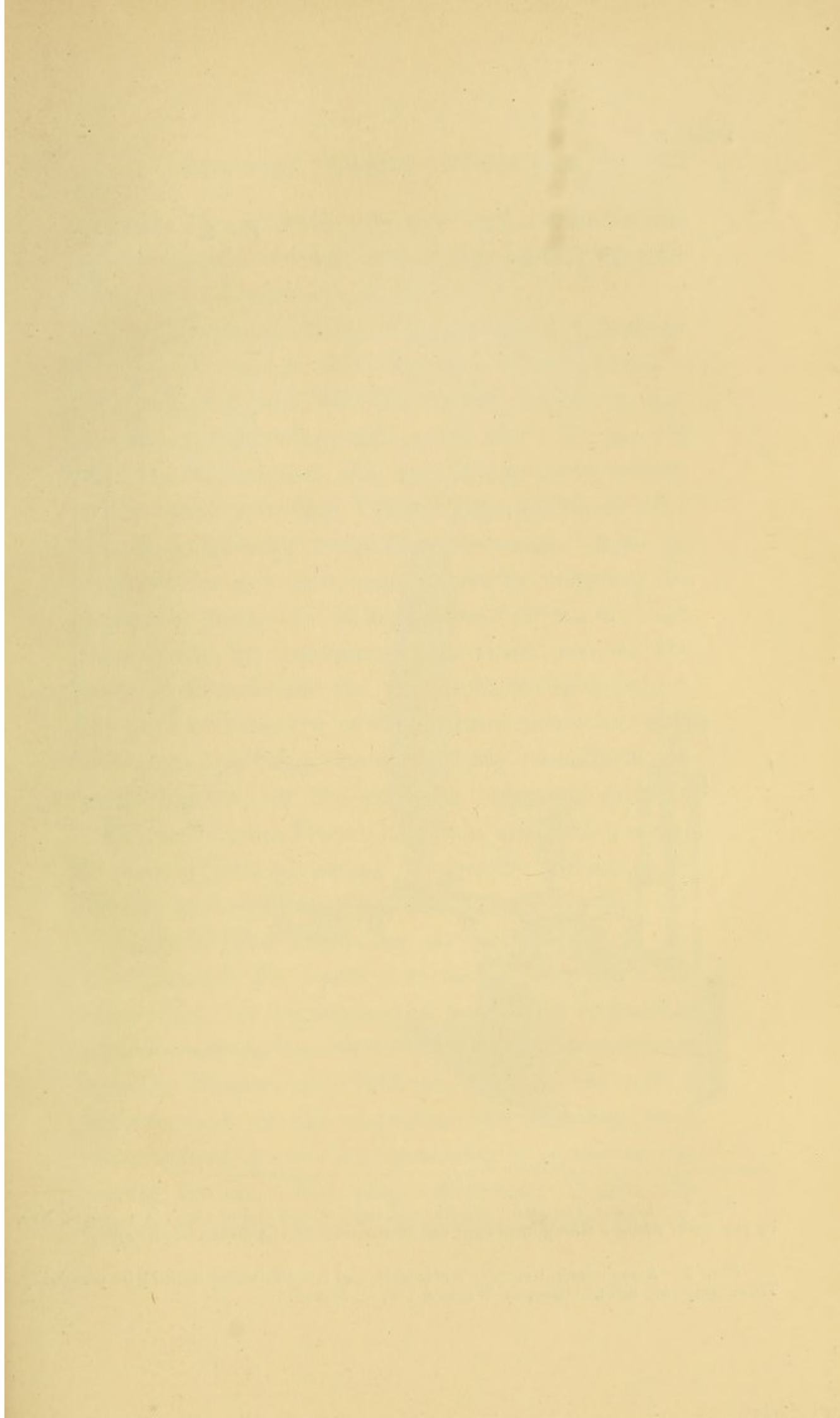


FIG. 1.

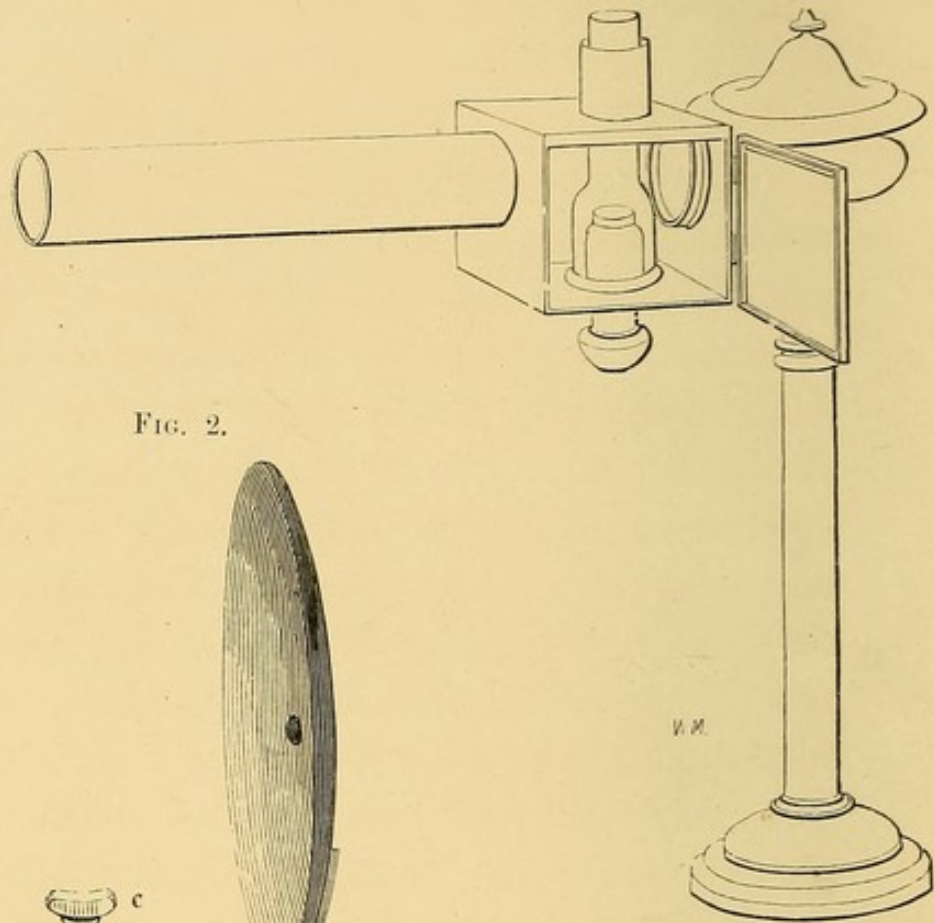


FIG. 2.

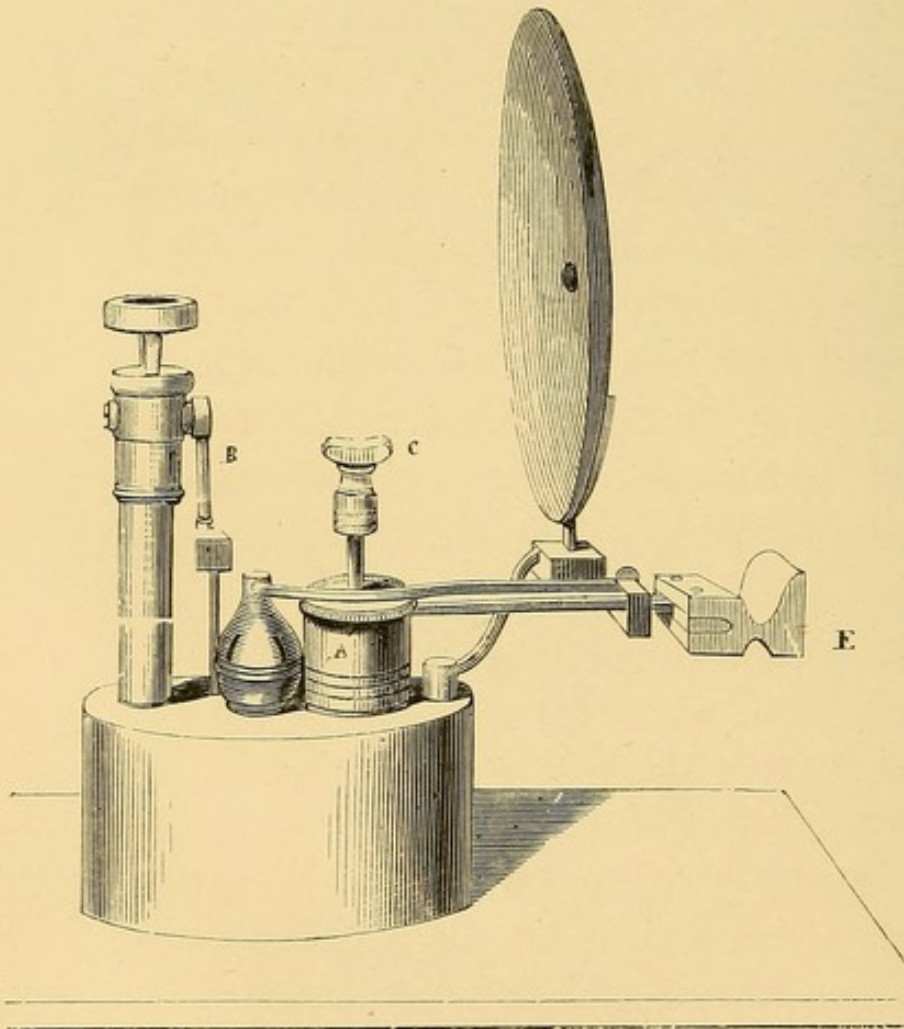


FIG. 1.—Argand lamp, with reflector and tube, at each end of which is a convex lens, by the aid of which a strong focal light can be thrown into the passage of the ear.

FIG. 2.—Avery's lamp : equally serviceable, and recommending itself by its portability. These lamps are manufactured by WEISS & Co., 62 Strand.

common Argand lamp, provided with a reflector and a tube opposite, several inches long, having at each extremity a double convex lens.

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 attracted much attention, and some very ingenious optical contrivances have been devised. Several years 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. One of the competitors was my friend and relative, Mr. Avery, one of the surgeons to the Charing-cross Hospital, who had invented a very ingenious lamp for inspecting the inner recesses of the body. Of all the instruments I had then seen, this was by far the most efficient, and, moreover, it commended itself by its portability. This lamp was afterwards much improved by its ingenious author, and it still takes a high place in optical contrivances for inspecting the ear by artificial light.

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 aural surgeon 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 characterised 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, alto-

gether 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.

It may be observed, that it matters not how great a quantity of wax fills the outer passage of the ear, provided it retains its moisture and keeps clear of the membrana tympani ; but the moment a particle of it is pressed down on that membrane its vibrability is lost, and the patient is made deaf. Thus it is that the nature of the malady may be defined at once when a patient tells you that he rises from the pillow quite deaf, but that before he has finished his toilet or eaten his breakfast he is relieved. Talking, or eating, or, indeed, any action of the jaw suffices to free the membrana tympani of the wax, which, from lying on the pillow, has been pressed down upon it.

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.

Syringing is only admissible for the removal of any accumulation which may be an impediment to hearing. This being effected, it should not be repeated; moreover, it should not be practised *upon speculation*. The surgeon who is competent to treat diseases of the ear will assure himself by inspection of the outer passage with a speculum that an accumulation is present, and not proceed to syringe the ears upon a mere expectation of finding it.

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 frequently are 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 ;

indeed, it is most extraordinary how extremely contracted may be the communication with the *membrana tympani*, without materially lessening the hearing. I have seen cases in which a small-sized probe would scarcely pass to the membrane, and yet the hearing be very good. 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—*otorrhœa*, as it is called—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*; and 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 dis-

charge 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 sometimes 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 treatment 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, to discover whether or not the membrane be 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 membrana tympani is so obliquely situated, that an aperture in it allows of the ready entrance of the 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, seldom failing 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.

Hitherto the treatment of External Otorrhœa has consisted chiefly of astringent injections of alum, zinc, copper, &c. ; and though it cannot be denied that they are generally successful, my experience has shown me that the hearing suffers more or less by such methods of treatment. It is with no little satisfaction, therefore, that I have been able to introduce a mode of cure which is unattended by such a result, and is far more rapidly successful. But, as a special chapter will be devoted to this important subject, I will here say no more at present.

II. DEAFNESS FROM DISEASES OF THE MIDDLE EAR.

Discharge from the tympanum or internal otorrhœa, is a much more serious complication 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 arise the foetid 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.

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 healthy 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 Eustachian 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 endowed with a power of active motion. They are only visible with the aid of a powerful microscope, being of a diameter not exceeding $\frac{1}{12500}$ 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 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

* Müller.

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 which are 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 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, the extremities of which 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, and 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 mem-

brane 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 parietes, 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 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

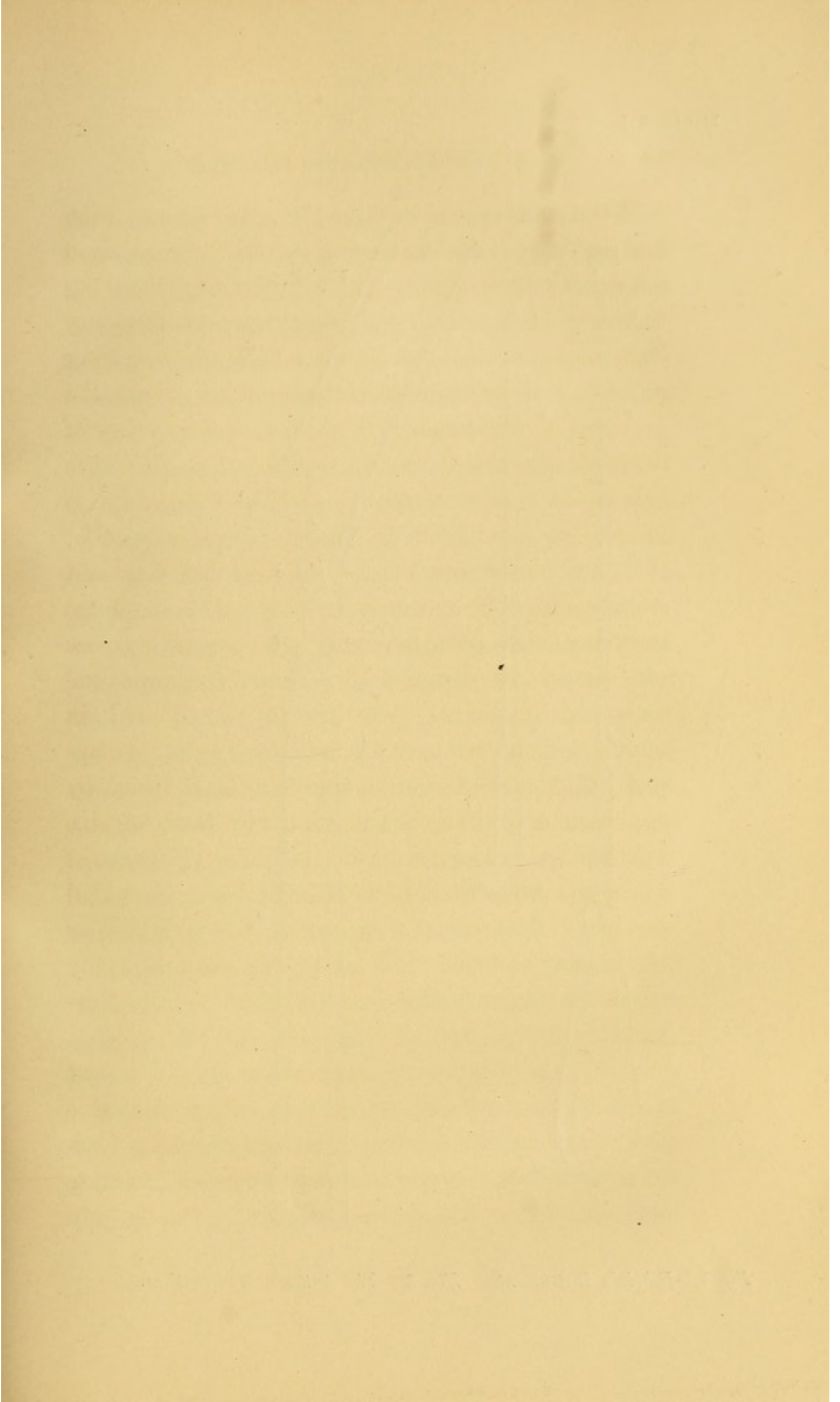
perceived by the person who hears naturally well, and tend to confuse him, so as to produce dulness of the sense, the deaf person enjoys the advantage of not perceiving the extraneous noises with sufficient distinctness to occasion inconvenience. And besides, a person who hears well, while riding in 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 in 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.

* Müller.

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 on 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. It often happens, that after the discharge has been cured by applications to the external ear, the deafness remains 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



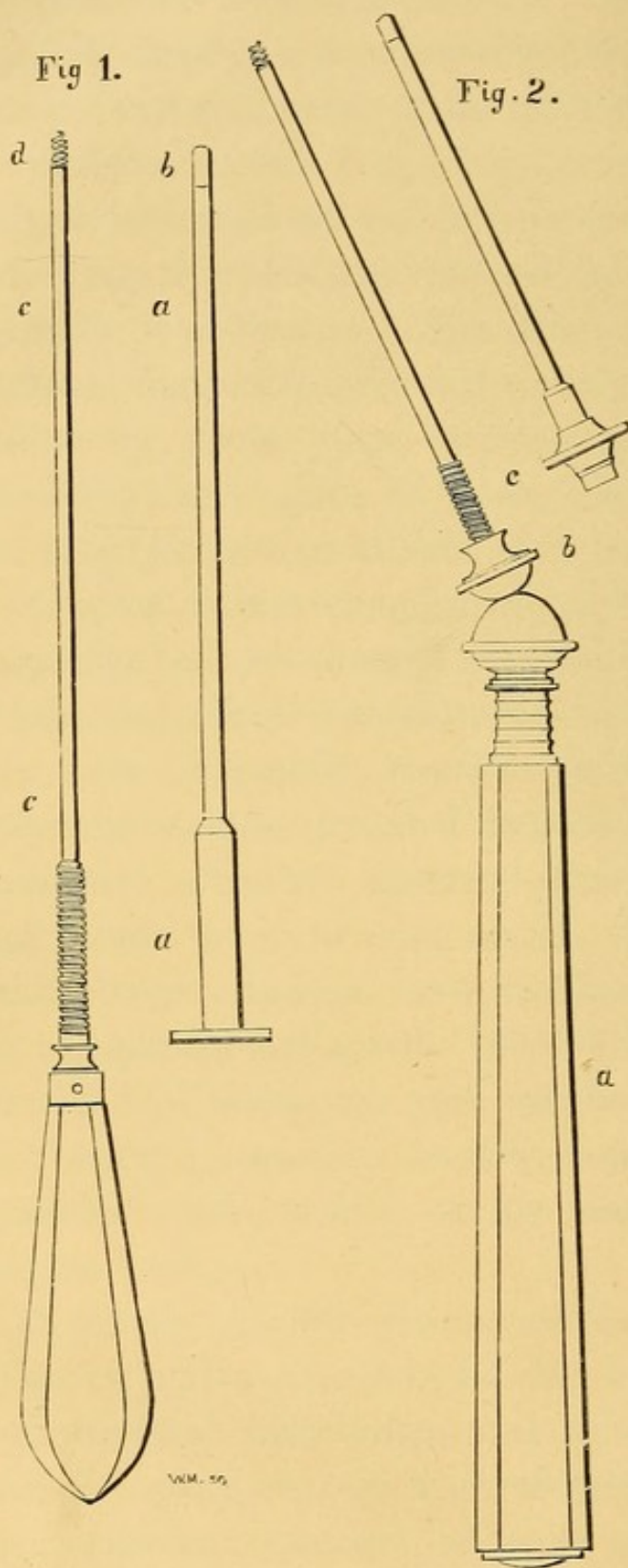


Fig. 1.—Fabrizi's Instrument. Fig. 2.—The Author's Modifications.

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 realise 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—1st. A canula, three inches and a half in length, and a line in diameter, terminating in a cutting edge or punch.—2nd. A perforator with a spiral extremity

similar to a corkscrew, and fixed in a handle 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 Fabrizi's instrument ; for, in holding it, the hand altogether intercepts the view of the membrane.

To remove these various objections to the instrument, I have lengthened the handle 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 instru-

ment; and it is only necessary to place the point of the forefinger, first, on the projecting rim of the perforator, 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, 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, and by means of which you get a view of the spot on which to fix it.

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 impression, 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

* Majendie.

sometimes remains after deobstruction 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 DISEASES OF THE INTERNAL EAR.

Deafness from disease of the auditory nerve is of far less frequent occurrence than is generally believed. 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, for instance 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 functions 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, considerable difficulty still 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 exists, he decides the case to be one of nervous deafness, and applies his remedies accordingly. The more accomplished observer goes much further 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 improved 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." Inasmuch 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 civilised 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

* Müller.

scouts prostrate themselves upon the earth, and applying their ears close 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 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 sensient, 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 questionable 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 increase 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 fill 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 many of these diseases, it constitutes the chief agent of cure ; or, at least, an important 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 of the human race.

CHAPTER III.

HISTORY OF CATHETERISM OF THE EUSTACHIAN PASSAGES.

IN treating of diseases affecting the middle ear I had occasion to advert to catheterism of the Eustachian passages, an operation of such importance as to merit a chapter to itself.

There can be but little doubt that Guyot, a post-master 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, if not of 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 inadequate 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 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 resembling 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 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 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,

* 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.

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 only 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 upwards 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.*

2/ " 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 chirurgical help are those of the external meatus, ulcerated and swelled tonsils, &c., al 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."

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

It appears, from the perusal of this paper, that a most important point in reference to catheterism of the Eustachian tube—namely, of 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 passages 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 stilet 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 la bouche. Quelques chirurgiens ont cherché le moyen de perfectionner cette découverte, plusieurs ont cru y avoir réussi ; mais, malheureusement, les succès n'ont pas répondu à ceux 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

* “Bell's Surgery,” vol. iv., p. 345.

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 passage 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 cavity of the *tympanum*, 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 nose*; 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

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

commencing at about an inch from the extremity ; its point is also slightly 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 assortment 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;

* The late Mr. Pilcher adopted a catheter of this shape, but such an instrument cannot be introduced without putting the patient to needless pain.

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 might 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 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 or 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 it 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, for immediately it is introduced into the nose, its surface becomes imbued with the mucous secretion of that canal.

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*

* Described at page 78.

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, and the same time that, with a certain degree of force, it is conducted into the mouth of the tube. By care-

ful 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.”

DESCRIPTION OF THE OPERATION.

The patient being seated on a chair, 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 maitre* 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 rotatory motion 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. Through the catheter thus inserted 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 de-obstruction, *compressed air* may be employed by means of a reservoir, four inches in diameter and five inches in height, connected with a condensing

syringe by a curved brass tube. 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 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 move 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 when it is desired to introduce injections into the tympanum, but mere exploration of the Eustachian tube may be made without an instrument. 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 nasal passages were extremely contracted, I was obliged to have a catheter made purposely, before I could accomplish the operation. Deleau had previously tried and failed.

Latterly my catheters have been made of malleable silver, which admits of their being bent to any curvature desired. 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° , 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, which is six inches, and provided with a funnel-shaped dilatation at the proximal extremity, in order to admit the pipe of the inject-

* The lamented Lord William Russell, afterwards murdered by his valet, Courvoisier, whose last moments I witnessed; Mr. Charles Kean and myself being the only non-officials admitted by the sheriff into the condemned cell.

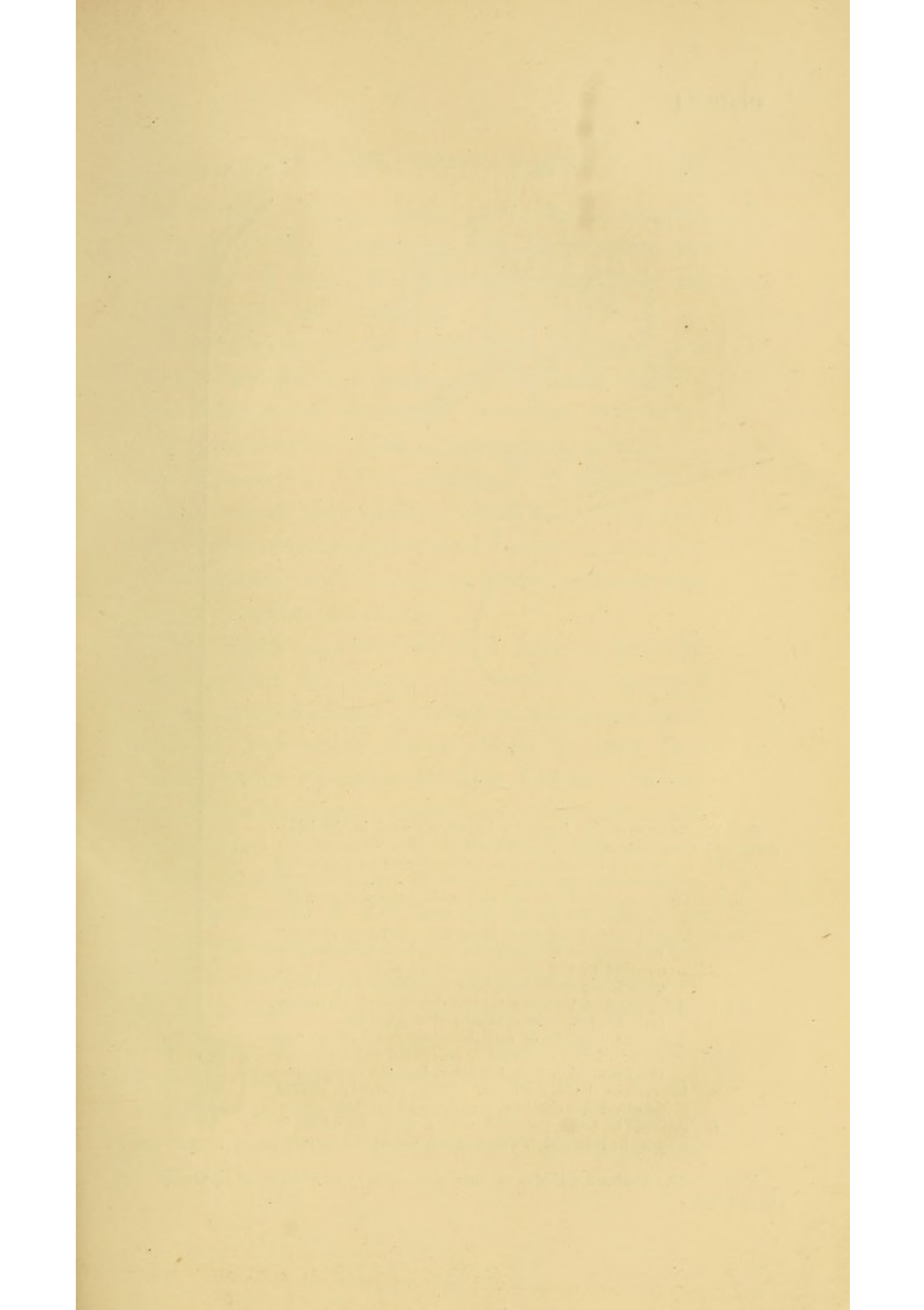


FIG. 1.

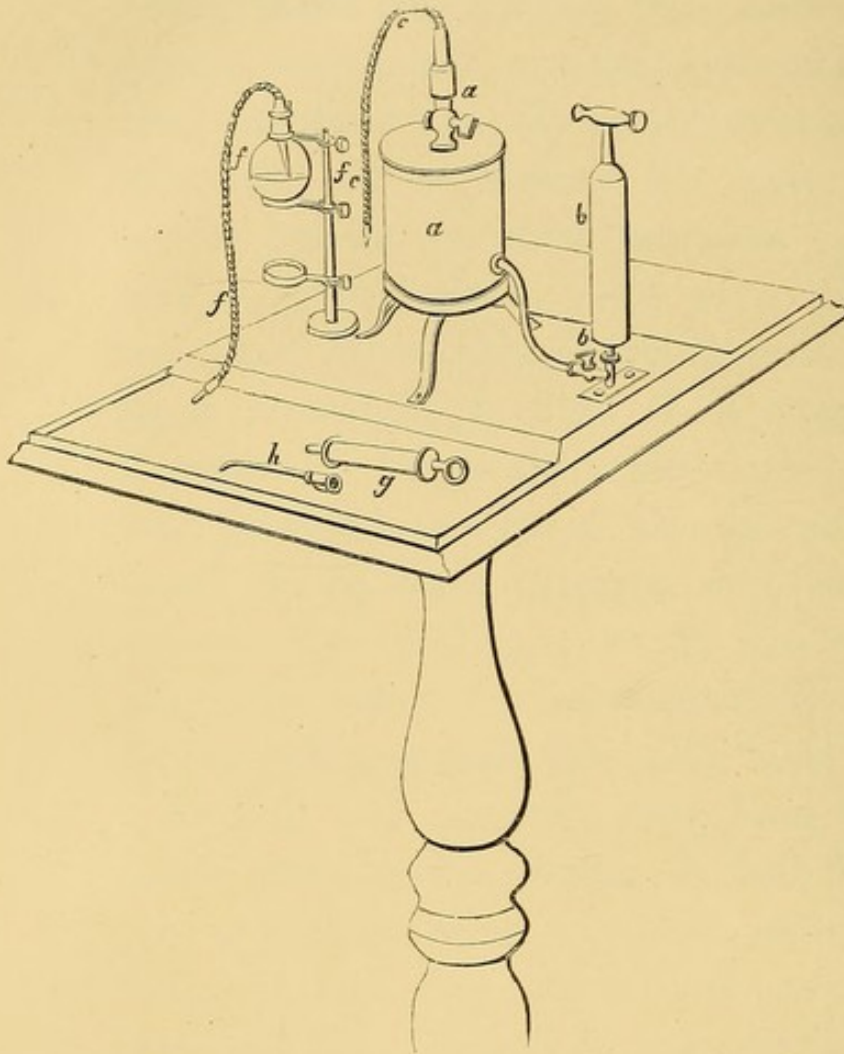


FIG. 2.

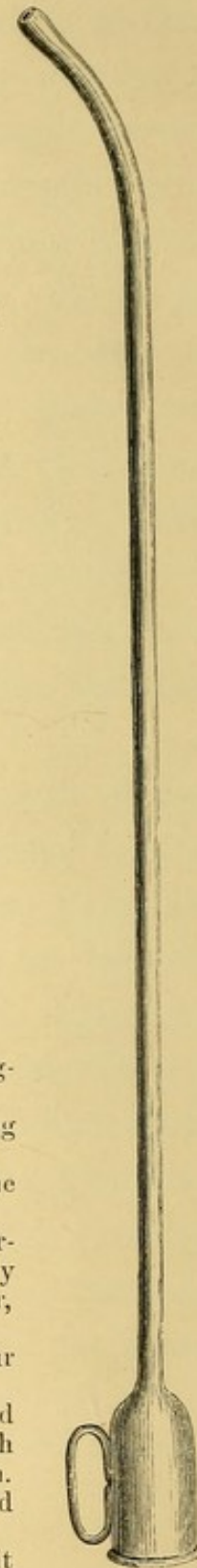


FIG. 1.—SKETCH of the Author's Apparatus used in the Diagnosis and Treatment of Diseases of the Ear.

- a. a. Reservoir for condensed air and stop-cock for regulating its escape.
- b. b. Condensing Syringe, and stop-cock connected with the reservoir by a curved brass tube.
- 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, after being introduced into the Eustachian Tube.
- f. f. f. An apparatus to serve for the conveyance of vapour into the tympanum, described at page 81.
- 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.

FIG. 2.—The Author's catheter of malleable silver so as to admit of alteration in the curve.

ing syringe. 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.

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 small apparatus which I have occasionally employed for this purpose of conveying vapour of air saturated with the moisture of medicated fluids into the tympanum, differs materially from that recommended by either Itard or Kramer. It consisted 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.

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; a method adopted by the late Mr. Pilcher.

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 in an air-press, 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, and elastic tube and stop-cock ; but 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 that which I have described, 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 in general practice who may be disposed to attempt this operation.

The frontlet bandage, 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 a very large number, 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 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, it is one of the chief methods of treatment by which aural surgeons of the present day achieve remarkable results.

CHAPTER IV.

DEAFNESS FROM DERANGEMENT OF THE STOMACH (STOMACH DEAFNESS).

IN the foregoing Outline of the Principal Diseases of the Ear, the deafness has been seen to be chiefly the consequence of structural disorganisation of some portion of the organ of hearing—we come now to a very common form of deafness in which no such lesions are observed.

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 best writings on the subject, not a page is devoted to the intimate connection existing between the stomach and the ear. But although aural practitioners have overlooked the fact, deaf

persons generally, those at least who are anywise observant, are aware of the sympathy existing between the stomach and the 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 analagous disorder affecting the ear should never have received more than the most

cursorily 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 an 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 a morbid condition of the throat and middle ear, as a cause of deafness. In the form of deafness arising from stomach derangement, with-

out 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 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.

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 with water.

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 of a moderate quantity of bread or vegetables in addition, 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 an 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.

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.

DEAFNESS FROM A DISORDERED CONDITION OF THE THROAT.

DEAFNESS, arising from a disordered condition of the throat, though of such frequent occurrence, had attracted so little attention prior to the publication of my first contribution to Aural Surgery,* that many persons, both in and out of the profession, were inclined to ask, "What relation there could possibly be between the throat and the ear?" and "How could a diseased state of the one organ affect the functions of the other?" Though this connection may not, at the first glance be evident, it is, in reality, so intimate, constant, and reciprocal, that no observant practitioner could possibly devote himself to the study of the one without being drawn to the examination of the other. In my own practice, I feel bound to declare, that in the diagnosis and treatment of affections of the throat and ear, they have shed a mutual light, the one on the other, con-

* "Deafness successfully treated through the Passages leading from the Throat to the Ear."

ducing in an especial manner to their more successful management.

The connection between the throat and ear, in their morbid conditions, admits of description under three natural divisions :—

1. The mechanical relation between the two parts, arising out of the necessity which exists in perfect hearing, that the free circulation of air through the Eustachian tube, and in the tympanum, be maintained.

2. The connection between the throat and ear caused by contiguity and continuity of structure through the medium of the mucous membrane.

3. The sympathetic connection between the nerves of the throat and those of the auditory organ.

1. The mechanical relation between the two parts, arising out of the necessity which exists in perfect hearing, that the free circulation of air through the Eustachian tube, and in the tympanum, be maintained.

1. The most obvious relation between the throat and ear is that dependent on mechanical causes ; yet it is a singular fact, and shows how little of scientific attention has been given to aural diseases, that the mode of removal of the most simple kind of obstruction of the Eustachian tube—namely, by Eustachian catheterism—is a remedial agent of comparatively recent introduction.

From whatever cause arising, an obstructed communication between the throat and ear is inevitably productive of deafness. When deafness of this kind exists, it can only be completely cured by the de-obstruction of the Eustachian canal. The cases laid down as curable by the operation of puncturing the membrana tympani, without interference with the tube, are extremely rare; that is to say, cases in which complete obliteration of the passage exists. Even under this rare contingency, the cure is often partial or temporary. Deafness ensues under all circumstances of obstruction or occlusion, simply because when the tube is stopped, the atmospheric pressure is withdrawn from the inner surface of the membrane. When the internal atmospheric pressure is present within the cavity of the tympanum, which it is in the healthy condition, on account of the open state of the Eustachian canal, it of course exactly serves to counterbalance the pressure on the external surface of the drum, leaving the membrane to be adjusted in the proper degree of tension for the purposes of hearing, through the medium of the small muscles of the tympanum and the ossicula. When the internal pressure is withdrawn by occlusion of the Eustachian tube, the external atmospheric pressure alone remains, which is sufficient to force the membrane of the drum inwards, and, by rendering it permanently tense, to put a stop to the action of the tympanic muscles, and to destroy the

vibratile properties of the membrane. It is well known that a certain degree of relaxation of the membrane is necessary to insure its vibration by the action of sound.

The communication between the throat and ear is cut off in a variety of ways. It is by no means uncommon in simple catarrh to have the tumid state of the mucous membrane of the nose and throat which attends a cold extend into the Eustachian canal so as partially or entirely to obstruct it. In some cases, this engorged state of the mucous membrane remains after all other signs of cold have disappeared, and keeps up a permanent obstruction of hearing. Another very frequent cause of occlusion is the secretion of a viscid mucus by the lining membrane of the tube and tympanum, which inspissates and remains in the tube, frequently for years, without any successful attempt being made to relieve it by nature alone. When the inspissated mucus is accumulated only about the trumpet-shaped extremity of the Eustachian tube it often becomes removed, and the attendant deafness is relieved spontaneously by some sudden respiratory action. The patient, whilst yawning, sneezing, blowing the nose, or it may be vomiting, feels a sudden click or "pop," and is instantly relieved of the deafness, and of every other unpleasant sensation.

But adhesion of the sides of the tube, so as to completely obliterate a considerable portion of its

length, is the most serious of the affections to which this most important passage is liable ; for in this case the guttural communication is probably for ever destroyed. Adhesion occurs sometimes during the course of inflammatory fevers, in the different forms of cynanche, and at other times exists as a congenital malformation. When the adhesion is limited in extent, or only implicates a part of the diameter of the tube, so as to form stricture, it may often be overcome by judicious management. The bands of adhesion may possibly be broken down, or the strictured part of the tube enlarged by gentle and repeated pressure with the aid of a small-sized silver or gum-elastic catheter, or by a stilette of whalebone or cat-gut passed through the Eustachian-tube catheter. The most consummate tact (probably to be acquired only by vast experience and practice) is necessary for the success of so delicate an operation.

In all these different forms of obstruction of the channel of communication between the ear and throat, catheterism of the guttural passage is of the utmost importance, both as a diagnostic and remedial agent.

Vomiting, the only other rational means of evacuating the tube and tympanum, is most uncertain in its action on the ear. I have met with numerous cases in which emetics have been pertinaciously tried without the slightest effect, where the simple introduction of the catheter was sufficient to remove the deafness. We have not, and never

can have, anything like an equivalent for catheterism in simple obstruction of the Eustachian tube.

Another obstruction arises from a cause exterior to the tube itself, and affecting it only in a secondary manner: I mean, enlargement of the tonsil gland. The tonsils are placed in the vicinity of the Eustachian canals, and when considerably enlarged (the enlargement extending in an upward direction), they press on the mouths of the tubes so as to cause obstruction or occlusion. Strange to say, this has altogether been denied by several writers on Aural Surgery; but I am prepared with abundant proof in support of its truth. The fact has probably escaped the notice of others, in consequence of the enlarged tonsil not being seen on an examination of the throat. In point of fact it must be felt for, to be detected. The inflammatory action which is attendant on the enlargement of the tonsil gland, produces adhesion to the arches of the palate, between which it is placed, and these adhesions prevent its advancing into the area of the throat, and thus it easily escapes detection; were it otherwise, defective voice and speech might perhaps be the result, but not deafness. If the enlargement encroach still more on the area of the fauces, then deglutition and respiration may become affected; and with these of course the general health suffers deterioration, so that the tonsil glands, in a state of enlargement

give rise to a variety of derangements dependent upon the position they take up in the throat. A considerable time has elapsed since I first made known these facts to the profession, but even yet they do not appear to have attracted all the attention they demand. I am anxious to make myself clearly understood upon these points, for I flatter myself the day will come when the enunciation of such facts and opinions will be admitted to be of the utmost importance, and a step gained in the walk of science.

8
Having experienced the good results of excision of enlarged tonsils, or, more properly speaking, morbid growths springing from the tonsil glands, in my own practice, in the various disorders mentioned, I cannot but take pride to myself also for having been instrumental in causing this important operation to be of frequent occurrence, by disabusing the minds of medical men of the risk and danger attributed to it by authors of eminence and distinction, who in thus condemning it, cannot have had any practical experience of the subject.

Excision is the only remedy to be depended upon in certain cases, and when performed in a proper manner, I know of no other treatment in the whole range of aural surgery, so uniformly, extensively, and permanently successful. It is worthy of remark, too, that there is scarcely any more frequent cause of deafness in this country

than tonsillary enlargement. This mechanical interference with the function of the ear is extremely prevalent among children and young persons.

Sometimes the enlargements are not sufficient to encroach on the mouths of the Eustachian tubes, but the irritation they keep up causes the orifices to be covered by a thick tenacious mucus. Patients in such cases, when the mucus by some accident is removed, hear perfectly for a time, but as soon as the mucus re-accumulates, the hearing is again affected.

There is yet another probable cause of mechanical obstruction of the mouth of the Eustachian tube, occurring in persons of middle and advanced life—persons who have suffered much from dyspepsia, as the result of improprieties of diet—from mental anxiety, or from general debility. In these cases, a relaxed condition of the mucous membrane of the throat is observable. It is seen hanging loose and flabby, and, as it were, in folds. Here I have sometimes suspected an overlapping of the mouths of the Eustachian tubes by the loose mucous membrane, and the results of treatment have occasionally justified the opinion I had formed; for, shortly after excision of a small slip of mucous membrane from underneath the arches of the palate, amendment, more or less considerable, has taken place.

These, then, are the chief modes in which a mechanical obstruction between the throat and ear is

produced so as to occasion deafness, and also the principal means of relieving the morbid conditions on which the loss of hearing depends.

2.—*The connection between the Throat and Ear caused by contiguity and continuity of structure through the medium of the mucous membrane.*

2. The next form of connection between the throat and ear, in aural disease, is that which occurs in the spread of disease from the guttural to the aural mucous membrane. I believe it to be rare that any case of deafness proceeds from the first failure of hearing to severe deprivation of the sense without this connection coming into play in an important manner, and yet the fact has been completely overlooked. In no published work on Deafness is it even hinted at. In former publications, I have shown that the two parts are connected in diseased states through the medium of the mucous membrane, which lines alike the throat and auditory organ; and I pointed out that when the mucous membrane of the ear is in a morbid condition, we may often effect its cure by applying remedies to the kindred mucous surface in the throat.

I have, throughout my entire practice in aural medicine and surgery, warred against that excuse for the ignorance of aurists—that bugbear behind which they have cloaked their inane treatment—namely,

nervous deafness. By a close examination of disease, by dissection, by physiological facts, and by the action of remedial agents, extending altogether over a great number of cases, I have satisfied myself that nervous deafness is a very rare disease; that is to say, the loss of hearing from disease, torpor, or inactivity of the auditory nerve, the different parts of the external, middle, and internal ear, comprising the osseous canals, strata of air and liquid, bones, muscles, membranes, and secretions, which form media for the transmission of sound to the nerve of sense, all remaining in a healthy condition. On the other hand, I have contended that the majority of those cases heretofore set down, from insufficient or unskilful diagnosis, as nervous deafness, are in reality dependent on a diseased state of the mucous membrane of the middle ear.

In my Fourth Contribution to Aural Surgery, I stated distinctly that more than two-thirds of all cases of deafness arose out of morbid conditions of the mucous membrane of the ear; and I gave a Statistical Table, showing the mode by which this state of the mucous membrane was produced in two thousand cases, treated at the Institution and in private practice under my care. In one hundred and twenty dissections of deaf cases, the aural mucous membrane was said to be diseased in no less than ninety-one cases, or upwards of three-fourths of the number examined. This result affords a remarkable

corroboration of the novel views of the nature and treatment of deafness previously developed by me on various occasions, particularly in a series of papers published in the *Medical Gazette* of Session 1841-2.

The continuity and contiguity of the mucous membrane of the throat and ear offer one natural and easy solution of the mode of the connection observed between diseases of the two parts. The distance from the throat to the tympanal chamber of the ear, by way of the Eustachian tube, is somewhat less than two inches, there being in the natural state a free surface of mucous membrane extending uninterruptedly through the tube between the two parts. Can we wonder, then, that disease in one spot should be transmitted with the utmost facility to the other in which the same anatomical elements exist? We see daily instances of catarrh extending from the nose to the ophthalmic mucous surface and the membrane lining the frontal sinuses, and from these points it often travels, in less than twenty-four hours, to the ultimate mucous cells of the lungs, or through the whole length of the intestinal canal, distances compared with which, that between the throat and ear is quite insignificant.

Among the most remarkable instances of the spread of a morbid condition from the throat to the ear, by the track of the mucous membrane, are cases of aural disturbance and deafness occurring in the course of the exanthemata, small-pox, scarlatina, and measles,

in all of which, throat disorder is an early and a prominent symptom. Deafness is well known to be a common symptom of the eruptive fevers; the congestion and inflammation speedily extend to the Eustachian tube and tympanum, occasioning severe pain in the ear, and deafness, from the alteration caused in the capacity of the *cavitas tympani*, by the engorged membrane.

Unfortunately, in the case of the exanthemata, the decline of the general disease is not always accompanied by restoration of the healthy state to the guttural and aural mucous surfaces. The cavity of the tympanum is so limited in extent, that any morbid change in its lining mucous membrane, however slight, interferes with the free action of the tympanal apparatus, and consequently with the ready transmission of sound. These changes have in themselves little tendency to disappear, unless assisted by art. The ear, indeed, beyond almost any organ of the body, is peculiarly inapt to throw off any morbid condition that has once been established in its structures. By a reference to the Statistical Tables, it will be found that, out of a large number of cases, seventeen per cent. are caused by the exanthemata alone. Of these, scarlatina (in which disease the throat symptoms are more severe than in small-pox or measles) leaves more deafness than the two latter added together. The *modus agendi* is, without doubt, the accumulation of mucus in the drum, which be-

comes inspissated and remains sometimes fixed for life, unless removed by catheterism, or some lucky dislodgement from sneezing, vomiting, &c., or, which is still more permanent and serious, the thickening of the mucous lining of the cavity, and in some cases the adhesion and agglutination of its sides together, so as to render the deafness utterly incurable. At other times the mucous membrane of the cavity ulcerates and erodes the membrane of the tympanum, thus setting up an otorrhœa very difficult of treatment, and generally destructive of acute hearing. The mucous surface secretes pus of an offensive odour, and the thickened and spongy membrane is enlarged to such a degree as to protrude through the opening of the drum, into the external passage, forming in this manner a kind of false polypus.

The uniformity with which a common cold extends from the nasal cavities and throat to the ear, along the mucous membrane, is a matter of every-day observation. In common colds, the engorgement of the mucous membrane is commonly resolved in a few days, and the increased secretion of mucus is either absorbed or expelled by way of the Eustachian tubes. Not so, however, in the endemic catarrh or influenza. Here the loss of hearing is more complete, and the morbid state of the ear remains long enough, in many cases, to destroy the efficiency of the organ.

The different forms of cynanche offer other examples of the spread or transmission of disease from

the guttural to the aural mucous surface. These disorders rarely, indeed, occur without being followed in their course by ear-ache, and more or less inflammation within the ear, sometimes passing away at the decline of the throat disease, but quite as often settling itself in a chronic form within the ear.

As the final illustration of the extension of disease from the throat to the ear, by continuity of surface, but certainly not the least important, I may instance that kind of deafness which comes on slowly, scarcely perceptible at first, and perhaps, not measurable in its increase from year to year, still causing a painful loss of hearing, if measured by longer periods, such as five or ten years, which is caused, or at least preceded, by a relaxed and thickened state of the mucous membrane of the throat. The guttural mucous membrane seems to have grown too large for the surface on which it is laid, and thus fits loosely, hanging at the back and sides of the throat in folds, or presenting little islets of membrane protruding from the natural surface. This state of throat may take its origin from acute or chronic inflammation of the part itself, but more frequently there is little, if any, sign of increased action throughout its whole course. It may often be diagnosed, without looking into the throat, by the state of the nostrils, which are commonly tumid and red at their inner edges.

The condition of the membrane, from whatever cause arising, by extending into the ear, necessarily

impedes the hearing; and in the course of years, when all induration and relaxation have left the throat, the patient still remains deaf, from the disorganisation which has occurred within the ear. Thus we see many patients of forty and fifty years old, or upwards, with a tolerably healthy condition of the throat, and little appearance of physical disease of the ear, who are nevertheless, deaf, and whose deafness has been gradually increasing in intensity for many years. On minute inquiry, these persons are often well aware of the bad state of throat, accompanied by the peculiar hacking cough which attends this form of impaired hearing, having existed many years while the deafness was advancing, but for want of a proper diagnosis such cases generally have all chance of recovery destroyed, from having been treated by some empirical aurist, and sometimes, I am sorry to say, by some professional aurist, as pure nervous deafness, quite independent of physical disease.

Dyspeptic complaints very frequently cause a morbid condition of the throat, scarcely distinguishable from the idiopathic affection. At other times the bad state of the throat is caused by, and is a symptom of, general debility. Indeed, no part of the body is more remarkable than the throat for the readiness and constancy with which it sympathises with the state of the general health.

It must be borne in mind, as of paramount im-

portance, that in the great majority of these cases of ear disease, whether arising from the specific sore throat of the eruptive fevers, the different forms of cynanche, influenza, simple catarrh, or relaxation of the throat, the throat disorder precedes the affection of the ear. Occasionally we find, from exposure to cold, &c., the ear is the first part affected, the catarrhal symptoms subsequently extending to the throat; but these cases bear a very small proportion to the cases in which the throat disorder is the primary affection.

Besides the illustration which may thus be taken, from the progress of disease, of the great dependence of ear disease on throat disorder, another series of proofs can be taken from the treatment of aural affections. From the earliest periods of medical practice, gargles have been used as remedies against deafness. These applications have for the most part been composed of astringent or stimulating substances. The actual cautery, the potassa fusa, and the nitrate of silver, are more recent applications. None of these agents can act upon the ear directly; they must of necessity produce their effects by improving the condition of the throat, and by benefiting the hearing in a secondary manner. That they are capable of improving the state of the ear, no observant aural practitioner can for a moment doubt. In my operations for the removal of enlarged tonsils, I have seen in very many cases the hearing

restored in which no obstruction to the Eustachian tubes could be supposed, but where the improvement of the hearing could be explained in no other way than by supposing it to depend on an improvement caused in the mucous membrane of the throat, which in its turn improved the state of the membrane within the ears. Guided by a sound and wholesome experience, I have not hesitated in certain cases of deafness, to remove the uvula, that is, in cases where great irritability of the throat existed, and where the uvula gave evident signs of being the cause of the guttural irritation. This operation must, I conceive, act in the same way as those operations for tonsilotomy, in which, from the position of the enlarged tonsils, it would be impossible for them to interfere with the integrity of the Eustachian tubes. Certain persons have not hesitated to question these operations; nevertheless, I believe them to be thus capable of a scientific explanation, as I know them in practice to be productive of most beneficial results. A French pathologist has lately published an account of some cases of deafness, cured by applying the actual cautery to the mucous membrane at the back of the throat—a much more severe remedy than any I have ever ventured to recommend.

Evidence such as this might be extended so as to show the influence excited by the condition of the throat on the organ of hearing. In the instances

already cited, I trust I have made it evident that, owing to the continuity of structure between the throat and ear, an injurious or a beneficial impression is rapidly transmitted by the guttural mucous membrane to the mucous membrane lining the cavity of the tympanum. It will, I have no doubt, soon come to be the general opinion, that this same mucous membrane is the principal, and generally the only tissue affected in deafness.

It has been the custom to recommend deaf persons to guard the outer ears from cold. There can be no doubt of the propriety of the recommendation, but I am persuaded that the important part of the ear (the mucous membrane) is more readily reached by way of the throat than by the external ear; so that in guarding against cold, we should be quite as careful of the throat as of the ear itself. Having descanted thus much on the connection between the throat and ear through the continuous mucous surface, I proceed to point out the nature of the nervous connection between the throat and the ear, and its applicability to the explanation and relief of aural disease.

3. *The sympathetic connection between the Nerves of the Throat and those of the Auditory Organ.*

3. The sensation of the whole face is principally excited through the medium of the fifth pair of

nerves, which is distributed extensively through the superficial parts of the face and side of the head, and which supplies the tongue, nose, and eyes, and, through its connection with the optic ganglion, the ears. Thus it is largely connected, as the nerve of common sensation, with the four principal senses, including the organ of hearing.

Further, this important nerve supplies the throat, uvula, tonsils, and soft palate, by numerous branches distributed to these several parts. It is to two of the localities supplied by the fifth or tri-facial nerve that I have now to claim attention. I have already shown that there is a mechanical connection between the throat and ear by means of the Eustachian tube, another connection by means of the mucous membrane extended from one to the other; and I now proceed to demonstrate, for the first time as I believe, a third, and not less obvious and important one, in the properties and functions of the nerves distributed to the two parts.

It is a remarkable quality of the great sensitive nerve of the face, that any irritation of one part of it frequently produces an irritation in other parts supplied by the same nerve. The instances of this fact are numerous. Thus, ear-ache is a very common sequence of a carious tooth; the pain of tooth-ache being reproduced, as it were, within the ear. The otalgia can be shown to be dependent on the diseased tooth, by its ceasing immediately on

the extraction of the tooth. While, again, drinking cold water, exposure to cold air, or anything which increases the tooth-ache, aggravates the secondary affection excited in the ear. In neuralgic affections of the tri-facial nerve, the pain frequently extends from the locality first affected to every part supplied with sensation by the fifth pair, including the auditory organ. Though in the first instance pain excited in the ear in a sympathetic manner is purely nervous, yet, after having existed for a time in a severe form, it produces organic disease in the part thus affected. Thus sympathetic otalgia, or nervous pain in the ear, often passes on to otitis, or inflammation of the ear. But the sympathy excited in the auditory organ, through the intervention of the fifth nerve, is not confined to the branches of the fifth supplying the ear. It certainly extends to the nerve of special sense, the auditory, and probably also to the twigs of the seventh, or portio dura, distributed to the tympanic muscles. As an example of this, I may adduce the effect of errhines on the ear. There can be no doubt that, in deafness from torpor of the auditory nerve, the judicious use of sternutatories stimulates the auditory nerve and the motor nerves of the ear, the stimulus applied to the nose being communicated by sympathy to the auditory nerve. Stimulants applied to the mouth and to the salivary glands probably act in the same manner. With the older writers and practitioners in aural

surgery or ear medicine, sialogogues formed a favourite class of remedies ; now they have been improperly allowed to fall into disuse, and have disappeared from the materia medica. Blisters behind the ear, sinapisms and tartar emetic ointment applied in this situation, probably act in the same manner ; at all events there is no direct connection between the nerves of the skin behind the auricle and the deep-seated distribution of the auditory nerve. Neither is there any direct explanation of the modus operandi of these applications. To pursue the subject further, in what other way than by sympathy between the different parts supplied by the fifth nerve can we account for the benefit derived in ophthalmia from spontaneous soreness behind the ears ? I believe counter-irritation to be a term without any definite meaning, and not at all adequate to the explanation of this class of facts.

But to return to the subject more immediately under consideration, namely, the sympathies between the throat and ear. A person rarely suffers from quinsy (acute inflammation of the throat) without enduring intense pain in the internal ear. It may be supposed that this is explicable by the continuity of the guttural and aural mucous surfaces in the manner already described ; but the explanation is not in this circumstance alone, because the otalgic affection begins early in the complaint, before there has been sufficient time for the spread of the inflam-

mation from the throat to the ear. Besides, the pain in the throat is continuous, whilst that in the ear is darting and intermittent. The mucous connection between the two parts often, indeed generally, comes into play in subsequent stages of the disease, and produces sometimes actual otitis; but the pain of this is quite distinct from the piercing nervous irritation in the ears so often felt at the very outset of severe sore throat. When the throat is inflamed without the ear being implicated, it frequently happens, as in certain cases of toothache, that the contact of cold water or cold air upon the throat, produces intense pains in the ears. I have often in practice had opportunities of witnessing in cases of deafness, during recovery from nervous fever, and some other kinds of impaired hearing, the great facility with which anything applied to the throat affects the auditory nerve. Thus, drinking a glass of ale or porter in many of these cases dulls the sense immediately; the same effect results from drinking strong coffee. This does not occur as part of the general effect of taking beer or coffee into the system. The effect is too sudden; and I am confident the same would occur were the throat merely gargled with these fluids. Neither is it simply owing to their stimulating effects, for other stimulants, such as gin or brandy diluted, do not produce the same consequences.

Enlarged tonsils are, in the chronic uninfamed

state, almost void of sensibility ; yet it is most remarkable, that if an enlarged tonsil be seized with a pair of forceps, though no pain may be experienced in the tumour itself, a disagreeable and even painful sensation is frequently felt in the tympanum.

In the operation for the removal of an elongated uvula, patients frequently cry out from the severe pain caused within the ear, though little is felt at the point of excision.

Irritation of the uvula, as I have explained in the former section, often spreads from the uvula to the ear through the Eustachian tubes by continuity of surface ; but I am also persuaded, by extensive observation, that an irritable uvula frequently deranges the organ of hearing by purely sympathetic irritation of the ear. I have seen many cases in which tinnitus aurium was manifestly excited in this manner.

In the therapeutic application of remedies to the throat for deafness and auditory disease, I have no doubt that the principle I am contending for obtains to a considerable extent, though it has been overlooked, and many valuable therapeutic aids have become obsolete in consequence. Thus, stimulating fluids to the throat affect the ear in a twofold manner, the one by producing an improved condition of the mucous membrane of the throat, which effect extends along the Eustachian tube to the

tympanal cavity; the other by the nervous transmission of the stimulus from the one locality to the other. These actions, though they often occur spontaneously, being produced by the same means, are essentially different in their nature. The one, in its mode of action, is obvious to our senses—the other seen only in its results; the one effect traverses gradually from the throat to the ear, over the mucous membrane—the other is often transported instantaneously from one point to the other without in the least degree affecting the intermediate tissues; to use the language of physical science, the one acts at sensible, the other at insensible distances. I have little doubt that all applications to the throat in cases of deafness, whether stimulants or astringents, have this double mode of action, though sometimes one, and sometimes the other, may preponderate.

I now proceed to a very important and interesting point, which very naturally engages our attention, growing, as it does, out of the study of aural medicine and surgery. I allude to the connection which exists between the organ of hearing and the organs of voice and articulation. This connection is so obvious, that it has always attracted the attention of those engaged in the study of aural disease. Congenital deafness is inevitably attended by dumbness. Complete deafness occurring after the powers of speech have been developed

causes a gradual, and generally in the end, an entire loss of natural articulation. Stammer, though by no means dependent on any defect of hearing, occurs I am fully persuaded, in a considerably greater proportion among deaf persons than among others. We read in Scripture of one that was deaf, and had an impediment in his speech, and the complication thus mentioned, is one of which all acute and experienced observers must be aware.

In cases of partial deafness, we rarely see an instance in which the defect has not altered, in some degree, the voice of the individual, rendering its pitch higher or lower, louder or softer, than is natural. Deaf persons generally speak slowly, and in conversation are tardy in answering questions, even when they hear what is addressed to them. That this does not arise entirely from habit I am persuaded, but rather that the passage of sound from the ear to the mind, the transmission of the will to speak, and the motor power to the vocal organs, are retarded. These alterations of the voice in cases in which the deafness is dependent on actual ear disease, are very different from the thickness of speech produced in cases of deafness from enlarged tonsils, in which the defective articulation is more dependent on the guttural enlargements than on the ear disease.

As regards the relief of these secondary affections

of the voice, of course the main thing to be depended on is the restoration of the hearing, after which the voice gradually regains its natural firmness of tone and distinctness. In the cases of thick speech from enlarged tonsils, and the occasional stammer which I believe to arise from this cause, the remedy is obvious, easy, and complete, in the excision of the morbid growths. By directing the attention of deaf persons to the subject, I am convinced they might often be enabled to preserve the natural voice, even in severe deafness, to a greater extent than is generally done. Patients are themselves placed in a position of great difficulty, because they have no means of measuring correctly the power or tone of their own voices with those of others. This want of comparison and contrast is severely felt. In certain cases, they hear their own voice much more loudly than that of others, and then they naturally lower their own to accommodate it, as they imagine, to others, and hence often become inaudible. On the other hand, when they do not hear their own voice distinctly, they generally speak loudly and harshly to bring it up to the point at which they hear the voices around them. But to remedy this, the friends may do much by making the patient aware of the real relation between his own and other voices.

CHAPTER VI.

ON DEAFNESS FROM MORBID CONDITIONS OF THE MUCOUS MEMBRANE OF THE THROAT AND EAR.

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—infinity more than has yet been imagined—the faculty of speech.

My subject confines me to the consideration of one division of the great mucous track, ramifying throughout 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 dependance 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.

The great agent in producing this morbid state of the mucous membrane 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 membrane, 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 blood-vessels, 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 sub-acute 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 organisation, secreting a thin mucus, which is either absorbed or carried off by the Eustachian tubes so as never to accumulate to any 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 accu-

rately informs the listener of the comparative fluidity or tenacity of the mucous accumulation. The patient, when the air is thus obstructed, sometimes obtains a temporary relief by a dislodgement 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 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 pulverises when rubbed between the fingers. The membrana tympani is seen shining at the bottom of the passage, like a thin lamina of ivory, of an opaline 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 of the permanently inactive state of the auditory organ ; there is, however, I believe no certain rule for its existence in this or any other form 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 membrane 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 Itard, 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 membrane 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 outer 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, by which they are fitted 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 organisation 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 referable to the mucous membranes amount to more than four-fifths 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 passage 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 now given, and observed again and again, at the Metropolitan Ear Infirmary, 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 nonentity ; 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 dis-

covered the paramount importance of the condition of the mucous surfaces in the production of ear disease.

If we scrutinise 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 on 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 referable 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 passage alone—the disorder is very commonly induced by disease within the drum. In fact, so intimate is the connection 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 dimi-

nished 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 between 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 up air 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 make the inquiry, for the touch of the probe will enlighten me as to whether my patient has been subjected to such treatment. Syringing the ears is admissible only

for the removal of accumulations of indurated wax or foul secretions, and the fact of their presence in the passage of the ear should be ascertained by means of the speculum before it is resorted to. To syringe upon mere speculation is unpardonable when we possess such facilities for determining its necessity, or the propriety of the operation.

CHAPTER VII.

ON DEAFNESS FROM ENLARGEMENT 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 considerable 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 tenaculum, 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 unfrequently 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 swallowing, 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 re-masticated. 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 disagreeable 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 com-

plaints are most common. Children of lymphatic temperament and fair complexion are most often affected with tonsillary disease as the sequel of cold. 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 connection 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 certainly to be removed "by surgical assistance;" and Valsalva relates a case of ulcerated tonsil, in which the presence of a tent blocked up the Eustachian tube, and thus occasioned deafness, showing most satisfactorily 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 the 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 they must henceforth 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 believe 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-cases. 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 15 lbs. 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 7 lbs., 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 tympanum, 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 passage 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 connection which exists between diseased states of the throat and the production of aural disease. The subject is especially worthy the thought and attention of those who attach any value to such outrageous absurdities as glycerine, almond oil, and ear-drops generally. That such quackeries should find advocates among qualified medical practitioners in this the nineteenth century, is disgraceful, and shows conclusively how little understood is the sub-

ject of aural surgery by the mass of the profession.

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.

1. *Acute and Chronic Otitis.*—*Inflammation of the Ear.*—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 acute 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 the disease the same thing happens, but in a less marked degree.

2. *Internal and External Otorrhœa.*—*Discharge*

from the Ear.—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 passage. 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.

3. *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.

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

The four 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 external 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 outer passage in cases of otorrhœa.

CHAPTER VIII.

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 versá*, 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 sudden and severe 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 until 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; 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 passage 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

otorrhoea 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 impels the sufferer to pick the passage with pins, etc., and thus provoke instead of ward off the disorder. Protection of the passage from cold, and the use of a solution of nitrate of silver, ten or twelve 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 neglectful in this respect.

CHAPTER IX.

TREATMENT.

IN the treatment of confirmed deafness, the strictest regard should be had to the cause of the disease, and the stage in 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, beneath 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 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 may be resorted to, when it can be performed without giving pain, and the air-douche moderately and carefully 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 circum-

stances, 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 antiphlogistic 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, with a variable amount of deafness. If the discharge disappears, and the membrane cicatrizes after suppurative perforation, which frequently happens, though it has been a subject of doubt, deafness, in an increased degree, 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 Infirmary, 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 the otitis advanced to suppuration, and the membrana tympani ruptured, the hearing was very considerably restored, showing, most satisfactorily, that the cicatrized membrane had been the obstacle to hearing, and, therefore, 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 this fact we have at once a clue to the frequent failures of Sir Astley Cooper, and his occasional success, for in ignorance of it he operated indiscriminately.

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, some counter-irritation applied behind the ear and beneath 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 passage 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*, and 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, for the reasons assigned hereafter, I have sometimes fancied that the secretion and disgorging of the mucous membrane have been assisted by their use. 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 catheter and stethoscope show unequivocally that the lining of the cavity of the tympanum is thickened, its resolution may be attempted by the daily application of an iodine ointment behind the ears and beneath 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 it 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 passage. 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 disorganisation 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.

The only treatment which can be adopted with success, having regard to the preservation of the sense of hearing, will be set forth in a subsequent chapter.

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 lifetime, 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 passage. 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 for a time 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 considerable power over the disorder. It will not often effect the cure, but it will generally afford more or less 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. The mere passage of the catheter along the nose and into the Eustachian tube sets up a more healthy action of the mucous membrane, over which it travels.

Other means to amend or invigorate the constitution may be tried. I frequently 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 is more calculated to do good than 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 passage 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 passage. I believe it will generally be found that tinnitus is caused by the variations of atmospheric pressure upon the membrana tympani, caused by

different conditions, as occlusion, or constriction, of the Eustachian tubes ; or it may be caused by bands of adhesion in the cavity of the tympanum, the result of inflammation of its lining membrane producing pressure. 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. Tinnitus is almost invariably absent in cases of perforate membrana tympani. Tinnitus, however, is a problem yet to be solved, but I am convinced it is somehow or other associated with *pressure*.

Counter-irritation is rarely, if ever, of service in deafness of long standing. Gargles, when allowed to penetrate to the throat, which the patient rarely permits, may be used where any relaxation about the throat is complained of ; and, in 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.

The *blistering* propensities of one of my contemporaries cannot be too severely condemned. The torture is all in vain. So of veratria or strychnia, internally or externally ; they are useless.

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 in a subsequent chapter 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 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 whalebone 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. 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.

Polypi in the Outer Passages and Middle Ear.
—Much has been written concerning this trouble-

some 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 of operations connected with aural surgery. Every case on which I have operated in the way mentioned has done well. When the diseased growth is in its incipient stage, a careful inspection of the passage is necessary to make it out exactly, for it either springs from the walls of the tympanum itself, or from the 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.

Tonsillary Enlargement.—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 devised 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 4,000 morbid growths from the throats of 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, and especially as to any difference of opinion of the curative results of the operation.

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, carefully avoiding the arches of the palate, which are sometimes adherent to the growth. 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.

The fears of the timid may be allayed by stating that the removal of a morbid growth from the tonsil is almost a painless operation, if performed with ordinary skill, and with a due regard to the mode of seizing the growth by the tenaculum. If more than the diseased growth be included within its grasp, pain necessarily follows, but it must be a clumsy and inexperienced operator who could thus manipulate. It may safely be set down as an axiom that, if either pain or hæmorrhage attend the operation, parts have been needlessly wounded, for the growth to be removed has neither nerve to give pain nor blood-vessel to bleed. It is neither more nor less than a deposit of fibrine, the result of repeated inflammations.

CHAPTER X.

ON OBSTRUCTIONS OF THE NOSE IN CONNECTION 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 connection 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 stockbroker consulted me for deafness, who for years had never been able to breathe through the nose. 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 ordi-

nary 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, in which 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 connection with deafness ; and it is in accordance with the principles laid down, that I consider the nasoguttural 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, has sometimes the effect of producing chronic engorgement of the mucous membrane of the nose, and thus occasions 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 glands 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.

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 nostrils 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 (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. In short, the patient believes he is gargling the throat when he is only gargling the mouth, not a drop of the fluid having penetrated beyond the veil of the palate, which shuts off the cavity of the throat from the cavity of the mouth.

CHAPTER XI.

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 disease 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 attributed 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,

* I know not whether the observation has been made before, but often whilst taking a part in the *conversational* instrumental music of Beethoven, my attention has been arrested in the midst of some of his most sparkling morceaux by half a dozen bars of most touching melancholy sadness. I have pictured to myself the great master, careering away in his flight of musical fancy, suddenly arrested by the thought, "Alas! the inconsistency! here am I, Beethoven, the most miserable of men, providing an everlasting feast for the happy and the gay of all future ages!" Then, embodying the idea in the melancholy phrase alluded to, once more giving reins to his fancy to the end of the strain destined to last for ever.

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 depressions which their malady tends to produce. This cannot be effected unless the bodily health be attended to. The best regulated mind yields to the effect 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 have 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, etc., 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 in 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?" etc. etc., will be half anticipated. Rather wander from the subject. Ask him the day of the month? the distance to Liverpool? what is the state of the weather? etc. 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 enter on an arithmetical calculation, or speak 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 themselves 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 the 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 that 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 connection 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, but before doing so I will make a remark which is appropriate here, though it has reference to such aids, and I may have to make it again—namely, the importance of selecting any such adventitious assistance as will not shut out from the eye of the deaf the lips of the speaker. The tendency of deafness is too frequently towards final extinction of the sense ; the compensating power of the eye, therefore, cannot be too highly estimated.

CHAPTER XII.

EAR TRUMPETS.

To many among the incurably 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 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

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

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

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 experienced 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 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 in-

efficient as too small. The happy medium will be found either in the tin trumpet I have adverted to, or 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 immortalised 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, 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,

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

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 Infirmary. 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 ears, 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 instru-

ments 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 be fairly 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, would be in vain.

In a work published some years ago by Mr. Wilde, of Dublin, he says :—“ The cases which derive most benefit from artificial means are those of pure nervous deafness, or such as have lost the membrana tympani and some of the ossicula in early life.” Now, according to my experience, these are the very identical cases in which ear-trumpets are of no use, as above stated.

The effect of an ear-trumpet is to convey sound with sufficient force and intensity, to the membrana tympani, in its thickened or diseased state, as to cause it to *vibrate*, which it would not do by transmission of the ordinary degree of sound. This is my theory of the rationale of an ear-trumpet. The same author goes on to say :—“ Patients with dense white tympanal membranes (in which case I believe

the lining of the tympanal cavity is also affected by the result of chronic inflammation), do not derive as much benefit from mechanical appliances as either of the former." Here, again, I am at issue with Mr. Wilde. If my theory be correct—and my experience assuredly tells me it is—patients with dense white tympanal membranes, or in any case of deafness resulting from chronic inflammation, which I believe to be in the proportion of seventy per cent.,—patients, I say, thus situated, are the very persons to be served by the use of an ear-trumpet, when their deafness has advanced to such a degree as to shut them out from social converse without such assistance. There must be a something to vibrate. By the vibration the impulse of sound is conveyed onwards through the ossicula to the inner membrane which encloses the aqua in which the sentient extremities of the auditory nerve terminate. The deaf generally hear better whilst riding in carriages, or where loud noises prevail, because the vibration of the membrana tympani, thickened and unyielding probably from inflammation, is thereby excited.

In these few brief observations on ear-trumpets, I set out with an axiom that the value of any such aid consisted in its power of collecting, concentrating, and directing into the passage of the ear more sound than would otherwise reach it. I will now conclude with another as to the selection of any

apparatus of the kind. It must be borne in mind that those only seek such help, in whose cases the deafness is slowly and insidiously stealing on, and threatening, perhaps, an extinction of the sense. Most important, therefore, is it that they should not forget the compensating power of the eye. Let, then, such an apparatus be selected as when used will not exclude from view the lips and countenance of the speaker ; and to the deaf generally I would say, at least to those in whose cases the treatment of experienced men has been of no avail, " Educate your eye to distinguish what is said, and thus render yourself, to some extent, independent of the failing organ ; and thus it may be you will make a valuable provision for the future."

CHAPTER XIII.

THE ARTIFICIAL TYMPANUM—A NEW MODE OF TREATING DEAFNESS WHEN ATTENDED BY PARTIAL OR ENTIRE LOSS OF THE MEMBRANA TYMPANI, ASSOCIATED OR NOT WITH DISCHARGE FROM THE EAR.*

UP to the present time, no successful mode of treating perforations of the membrane of the drum of the ear, either as respects the restoration of the membrane, or the relief of the accompanying deafness, has been discovered. The only means resorted to for the latter purpose has been the removal of pus or mucus from the tympanal cavity by syringing, or rendering it free by passing air through the perforation, by way of the Eustachian tube. Either of these proceedings will produce a temporary improvement of the hearing in cases where the tympanum suffers

* This account of the Author's discovery of the principle, and of the means of alleviating deafness, dependant on perforate membrana tympani, in ordinary phraseology, called the drum of the ear, first appeared in the *Lancet* of July 1, 1848, and subsequent numbers.

from obstruction, but in many others, when such a state does not obtain, they are of little, if of any service. Another mode of treatment, but one directed to the renovation of the drum, is the employment of mercury, with a view to produce "a new creation of membrane." The translator of Kramer's work (Dr. R. Bennett) has referred to such a case, but it was not attended by results that would justify others in pursuing a similar treatment. In this case, one-fourth of the membrane was gone, but, under the influence of mercury (?) a thin pellicle extended over the aperture, which led to the hope that an artificial membrane would form. But, in the first place, I believe a patient would be in much better condition, with a loss of one-fourth of the membrane, than with either an artificial membrane or a cicatrix; in the next, I doubt whether the supposed membrane was anything more than a film of mucus, such as frequently fills up a perforation; at all events, it disappeared as mysteriously as it had formed. The hearing was at first stimulated, but, after the mercurial course, the auditory organ gradually became, as is usual in such cases, more and more torpid.

I have now, however, the extreme gratification of promulgating a mode of relief for deafness attended by loss of the membrana tympani, which will cause great surprise among the readers of the *Lancet*, not less from its extreme simplicity, than from the ex-

traordinary success which generally attends its employment.

In 1841, a gentleman came from New York, to consult me under the following circumstances :—He had been deaf from an early age, and on examination I found great disorganisation of the drum of each ear. On my remarking this to him, he replied, “How is it, then, that by the most simple means, I can produce in the left ear a degree of hearing quite sufficient for all ordinary purposes ; in fact, so satisfied am I with the improved hearing which I can myself produce, that I only desire your assistance on behalf of the other ear.” Struck by his remark, I again made a careful examination of each ear, and observing their respective conditions, I begged him to show me what he did to that ear, which I should unhesitatingly have pronounced beyond the reach of remedial art. I was at once initiated into the mystery, which consisted of the insertion of a spill of paper, previously moistened at its extremity with saliva, which he introduced to the bottom of the passage, the effect of which, he said, was “to open the ear to a great increase of hearing.” This improvement would sometimes continue an hour, a day, or even a week, without requiring a repetition of the manipulation. Such an interesting fact could not fail to excite my attention, and it naturally occurred to me to try so simple a method in other cases. I did so in several which appeared to me to

be identical with that of my patient, but I invariably failed. I was on the point of abandoning the idea that the remedy could ever be made available in practice, and of considering either that my American patient's case was unlike all others, or that it depended on some idiosyncrasy, when it happened that a young lady came under my care, by the recommendation of Mr. Squibb, surgeon, of Orchard street. She was the daughter of wealthy parents, whose anxiety for her relief was so great as to induce them to bring her to me long after I had discouraged their visits, and openly expressed my inability to relieve her. She had become deaf at a very early age, after scarlatina, which had produced disorganisation of the drum of each ear, and the deafness was extreme. Unwilling, however, to abandon hope, her friends continued to bring her to me, in order, as they said, that "nothing might be left untried." With little expectation of success, after so many previous failures, I was induced to apply the new remedy, with some modifications upon my previous experiments. Instead of adopting my American patient's plan, it occurred to me to try the effect of a small pellet of moistened cotton wool, gently inserted and applied at the bottom of the passage, so as to come in contact with the small portion of membrane which still remained. The result was astoundingly successful. On the evening of a day in which she had risen from her bed with the sad

reflection that she must be for ever debarred from social converse and enjoyment, she joined the family dinner party, and heard the conversation which was going on around her with a facility that appeared to all present quite miraculous. Day after day the remedy was applied with the same marked success, and eventually she learned the art of applying it herself, and thus became independent of me. It was observed that, until the wool could be brought in contact with a particular spot at the bottom of the passage, the hearing was not at all benefited, on the contrary, was prejudiced ; but the moment it was properly adjusted on that particular spot, the hearing was restored. Subsequent experience, in a vast number of cases, confirms this remarkable fact. It is not merely necessary to insert moistened cotton wool to the bottom of the passage. Such manipulation would in most cases add to the deafness. It is essential to find the spot on which to place the wool, and so adjust it as to produce the best degree of hearing of which the case may happen to be susceptible. This of course differs according to the variety and extent of the disorganisation.

I quote the above case, not only because it was the first which it was my happiness to relieve by this novel plan, but because I am in a position to show the permanency of the remedy ; for recently I have made it my business to write to the mother of the young lady, who states that her daughter " con-

tinues to derive the same benefit as ever from the remedy, and that in her case it has been most successful, restoring her to the charms of society, from which she had been almost entirely excluded. It is now scarcely necessary for the members of her family to raise their voices when addressing her." She adds : " When the aid is removed she scarcely hears at all."

For nearly five years this young lady has used the remedy with undiminished success, and during the same period I have been availing myself of it in the ordinary routine of my practice, stepping neither to the right nor to the left to seek for cases in which it would be applicable, nor even speaking of its extraordinary success out of the circle of my immediate medical acquaintance. And most probably I should have continued so to do, if it had not happened that a gentleman, an army surgeon, recently consulted me, who having experienced the most happy result from the same mode of treatment, thought proper to publish some account of it in a local newspaper, considering, as he stated, that so important a mode of treatment ought to be more extensively known.

Mr. Griffiths, of Pantgwyn, Newcastle Emlyn, Carmarthenshire, the gentleman in question (I am at liberty to use his name), did me the honour to call on me in September, accompanied by Sir David Davies, to consult me about a young friend labouring under an affection of the throat. During the consultation it was necessary for me to raise my

voice very considerably to make myself heard by Mr. Griffiths, and I observed that when he blew his nose he distinctly passed air through the tympanum. After the consultation, I alluded to his deafness, and the probability, that by a new remedy I could afford him some relief, more especially as he had unconsciously revealed to me, in blowing his nose, a state of ear favourable for success. He readily assented to a trial ; and I must be permitted to quote his own statement of the result. On the remedy being applied, he says, "To my utter astonishment I heard every sound so loud, that I felt I had never known what it was to hear until that moment. Sir David Davies could hardly have believed it had he not been present. On entering the streets, the noise was so intense, that I was compelled to stop up my ears to deaden the sound ; but after a time I became accustomed to it, and can now enjoy the pleasures of social converse without straining my auricular organs, or being obliged to be addressed in a considerable elevation of voice. Personally I continue to apply the remedy with the same beneficial effect, and am convinced of its permanent nature, when persevered in, and properly attended to. This extraordinary discovery comes too late to be of that essential service it would have been to me in earlier life, yet it may render the rest of my days more comfortable in my intercourse with the world."

The following brief history of Mr Griffiths' case, as

detailed by himself, is interesting in many points of view :—“ The crisis of a severe attack of scarlatina in my infancy was attended by abscesses in both ears, which produced deafness, and a continual discharge of purulent matter, more or less, until I attained my twenty-second year, when the latter ceases. Occasionally concretions of wax formed in the passage, increasing the deafness. These were removed by syringing, after which a thin pellucid fluid would issue from the ears, during which my hearing was much improved, again becoming worse as the discharge ceased. While the discharge lasted, I experienced a slight tenderness in my ears, which also ceased with the discharge. I find that your remedy sometimes does the same thing, and that is my reason for not constantly using it ; but if it is *not* applied, my hearing is not in the least degree remedied ! The discharge is always more profuse when in bed, even without the remedy, and I am somewhat puzzled to account for it. My children know as well as I do when the remedy is applied ; and when it is, they remark, ‘ Your ears are too sharp ; we cannot now speak to mamma, even in a whisper ;’ but they cannot, more than other people, discover why I should hear so well one day, and the next, perhaps, not better than usual ; and the question now is, ‘ Have you got your new ears on to-day, papa ?’ The invention is invaluable.”

From this communication, written three or four

weeks after his visit to town, it appears that the remedy at first set up an irritation in the ear, which occasionally rendered it advisable that it should be discontinued ; but now I am enabled to state that such obstacle to its use no longer exists, and that he applies it regularly, uninterruptedly, and with undiminished success.

This case, like the first quoted, proved to be one in which there was the loss of a great portion of the *membrana tympani* ; and I may here observe that all my experience tends to show that this is an essential condition of the ear for success. At the present time I can refer to not very far short of two hundred cases, in which the new treatment has been successful, and in all of which more or less perforation or destruction of the membrane exists.

A very small quantity of wool is sufficient. It must be moistened in some fluid without any compression, and gently pushed down the passage with the point of a probe. I have had constructed for the purpose a set of instruments, which are calculated to meet and overcome every difficulty ; for I need scarcely say that it is very easy to talk of passing a foreign body down the meatus, but it is not so easily done. Besides it is not sufficient to merely pass it down to the site of the membrane ; but when there, the spot must be found which it is indispensable the wool should occupy and cover ; for

then only, and not till then, will success attend the application, and the patient regain the hearing.

With a few rules, which of course vary with the case, the patient may be taught to manipulate upon himself, and all that is required is, to renew the cotton, night and morning, or morning only. This is quite sufficient to maintain the improved hearing in the intervals.

† It will be expected that I should say something of the *modus operandi* of this new application ; but I can offer nothing that is conclusive. It has appeared to me in some way or other to supply the place of the lost membrane. The moisture is absolutely necessary to its perfect action ; for when the cotton becomes perfectly dry it impedes rather than improves the power of hearing. Is it possible that moist wool placed at the extremity of the passage can transmit the vibrations of sound in the same manner as the natural membrane, or must we look for some other explanation ? However, of its relieving this kind of deafness there can be no doubt. Some may feel incredulous at such simple means producing such brilliant results ; but in order to substantiate that which I have now written, I propose, in a future paper, to quote the statements of my patients, appended to histories of their cases.

The question as to how far this new mode of treatment can be made available in cases in which the

† see Boynton et al.

membrana tympani remains intact, is now occupying my anxious consideration, and forms the basis of a series of experiments, the result of which at a future time will be made known to the profession.

It has been intimated to me, that although the new mode of treatment has been explained in my last communication, and the cases to which it is at present applicable clearly indicated, yet I have not so fully described the *modus operandi* as to enable others to adopt it with more than a mere chance of success. In answer, I have only to say, that the experience of several years has taught me that it is impossible to convey to others, in words, such explicit directions as shall enable them to manipulate with any degree of certainty. In fact, it was on this account that I have so long held back from publishing any account of the remarkable fact I had observed in my practice. Apart from other considerations, I felt that publicly to ascribe such extraordinary effects to so simple a remedy, would scarcely be credited; and not without reason; for it would naturally be tried in and out of the profession, although I will venture to say, that in not one instance in twenty, however appropriate and well adapted the case might be, would it succeed, solely from ignorance of the rules, the observance of

which is essential to success. These rules more especially apply to the discrimination of the case—the preparation of the ear—the size of the pellet of wool—the degree of moisture—the degree of pressure—the precise spot on which to place the wool—under what circumstances to omit it, and when to resume it, &c., &c. In the absence of such knowledge, circumstances might arise by which not only the patient, but the practitioner, would be puzzled, balked, and might possibly do some serious injury. An instance of the kind has lately occurred. A surgeon brought a case to me in which the treatment was successful; and having seen me produce a great improvement in the hearing, he thought he should be able to succeed also, without further assistance. He inserted the wool, but could not reach the necessary spot; and in endeavouring to adjust it, some injury was done, which completely ruined the ear for future treatment. I have never since been able to get the remedy to act in this case. Many instances of the lamentable results of unskilful attempts on the part of patients, as well as practitioners, have since come to my knowledge. But although it is impossible in words to convey all the necessary information, it will at all times afford me great pleasure practically to illustrate the subject before any practitioner who will favour me with a visit.

As I have already shown, the cases in which the

new treatment is at present found applicable are those in which there is partial or complete loss of the membrana tympani: such cases are very frequently accompanied by otorrhœa; but whether this symptom be present or not, the remedy may be found successful. Upon this subject of lesions of the membrane, I therefore offer a few remarks:—

Perforation of the membrane of the tympanum may be a congenital malformation, unattended by any discharge, deafness, or greater tendency than usual to disease of the ear. These cases are generally known by the subjects of them being able to pass air through the meatus, by way of the Eustachian tube and tympanum, when the mouth and nose are stopped. Many persons thus situated are able to pass the smoke of tobacco through the ear with a very slight expiratory effort.

Of the morbid causes of perforations, accumulations of matter in the tympanal cavity from acute or chronic inflammatory action are the most frequent. In such cases, the membrane itself may be involved in the inflammatory disease which precedes the suppuration, and the greater part of it may be destroyed, or it may only give way to a limited extent, so as merely to permit the exit of the matter. In the one case, the ossicula frequently remain *in situ*; but in the other, they are commonly detached and expelled, or at all events the manubrium mallei is removed from its natural position in contact with the membrana tympani.

Perforation and loss of membrane may also occur from the extension of disease of the passage to the tympanum. In such cases, the disease of the passage in the form of chronic otorrhœa extends itself to the cuticular covering of the membrane of the tympanum, and the fibrous and mucous laminæ of the membrane are gradually eaten through by ulceration, which may be confined to one particular spot, or extend to the whole of its surface.

Loss of membrane is also frequently caused by ulceration in diseases confined to the membrana tympani itself, such as the form of *tympanitis*. It may also occur from blows on the ear and from loud noises, such as the report of artillery. Writers on the ear have generally allowed the latter as a cause of perforation without question, but Kramer stoutly denies that such an accident can ever happen. I am confident that Kramer is wrong in this respect, his opinion being adverse to that of those with most opportunities of judging,—I mean military and naval surgeons,—besides being opposed to ordinary reason. Panes of glass may be not only loosened and driven out of the window-frame, but actually bent and broken by the vibrations caused by a loud report ; and to me there seems no difficulty in believing that powerful sounds would, from the facilities for the concentration and conduction of sound possessed by the auricle and meatus, strike more forcibly upon the membrane than upon any other surface whatever, unless one were specially

contrived for the purpose. At the same time, I must remark that a great many of the cases which are usually set down both by professional and unprofessional persons as rupture of the tympanum from loud noises, are cases in which the vibratory shock produces instant deafness from its effects on the brain or auditory nerve ; whereas mere rupture of the tympanum would produce but a very slight amount of deafness at the time of the accident. Those cases in which rupture and loss of hearing occur simultaneously are of a more complex kind ; there must be not only injury of the membrane, but serious lesion of the auditory nerve. These circumstances, which are probably the sources of Kramer's errors, I may have to refer to again.

Rupture from loud noises generally occurs from sudden reports taking place when they are not anticipated. There is an admirable preservation against this accident in the power we have of voluntarily rendering the tympanum tense, through the means of the ossicula and their muscles. Persons may thus prepare for loud noises by strengthening the drum, and diminishing the intensity of the sound.

There is also the involuntary provision, of a reflex kind, for the safety of the ear when exposed to loud sounds—namely, the tension of the membrane of the tympanum by the small muscles of the ear, in a manner analogous to the closure of the iris by a bright light ; but as, in the case of the eye, an

intense flash of light produces its effects at once upon the retina, before there is time for the reflex closure of the iris, so, in the case of the ear, a great impulse of sound may both paralyse the auditory nerve and rupture the membrana tympani before there is time for the defence of both by the reflex tension of the drum.

When the drum is ruptured by accident, there is always some amount of bleeding from the membrane; when it occurs from blows on the ear, the hæmorrhage is often so considerable as to escape from the meatus or even from the guttural extremity of the Eustachian tube; but in such cases the blood is probably effused from other parts besides the membrane. On the other hand, when the membrane is partially or wholly destroyed by disease, there is, as long as the drum remains open, some amount of otorrhœa.

With regard to the interesting question which has been so much debated—Can loss of the membrane be repaired?—and to which the negative has commonly been given, one important distinction must be made as a preliminary to its consideration. We must distinguish between those cases in which, from accidental causes, and the pressure of matter, the membrane has been merely perforated without loss of substance, and others in which, from ulceration, the greater part of the membrane has been entirely destroyed.

In the first class of cases, I have no hesitation in

declaring that nothing is more common than for the membrana tympani to cicatrize. Numbers of persons suffer in their childhood from suppuration in the tympanal cavity and the exit of matter through the membrane, in which in after-life no solution of continuity whatever can be discovered by the most searching examination, but in which there are evidences of cicatrization. In the accidental forms of the affection, the drum frequently closes up perfectly within a few days after its perforation. Some years ago, I was induced to perform numerous operations upon the membrane when in a thickened and semi-cartilaginous state, in which puncturation appeared to offer the only means of procuring relief to the hearing. And in cases where I thus operated, the great difficulty was to keep the membrane open; which, in point of fact, was insuperable. I have performed the operation repeatedly in the same case, in which relief was afforded after each operation; but after a while, the wound would cicatrise in spite of all means I could devise to prevent it. One of the last cases thus operated on (for I have long discontinued this operation, as a remedy, *per se*, not to be depended upon) was a lady, brought to me by Dr. Richards, of Bedford square, in which decided relief was afforded to the patient so long only as the opening could be maintained.* In these cases, it

* Improved instrumentation, of which I shall have to speak when treating specially of artificial perforation, now enables me to trephine the membrane with perfect success.

has not been a mere obstruction to the passage or the tympanum, but an actual cicatrization of the membrane.

It was thought by Sir Astley Cooper, who in the commencement of his career paid some attention to diseases of the ear, that loss of the membrana tympani was of little consequence to the hearing, he having seen many cases with loss of membrane, and little perceptible deafness, and many of his patients hearing well after he had performed perforation of the membrane of the drum. Other writers have followed this eminent surgeon in this opinion, while others, and particularly Kramer, have as violently opposed it, and maintained that perforation was invariably followed by a greater or less amount of deafness, according to the extent of the loss of membrane. Itard held the same opinion as Sir Astley Cooper. I believe a modified view must be taken of the question. My own opinion is simply, loss of the membrane of itself never entails severe deafness ; but yet, when taken alone, it often produces a marked diminution of hearing ; and sometimes, in consequence of the exposure of the mucous membrane of the tympanum and membranæ fenestræ, these structures become diseased to such an extent, which, together with loss of membrane, produce extreme deafness. The middle ear cannot be exposed to the air for any length of time without such a result being produced.

There is some difficulty in judging of the influence

of the *membrana tympani* on the hearing ; but there can be no doubt that hearing is more acute when it is removed altogether, than when it is thickened and diseased. Its importance has often been calculated from the amount of hearing regained when the membrane has been punctured, under the latter circumstances. This is evidently a fallacious estimate. As Kramer truly remarks, those with loss of membrane may obtain sufficient acuteness for ordinary conversational purposes ; but it is by no means equal to the appreciation of the delicate pulsations of sound perceptible by the organ in a state of integrity.

MY last communication chiefly consisted of observations on partial or complete loss of the *membrana tympani*—a condition of the ear indispensable for the successful application of the cotton wool. Internal *otorrhœa*, or discharge from the cavity of the tympanum through the passage of the ear, is another indication of the appropriateness of the remedy ; and upon this subject, therefore, I will also proceed to offer a few remarks.

Internal *otorrhœa* may appear as the sequela either of acute or chronic inflammation of the mucous membrane of the tympanum. The seat of the discharge is generally the mucous lining of the tympanum, but occasionally it is produced by the deeper-seated

structures of the ear, or the ear may be merely the channel by which matter escapes from the brain or spinal cord, and it has even been known to come from the parotid gland, or the muscles in the vicinity of the ear. In the great majority of cases, the discharge escapes by way of the external passage, but it sometimes passes from the ear through the Eustachian tube into the throat, or by ulceration through the mastoid process.

The term *otorrhœa* is generally limited to discharges by way of the external passage ; but there seems to me to be no valid reason against applying it to all discharges having their origin in the ear itself, whatever may be the channel through which they may obtain their exit. This difficulty, if any, is, however, lessened by the fact, that though discharges may, in the first instance, make their way through the Eustachian tubes or the mastoid bones, these channels rarely, if ever, continue, the *membrana tympani* becoming affected, and the discharge then establishing itself through the external passage. Respecting the nature of *otorrhœal* discharges, I consider that no definite classifications of disease can be drawn from the different kinds of matter which escapes from the ear, neither do I approve of the division into mucous and purulent *otorrhœa* which has been commonly made. Almost all cases of *otorrhœa* supervening on acute inflammation, are at first purulent, but as they proceed and acquire a

chronic character, the discharge generally becomes muciform, and sometimes appears to consist of pure mucus. On the other hand, otorrhœa, which attends chronic inflammation, and which comes on very gradually, is almost always of a mucous or mucopurulent kind at first; but if its progress be watched, it will be found that as it goes on the matter becomes puriform. These changes from one kind of discharge to another are so constant, that no arbitrary division of otorrhœa can be fairly made. When we see a case for the first time, and find it discharging either pure pus, or mucus, or a thin serous fluid, we cannot adopt a separate mode of treatment to the different states, for, a few days after, the nature of the discharge may be entirely reversed, either from external causes, or the state of the patient's health. In all ordinary cases, the discharge is secreted from the mucous membrane of the tympanum, or the degenerated cuticular lining of the passage, in the same manner as any other discharge from a mucous surface—bronchorrhœa, or bronchitis, for example. There is not necessarily, nor even generally, any ulceration of the secreting surface. These conditions explain the variable nature of the discharge, it being well known that the mucous membranes may, without solution of their continuity, secrete every variety of matter, from pus to ordinary mucus.

The state of the *membrana tympani* and of the

ossicula is always a matter of importance in ear discharges. Kramer thought that the membrana tympani never ulcerated, unless from independent disease of the membrane itself; but to me this opinion is very questionable. In a great many cases the perforation of the tympanum simply results from the presence of pus, or some other accumulation of matter, in the cavity of the drum, just as perforation of the skin attends the presence of pus or any foreign body beneath the cutaneous tissues. In otorrhœa we may find the tympanum either perforated or entirely destroyed by the same amount of internal disease. As I have already stated, the membrane, according to my experience, may cicatrise when even large portions have ulcerated. The state of the membrane necessarily exerts considerable influence over the ossicula, as, when wholly destroyed, they lose the support derived from the attachment of the handle of the malleus. Hence they are more likely, during the progress of the otorrhœa, to become loosened from each other, and discharged through the external passage. The whole of the membrana tympani may disappear, and the malleus and incus become dislocated from the membrane and from the stapes, and in some cases no greater deterioration of hearing occurs than in simple otorrhœa; but the loss of the stapes, from its connection with the labyrinth, is of the gravest importance in regard to the sense of hearing, producing, in

fact, total deafness to all sounds not in immediate contact with the solid parts of the head. This point—namely, that hearing may remain while the stapes continues *in situ*—illustrates a delicate question in the physiology of the human ear. It has been matter of doubt whether the membrane of the fenestra rotunda is intended for the propagation of sound to the auditory nerve, or to receive the counter-stroke of the wave of sound after it had passed to the labyrinth by way of the ossicula and the membrana fenestræ ovalis. If the membrana fenestræ rotunda were not capable of receiving and transmitting sonorous vibrations from without to the labyrinth, there could be no hearing when the stapes remained fixed to the oval fenestra without any attachment externally, it being a law in acoustics, that aëriform vibrations cannot be communicated, except to a very insignificant extent, to a solid body like the stapes. Hence it appears to be an unavoidable inference, that in such cases it is not the stapes which propagates the sound, but the sound membrane. Looking at the stapes, in such circumstances, as merely a mechanical means of guarding the aqua, the remains of the organ of hearing, consisting of a simple vibratory membrane, (the membrana fenestræ rotunda,) covering in a fluid which is in contact with the termini of the auditory nerve, is precisely analogous to the organ of hearing in many of the lower animals.

Other authors have looked on this disease as being extremely formidable, and appear to consider a fatal termination from the extension of disease to the brain as very common. Fortunately, this gloomy view of the subject is not warranted, at all events in this country, by the results of experience. Patients suffering from otorrhœa are at all times liable to the supervention of disease ; but its actual occurrence is extremely rare ; and when it does appear, it is usually in scrofulous constitutions, or in persons of irregular habits.

The treatment of internal otorrhœa must in principle be the same as that of external otorrhœa, the chief point for additional consideration being the risk of cerebral excitement, or disease from suppression of the discharge. Whenever there is pain in the internal parts of the ear, or when the introduction of a probe into the tympanum gives acute pain, we must resort to local depletion by cupping or leeching behind the ear, with fomentations and other soothing applications. If the discharge be immoderate or offensive, a very weak astringent injection may be used, the same as in otorrhœa externa, but during the use of any medicinal application to the middle ear, counter-irritation may be advantageously kept up over the mastoid process, to lessen the tendency to inflammation of the internal structures. Aperients should also be administered. Poultices over the ear at

night will be found extremely beneficial. In children, simple measures are often sufficient to arrest the discharge and promote the cicatrization of the membrane ; but in adults, or when the discharge has been of long standing, it is exceedingly difficult to make any impression upon it.

When internal otorrhœa has become chronic, and the membrana tympani seriously diseased, it appears to me, that so long as the discharge is moderate, and the deeper-seated structures of the ear unaffected, if a tolerable amount of hearing remain, the subject of it is in as good a position as regards hearing as is compatible with the nature of such cases. It is found that the use of astringents to the ear, whether they diminish the discharge or not, invariably aggravate the deafness, sometimes causing permanent tinnitus ; and even if the discharge cease spontaneously, which it sometimes does, the hearing is always worse than during the discharge. These circumstances, together with the possibility of inducing cerebral inflammation, taken with the fact, that in the great majority of cases, otorrhœa remains during the whole life-time without injury to the patient's health, and without annihilating the sense of hearing, are sufficient to make us direct our attention to the preservation of the patient's health, and the maintenance of as great a degree of hearing as possible without the suppression of the discharge. If a good state of health be preserved, and the exciting causes

of ear disease be avoided or guarded against, there is little risk of the fearful termination which attends the spread of the disease inwards to the brain. But as age advances, there is a natural tendency to the suppression of ear discharges of all kinds, and their spontaneous disappearance is rarely, if ever attended by any ill effects, but the desirability of such a termination is lessened by the increase which takes place in the deafness.

Happily, the moistened cotton-wool now presents itself as a remedy for such cases, and my experience justifies me in saying, that in a very great majority when skilfully applied, it will materially add to the comfort, gradually lessen the discharge, and vastly improve the state of hearing.

In the relation of cases confirmatory of the happy effects of the cotton-wool, it will be unnecessary to describe with minuteness the precise appearance which each ear presented in which it has been successful; it is sufficient to say, that in every case there was partial or entire loss of the membrana tympani with more or less otorrhœa, though it is not a *sine quâ non* that the latter symptom of disease should be present. A perfectly dry ear, with perforation of the membrane, may be always considered a highly favourable case for the operation.

The only question we have, therefore, to consider is how far it is possible that the sense of hearing can

be improved by so simple a remedy ? and to enable us to form a proper estimate, I propose to quote two descriptions of cases : the one to prove the *permanent* value of the remedy ; the other to show its *immediate* effect.

With respect to the instruments which I use, I may briefly state that they consist of a pair of small forceps, weak in the spring, so as to admit of the blades coming accurately together with the slightest possible pressure. This instrument should differ from the ordinary forceps in another respect, namely, the blades or prongs should have no roughness at their extremities, and should be so rounded as to act as a common probe when in apposition. The intention of this instrument is, of course, to introduce the moistened cotton to the bottom of the meatus, having done which, they should be disengaged from the cotton, and withdrawn. The blades being then brought together, the forceps may be again introduced, acting as a common probe, for the purpose of adjusting the cotton on the spot, which, when covered, produces the best degree of hearing of which the case may be susceptible.

An instrument, then, is required for its introduction, the adjustment, and the withdrawal of the cotton ; and I need scarcely say, that the forceps I have described is sufficient, in dexterous hands, to accomplish these requirements ; but I have found that my patients have preferred a separate instrument

for the adjustment as well as the withdrawal of the cotton. For these purposes, therefore, I have constructed a simple rounded bar of silver, probe-pointed at one extremity, and with a small screw at the other; the one end serves to adjust the cotton, the other most surely will entangle and withdraw it.

A few words as to the mode of applying the cotton. The practitioner should get a view of the tympanum, and make himself acquainted with the nature and extent of the disorganisation. A small piece of fine cotton, differing in size according to the case, and fully moistened in water, is then introduced through the speculum to the bottom of the meatus, and adjusted superiorly, inferiorly, anteriorly, or posteriorly, according to the situation of the perforation and other circumstances connected with the case; but care must be taken that the entire opening be not covered, otherwise the experiment will not succeed. It is also indispensable to success that the moisture of the cotton should be preserved; and, for the sake of cleanliness, if for no other reason, it should be removed once, at least, during the twenty-four hours.

The following relation of cases will serve to show the value of this little operation and its results:—

CASE 1.—April 13th, 1845.—Miss —— consulted me in regard to a deafness which, she stated, had commenced in infancy, from a neglected cold. There was no predisposition to the malady derived from her family; and, although of a delicate habit

of body, she had never suffered from any serious illness. At the time of her visit to me she was in the enjoyment of good health, but highly nervous and excitable. The deafness was so great, that she could only hear the watch in contact with her ear, and even the loud tick of the metronome could be heard but indistinctly. The tympanum was entirely disorganised ; no appearance of healthy membrane could be detected ; and a discharge had issued from the passages of the ears from the commencement of the disease.

The passages having been first cleansed of an accumulation of muco-purulent secretion, the pellet of cotton was introduced, and, when properly adjusted, a degree of hearing was produced which astonished my patient. The lady who accompanied her conversed with her without difficulty,—sounds which before she had never heard became audible to her ; but the improvement in hearing was not more surprising to us, as observers, than the remarkable change it produced in the expression of her countenance. Youthfulness shone out upon a face which had been aged, not by time, but by the anxiety her infirmity had caused her.

The remedy was removed, and the improved hearing was immediately lost. Again the experiment was tried, and again it was successful. The power of the remedy being now well established, it was arranged

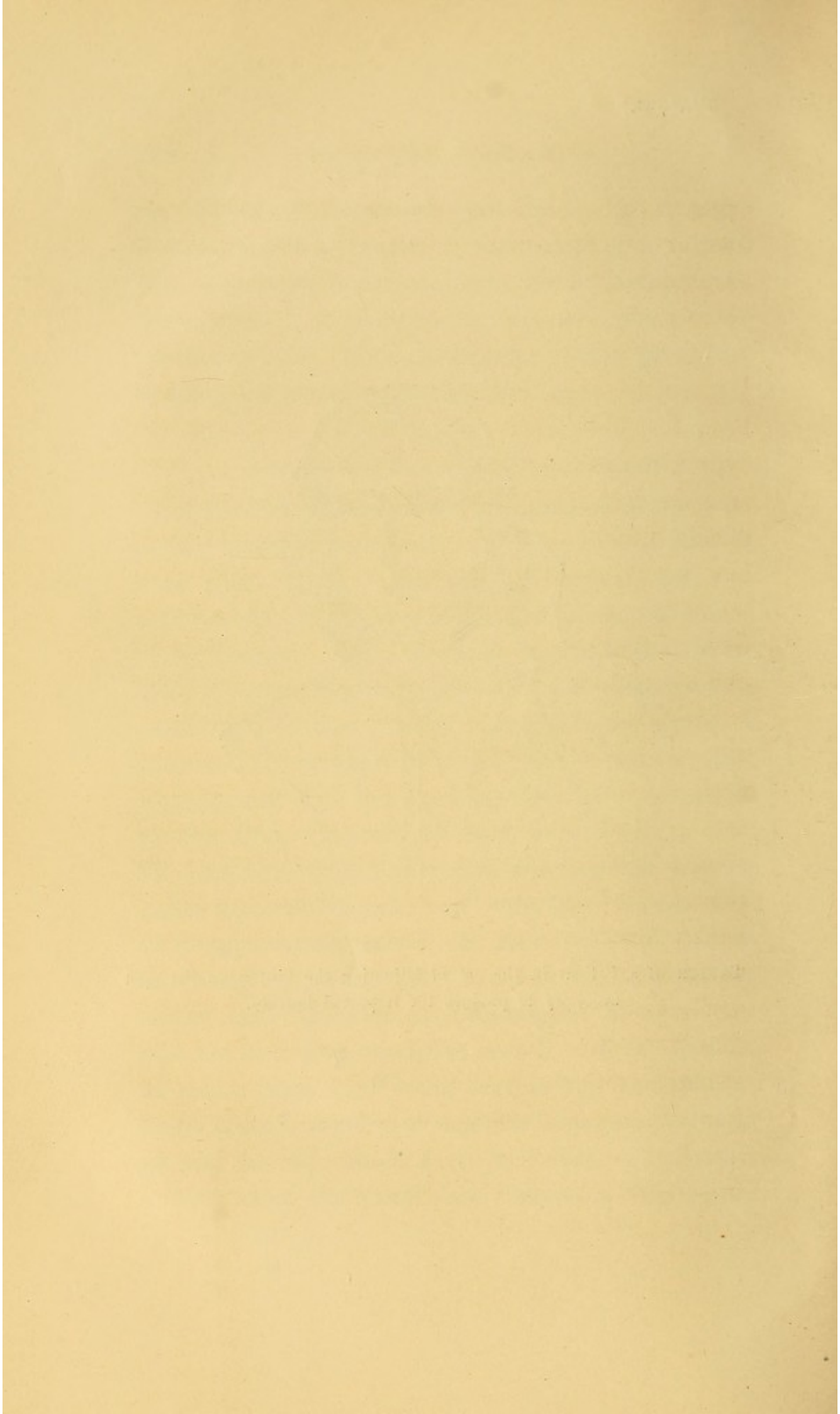
that she should attend me from day to day, in order that she might be taught to manipulate upon herself. Not being very dexterous in the use of instruments, this occupied about three weeks, when she left me for the sea-side. My patient must now be permitted to speak for herself as to the result :—

Southshore, Preston, Lancashire, May 27, 1845.

“DEAR SIR,—I have now been settled in my temporary home a week, and I think you will like to hear what report I can give of myself, and the opinion my friends have formed of the improvement in my hearing. I am happy to say the little trifling daily operation does not continue the same nervous protracted business I found it the first two days. I am much more expert in placing aright your magical remedy, and feel less anxious, from the wonderful success even my own efforts meet with The certainty that I have now the sense of hearing under my own control, as it were, is a blessing most truly appreciated, and I am sure you will believe how completely I must feel in a new world, when my sisters and relations at Leamington consider my case not only *improved*, but *cured*. All my friends, on return here, think I can hear as well as anybody. I am, indeed, sensible of comfort and enjoyment in general society, which I never before experienced, and my chief annoyance now consists in some noises



SKETCH of a Patient in the act of adjusting the Cotton on the spot
necessary to produce the improved hearing.



being quite too shrill for me, and general noises attracting my attention, to which I had previously been perfectly dead.*

“To Jas. Yearsley, Esq.”

CASE 2.—Miss J. J——, aged twenty-eight, has been deaf from childhood ; does not remember the early history of her case ; believes that, many years ago, she had a slight discharge from the ears, but during the last three years this symptom of disease has been invariably present ; has observed that when the discharge is most profuse she hears the best. Occasionally she experiences a little ear-ache and discomfort about the ears, especially when she takes cold. About four years ago, a considerable aggravation of the deafness took place, and she then first consulted me. It appears that my attention and treatment were then mainly directed to the state of her throat, under which she considerably improved ; but her father dying about that time caused her to discontinue her attendance. In April last, she again applied for my advice, when I observed a condition of the ears favourable for my new treatment. The membrane of the drum of the ear was almost entirely gone on each side. The moistened wool was immediately successful, and the power of the

* To this date, October, 1862 (seventeen years), this lady, long married and resident at Bath, enjoys all the advantages as at first from the remedy.—J. Y.

remedy was made evident by omitting it one day and resuming it the next. The result of to-day's visit (April 26) is as follows:—She entered the room *without* the remedy (for I had intentionally, but unconsciously to her, omitted to apply it the day previously), and remarked, with much chagrin, that she had been as deaf as ever since her last visit. I set the metronome going, and directed her to take exact notice of its loudness. At the distance of four yards she heard the tick, but not the bell which is intended to indicate the commencement of a bar of music. She approached close to the instrument, but could not hear the bell. The remedy was applied to the right ear. She was instantly sensible of the difference, and remarked that she now heard the bell as distinctly as before she had heard the tick. In order to get at a correct estimate of the improved hearing, I asked her if she could hear fifty per cent., or one-half better; she replied with confidence, that it must be seventy-five per cent. better.

I am now writing this case in her presence, and in the questions I have to ask her I speak in my ordinary tone of voice, and she does not lose a word.

July 25.—I have this day seen and conversed with this patient, and find, to my great satisfaction, that she is still using the remedy with increased success.

CASE 3.—As we are dealing with the question as to the possible amount of benefit derivable from the new treatment, it may be better that we should quote the statements of patients themselves; and, in selecting these cases, I beg to assure my readers that I am by no means bringing forward the most extraordinary instances of success.

The subject of the following case is housekeeper to a family in Gloucester-place; and, agreeably to my wishes, she has never neglected to report to me, on her visit to and departure from town, the state of her hearing, which does not appear to have varied, from the first to the present moment, since the remedy was applied—a period of more than three years. In February last I requested her to write her own statement of the case, which she did as follows:—

February 10, 1848.

“It is now three years since I first attended the Ear Institution in Sackville-street. My deafness was caused by scarlet fever, at the early age of two years. My present age is thirty-six. My left ear recovered for a time, but I lost the hearing again, and I became so deaf that I could not hear a word of conversation. I had advice; and on being told that the drums of my ears were decayed, I of course gave up all hopes of ever being any better, until a friend advised me to consult Mr. Yearsley. The first time that gentleman saw me, he said he thought he could

benefit me by a new remedy. He then applied it, and I immediately found a great difference. On my return home, the noise in the streets quite confused me. On my way to the Institution, the noise of the carriages was dull ; but on my return, I could hear the footsteps on the pavement, and caught words from the people as they passed me. My friends, too, were very much pleased and surprised to find how well I could hear. My life is rendered quite comfortable, for I can now hear conversation without being addressed in a loud voice, and all that passes at meals I can hear, whilst before I seldom caught a word.

“ C. J.”

“ P.S. Another great advantage is, that after having been taught by Mr Yearsley, I am now able to make use of the remedy myself, without giving trouble to any one.”

[Three other cases are cited from the communications of his correspondents; testifying, equally as the foregoing, to the success of his new plan of treatment ; and Mr. Yearsley then goes on to remark :—
ED. LANCET.]

I trust that enough has now been quoted to substantiate that which I have myself written, in respect to the singular fact which it has been my happiness to observe and reduce to practice.

And now it remains to be considered how far it may be in our power, and by what means we can extend the range of its applicability and usefulness, in the discussion of which subject I propose to make some remarks in a future chapter on Artificial Perforation of the Membrana Tympani.

Many years have passed away since the foregoing papers appeared in the 'Lancet,' nevertheless I prefer they should remain intact, as there is not a single remark I would wish to retract. I desire it to be regarded as an example to my contemporaries to make sure of a medical fact, as I did in this instance, by several years of experience, before giving it publicity ; then they are not likely to advance anything which might afterwards require revision. It is true, that in the case of the wetted cotton remedy there were some points at first involved in mystery, which now admit of satisfactory elucidation ; for instance, the *modus operandi* of the appliance, which will be explained in the following Paper.

CHAPTER XIV.

ON THE MODUS OPERANDI OF THE WETTED COTTON,
OR ARTIFICIAL TYMPANUM, AND ITS APPLICABI-
LITY TO OTHER CASES THAN PERFORATE MEM-
BRANA TYMPANI.*

WHEN, in 1848, ten years ago, I made known to the profession a new principle of treating deafness, attended by perforate membrana tympani, I was unable to account physiologically for the success of the remedy, nor could I offer any satisfactory solution of its *modus operandi*.

In speculating upon the subject, and in my innocence, I asked, "Is it possible that moist wool, placed at the extremity of the passage of the ear, can transmit the vibrations of sound in the same manner as the natural membrane, or must we look for some other explanation?"

In 1853, five years after my new treatment was made known, I was enabled to give a probable solution to many points at first involved in mystery,

* This Paper was read before the British Medical Association, assembled at Edinburgh, August, 1858.

and I then accounted for the success of the wetted cotton thus :—“ The loss of the membrana tympani deprives the ossicula of their natural tension ; the cotton is so adjusted as to restore the necessary support, and then the waves of sound break upon the cotton, through which substance the impulse is conveyed to the ossicula, and so onwards to the brain.” From that time to the present, I have seen no reason to alter this view of the question, whilst much additional evidence has been afforded me to confirm it. Of late, the new treatment has occupied the attention of continental surgeons engaged in aural surgery ; and during the year 1856, a pamphlet was published by Dr. Ehrard, of Berlin, proving indisputably all that I had said and written upon the subject. I may observe, *en passant*, that Dr. Ehrard has been himself long a sufferer from the condition of ear favourable for the use of my remedy, and that he has used it with great success for many years, after having experimented with other substitutes, including the gutta percha membrane, which he entirely condemns. But the statements of Dr. Ehrard are particularly interesting to me, as establishing the fact of another condition of the ear beyond the loss of the membrana tympani, in which I had myself proved the remedy to be of infinite service, and it is to this that I most particularly wish to call your attention.

Once now and then it has happened to me to

have met with a case benefited by the application of the wetted cotton, in which, notwithstanding the most minute examination, I could discover no perforation of the membrana tympani whatever, a condition of the ear which, as you are probably aware, has been always considered a *sine quâ non* for success ; often have I been puzzled to find an explanation for this fact. Well assured that the wetted cotton acted by giving support to the ossicles of which they are deprived when the membrane gives way, I could not but attribute the success of the remedy when the membrane was *not* perforate, to a disorganisation, involving, somehow or other, the ossicles within the cavity of the tympanum itself. This view is borne out by Dr. Ehrard ; for, in a museum in Germany, he found a preparation of the tympanum of a child, in which the mucous membrane was thickened, red, and covered with granulations, in which the stapes was entirely buried : the membrana tympani was half-destroyed, its anterior part only, with the malleus, being present : the long process of the incus was easily seen (the part of the membrane which conceals it being wanting), and might at first have been taken for the handle of the malleus. But, and this is the main point, the incus was withdrawn from the stapes about a quarter of a line, and the connection was thus interrupted. The long process of the incus was easily withdrawn from the stapes, and just as easily restored to its position ; slight

pressure upon the malleus and the remaining part of the tympanic membrane, at once restored the interrupted connection between the incus and the stapes.

Let us consider the ossicles during life more attentively : the malleus is firmly fixed in its position by the processus longus, by its manubrium, by the tensor tympani muscle, and by the capsule of its joint with the incus, also by fibrous bands, which fix its head to the bony walls of the tympanum. The same is true of the incus ; on the one side it is firmly fixed to the malleus, on the other its short process is fastened to the membrana tympani. The position of the stapes is similarly insured ; its base forms a complete joint with the oval fenestra, and the stapedius muscle assists in retaining it.

On the other hand, the incus and stapes have at their junction no fibrous ligaments ; they are only united by the mucous membrane of the tympanum, which covers all the ossicles, and which, during otorrhœa, may so easily give way.

Now, let me sketch the successive steps which lead to the disorganisation Dr. Ehrard has described. The cases in which it occurs are generally the subjects of scarlet fever or measles, especially the former. The inflammation of the mucous membrane of the pharynx, which attends these cases, extends along the Eustachian tubes to the tympanic cavity ; suppuration ensues ; the tympanum becomes filled with pus, for which there is no escape, the Eustachian

tube being closed by the inflammation of the mucous membrane ; the pus presses in all directions, pulls the ossicles asunder, tearing the inflamed mucous membrane at the junction of the incus with the stapes ; and at length the membrana tympani yields to the pressure of the accumulated matter. Such a rupture of the membrana tympani but rarely heals ; and we have then the permanent perforation, for the relief of which my wetted cotton happily adapts itself as a remedy.

But is it not possible, nay, probable, that many cases occur, in which the disunion of the ossicles takes place from the ulcerative process, as in the preparation cited by Dr. Ehrard, the accumulation of pus being insufficient to force its way through the membrana tympani ; but the inflammatory condition of the mucous membrane subsiding, without involving the membrana tympani, the pus makes its way down the Eustachian tube, the natural route for pent-up secretions in the tympanum ? In no other way can we account for benefit arising from the employment of the cotton in cases of deafness unattended by perforation of the membrana tympani.

However it may be, there can be no doubt that the *modus operandi* of the wetted cotton, or the artificial tympanum, as I have named it, is purely mechanical. By the partial or the entire loss of the membrana tympani, the ossicles are deprived of their natural tension, and deafness is the result. The

cotton is so adjusted as to re-supply the ossicles with the *support* necessary for the conduction of sound to the fenestra ovalis, and hearing is restored. In like manner, in cases in which the ossicles (the incus and stapes) become disconnected by the ulcerative process, the cotton exercises the *pressure* necessary to bring them again into apposition, so that sound may once more press onwards to the brain, where the mind realises its impression.

Support in the one case is the *modus operandi* of the treatment, support with slight pressure, in the other.

In conclusion, the practical deduction to be drawn from this new fact in the history of the artificial tympanum is, that all cases of deafness traceable to disorganisation of the drum of the ear, as a sequela to scarlet fever or measles, should be tested as to the applicability of the wetted cotton for their relief.

As time wears on, the discovery of the wetted cotton, or artificial tympanum, by which name it is now known, cannot fail to engage more and more the attention of philosophic minds. The fact of a fellow-creature, known to have been deaf from infancy, and from a supposed incurable condition, namely, "loss of the drum of the ear," suddenly walking forth among his friends hearing like them-

selves—whilst presenting a living memorial of the success of the treatment—offers a phenomenon which cannot fail to strike the beholders with surprise and astonishment. Then, to find that this apparently miraculous relief is produced by the most simple means, adds to the interest created by such a triumph of art.

8 Having originated this method of treatment, it cannot but be gratifying to me to see the subject followed up, and testimony borne to its merits by my contemporaries ; and although differences may arise as to the theory of the treatment, and even as to the material to be employed, I may congratulate myself on having collaborators industrious and persevering, who may some day succeed in improving upon my own method, but in which as yet they have most signally failed. The fact is, many difficulties beset the inexperienced surgeon, and the still more inexperienced patient, in his attempts to use the remedy, and failures have prompted all sorts of deviations and substitutes. For instance, M. Deleau, soon after I had made known my discovery to the French Academy, proposed the introduction of a funnel-shaped, silver-wire spring, covered with a thin coating of sponge, in lieu of the cotton ; and recently, without the slightest intimation to the parties (non-medical) who were appointed to adjudicate on the matter, that such a discovery as mine had been made, an Aurist absolutely obtained a medal at

the Society of Arts for the invention of an artificial *membrana tympani*, composed of a thin plate of gutta-percha stuck at the end of a silver wire, which however specious in theory, is altogether useless in practice, for the irritation the presence of such an appliance produces, renders it unbearable to the patient. For the credit of the profession I withhold from publication the name of the party who has thus plagiarised my ideas at the expense of honour, truth, and common sense,* more especially as an attempt at *amende* has been made in the 'Medical Times and Gazette' (No. 368), in which the writer admits the priority of my discovery, and his obligations to me for the same.† Thus stands the case :

I. I claim to have discovered *a new principle of treatment* applicable to cases of deafness, attended by perforation of the *membrana tympani*. Whatever be the material employed, whether it be cotton-wool, sheep's-wool, sponge, gutta-percha membrane, vulcanised india-rubber membrane, a piece of bacon-fat, a piece of stick, or a piece of whipcord, each of

* See Medical Circular,' Nos. 52, 53, and 54.

† The controversy in the 'Medical Times and Gazette,' which arose out of this strange conduct of my contemporary, has been reprinted, and is published by Baillière, 211, Regent street. In that reprint are discussed the respective merits of the original method of the wetted cotton, and the various substitutes, with the theories advanced in explanation of the *modus operandi* of the treatment.

which has been found more or less successful, this claim cannot be invalidated.

II. I claim for moistened cotton-wool a superiority over all other substances, as the best material to be used, for the following reasons:—It is more easily applied. 2. It is simple, safe, and cleanly. 3. It retains its proper position longer. 4. It causes no irritation, but, on the contrary, a feeling of comfort. 5. It produces no noises in the ear in the acts of eating or talking. 6. It *cures* the discharge of the ear which generally attends loss of the membrana tympani. 7. It produces the highest degree of hearing of which a patient with perforated membrana tympani is susceptible.

III. Any substance will produce the desired effect if applied so as to support the remaining portion of the membrane or the ossicula, but cotton-wool is the best, for the reasons already assigned.

Notwithstanding the publicity given to this new method by every existing medical journal throughout the civilised world, copied also as the narrative was into every other channel of information, it is lamentable to think that thousands and thousands of persons are still living, sufferers from one of the greatest calamities incidental to human existence, whose malady is easily and permanently amenable to this very safe and simple treatment.

How is this state of things to be amended? 1st, by diffusing more widely amongst the community

at large the knowledge of the fact ; and, 2ndly, by instructing, as far as words can instruct, the professional adviser, as to the rules to be observed in making a trial of the remedy. The latter is attempted in the course of the foregoing observations, the former is enjoined on all who do me the honour of reading them ; for it is desirable that every one, who in ordinary phraseology may be said to have lost the drum of the ear, should at least be made aware that art can supply them with the means of relieving their sad affliction.

CHAPTER XV.

ON A NEW METHOD OF TREATING OTORRHŒA.*

It would be contrary to experience, as evinced in the history of almost every discovery, were the advantages deducible from it to be at once either fully developed or duly appreciated. When in 1848 it was my good fortune to introduce a mode of treatment capable of alleviating so materially certain cases of deafness previously deemed beyond the reach of our art, and that by one of the simplest of remedies, it could scarcely have occurred to me that this very practice would in its turn lead to an improved method of treating successfully another very troublesome affection—*otorrhœa*—an affection which has so frequently baffled the best-directed and most persevering efforts of medical practitioners to remedy.

In the present as in the former case, the agent by which such a result is accomplished is so simple, and seemingly so inadequate to the end, that nothing short of the most irrefragable and conclusive expe-

* This paper appeared in the 'Lancet' of May, 5, 1855.

rience could suffice to convince me of the value of the method, and the superiority it possesses over the uncertain and precarious modes of treating otorrhœa by injections hitherto in use ; nor will it be less surprising when it is added that it is neither more nor less than a modification of the remedy already introduced to the notice of the profession, for the alleviation, if not for the cure, of all those cases of deafness that arise from partial or entire loss of the membrana tympani—namely, *cotton-wool*.

But what I have just stated regarding this new mode of treating otorrhœa does not comprehend by any means the only advantage derivable from its employment ; for its value is not limited to the mere arrest and cure of the discharge. It has this additional superiority over the usual modes of treatment, that the sense of hearing, so frequently impaired under the use of astringents, is, on the contrary, not only not diminished, but decidedly and in many cases immensely improved.

It is not denied that astringent injections containing alum, salts of lead, zinc, &c., which from time immemorial have formed a prominent feature in the routine treatment of otorrhœa, have sometimes been successful in suppressing the discharge ; but how often have practitioners and patients had reason to regret in such cases, that in an exact ratio with their success,—that is, in exact ratio with the subsidence of the discharge,—has there been a corre-

sponding diminution of the sense of hearing! In my experience this has been so manifestly the case, that for many years past I have preferred recommending patients to submit to their malady rather than incur the alternative, I have accordingly limited the treatment generally to the mere cleansing and soothing of the ear, without prescribing the use of such means as might be supposed capable of suppressing entirely the discharge.

I had not long practised my plan for the relief of deafness arising from partial or entire loss of the membrana tympani, ere my attention was arrested by the fact adverted to—namely, the gradual diminution, followed by the entire cessation of the discharge, which almost invariably occurs in cases where the wetted cotton is used for the purpose mentioned, and to the use of which there can be no doubt such a result is alone attributable. Frequently would some patient exclaim with no little satisfaction, if not exultation, “Your remedy has not only improved my hearing, but the discharge which was so offensive to me has entirely ceased.” A fact so remarkable could not fail to claim attention; and the first cases of chronic discharge from the ear that presented themselves, irrespective altogether of deafness, were made the subjects of my experiments with the cotton. A few cases by way of illustration will be appended.

I come now to mention the manner of applying

this remedy. First of all, the passage of the ear is to be carefully cleansed by gently syringing it with warm water, and the moisture removed by means of a porte-sponge. The parts are now to be so clearly displayed by the aid of a powerful gas-reflector, that the necessary manipulations may be readily and accurately accomplished, when I take some prepared cotton drawn out to a great length, and adjust it by gently pressing down every part of it bit by bit, and almost fibre by fibre, upon the surface from which the discharge proceeds, gradually filling the meatus, and impacting it therein, exactly as if dressing an ulcer on any other surface of the body; this done, quiet is enjoined, restricting as much as possible every movement of the jaw, such, for instance, as takes place in eating and speaking. Twenty-four hours afterwards I remove this, and apply another dressing of the cotton. The importance of restricting the patient as much as possible from moving the jaws will be at once manifest, if the reader will take the trouble to place the point of a finger in the passage of the ear and read aloud the present paragraph. It will then be perceived how easily the cotton, however accurately adjusted, may be loosened and moved from its state of exact apposition. In eating, this displacement takes place still more readily, yet the patient cannot be debarred all use of the jaw, seeing he must have food, but the food should be such as to require no mastication;

nor, if great care be taken to keep the jaws in a state of motionless apposition, need speech be altogether [interdicted], for persons may speak intelligibly with the teeth closed. Doubtless no one will consider these restrictions as objections to this mode of treatment ; though a more specious but equally invalid objection to it may be raised on the ground that the tympanum, being a cavity, such a degree of accuracy in adapting the cotton to its surface as described, cannot be attained. If the ear be examined with the admirable appliances for its illumination now at the command of the aural surgeon, it will be found, in cases where the membrana tympani is destroyed, that the extent of the surface from which the discharge proceeds is not only exposed to view, but the cavity is observed to be obliterated, and the walls of the tympanum, red and vascular, are seen thickened and tumid, if not spongy or fungoid. I speak here more especially of the worst cases that come under the notice of aural surgeons, in the great majority of which not only is the discharge itself cured, but the patient experiences a great amelioration in the state of his hearing also. Nay, more : cases can be referred to in which the great disorganisation of the ear seemed to preclude all hope of effecting any amelioration of the hearing, yet in which, after persevering in the treatment for a greater or less period, a change has been accomplished, which could not have been con-

fined to the fungoid tissues alone, for in the cases I speak of a sensible improvement of hearing has been a coetaneous result.

The successful treatment of external otorrhœa by the same simple means has been hitherto not less rapid than certain. Moreover, in nearly every case, relief of the deafness has accompanied the cessation of the discharge—a result the reverse of that which almost invariably follows the treatment of external otorrhœa by astringent injections. The arrest of the discharge may, indeed, by such means be accomplished in many instances without any great difficulty, but when that has been done, we have no great reason to rejoice at a cure that has been effected at the expense of the patient's hearing.

As already hinted, I foresee the argument, based on the fact of the tympanum being a cavity with a traversing passage, that may be adduced against the treatment: but it is contended that in chronic otorrhœa, of that aggravated form at least of which I speak, no such cavity, for reasons already stated, is found to exist. The theorist, indeed, as in the case of the treatment of certain cases of deafness by excision of enlarged tonsils, may contend that the occlusion of the guttural extremity of the Eustachian tube is a physical impossibility; but as in that case, so in the present, facts that stand out in bold relief are not to be overthrown by the laugh of illogical reasoners, how eloquent soever may be their mis-

taken efforts. What fact in surgical therapeutics is now better attested than the cure of deafness by the excision of enlarged tonsils? As in that instance, so now in the treatment of otorrhœa by the simple means so confidently recommended, look at the facts; it is true the investigation of this subject is still going forward, and cannot, therefore, be considered as complete, but if any modification of what is here stated become necessary, it must be sought for in future experience, not in that of the past.

A chronic discharge of mucus, or of pus, from the passage of the ear, or of mucus and pus intermingled, is usually denominated otorrhœa. This affection, which may be confined to the external meatus, involving chiefly the ceruminous follicles and lining membrane, or which may extend to the internal ear, when it does not originate therein, is one of the most common as well as most troublesome affections to which the ear is liable. And not only so, but otorrhœa is usually regarded as an affection more intractable than any other to which the ear is subject; and it is one besides which it is considered dangerous to cure, and against attempting to cure which cautions have been from time to time addressed to practitioners by almost every writer on diseases of the ear. How far such cautions, which should have been directed against the means rather than the end, were necessary, will afterwards be seen. But otorrhœa, even when ne-

glected or when unsuccessfully treated, is not always a disease from which the patient experiences much suffering, for pain is by no means a necessary accompaniment ; and cases may be met with where the discharge has existed for years ; nay, for the greater part of a lifetime, yet unattended all the while by any appreciable measure of pain.

Though otorrhœa may be considered generally as a purely local disease, yet practitioners there are who seem disposed to regard it as dependent more on constitutional than on local causes, and requiring for its successful treatment chiefly constitutional remedies—a view too exclusive to require any formal refutation. That in many cases otorrhœa may be modified by constitutional causes is no doubt quite true, and scrofula may be named, especially in the young, as an undoubted example. But its manifest origin is, in a great majority of cases, from causes that are local, and that act directly on the ear itself ; the visible, consequent alteration of the tissues that takes place, consisting usually in a turgid, if not fungoid, state of the lining membrane ; the readiness with which both these and the discharge yield, and all vestiges of the disease disappear, under a mode of local treatment now advocated, without being followed by any of the untoward effects which we are cautioned to expect—these are all reasons which, when combined, are more than sufficient to show how little claim

otorrhœa can have to be considered generally as a disease of constitutional origin. That an affection so little amenable to the modes of local treatment usually had recourse to, should, in the end, come to be looked on as one of constitutional rather than of local origin, admits of a ready explanation; but beyond constitutional states that may be coincident with this, as they may be coincident with any other local disease, I can see no ground for making any such exclusive admission in favour of otorrhœa.

Otorrhœa may occur in persons of all ages; but the young are more liable than the aged, and the feeble, sickly, and ill-fed than the robust and vigorous. It is perhaps on this account that it has been said that women are more liable to it than men; but although the lymphatic temperament and scrofulous diathesis may be regarded as predisposing causes, yet opposite conditions do not seem to confer any certain degree of immunity.

As in a great number of cases otorrhœa is a result of inflammation of the ear, and is still dependent, in many such cases, on the existence of chronic otitis, so it is hence plain that whatever may give rise to otitis may, for that reason, become a remote cause of otorrhœa. More particularly I would mention, among these causes, exposure of the body, and of the head in particular, if uncovered, to draughts of cold, humid air, more especially after perspiration; imprudent use of cold bathing; external injury,

such as blows, &c. ; irritant and other injudicious applications to the ear for the cure of deafness, among which may be enumerated electricity and galvanism, too oft repeated or long-continued ; foreign bodies lodged in the ear ; indurated cerumen ; caries, syphilis, lepra, porrigo, and the exanthemata, more especially scarlatina. Otorrhœa may also succeed to other diseases, such as ophthalmia, leucorrhœa, &c. ; or it may, as we have said, be connected with, if not dependent on, a scrofulous diathesis, appearing in the young more especially, and disappearing on their attaining the age of puberty. Otorrhœa, moreover, has been observed to occur during the course or towards the decline of some acute diseases, such as typhoid affections generally, and has also been found coincident with disease of the spinal column ; but beyond all others, it shows itself as a sequela of scarlatina.

Otorrhœa may, like otitis, commence either in the external or in the internal ear, or, more rarely, in both simultaneously. Hence, like otitis, it may properly be divided into external and internal,—in all those cases, at least, where it does not attack the external and internal ear at the same time, or where the membrana tympani being destroyed and the two cavities thrown into one, each portion of the affected tissues contributes its share of the secretion. When the external meatus is alone the seat of the affection, and the disease is either neglected or does not yield

to treatment, not only are the subjects thereof liable, on exposure to cold and other occasional causes of otitis, to great aggravation of their malady ; but the disease, in conformity with its well-known tendency, usually, under such circumstances, extends to the internal ear, producing there perforation of the membrana tympani, and occasioning more or less serious disorganisation. Hence the desirableness of putting a speedy stop, in all cases, to this discharge and the causes on which it depends ; and hence, also, the great importance of my remedy, by which this may, in almost every case, be so easily, so safely, and so surely accomplished.

When, on the other hand, the disease originates in the internal ear, the fluid there formed, making for itself a passage through the membrana tympani, gives rise to inflammation of the external meatus also ; so that the external and internal ear—the membrana tympani being in part or wholly destroyed—become united into one common cavity, from every part of which the discharge is, in such cases, derived,—if, indeed, that can be called a cavity where the turgid state of the tissues scarcely leaves an issue for the discharge of the secretion.

There are, moreover, some rare varieties of otorrhœa in which the affection cannot be considered as idiopathic, nor yet as symptomatic, but which may more properly be denominated spurious ; for in the examples I would designate by this appellation, the

discharge, though passing through the ear, is not furnished by the ear itself, but is derived from a source more remote—the ear, before it becomes itself inflamed by the constant contact of an irritating fluid, furnishing to this discharge nothing more than a passage. Of this kind are various instances mentioned by Itard and others, where the discharge proceeded from an abscess within the cranium ; in some cases the abscess has been in the brain itself, in others by suppurating glands in the neck.

Those who regard otorrhœa as a disease of constitutional origin, no less than those who consider it a merely local affection, seem alike imbued with ideas of danger that may arise from attempts to suppress, by topical applications, the discharge. Examples of danger arising out of such practices are indeed not unknown, and deserve the attentive consideration of all who undertake the treatment of aural diseases. But the danger, when danger occurs, arises not from obviating the *disease*,—that is, the morbid alterations of structure, which, indeed, such treatment professedly does not attempt to do,—but from the too energetic use of astringents, through which only the prominent symptom of the disease, rather than the disease itself, becomes, possibly, suddenly suppressed. It is obvious, however, that were the diseased state of the parts to be first of all remedied by means, simple or complex,

no matter which, and changed from an unhealthy to a healthy condition, then would the otorrhœa, as a necessary consequence, disappear. But how have practitioners—at least, the more incautious of them—attempted to get rid of the discharge? Not always, certainly, in the manner we would indicate. On the contrary, every one knows that injections, containing salts of lead, zinc, and copper, nitrate of silver, creosote, &c., &c., constitute the usual routine in such cases; and though they may, as has been said, be capable of suddenly, and in a dangerous manner, suppressing the discharge, yet cannot now, after such ample and lengthened experience of their inefficiency, be supposed capable of removing that morbid state of the tissues on which the discharge depends. That danger, then, may arise to the patient under such a treatment is quite conceivable; and it is a source of unfeigned satisfaction and pleasure to me to be able to make known a mode of treatment as safe in all such cases as it is efficient; by which the usual mode of treatment, accused of being so hazardous, must soon, and I hope for ever, be superseded. My treatment will thus do away with all ground for non-interference with this discharge on the pretext of danger, as well as remove every reason for counselling submission, on the part of the patient, to a loathsome discharge, which is at all times not only a source of disgust, but which renders the subjects thereof, so long as it is allowed

to continue, peculiarly liable to aggravation of their malady from all those influences that have been mentioned as occasional causes of this disease.

CASES.

Miss L——, pupil in the establishment of Miss H——, St. John's wood, became my patient in June, 1854, suffering from a most disagreeable discharge from the right ear, which was left as one of the sequelæ of scarlatina several years ago. Considerable deafness attended the case, which varied with the state of the discharge, being greater when the latter was least abundant. On examination, a small perforation existed in the membrana tympani, below the insertion of the malleus ; and the walls of the meatus, near to the membrane, presented a vascular appearance approaching to a state of semi-ulceration. Contenting myself with cleansing the meatus, by carefully syringing it with warm water, I directed her to apply a poultice, enclosed in a linen bag, to the side of the head, including the ear, for two nights in succession, and then to visit me again. At the second visit the irritable appearance of the meatus had subsided, and I proceeded to adjust and impact dry cotton at the bottom of the meatus. From day to day the same treatment was employed for upwards of a week, by which time all

discharge had ceased. It was my wish to continue the application for three or four days longer, but arrangements had been made for her return to her friends for the holidays, which could not be overruled. As I feared, the result proved that the treatment was too early discontinued, for in six weeks she returned as bad as ever. This time she was instructed by her friends to attend me until the cure was complete ; and this was happily effected in a period of three weeks. The discharge entirely ceased, and the hearing was perfectly restored. On examination of the membrane, no appearance of perforation remained.

W. W——, foreman to Messrs. Haward and Nixon, became a patient of the Metropolitan Ear Infirmary, Sackville street, January, 1855, suffering from otorrhœa of some months' continuance, accompanied by a considerable degree of deafness. It appeared to me to be a very favourable case for the new treatment, and he was desired to attend me daily for the purpose of trying it. The cotton was accurately adjusted, and from day to day it was replaced by a new piece. Every application was followed by an improvement, and the patient invariably spoke of the great "comfort" he experienced from the remedy. In one week all discharge had ceased, and his hearing was better than it had been for years. In this case both membranes were entirely absent ; still there was no ap-

pearance of a cavity. The walls of the tympana were fully exposed to view, and the patient could "whistle" through the ears. Under such circumstances, so rapid a cure could not have been expected. [I had the satisfaction of hearing from this patient that many years ago I had entirely cured his son of an extreme deafness by excision of exuberant growths from the tonsils. The lad, now a man, had been entirely restored to hearing by the operation.]

Miss ——, the daughter of a surgeon in the North, favoured me with a visit on the 10th of January, bringing with her an introductory note from her father, from which I extract the following brief history of her complaint:—"When she was about five or six years of age (she is now twenty), she had a severe attack of scarlet fever, during which her ears began to discharge; and on becoming convalescent, I was grieved to find her hearing affected. Except keeping the ears clean with the daily use of warm water (injected), I did nothing more, and scarcely have done anything more ever since, although occasionally urged to do so by several of my medical friends. You will find the membranæ tympanorum more or less gone in both ears. Her general health is uniformly good. She hears very fairly on one side, but very imperfectly on the other. I have thought the case a favourable one for the cotton wool, as advised by you some

years ago," &c. &c. All this I found verified on examination, with the exception of not finding the membrane perforated on the right side, though it had evidently suffered damage during the fever. The discharge existed only on the left side, and to that I directed my attention. The passage of the ear was tumefied and contracted, so that the cotton remedy could not be applied with effect. I therefore set to work to cure the discharge by my new method, trusting that, if successful, improved hearing also would be experienced by my patient. Day after day the dry cotton was applied, with a gradual improvement certainly, but still with only partial success. The tumefaction, however, diminished, and the calibre of the passage was proportionately increased. One day my patient reported to me that she had experienced a sensible improvement in her hearing, and she herself suggested another trial of the moistened cotton. This was done, and a decided improvement in hearing ensued, so that from this time the treatment of the discharge was a secondary consideration, and I proceeded to teach her how to apply the moistened cotton, which is now followed up with daily success, the discharge ceasing as a matter of course. The great impediment to the suppression of the discharge in this case, by the impaction of the dry cotton, arose, I suspect, from the free passage of the Eustachian tube, along which the discharge in the tympanum freely travelled, a cir-

cumstance of which my patient was frequently and most disagreeably made sensible.

Mr. W——, Surgeon in the Navy, who had just received orders to hold himself in readiness to proceed to the Crimea, consulted me, in December, 1854, for disease of the left ear, attended by a loathsome discharge. On examination, I discovered a small fleshy excrescence growing from the surface of the membrana tympani, which was very much disorganised, without any apparent perforation, though it seemed as if such a condition had at one time existed. The hearing was greatly deteriorated, but having the sense perfect on the opposite side, he was but slightly inconvenienced. The discharge, and a sense of oppression on the affected side, were the chief sources of complaint. I explained that it would be necessary first to remove the fleshy excrescence, and that then I should proceed to relieve him by my new mode of treating cases of otorrhœa, and that such treatment would require his daily attendance for several days in succession. At that time it was inconvenient to him to remain, and he returned to his duties at the Royal Naval Hospital at Deal, until he could make arrangements and obtain leave of absence for about a fortnight in town. In the interval he was one day exposed to a cold, piercing, easterly wind, and wishing to protect the diseased ear, he pushed in the passage a piece of dry cotton, of which he took no further

notice. On the 18th of January I received a note from him, to say that he had obtained leave of absence and would visit me on the following day, which he did. On examining the ear, I said: "Why, what have you got in your ear?" "Nothing; I have done nothing to it." "Oh yes, you have," I replied, at the same time withdrawing from the ear a dry piece of cotton, which had evidently been impacted there for several days. Again applying the speculum, I remarked: "The fleshy excrescence has disappeared, and you have unintentionally cured yourself of the discharge. You have absolutely cured yourself upon the principle of treatment of which I told you at your last visit. The piece of cotton I have just extracted has by some good luck been pushed down upon the seat of the disease; its pressure has dissipated the excrescence, and with it the discharge has vanished." His astonishment was succeeded by an immediate fit of laughter, which was thus accounted for: A Surgeon had examined his ear the day previously, and said: "Oh yes, I see the fleshy growth quite plain: Mr. Yearsley will have no difficulty in removing it!" So much for the opinion of Surgeons unaccustomed to see diseases of the ear. The gentleman alluded to could only have seen the pellet of cotton wool. But more experienced Surgeons than he may be deceived in regard to disease in the passage of the ear. I remember once to have removed a polypus

from the ear of a young lady, the existence of which had been denied by two of the most eminent Surgeons of the day.

Harriett Le H——, a lady's maid, had suffered from discharge from the left ear since her childhood, attended by a considerable degree of deafness. About a year ago, slight bleeding was occasionally seen to be mixed with the discharge, which led her to seek medical assistance. The surgeon discovered a polypus in the left ear, and removed it, but the discharge became "more offensive than ever." Thus situated, she was sent to me. I at once began the use of the cotton, and in a few days all discharge disappeared and the hearing was re-established.

June 11th.—She has this day called on me again, being entirely cured of the discharge, but still complains of a slight tinnitus in the ear which had been affected, the hearing remaining good.

CHAPTER XVI.

ON ARTIFICIAL PERFORATION OF THE MEMBRANA TYMPANI.

THE operation of perforation of the membrana tympani, when first introduced as a mode of removing deafness, was performed by Sir Astley Cooper in two kinds of cases—those attended by obliteration of the Eustachian tube, and those caused by accumulation of extravasated blood in the tympanic cavity. But other surgeons have held very different views as to the proper cases for the operation. Thus Saissy does not trouble himself at all about the state of the Eustachian tube, and merely recommends puncture in indurated and thickened states of the membrana tympani. Itard, on the contrary, would have made the operation entirely dependent on invincible obstruction of the tube. Deleau, following Itard, recommends it in obstruction or obliteration of the canal. Kramer severely criticises the indications for the operation which other writers have advanced, and for himself, attempts to limit the operation to

actual disease of the *membrana tympani*. He remarks, that “if the *membrana tympani* be considerably thickened, quite insensible on being touched with the probe, and of cartilaginous hardness, and if, in consequence of this, the hearing has seriously suffered, there remains nothing for the improvement of the latter but perforation of the membrane. Even in these cases, however, in which the operation is really indicated, it ought not to be had recourse to, excepting when both ears are affected in the same way, and suffer simultaneously from a high degree of difficulty of hearing; or when the second ear, the tympanic membrane of which is not diseased, yet suffers from difficulty of hearing, so incurable, that perforation of the *membrana tympani* affords the only prospect of probable improvement. To this permission for the performance of the operation I must, however, annex the following clause: that the most careful investigation of the ear to be operated on must have proved that it is suffering from no other morbid condition by which the operation would be rendered fruitless.” Kramer considers these remarks sufficient “accurately to define the indications for the operation;” but I believe I shall presently show them to be equally unsatisfactory with those which he so confidently impugns.

The introduction of catheterism at once puts aside a large proportion of the cases considered proper for the operation by Sir A. Cooper—namely, obstruc-

tion, without stricture or adhesions in the Eustachian tube, and also extravasations of blood in the tympanum, with a free state of the Eustachian tube—such cases now admit of relief by catheterism and the injection of air, or the warm-water douche ; but though the point has been generally omitted from consideration, I can conceive no good reason why perforation should not be resorted to in cases of extravasation into the tympanum, together with occlusion of the Eustachian tube, invincible to catheterism, as practised by Sir Astley Cooper. Even in many cases of stricture of the Eustachian tube, we have first to resort to attempts at dilatation, by means of fine bougies, before the operation upon the membrana tympani can be with propriety entertained. There can be no doubt that Cooper, Itard, Deleau, Saissy and others, are wrong in omitting an insensible and unvibratile condition of the membrana tympani from the cases proper for the operation ; but Kramer, in his zeal for the performance of the operation in such cases, which are, indeed, of equal importance and frequency with any others, entirely overlooks the necessity for the operation in cases of invincible occlusion of the Eustachian tube. He acutely observes, that of all the cases detailed by Itard, the only one in which real and decided benefit was occasioned was a case of deafness from induration of the membrana tympani. But Kramer is himself to the full as inconsistent ; for after the specific directions

given for diagnosing the cases proper for the operation, and maintaining that uncomplicated cases of hypertrophy, or thickening of the membrane, were the only cases proper for the operation, we find that, in the single case he records, in which the operation was performed by himself, none of the requirements on which he laid such a stress were present. In his thirty-eighth case he punctured the membrane in a patient suffering from stricture of the Eustachian tube on one side, and deaf in one ear only, in which the performance of the operation proved the existence of obstruction of the *cavitas tympani* from puriform mucus, and a permanent state of chronic inflammation of the middle ear. The operation was performed twice, and was entirely unsuccessful.

Taking the cases and data of other authors into consideration, and guided by my own experience, it can be clearly made out, that the operation may be performed with a fair prospect of benefit, under the following circumstances, and when no other mode of proceeding affords any hope of relief :—1. When there is no disease of any other part of the auditory organ. 2. When there is stricture, occlusion or obstruction of the Eustachian tube, irremediable by catheterism, and no disease of the *cavitas tympani*, except simple obstruction, the other parts of the ear remaining healthy. 3. In cases of extravasated blood in the tympanum, which cannot be removed by way of the Eustachian tube, either from its stricture,

occlusion, or some other cause. In addition to these points, it must be noticed that, even in the best cases, the assistance is only the removal of a mechanical obstruction. The membrana tympani is an adjuvant to hearing, but unless the nerve of audition remain tolerably healthy, no alteration in the state of that membrane will be of any avail. The membrane, only aiding in the transmission of aeriform vibrations, its induration, or insensibility, in nowise interferes with the sonorous vibration of solid bodies in contact with the side of the head, so that the removal of impediment in the membrane is of no service, unless the patient can, before the operation, distinctly or tolerably hear a watch when held between the teeth, or applied by contact to the ear. This is of paramount importance, and was insisted on by Sir Astley Cooper, though little attended to by subsequent writers.

In my own practice, an additional indication for the performance of the operation,—as far as I am aware, not known to other aural practitioners, but equal in importance to any of those previously pointed out,—has been satisfactorily proved. This is, in those cases where there has been accumulation of pus in the middle ear, from inflammation of the tympanum and rupture of the membrane, to allow the exit of matter, but in which the membrane has subsequently cicatrized. The cicatrization of the membrane, by increasing its tension, and altering its

structure, invariably produces more or less deafness. In such cases it often happens that no other injury to the ear has been left by the disease, which is most common in children or young persons, and in which the membrane of the tympanum cicatrizes in a few days after the eruption of the matter. In other cases the membrane only closes after the long persistence of internal otorrhœa. Here there is not the same chance of relief, because the disease may have affected the fenestral membranes, so as to render them insensible to sound, in which case neither the removal nor restoration of the membrana tympani would prove of any avail.

Careful examination of the ear in such cases will often reveal no sign of a cicatrix, nor any indication whatever of a diseased state of the tympanum. We must get our diagnosis from the previous history of the case. If the patient has ever had inflammatory disease of the ear, followed by discharge, in which deafness appeared as the discharge ceased, the diagnosis is almost complete, as external otorrhœa does not produce deafness without some objective signs of disease of the membrane. In fact, if in such cases a watch can be heard distinctly when in contact with the auricle, or with the teeth, we become quite certain of the cause of deafness, with the single exception of the possibility of disease of the fenestral membranes. Other cases of the same kind are sometimes produced by accidental rupture of the

membrane, followed by cicatrization and loss of hearing.

We may sum up, then, by saying that in cases of deafness from obliteration or irremediable obstruction of the Eustachian tube, either with or without extravasation of blood in the tympana ; in cases of excessive induration and hypertrophy of the membrane ; and in cases in which it is rendered non-vibratile by ulceration and subsequent cicatrization, there is a probability of improving or restoring the hearing by the operation on the membrane, provided always that the function of the auditory nerve remains tolerably perfect.

As far as my experience and observation go, the operation will always be unsuccessful in more complicated cases, or in cases in which these conditions do not exist.

There is one other indication for the performance of perforation, not so much with a view to remove a symptom like deafness, as to preserve as much as possible the integrity of the whole organ. This is the occurrence of suppuration within the cavity of the tympanum. When matter has formed, the only natural outlet is by way of the Eustachian tube ; but in nine cases out of ten, this canal participates in the disease to such an extent as to prevent its escape in this way. It therefore either bursts through the membrane of the tympanum, or extends in other directions, with sometimes the most alarm-

ing results. The pus in such cases may be removed by an incision through the membrane, with the same success as it is removed by artificial means from ordinary abscesses.

With respect to the mode in which the operation is to be performed, we are now in possession of a tolerably perfect instrument for the purpose. It has been only by very slow steps that anything like perfect instrumentation has been attained. Sir Astley Cooper used a small trocar ; but this kind of instrument, however well adapted for the evacuation of fluid from a cavity, has, in the case of the membrana tympani, the disadvantage of allowing the subsequent cicatrization of the opening it makes. Upon this plan Itard's stilette of tortoise-shell was a very unnecessary refinement, and had otherwise so many disadvantages, that I believe no one ever used it but the author. Saissy merely used a trocar, as others have done before him. Himly devised a round punch for removing a circular piece of the membrane ; but this procedure, though an obvious improvement, inasmuch as it prevented the ready cicatrization of the aperture, required so much force to pass it through the membrane as to endanger other parts besides that intended to be removed by the instrument. A more complex instrument was invented by Deleau. It consists of a fine steel rod ending in two barbed points, each forming segments of the worm of a screw, which are so arranged that

the barbs shall hold the piece of membrane which is being cut out by the rotation of the instrument. If this were done perfectly, the objections to which a mere punch or trocar is liable would at once be met; but such can hardly be said to be the case. It is, however, on the principle devised by Deleau that the ingenious instrument of Signor Fabrizi is constructed. A few years ago that gentleman brought his instrument to this country, and at first view it appeared to realise the fondest hopes of the few remaining advocates of the operation, and I took opportunities of trying it on the dead subject; but I soon found many objections to the instrument which seemed to me could be easily obviated. How far I have succeeded must be left to the judgment of my readers; but I may observe, that I had the pleasure of a visit from Signor Fabrizi himself, who is surgeon to the hospital at Modena, and to whom I submitted my modifications of his instrument, with which he not only expressed himself greatly pleased, but candidly admitted that his own must be henceforth entirely superseded by it.

Mode of performing the operation.—The proper case being selected, the shaft of the instrument is to be introduced into the ear through a speculum, and the circular piece of membrane removed from the lower and anterior part of the membrane, this being the situation which offers the largest surface of free

membrane. The chief points for observance in the operation are the selection of the proper spot, and great care that the spiral has good hold of the membrane before the cutting process is commenced.

Before performing the operation, the action of the instrument may be beautifully illustrated by operating on a stout bladder or a piece of damp parchment, which resembles the structure of the membrana tympani sufficiently for this purpose.

After the operation the ear should be guarded for some days against cold and the influence of the atmosphere, by wearing a cap, or inserting a piece of cotton wool in the concha. Many cases in which the operation is at first highly successful are followed by deafness, after a short time, even when the orifice does not close. The cause of this is, I believe, to be found in disease of the cavitas tympani, from the entrance of cold air, by which the fenestral membranes become unfitted for the propagation of sound. For this reason the operation is more likely to be successful if performed in summer than in winter, unless patients can defend themselves by confinement in an equable temperature for a short time after the operation. The wind should also be guarded against, whatever may be the season of the year, after the tympanum is thus suddenly opened, and the ear should be carefully protected from cold until the internal surface of the drum and the cavitas tympani have become accustomed to the new stimulus.

Whether it be so recorded I know not, but I have heard it said that Sir Astley Cooper always regretted having meddled with diseases of the ear. Another version of the story is, that he ever lamented the mistake he had made in respect to perforation of the drum of the ear. However it might have been, it is very certain that his reputation as an aural surgeon rose and fell with that operation. Introduced and practised by so eminent a practitioner, it was too indiscriminately performed by others, and there can now be no doubt that in almost every instance it failed. Numerous cases in which Sir Astley himself operated have passed under my observation, and, in almost all, the operation was either entirely unsuccessful, or only temporarily improved the hearing. It is satisfactory, however, to be able to state that, when skilfully performed, it is not followed by any marked increase of deafness.

On the discovery of my new method of treating successfully perforation of the membrana tympani, a new field appeared to open for testing the utility of perforation—not so much with the expectation of amendment from the operation *per se*, but as to how far it could be made subservient to the use of the moistened cotton. It is indispensable that the tympanum should be open for this singular remedy to succeed. When, therefore, disease had not produced such a condition of the ear, artificial perforation, or trephining of the membrane, seemed to present itself

as a reasonable means by which such a result might be attained. I regret to say that hitherto my experience has not borne out my expectations, but the experiments have led me to another important discovery—namely, the discrimination of the cases in which alone Sir Astley Cooper's operation ever succeeded. They were those in whom perforation of the membrana tympani once existed as a consequence of disease, which perforation had healed, leaving a cicatrized and unvibratile membrane. In such cases I now reopen the membrane by the tympanatoire, reproduce the otorrhœa, and the result is usually most beneficial to the hearing.

If in the history of any case of long existing deafness, no matter how long affected, the patient can remember a continuous discharge—the grand characteristic feature of perforation—I never hesitate to counsel the operation of trephining the membrane by the tympanatoire above described. Sometimes it is eminently successful; and, if otherwise, the operation leaves no bad consequences.

CHAPTER XVII.

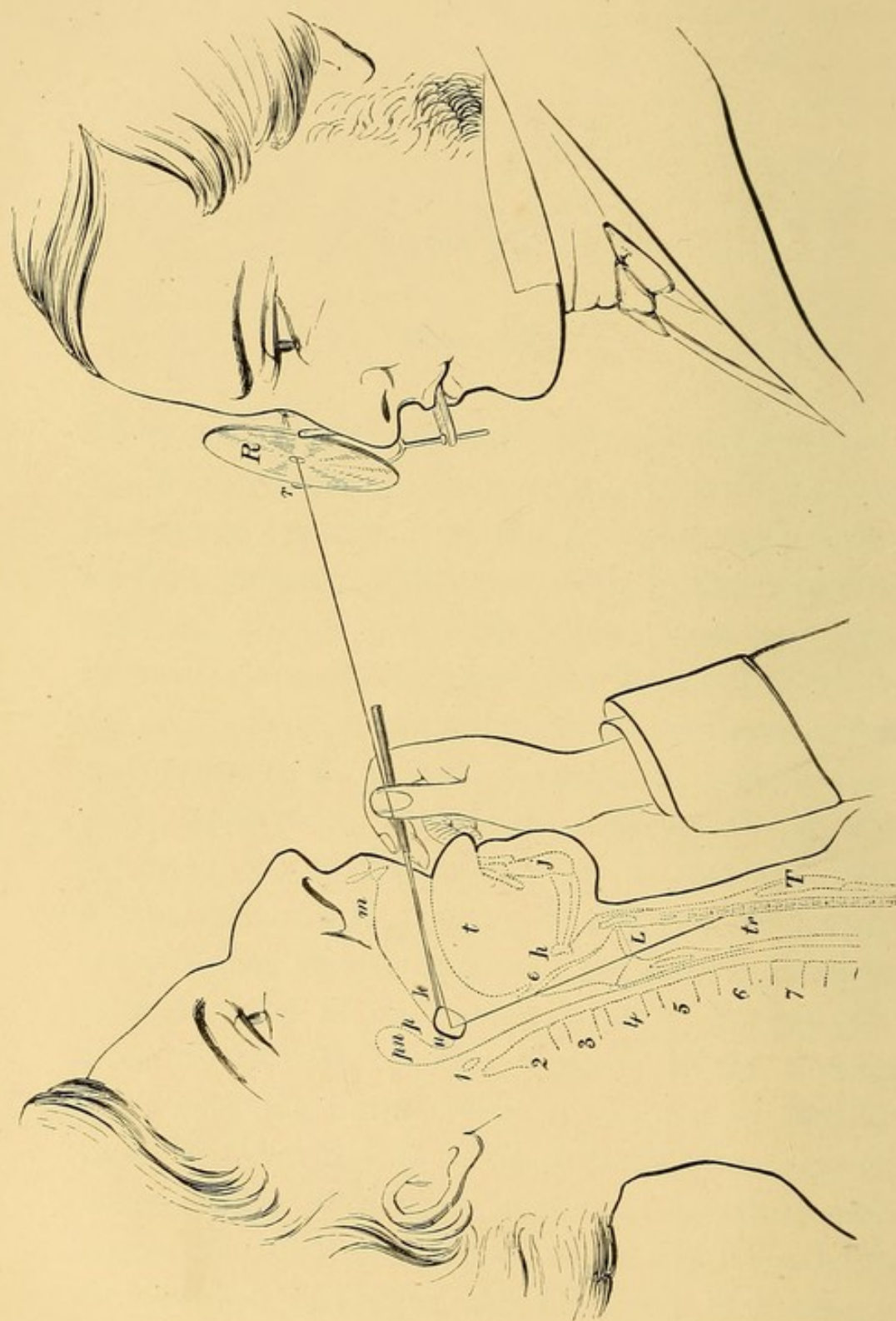
RHINOSCOPY.

By the aid of apparatus specially adapted for viewing the upper part of the pharynx, the orifices of the Eustachian passages, and the posterior nasal fossæ, we have recently added materially to the means of detecting disease previously hidden from our sight. Professor Czermak, of Prague, has the merit of directing professional attention to the advantages which may accrue to the practitioner and the patient from such exploration. Speculation as to the precise nature of the malady is now set at rest by ocular demonstration, and I have already in a great many cases verified the statements of the learned Professor as to the value of the manipulations. For my relative, the late Mr. Avery, Surgeon to the Charing Cross Hospital, I must claim the honour of first devising the instruments by which these advantages are achieved, but he did not live long enough to make known the result of his experiments, and it was left to Dr. Czermak, of Prague, and Dr. Turck, of Vienna, to

1870

[Faint, illegible handwriting]

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APPARATUS FOR LARYNGOSCOPY AND RHINOSCOPY.

DESCRIPTION OF PLATE.

The Engraving on the opposite page, represents CZERMAK'S LARYNGOSCOPE in its application, with a section of the throat and neck of the person examined.

- 1 to 7.—the bodies of the Seven Cervical vertebræ.
- p*—the Soft Palate.
- u*—the Uvula.
- pn*—the Superior or Nasal portion of the Pharynx.
- m*—the Palate Process of the Superior Maxillary Bone.
- t*—the Tongue.
- h*—a Section of the Hyoid Bone.
- j*—the Inferior Maxillary Bone.
- e L*—the Epiglottis and the Larynx, with a Section of the Cartilages.
- tr*—the Trachea.
- T*—the Thyroid Body.
- k*—the Laryngeal Mirror.
- R*—the Large Reflector, perforated by a Round Hole in the centre.
- r*—the Axis on which the Reflector moves.

The mouth-piece of the large Reflector *R* is held by the observer between the molar teeth.

The Reflector may also be held by means of a forehead frame, which adjusts itself like a pair of spectacles.

The rays of the sun or a good moderate lamp are concentrated by means of the Reflector on the Laryngeal Mirror, which is placed against the soft palate and uvula, *p u*.

The Laryngeal Mirror, *k*, introduced with the right hand, which supports itself on two fingers resting on the jaw, as represented in the engraving, is maintained at such an inclination, that it throws the light downwards, and illuminates the parts to be examined, and, at the same time, reflects the images of these parts into the eye of the observer. If, for instance, everything is disposed as the woodcut shows, the observer can look through the Larynx into the Trachea.

In order not to complicate the drawing, the observer's left hand is omitted ; it may be either used to support the head in its position, or to depress the tongue with a Spatula, &c.

N.B.—The various Instruments used in these new methods of exploration of the Larynx and adjacent parts are manufactured and sold by MESSRS. WEISS & Co., 62 Strand.

pursue the investigation. These gentlemen applied themselves vigorously to the task, and Rhinoscopy and Laryngoscopy under their auspices are now recognised facts in the profession. The accompanying sketch shows the method by which the surgeon may practise Laryngoscopy, and it will be seen that in Rhinoscopy it is only necessary to turn the reflecting mirror in the opposite direction to that we should adopt in Laryngoscopy, that is upward, to get a view of parts which without such help are hidden from our ken. Dr. Czermak did this, and he has taught us that by a little tact and management we need be no longer in a state of uncertainty as to the precise nature of disease leading to deafness when situated in the upper part of the throat. During a recent visit of Professor Czermak to this country, I had opportunities of exhibiting to several of my medical friends these new methods of exploration at meetings held at my private residence for the special purpose, which that gentleman kindly attended. On one of these occasions I was enabled to show in the case of a young girl, deaf from mucous engorgement of the tympanum, the extremity of the catheter as it rested in the orifice of the Eustachian passage. In another case of a young gentleman from Scotland, Dr. Czermak showed the exact spot which in the morning I had touched with the nitrate of silver.

More recently I have tested the value of the method by detecting a tumid condition of the mucous

membrane at the orifices of the Eustachian tubes, patches of diseased mucous membrane on which the secretions have become putrescent in that most disgusting malady, ozena, ulcers on the posterior nasal fossæ, with other deviations from a healthy structure.

Nevertheless, it is a manipulation which requires great tact and experience on the part of the surgeon, whilst the patient often requires to be, as it were, trained and educated before his rebellious throat will submit to the contact of the necessary instruments.

But in Laryngoscopy the value of these new methods of exploration is still more conclusively shown. Any departure from a healthy condition in or about the vocal cords, or in the interior of the larynx, giving rise to aphonia or other inconveniences, may be readily detected. I have lately completely restored the voice to the wife of a surgeon in Hertfordshire, which she had lost entirely for a period of eight years. By the aid of the Laryngoscope I was enabled to brush away with a probang a small tumour, which doubtless had caused the aphonia by interfering with the action of the vocal cords,—her voice immediately returned, and is now as strong as it ever was.

I reserve for another time and for a separate publication further observations on these new methods of exploration of disease, which are engaging much of my attention.

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. Twenty-five years ago, when I first devoted my attention to the subject of aural disease, strange as it may appear, there was scarcely one regularly educated medical 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 treatment, 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 when many of these pages were first penned.

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 puffing advertisements and self-laudation.

Altogether to put down aural or any other quackery seems an impossibility, but it has been my wish to assist 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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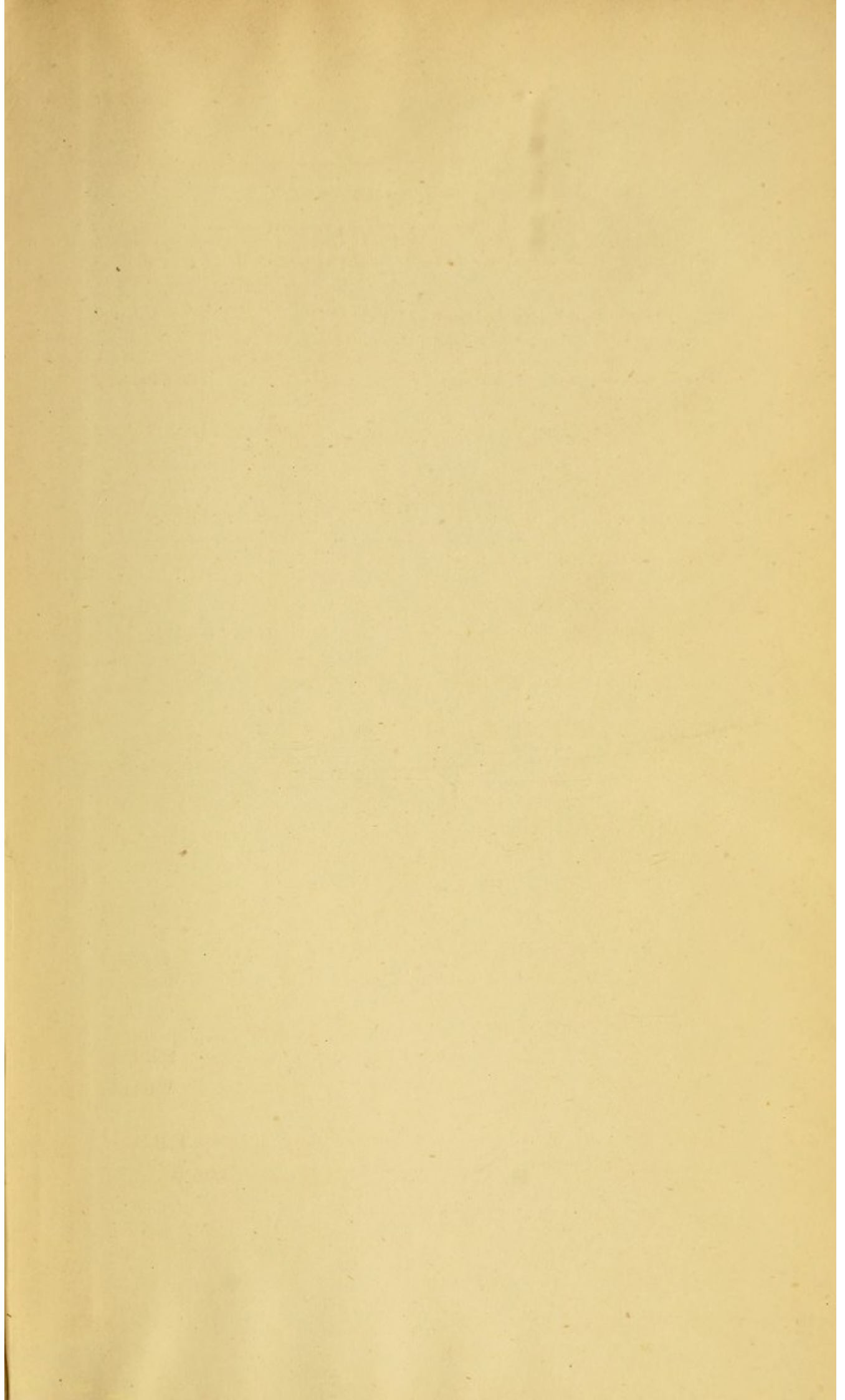
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