Defective hearing : its causes and treatment / by James Keene.

Contributors

Keene, James, 1834-1883.
Royal College of Surgeons of England

Publication/Creation

London : Hardwicke & Bogue, 1878.

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DEFECTIVE HEARING.

By the same Author.

A MANUAL OF

AURAL SURGERY

FOR THE

USE OF STUDENTS AND PRACTITIONERS OF MEDICINE.

SECOND EDITION IN PREPARATION.

OPINIONS OF THE PRESS.

"The volume by Mr. Keene is a most creditable production, both publisher and author having executed their respective tasks thoroughly well. * * *

"The language in which the author expresses himself is judiciously chosen, the style precise, and the method in which he treats his subject exhaustive. * * *

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See also *The British Medical Journal*, December 6th, 1873, *The Lancet*, July 11th, 1874; and other Medical Journals.

London: HARDWICKE AND BOGUE, 192, Piccadilly W.

(2)

DEFECTIVE HEARING:

ITS

CAUSES AND TREATMENT.

BY

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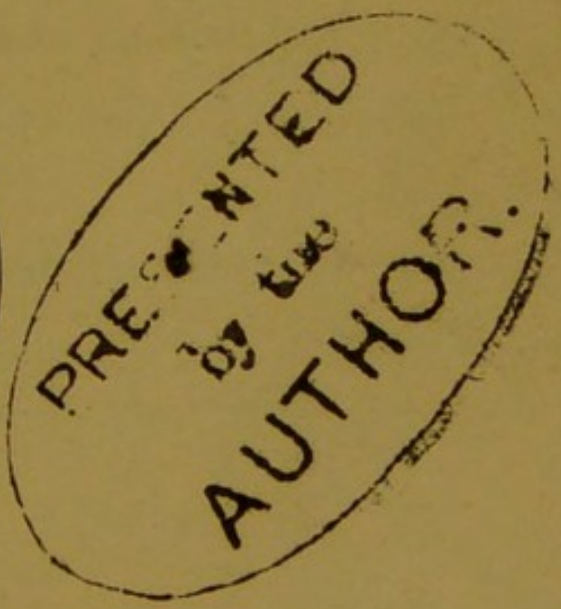
FOURTH EDITION, WITH AN APPENDIX.



LONDON:
HARDWICKE & BOGUE, 192, PICCADILLY.
1878.

PREFACE

TO

THE FOURTH EDITION.

THE material for the present volume originally formed the subject of a paper read before the Harveian Society, and printed at the request of some of the Members.

It has now passed through three editions, during which the necessarily brief limits of a paper have been somewhat outstepped: the whole has undergone careful revision, and a few wood-cuts have been added.

A short communication made to the Harveian Society during the Session of 1877 constitutes the Appendix.

I cannot but feel flattered at the very favourable reception accorded to the former editions, and I trust that the present one will prove equally successful.

59, BROOK STREET,
GROSVENOR SQUARE,
April, 1878.

DEFECTIVE HEARING.

CHAPTER I.

Affections of the Nose and Throat which cause Disease of the Middle Ear.

THE frequency with which persons are met with who talk thickly, and who do not pronounce nasal consonants correctly, cannot have escaped the most ordinary observation. Indeed, so common is the defect, that when once attention has been directed to it, few persons will fail to notice many cases during each day of intercourse with their fellow-men.

The diseases which give rise to this defect of speech—for we must at once dismiss the idea that it is a mere habit—occur at all ages, though more commonly in childhood and early life, and depend, as I shall endeavour to show, upon obstruction to the free passage of air through the nostrils. Augmented or thickened

nasal secretion, snoring, and loss of smell or taste, are likewise symptoms of these affections, which are not unfrequently accompanied or followed by defective hearing.

It will be at once perceived that these symptoms are usually present in an ordinary "*cold in the head*," to which cause they are generally attributed, and consequently neglected. To the aural surgeon, however, the persistance of such indications becomes of considerable importance, because he knows that the catarrhal and inflammatory affections upon which it depends are very liable to extend from the nose to the throat, and thence to the Eustachian tubes and middle ear, where they constitute the commonest causes of defective hearing.

A person who has the peculiarity of pronunciation to which I have alluded is, in common parlance, said "to speak through the nose," though, in point of fact, he is unable to do so by reason of obstruction of the nasal passages. I do not wish it to be understood that absolute closure of the nose is always, or even usually, present in these cases, but that a certain resistance to the *free* passage of air occurs, which the feeble expiratory effort accompanying the pronunciation of nasal consonants is insufficient to overcome.

Our alphabet contains two nasal consonants,

the M and the N. When these are deprived of the nasal expiration which should accompany their articulation, they become B and D respectively. This will be readily perceived by endeavouring to pronounce a word or monosyllable containing a nasal consonant, while the nose is closed. *Me* will then become *be*, *no do*, *moon bood*, *sun sud*, and so forth.

By placing a cold mirror below the apertures of the nostrils, in such a manner that its polished surface is directed upwards, and out of reach of the breath issuing from the mouth, we may readily satisfy ourselves that nasal expiration actually takes place during the pronunciation of syllables containing M and N, and with these only. In this manner we may repeat each of the consonants, in combination with each of the vowels, without any deposition of vapour taking place on the mirror, until the syllable contains *m* or *n*, which will at once become manifest by the appearance of a spot of dimness on the glass.

If we take into consideration the relative positions assumed by the organs of articulation —the tongue, lips, teeth, and palate—we shall perceive that they are the same for the pronunciation of *me* and *be*, *no* and *do*, and consequently we may infer that the difference between the sounds produced depends upon

the passage or non-passage of air through the nostrils.

Having thus arrived at the conclusion that nasal consonants can only be properly pronounced when air passes through the nose, it will be evident that any cause which gives rise to nasal obstruction will also give rise to the form of thickness of speech commonly, though improperly, termed "speaking through the nose."

The defect may vary in degree from an amount scarcely perceptible in some cases to the most aggravated and unpleasant extent in others; but, wherever present, it may be considered as a symptom of obstruction to the nasal air-passages, and indicates a diseased condition in some part of their course. Increase in quantity or tenacity of the nasal secretion, impairment of taste or smell, as well as heavy breathing and snoring, have a similar import, and some one of these indications will be found to have preceded most cases of deafness.

This is in no way surprising when we remember that at least four-fifths of all cases of defective hearing are due to disease of the middle ear, and of this number, in by far the largest proportion, the affection spreads to the Eustachian tubes from the naso-pharynx. The continuity of surface between the parts readily

explains this, and at the same time points out that, if we wish to attain success in aural practice, we must first acquire a thorough knowledge of nose and throat affections. For these reasons it has been deemed advisable to say a few words concerning the structure and functions of the nasal air-passages, as an introduction to the study of their pathology.

I have employed the term *nasal air-passages* in order to comprise the whole tract through which air passes in its way between the external apertures of the nostrils and the glottis. By this arrangement we shall include the whole of the interior of the nose, the upper portion of the gullet, to the level of the opening of the larynx, the soft palate, and the tonsils.

The mucous membrane which lines this tract is continuous with the general mucous surface of the body, and varies considerably in thickness in different parts. Near the exterior orifices of the nose and along the floor of the nostrils, where glandular tissue is absent or nearly so, the mucous membrane is thin and even. In the remaining portions mucous glands form an almost continuous layer, and the membrane is in consequence much thicker. Glands are most conspicuous at the upper part of the naso-pharynx, particularly in the neighbourhood of the Eustachian tubes, where they

form aggregations, known as the pharyngeal tonsils. The mucous membrane covering the inferior turbinated bones is corrugated and irregular, thick, and very vascular. Indeed, capillary vessels are so abundant in this situation that the part may be considered almost cavernous or erectile, and on this account is very liable to swell, constituting the principal cause of obstruction in nasal catarrh.

The olfactory portion of the nasal tract, or that part to which is distributed the nerve of smell, is limited to the superior and middle turbinated bones, and to the upper part of the septum narium. For the proper exercise of the sense of smell it is necessary that odorous particles suspended in the air should be brought into contact with the upper portion of the nasal cavity which must itself be in an efficient condition. Whenever, therefore, the nose becomes obstructed from any cause, these conditions are not fulfilled, and, consequently, smell is lost or impaired.

The same may also occur even when inspiration can be performed through the nose, whenever the current of air is diverted from the part in which resides the olfactory sense. Of this an interesting instance was lately brought before the Medical Society of London. A man who had lost the whole of his nose and palate,

as well as the anterior portion of his upper jaw, was, in consequence of this wholesale destruction of parts, deprived of the sense of smell. When he was fitted with an artificial nose, teeth, and palate, however, the sense returned, to disappear again immediately the gutta-percha nose was removed. In this case it was clear that the artificial nose guided the current of air to the olfactory region instead of permitting it to take the more direct course to the respiratory organs. More simple and frequent cases are of daily occurrence during and following colds in the head, when swelling of the mucous membrane covering the inferior turbinated bones suffices to cause loss of smell, by diverting the current of air from the superior fossæ of the nose.

We must bear in mind, therefore, that loss of smell does not always indicate an affection of the olfactory region, but that its cause is often seated in other portions of the nasal air passages, portions in more immediate connection with the auditory apparatus. The sense of taste is influenced by that of smell, and requires for its efficient exercise clearness of the nasal air-passages. This fact is practically impressed upon our minds from early infancy when we are taught to hold our noses in taking physic. Independently of smell, much of the delicacy of

taste resides in the soft palate, which is liable to suffer from the same diseases as the nose and throat. Impairment of taste must therefore be looked upon as a symptom in both nose and throat affections.

It will be apparent on the least reflection that these indications, though frequently overlooked by patients, or perhaps forgotten before they seek advice for defective hearing, are of considerable importance as premonitory signs. We know that the Eustachian tubes, which are prolongations of the middle ear, open into the throat immediately behind the internal aperture of the nostrils, and that the mucous membrane which lines the nose and throat is continuous, through the Eustachian tubes, with the interior of the tympanum. This continuity of surface causes the drum cavity to suffer from extension of the diseases which so frequently affect the nasal air-passages in this climate.

Having pointed out the important influence exercised by the nasal air-passages in causing disease of the ear, it will be almost superfluous to dwell upon the necessity of making a thorough examination of these parts. The nasal speculum enables us to examine the lower fossæ of the nose to a considerable depth, as well as the mucous membrane which covers the inferior turbinated bones. The soft palate,

fauces, tonsils, and a portion of the posterior pharyngeal wall may be readily seen by looking into the mouth. The parts situated above the velum palati can only be viewed with the aid of the rhinoscope—an examination which is attended with considerable difficulty in many patients, and in some cases cannot be performed successfully. Thus, too great proximity of the soft palate to the vertebral column, enlargement of the tonsils, a not unfrequent accompaniment of catarrh, and irritability of the throat, may each or all contribute to cause failure. It is true that in most instances, when the disease is advanced, the space is found large enough to enable us to use the mirror; but in the earlier stages of the affection, to which I wish more particularly to direct attention, this is frequently not the case.

In order to overcome these difficulties, a variety of hooks and retractors for the soft palate have been devised. I have tried many contrivances, and have been disappointed in them all. Patience and constant practice will do more than any apparatus; but, in spite of all, occasional failure will occur.

I will now proceed to describe the principal affections of the nasal air-passages which produce disease of the auditory apparatus and impairment of hearing. Of these, catarrh—com-

mencing in the nose or pharynx, and spreading to the Eustachian tube and tympanum—is certainly the one most frequently met with in this country ; and if we take into consideration the acute and chronic forms of the disease, as well as the consequences to which it gives rise, this will be found to constitute a common, if not the commonest cause of defective hearing.

The symptoms which indicate acute nasal catarrh, or a common *cold in the head*, are too familiar to need much description. First comes the dry or sneezing stage, succeeded by the moist stage, characterised by a constant flow of thin transparent mucus. After a time this is followed by the third stage, in which the secretion becomes thicker and more tenacious and assumes a yellow or greenish colour. The affection often commences in one nostril, and is sometimes limited to this; more frequently, however, both are affected simultaneously or in rapid succession. If the disease does not extend beyond the nasal fossæ, altered secretion, thickness of speech, and breathing through the open mouth are the chief local symptoms observable. Most cases will likewise be accompanied by some general malaise, which will be greater when the sinuses are involved.

Post-nasal catarrh may result from extension backwards of the nasal affection, or it may

have its starting point in the throat or soft palate. When present, a feeling of discomfort or stiffness about the fauces and uvula will be complained of. This does not amount to actual pain, though it is decidedly uncomfortable, and leads to an inclination to swallow, hem, sniff, or perform some analogous action, in order to get rid of a sensation as of something adhering to the soft palate.

If we make an examination of the throat in a case of this kind, we shall probably find the uvula and pilars of the fauces presenting a reddened semi-transparent appearance, the redness being due to enlarged veins immediately beneath the mucous membrane. The parts appear to be infiltrated, and, as it were, œdematous, and a drop of mucus not unfrequently dips down below the point of the uvula. A very similar condition may be seen to exist on the posterior and upper portions of the pharynx, and when it extends to the Eustachian tubes, hearing will be considerably impaired. In the first instance this usually depends upon closure of the tubes either by adhering mucus or by swelling of the mucous membrane around their orifices. By extension further along the canal the cavity of the drum becomes involved and we have simple catarrh of the tympanum. This as it is met with in the course of an ordinary

cold in the head is what I believe to be simple acute catarrh of the middle ear, and distinct from acute inflammation of the part, which is a most severe and sometimes dangerous disease.

Time will not permit me to discuss the question whether catarrh be an early stage of inflammation as is generally taught, or whether it be a distinct affection. Whichever theory we may think proper to adopt, certain it is that the symptoms, appearances, and treatment of catarrh are altogether different from those of established inflammation, whether seated in the tympanum or elsewhere. If catarrh be but a stage of inflammation, in many, I may say in most cases, it goes no further, but proceeds to resolution, or assumes the chronic form without inflammatory exudation taking place.

In acute catarrh of the nasal air-passages the symptoms are usually transient and disappear of themselves. The affection of the Eustachian tubes frequently extends no further than their guttural orifices, and, like the nasal affection in which it originated, will, in general, spontaneously subside. Often, however, the mucous membrane which has been affected does not return to its normal condition and function for some time, and not unfrequently the third stage, such as I have described, persists, constituting chronic catarrh. The thick secretion and

tumefied mucous membrane continue, with occasional exacerbations and remissions, for an almost indefinite period of time, unless checked by appropriate treatment.

Chronic catarrh is often accompanied by enlargement of the glandular structures so abundant in these parts, and may be observed on the under surface of the soft palate in the form of minute semi-transparent swellings, of the size of pins' heads. These bear a striking resemblance to small vesicles, and for this reason the disease is spoken of by French writers as *herpetic*. On the uvula and posterior wall of the pharynx glandular enlargements attain greater proportions, and in these situations swellings may often be seen of the size of a pea, or even larger. Whether colds in the head act as causes in setting a latent condition into activity, or whether the first symptoms of incipient disease show themselves by nasal catarrh in its acute or chronic form, certain it is that we generally meet with them associated together. Weakly scrofulous children are very liable to discharge of mucus from the nose, enlargement of the pharyngeal glands, including the tonsils, and to more or less deafness. They are frequent attendants at the aural departments of our hospitals, and have such a peculiarly characteristic appearance that

they can be recognised directly they enter the room. The nasal obstruction from which these patients suffer causes them to open their mouths, and this, together with the deafness, gives them a vacant stupid appearance.

From the condition of glandular enlargement just described to that of adenoid vegetations, is but a question of degree. The latter affection, stated by Dr. Meyer to be so common in Copenhagen, chiefly involves the glands situated higher in the pharynx and would be more frequently observed in this country if more frequently looked for.

In some cases abnormal growths of glandular structure fill the naso-pharyngeal cavity, and may be felt by the finger introduced under the border of the soft palate. To the touch they resemble a bundle of worms, are of different consistence and form according to the situation from which they spring, and very readily bleed on being handled. We need not stop to consider the various shapes which these assume; it is, however, important to remember that some of the glands affected by the disease are in close proximity to, and in fact surround, the orifices of the Eustachian tubes. It is very common also to find deafness associated with adenoid vegetations, and thus the disease is one of interest in our present enquiry.

The signs which serve to indicate the presence of these morbid growths vary in degree with their extent, and are sometimes altogether absent even when the affection is so situated as to be most dangerous to hearing. Foremost among the symptoms should be mentioned a peculiar *deadness* of voice and inability to pronounce nasal consonants. It will be found, however, on examining the nose, that there is no unnatural redness within, and that the nostrils are generally contracted and pinched. The quality and quantity of secretion is also liable to considerable variation. In some cases the nose is almost dry, in others there is a greenish, red, or brown thick secretion which may either be discharged by the nostrils or run down the posterior wall of the pharynx. Not unfrequently blood appears in the mouth at times, and occasionally assumes the appearance of rusty pneumonic sputa. When the growths have attained certain proportions, a sensation of fulness as from the pressure of a foreign body in the upper part of the throat behind the posterior nares may likewise be experienced.

Chronic enlargement of the tonsils is very similar in character to the affection of the smaller glands, and due to similar causes. All these diseases affect the secreting structures of the mucous membrane, are catarrhal in their

nature, and are the most common affections met with in the nose and throat.

Swelling of the mucous membrane, covering the nasal air-passages, may likewise result from inflammation, and may likewise cause impairment of hearing. The cases differ, however, from those just described in many important particulars. The throat is the part most frequently affected, and it is rare for the disease to commence in the nose. The appearance of the mucous membrane is much redder and more angry looking. The parts are tender to the touch, and painful on movement, and the muscles contract spasmodically on attempting to make an examination. When secretion is present on the surface of the mucous membrane, it is generally more glary and transparent than the mucus of catarrh, and it is also less abundant.

Inflammation seems to attack the submucous areolar tissue rather than the secreting surface. It is, therefore, more deeply seated, and surrounds the muscles and nerves, which are situated here immediately beneath the surface. For this reason the disease is generally attended with pain, more particularly when the parts are moved.

Inflamed sore throat will not unfrequently proceed to ulceration or suppuration, whilst the

thickening of the parts is much greater and does not so readily disappear. In early life the commonest form of inflammation met with in the throat is the scarlatinal. This is sometimes followed by suppuration in the middle ear, and if neglected often results in total loss of hearing, together with dumbness, if the child has not learnt to speak thoroughly before it became deaf.

During adolescence and early manhood, inflammation usually attacks the tonsils or the tissues which surround them, and thus quinsy is the most usual form met with at this time of life. The syphilitic sore throat also belongs to this age, and causes deafness both by obstructing the Eustachian tubes and by extension of the affection to the cavity of the tympanum. The proportion of cases of defective hearing resulting from inflammatory diseases is small, however, when compared with those due to catarrh, and the effects are different.

CHAPTER II.

Mechanism of the Middle Ear, and the Diseases which affect it.

THUS far I have confined my observations almost exclusively to the nasal air-passages, and have only incidentally alluded to affections of the middle ear. I have done this from a conviction that disease of the nose and throat is really the starting point of most cases of defective hearing. I will now say a few words concerning the mechanism by which sounds are conveyed to the brain, in order to explain how the function of hearing becomes disturbed by disease of the nasal air-passages.

Sonorous vibrations communicated to the air are collected by the external ear, and received by the membrane of the drum, which forms the outer wall of the tympanum. For the transmission of these vibrations to the brain, and consequently for the correct appreciation of sound, the tympanic membrane must possess a certain degree of tension and vibratile power.

The tension is maintained and regulated by atmospheric pressure and muscular action, whilst the vibratile power is due to the free suspension of the membrane between two bodies of air.

For the proper working of the mechanism of the middle ear and the correct performance of its functions, these forces require to be kept in a state of equilibrium. The middle ear may be considered as a box containing air, the density and tension of which is regulated by a safety valve—the Eustachian tube. Normally this is closed by its own elasticity, but opens readily when the pressure of air exceeds a definite amount. The perviousness of the tube can also be increased by the action of the salpingo-pharyngeus muscle, which removes the elastic pressure of its walls, and is set in action during swallowing.

The whole of the middle ear is lined with mucous membrane, and one of the properties of mucous membranes being to absorb the air which they inclose, that within the tympanum undergoes constant diminution. In order, therefore, to maintain a state of uniform pressure within the drum the air requires frequent renewal. This is effected during the act of swallowing, because at that time the closure of the Eustachian tube is reduced to a minimum,

and the quantity of air admitted is regulated by the demand.

In addition to the regular tension of the membrana tympani maintained by air within the drum, certain variations are produced, so as to adapt the membrane for the reception of different sounds. The regulation of tension under these circumstances is called *accommodation*, and is performed by muscular action.

The chief muscle concerned in accommodation is the tensor tympani. This is inserted into the malleus, which is itself firmly attached to the membrane of the drum. The action of this muscle is to draw the membrane inwards, and, therefore, to increase its tension. When obstruction of the Eustachian tube prevents the renewal of air to the tympanum, absorption, which is constantly taking place, reduces the quantity below its normal standard. From this results augmented concavity of the membrana tympani, and drawing inwards of the malleus handle. The consequence of this is diminution of the force opposed to the tensor tympani, which contracts so as to maintain a certain amount of pressure on the cushion of air within the drum.

The ossicles of the ear form a continuous chain, consequently drawing inwards of the malleus exerts pressure on the other bones.

The stapes, which is the last link of the chain, communicates with the labyrinth through the oval fenestra, and thus it happens that increased concavity of the tympanic membrane causes abnormal pressure on the auditory nerve which is distributed to the labyrinth. The altered position of the parts contained in the tympanum naturally interferes with their delicacy of movement, and shows itself by impairment of function. In addition to this compression of the nervous element produces tinnitus, as well as gradual diminution of nerve power, and therefore patients generally complain of noises in the head, and progressive diminution of hearing.

In the first instance, these symptoms can be readily relieved by supplying air to the tympanum, and a permanent cure may be effected by removing the cause which obstructs the Eustachian tube. If, however, the tube has continued impervious for a considerable time, the difficulty will increase in proportion to the time it has endured. The reason of this is obvious. The parts within the tympanum—muscles, bones, and ligaments—gradually accommodate themselves to the altered condition in which they have been placed, and will no longer return to their normal positions unless some force be applied to overcome the morbid contraction. Thus the tensor tympani muscle

becomes shortened, just as the muscles of the calf are shortened in a case of club foot. The ligaments of the articulations between the small bones become contracted, and a certain degree of rigidity results. For this reason, we find, even when the Eustachian tube has been rendered pervious, that indrawing of the malleus persists, and as a consequence of this, pressure on the nervous element contained in the labyrinth continues. In such cases we sometimes notice that inflation of the tympanum distends the membrane, but that the manubrium continues drawn inwards and slightly rotated, showing that the bone is kept in its abnormal position by muscular and ligamentous contraction rather than by atmospheric pressure, which caused it in the first instance.

In this manner, simple tubal catarrh, which, at the onset is so amenable to treatment, ultimately causes severe and obstinate deafness, aggravated by intolerable noises in the head. If these facts were better understood, the number of persons afflicted with impairment of hearing would be enormously decreased. We should no longer meet with the cases, now too numerous, of persons who, during the early stages of the affection, were treated by blisters and syringing until serious and often permanent mischief followed.

The symptoms which indicate the presence of catarrh of the Eustachian tube are due to obstruction. Assuming, as I wish to do, that the disease has not reached the cavity of the tympanum, the symptoms observable in the auditory apparatus will be entirely due to abnormal closure of the tubes. The first consequence of this will naturally be increased concavity of the membrana tympani, indicated by diminution of the light-spot. This no longer appears triangular in form, but becomes more or less rounded and diminished at the periphery. Sometimes it is reduced to a mere point. The short process of the malleus looks more prominent from the tightening of the membrane over it, and the manubrium seems shorter than natural because its lower extremity recedes from the eye of the observer and approaches the horizontal position. With this altered condition of parts, the membrane of the drum retains its normal transparency, and as its position will be nearer to the long process of the incus and to the stapes, these may sometimes be made out with more than usual distinctness.

The patient will generally complain of stuffiness in the ears, with more or less impairment of hearing, and not unfrequently tinnitus. These symptoms are liable to considerable variation in degree, and one may be present without the

other. Thus we very frequently see cases, more particularly in children and young people, in which the deafness is considerable, but no noises in the head are complained of. Occasionally tinnitus is very troublesome, and yet deafness is scarcely perceptible.

In addition to the defects of hearing, caused by obstruction of the Eustachian tube, catarrh of the nasal air-passages may extend through the tube to the cavity of the tympanum. When this part of the middle ear becomes affected its functions are considerably interfered with by swelling of the mucous membrane, as well as by the presence of augmented secretion. To these causes is usually added increased concavity of the membrana tympani, due to obstruction of the Eustachian tube, and in this manner the cavity of the drum, which is normally so small, becomes almost obliterated.

Simple catarrh, in its acute form, sometimes spreads from the nose to the tympanum. Though instances rarely come under the notice of aural surgeons, many of my readers have no doubt experienced this in their own persons. When suffering from a severe cold in the head it may sometimes be noticed that, on blowing the nose, a very moist sound is produced in the ear. This sound is not unlike that caused by walking in shoes which contain water. Acute-

ness of hearing is considerably interfered with, and the presence of thin secretion in the tympanum may sometimes be seen on examination with the speculum.

These symptoms, which are undoubtedly due to acute catarrh of the tympanum, will generally subside of themselves with the affection of the nose and throat in which they originated. At any rate the moist stage which I have described is very transient, and will have passed away before the patient will think it necessary to seek advice. For this reason, as I have said, catarrh in the acute form, rarely comes under our notice, and is not enumerated among diseases of the ear.

When the affection passes into the third stage the secretion of mucus within the drum becomes thicker and more tenacious, as it does in the nose. It does not readily escape by the Eustachian tube, but adheres to the ossicles or tympanic walls, and the delicate mechanism of the middle ear is still further interfered with. Should this continue for more than a brief period, the disease may be considered to have become chronic, and in this form, with repeated exacerbations and remissions, will not unfrequently accompany the patient through life unless he adopt proper measures for its cure.

Chronic catarrh, together with the con-

sequences to which it leads, are the most common causes of defective hearing, and constitute a large proportion of the cases which occur in practice. As it is important to be able to recognise this condition, I will give a brief outline of the symptoms by which it is characterised.

If we make a careful examination of such a case it is not unusual to find the hearing power for conversation greatly diminished. Often the watch can only be heard in contact, though the tuning-fork placed on the bridge of the nose will be well heard, and probably better on the side which is worse for ordinary purposes. Patients will tell us that they hear sounds well but that they are unable to disentangle conversation. Some words are much more difficult to understand than others, and it not unfrequently happens that all sounds have a muffled character and appear as if they were heard through some thick substance. These symptoms clearly point to an interference with the free movement of the parts contained in the middle ear, and are due either to the presence of thick secretion or to swelling of the lining membrane of the tympanum.

The membrana tympani has an opaque appearance in parts, and is generally abnormally concave with diminution in size and alteration

of form of the light-spot. The short process of the malleus is more prominent than natural, and the handle of the bone is drawn towards the promontory, and thus has the appearance of foreshortening. Around the hammer bone may frequently be observed a yellowish appearance, which is sometimes situated at the upper part and sometimes at the apex. Auscultation of the middle ear reveals in the earlier stages a gurgling sound, which gradually merges into a sort of squeaking as the mucous contents of the drum become thicker.

The hearing power of patients suffering from catarrhal affections of the middle ear, whether in the Eustachian tubes alone or in the tympanum, is liable to great variation. It is affected by temperature and barometric pressure as well as by stomachic derangements. We generally find that hearing improves during dry weather, either hot or cold, and that humidity aggravates the disorder. In like manner irritation of the digestive organs will often extend to the mucous membrane of the nasal air-passages, and from them to the middle ear. For this reason it is not uncommon to find that persons who suffer from catarrh are worse when their stomachs are out of order.

Catarrh of the tympanum may terminate in one of three ways,—1, by resolution in which

the parts return to their normal condition and function without any perceptible detriment; 2, by retention and inspissation of the mucus secreted in the middle ear; 3, by the accumulation of secretion causing perforation of the membrana tympani.

The first of these terminations is, apparently, at least, the most common in acute catarrh. The deafness, stuffiness, and noises in the head gradually disappear, and the patient is considered well again. If, however, the hearing power be carefully tested, it will not unfrequently be found to have suffered slight impairment. This shows that some mischief, however slight, has been left behind. Now we know that in this climate catarrh is an affection very liable to recur, and that on each recurrence the disease shows less inclination to depart until it finally establishes itself permanently in the part. After a certain number of attacks of catarrh of the tympanum the effect becomes manifest to ordinary observation, and the patient reluctantly acknowledges that he has become "hard of hearing."

By gradual and almost imperceptible degrees, a case of chronic catarrh of the tympanum may become one of inspissated mucus. The cohesive properties of the secretion increase, whilst its adhesive ones diminish, and so it happens

that the mucus forms tough gelatinous masses in the middle ear. These can often be moved from one part to another by inflating the tympanum, and patients are not unfrequently conscious of something moving in the ear when they shake their heads. Sometimes hearing can be so much improved in this way, that persons acquire a habit of giving a sudden shake of the head. It is not improbable, although, of course, insusceptible, of the proof of actual observation, that hearing is more impaired when a mass of inspissated mucus rests against the fenesta rotunda. If this supposition be correct, any sudden movement which dislodges the plug from this position, will naturally improve hearing. Persons suffering from the affection to which I allude will often tell us that they hear better in the morning—a fact which may on the same principle be explained by gravitation of the mucus during the recumbent position.

In some cases large masses of tough, elastic secretion have been removed from the middle ear, which, from their size, must have extended into the mastoid cells. Continued pressure, caused by this inspissated mucus in the tympanum, will occasionally give rise to perforation of the membrane and escape of the secretion.

Perforation of the tympanic membrane may

likewise result from accumulation of non-inspissated mucus. This is the commonest cause of ear-ache among children, and is distinct from the very severe form which accompanies acute inflammation, and which terminates usually in suppuration. The ear-ache of catarrh is mild in comparison with this, and in adults the symptoms are usually so inconsiderable as scarcely to deserve the name of pain.

After two or three days, slight discharge takes place from the ear, and is due to a perforation having occurred in the membrana tympani. On examination a small circular or oval opening with thickened and rounded edges may generally be seen. The pain, when any was present, is immediately relieved, and in a few days later the perforation closes. After this, hearing soon returns, if not to its normal state, at least to a very useful degree, and the patient is considered well again. Such is an outline of a case of perforation as it results from catarrh. These attacks do not occur, however, without producing a certain amount of mischief, though it may be imperceptible at the time, and relapses must be expected to occur.

I consider all these affections as purely catarrhal in their nature and distinct from inflammation. They appear to be seated in the secreting structure of the mucous membrane,

and do not give rise to the deposition of organised material in the tissues.

True inflammation, on the other hand, affects the submucous tissue, in which are situated the vessels and nerves. Leucocytes migrate from the interior to the exterior of the blood-vessels, and there become converted into organised material or degenerate into pus. Now the submucous tissue of the middle ear is likewise the periosteum or nutrient membrane of the bones, and consequently inflammation attacking this part is a periostitis.

Inflammation of the middle ear like catarrh may give rise to defective hearing either by causing obstruction of the Eustachian tube, or by extension of the disease to the tympanic cavity. In whichever of these parts it is situated, the affection may, as I have said, be plastic or suppurative in its nature—that is to say, it may either proceed to the deposition of organised material in the tissues, or it may terminate in the formation of pus. When inflammation is plastic, and attacks the Eustachian tube, we find that the resulting obstruction is firmer, and more resisting than in catarrh. So also, when the cavity of the tympanum is affected, fibrous deposits are formed in the lining membrane, including that of the fenestræ. As a consequence of this thickening and of progressive condensation of

the new material, fixation and rigidity of the parts take place. The periosteal character of the tissue affected sometimes leads to osseous or calcareous material being deposited, and thus thickening of the bone and anchylosis of the ossicles are produced.

When inflammation is suppurative, it may proceed to ulceration, caries, or necrosis, and it is in these cases that wholesale destruction of tissue occurs. The membrana tympani becomes perforated, the ossicles are loosened and destroyed, and caries of the petrous bone extending even to the interior of the skull, may be met with.

Acute inflammation of the middle ear is always accompanied by pain, perhaps the most severe which it is the lot of mortals to endure. A striking exception to this rule occurs, however, in the rapidly destructive form of inflammation met with in scarlatina. In these cases it commonly happens that the first indication of ear mischief is noticed when the accumulation of pus finds vent by rupturing the membrana tympani, and purulent matter flows from the meatus.

In most instances of acute inflammation of the middle ear, suppuration will take place if the symptoms are severe, and as the Eustachian tube is most frequently obstructed by

tumefaction of its walls, the purulent secretion will escape by perforation of the tympanic membrane. The tinnitus which accompanies this affection is generally of a pounding throbbing character, and there is usually considerable impairment of hearing. If the disease is limited to the Eustachian portion of the middle ear, the appearances noticeable on inspection are similar to those of catarrh of the tube; but when inflammation extends to the tympanic cavity intense redness of the promontory is reflected through the drum-head and gives to it an appearance as of polished copper. Soon the membrana tympani itself becomes implicated, and ceases to be transparent; the vessels which accompany the malleus handle become injected and turgid; other minute blood-vessels appear around the periphery and gradually the entire surface becomes red and velvety. As suppuration takes place the membrane becomes of an opaque yellowish grey colour, and ultimately perforation occurs, followed by relief of the symptoms.

Chronic inflammation is attended with very similar though less marked appearances. It sometimes happens in these cases that the membrana tympani continues unaffected, or nearly so, throughout, and the changes taking place within can be watched. Usually, how-

ever, the membrane becomes opaque, but the active redness and pain, described when speaking of the acute disease, are not present. In proportion to the mildness of the symptoms, it is more probable that thickening of tissue will take place than suppuration and discharge, and, although impairment of hearing is less in the first instance, more permanent damage often results.

After perforation of the membrana tympani, more particularly when due to suppurative causes, discharge from the ear may continue for months or years. Often it is accompanied by a most offensive smell, and sometimes by occasional bleeding. This form of otorrhœa, called internal because it proceeds from the parts within the tympanum, requires careful attention. It may depend upon the lining membrane of the middle ear continuing to secrete pus or excess of mucus, or upon ulceration, necrosis, or caries being present. When the discharge is mixed with blood, the disease will often be complicated by polypus, which may at any time prove a source of danger to life by obstructing the flow of matter from the ear. In this manner suppuration is sometimes made to extend inwards to the bones, and even to the skull cavity, causing death.

When otorrhœa is accompanied by caries or necrosis of the temporal bone, we can never consider a patient to be out of danger, as it is impossible to tell whether the disease will extend to the many vital parts which surround the ear. In this way the brain and its membranes, the petrosal and lateral sinuses of the dura mater, the jugular vein, and internal carotid artery, are all exposed to injury, and a fatal termination may depend upon extension of inflammation to any one of them.

Sudden cessation of discharge from the ear often precedes symptoms of a serious nature, and for this reason many persons, both doctors and patients, are afraid to cure otorrhœa. This fear is only well founded when the cessation is brought about by such means as tend to keep back the discharge, which thus becomes a source of irritation to the important structures around.

In addition to diseases of the middle ear, which have hitherto occupied our attention, defective hearing may depend upon obstruction, from various causes, situated in the meatus externus. These affections are not nearly so common as those which have been mentioned and are sufficiently evident on examination to render any description unnecessary.

CHAPTER III.

Treatment of Disease of the Nasal Air-passages.

HAVING briefly alluded to the commonest causes of defective hearing, it only remains to point out the methods which appear to be most successful in the management of these cases. Before doing so, however, I will say a few words in order to explain why so many deaf persons are reputed incurable.

When a patient suffering from any bodily ailment consults a physician or surgeon, it is the custom to enquire whether he has already adopted any treatment for his complaint. If we apply this rule of practice to cases of defective hearing, a considerable number will tell us that when their hearing first became impaired they did not take professional advice. For this omission a variety of causes will be assigned—either that the case seemed too trivial,—that they expected to grow out of it,—that they were too old or too young,—that their doctor knew nothing about ears, or that they had employed domestic remedies or quack nos-

trums. Some will tell us that they consulted their ordinary medical attendant, who syringed the ears without bringing away anything from them, and then applied blisters. No improvement resulting from this, they were told that nothing more could be done, but that in time hearing would improve.

Thus it happens that patients neglect to submit to treatment in the early stages of ear disease, and valuable time is wasted while the affection is most curable. This is to be accounted for by want of confidence on the part of the public, and can hardly surprise us when we remember that very few years ago none of our hospitals possessed ear departments, and that aural surgery, untaught in our schools, was almost entirely in the hands of quacks. Although the labours of the late Joseph Toynbee did much to elevate this branch of study, we find, even at the present day, that works on general surgery contain very scanty and unreliable information on this subject, and thus, with very limited opportunities for observation, with little time at his command, and with no assistance, the medical practitioner continues in the belief, prevalent in his earlier days, that aural surgery is but a delusion and a snare. By the dissemination of these opinions want of confidence is engendered and becomes

one of the principal causes of failure which we have to contend against.

Both the profession and the public are too apt to forget that most of the cases of defective hearing which come before us are chronic. Many have been stationary or perhaps steadily getting worse for years, and we are resorted to as a sort of forlorn hope. It is well to remember that all chronic diseases are more difficult to manage in proportion to the time they have endured, and therefore we should not expect these to be exceptional. In some instances no doubt immediate benefit will follow judicious management, but we cannot shut our eyes to the fact that in many this will not be the case until after a prolonged course of treatment.

The forms of defective hearing chiefly described in this paper, and they are the commonest observed in practice, depend upon disturbed function of the middle ear. These are all seated in the conducting apparatus, and are consequently all amenable to treatment, provided that treatment be appropriate and not abandoned too soon. Some cases certainly give more trouble than others, but I repeat that so long as the tuning-fork shows that the nerve remains sensitive, we ought not to despair of being able to restore useful, if not perfect hearing. We may even go further, for it some-

times happens that persons whose hearing is moderately good do not hear a tuning-fork placed on the vertex, and for this reason, we are not justified in destroying a patient's hope on the evidence of this test without a very careful examination.

In those instances which require the treatment to be persevered in for many weeks, it is of considerable importance to adopt methods which patients can themselves carry out. This is quite practicable in most cases, and will be found very materially to assist the progress towards cure. It not unfrequently happens that the daily employment of remedies is called for during a considerable period, and it is hardly reasonable to expect that patients will spare the time and money to visit their surgeons, thus often more particularly if the progress they are making be not very perceptible. For this reason I have dwelt more especially on those forms of treatment which may be safely entrusted to patients themselves.*

In considering the management of cases of defective hearing, I have thought it most convenient to commence with that of the nasal air-

* The other methods are described in detail in my "Manual of Aural Surgery," to which the reader is referred for fuller particulars.

passages. This arrangement has been adopted, not only because affections of the nose and throat so frequently precede and act as causes of the ear disease, but also because it is only by way of the naso-pharynx that remedies can be applied to the middle ear.

The treatment of catarrh, whether seated in the nasal, buccal, or pharyngeal mucous membrane, should be stimulating. In the early stage of a cold in the head, it has been long known that smelling ammonia, acetic acid, camphor, chloroform, ether, iodine, carbolic acid, and other stimulating substances which give off vapour, will often effectually arrest the progress of the disease.* I have frequently known a pinch or two of snuff to drive away a cold altogether if taken when the first symptoms appeared. It is true that these will sometimes return on the following evening to be again stopped by the same means, and perhaps return no more. It must be admitted that this plan will often fail, but it is, nevertheless, worthy of being tried. Though less effective in the second or moist stage, this treatment will often afford consider-

* It will surprise some of my readers to learn that chloroform anæsthesia has been recommended to cure a cold in the head. Though this treatment should prove invariably successful few will consider the cure worth the risk incurred.

able temporary relief to the feeling of oppression and fulness in the head.

Dry air, whether hot or cold, will always during the moist stage of the affection relieve nasal obstruction. We all know the alleviation experienced when suffering from a severe cold, on going out during dry, frosty weather, and those who use the Turkish bath will bear testimony to the comfort of the hot room under similar circumstances.

When catarrh has reached the third stage, characterised by the secretion becoming less abundant though thick and tenacious, stimulants and tonics to the mucous membrane are indicated. The management of chronic catarrh should be conducted on the same principles.

Remedial agents may be applied to the nasal air-passages in the form of solid, liquid, or vapour. The first of these comprises powders used as snuffs, or for insufflation. In this manner we may employ various stimulant and astringent preparations, their strength being regulated by admixture with different proportions of inert powder. Powdered camphor and sugar in equal parts forms a useful snuff in some cases, and is generally appreciated by patients suffering from catarrh.* Alum and sugar or

* Messrs. Bullock and Reynolds, of Hanover Street, have made the preparation much more elegant, by sub-

iodoform and starch sometimes prove advantageous as snuff, or when blown up behind the soft palate with the apparatus of Rauchfuss.

One of the best methods for making liquid applications to the nasal air-passages, is by means of a douche which consists essentially of the following parts :—1, a reservoir, for which a jug, basin, or other convenient utensil, will answer the purpose ; 2, a syphon tube, by which the fluid is delivered in a constant stream, the force of which may be regulated by raising or lowering the reservoir ; 3, nozzles of various forms, so that the liquid may be applied to different portions of the nose and pharynx.

The first nozzle made to fit closely into the nostril will enable the stream to be directed into one side of the nose, whence it will pass round the septum and return by the other nostril. This is called Weber's douche, and the mode of using it is represented in Fig. 1. It will be found very useful in the treatment of disease of the nose and naso-pharynx. The patient should bend his head forward over a basin and

stituting powdered liquorice root for the sugar. In this form it will not become lumpy ; but it should be remembered that camphor gradually volatilizes, and, therefore, after a time, will disappear, leaving the liquorice powder. For this reason the snuff is always better freshly prepared.

breathe entirely by the mouth kept widely open for the purpose. When using this form of douche, it is important not to place the reservoir too high, as by so doing, it is possible to cause the liquid to enter the Eustachian tubes

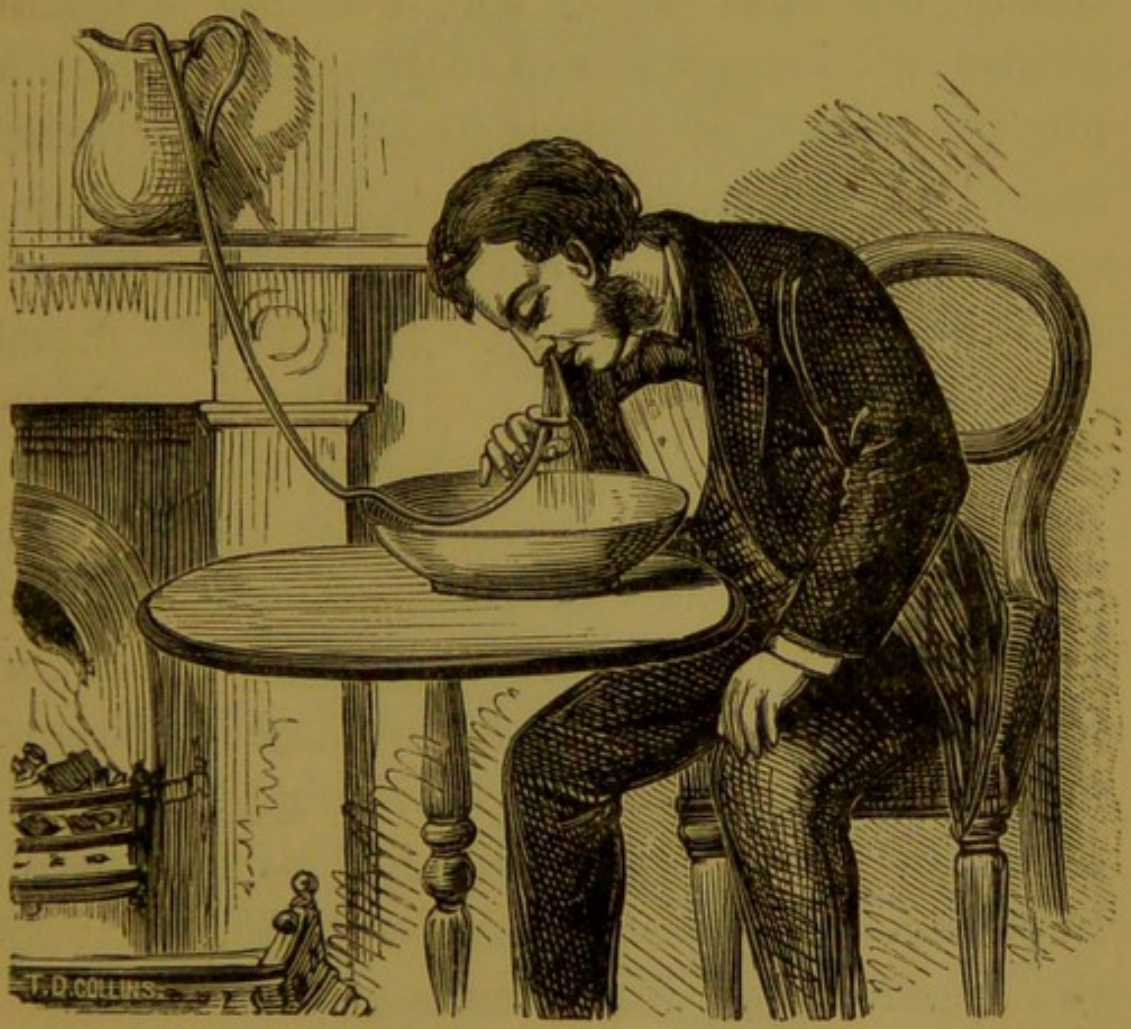


FIG. 1.—WEBER'S NOSE-DOUCHE.

and inflict injury on the middle ear; of this accident several cases have been recorded. If the water have a fall of six or eight inches it will be quite sufficient, and danger will be avoided. As an additional precaution, the patient should be told not to swallow during

the operation, because we know that this opens the Eustachian tube. By adopting these simple precautions, I have never seen any ill effect from the use of Weber's douche, but on the contrary, the greatest advantage. The same nozzle will also serve for directing a gentle stream of warm water into the auditory canal for the relief of inflammatory pain, whether seated in the external or middle ear. When used for this purpose it should not be pushed into the meatus, as it would prevent the return current and cause pain.

A form of nozzle, which will be found of service when the upper portions of the nose are affected, consists of a tube slightly curved, and having on its convex side five or six perforations, 2 Fig. 2. This is intended for passing along the floor of the nose on either side to the extent of about three inches. The jets should be directed upwards, and they will play upon the upper and middle meatus of the nose.

A third nozzle by which liquids may be applied to the naso-pharynx, is formed by a tube terminating in a bulbous extremity perforated in various directions, 3 Fig. 2. This is intended to pass along the floor of the nose beyond the posterior nares, where the jets will wash the different portions of the space situated above the soft palate. It is more especially

useful in post-nasal catarrh, and reaches the orifices of the Eustachian tubes.

In the "Universal douche," Fig. 2, the reservoir consists of a graduated tin box, A, which serves to contain the rest of the apparatus.

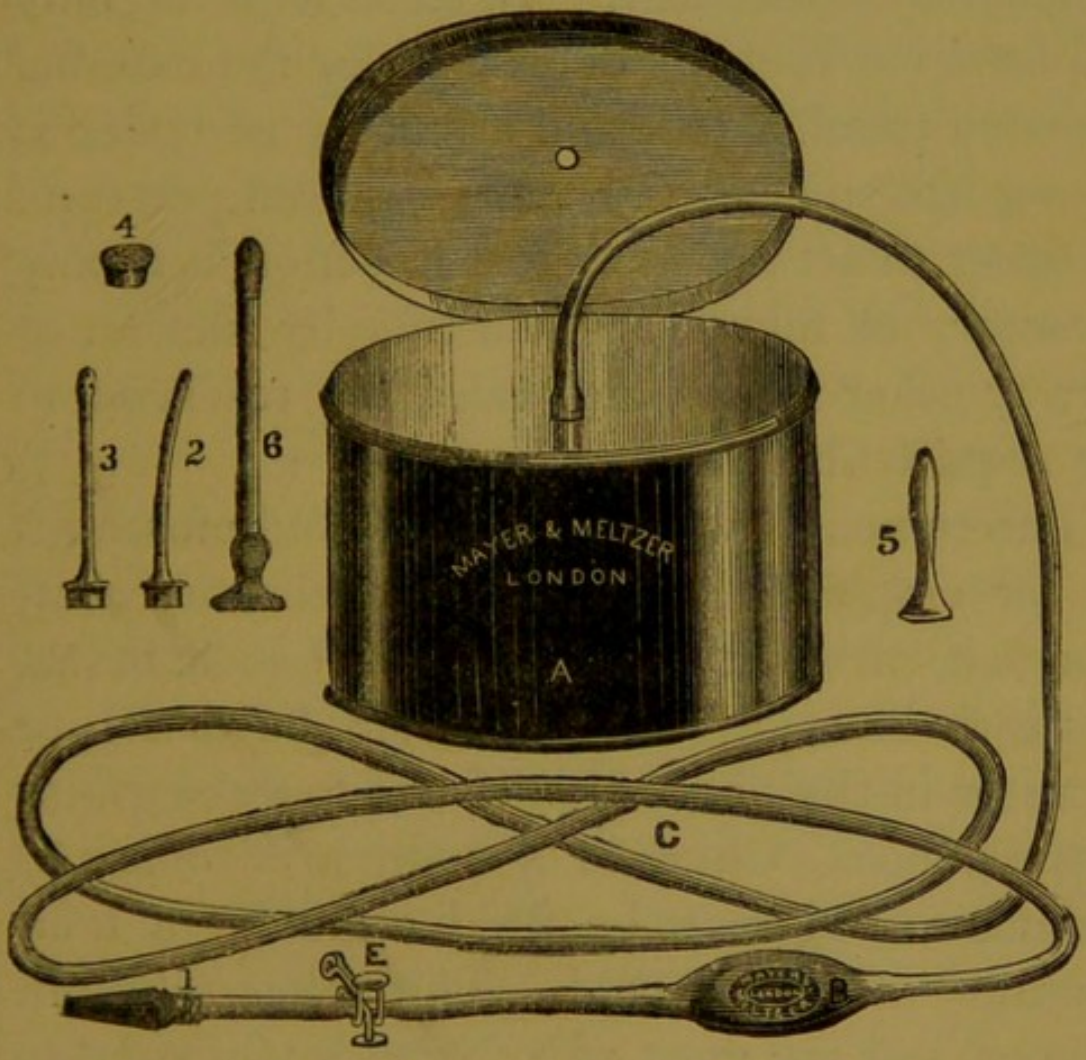


FIG. 2.—THE UNIVERSAL DOUCHE.

The syphon tube, C, is filled by compressing an india-rubber ball, B, instead of by suction with the mouth, and a small wire clip, E, serves to arrest the flow of liquid when desired. All these are refinements which, though very desirable, may be dispensed with, when economy

is an object, without in any way sacrificing the efficiency of the apparatus. Thus four or five feet of india-rubber tubing fitted on the end of a piece of curved composition gas pipe will answer every purpose, as well as the most expensive instrument. Indeed, if it is only required for Weber's douche or for the external auditory canal, a foot and a half or two feet of tubing will suffice to give the required pressure. In order to set the apparatus in action, it is only necessary to fill the syphon tube by suction, or by any other means, and raise the reservoir to the required height.

The remedies which I have found most useful for employment with the douche, are common salt, carbonate or phosphate of soda, borax, and carbolic acid. These should be dissolved in water in the proportion of two to three grains to the ounce. Chloride of sodium is tonic and stimulant, and may be used either at a temperature of 90° or cold. The other salts are solvent, and are most effective at a temperature of about 100°. Carbolic acid may be mixed with any of these; it is a most useful application, and appears to have an anæsthetic action as well as being stimulant and antiseptic. It is well to remember that simple water, particularly if used cold, is not a little irritating to the mucous membrane of the nose. It is less dis-

agreeable, however, if employed at a temperature of 90°, and if the specific gravity is raised by the addition of any of the salts I have mentioned it becomes quite pleasant and refreshing.

Astringent solutions are best used in smaller quantity than could be conveniently done with the douche. Two drachms will generally suffice for each application, and a small syringe or india-rubber bag will constitute a ready method of making the application. When it is deemed advisable to carry the lotion into the naso-pharynx, without first coming in contact with the mucous membrane of the nose, a tube of sufficient length to reach the posterior wall of the pharynx should be attached to the syringe. In this manner we may employ a variety of stimulants and astringents, among which may be mentioned alum and iron-alum, sulphate and sulpho-carbolate of zinc, carbolic acid, iodine, iodide of potassium, and many more, either singly or in combination.

Another useful form in which liquid applications can be made to the nasal air-passages is in the shape of spray. This may be used by the patient himself, and may be introduced by the nose or by the mouth. The various forms of spray-producing apparatus, though sufficiently numerous, are not all equally suitable. The

spray should be fine, and the apparatus so constructed as to be easily cleaned. Fig. 3

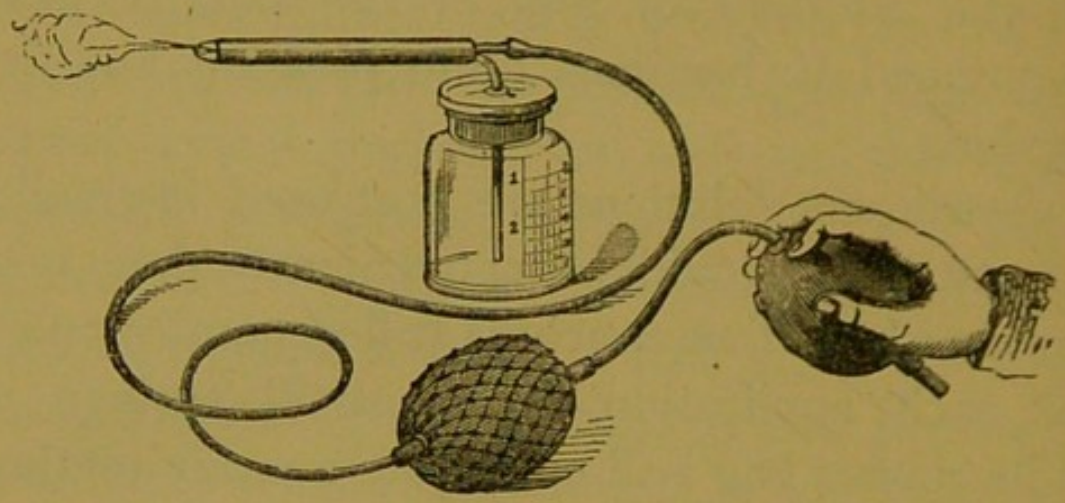


FIG. 3.

represents a very good instrument for the throat, but it is not convenient for use in the nose. With Fig. 4 the jet of spray may

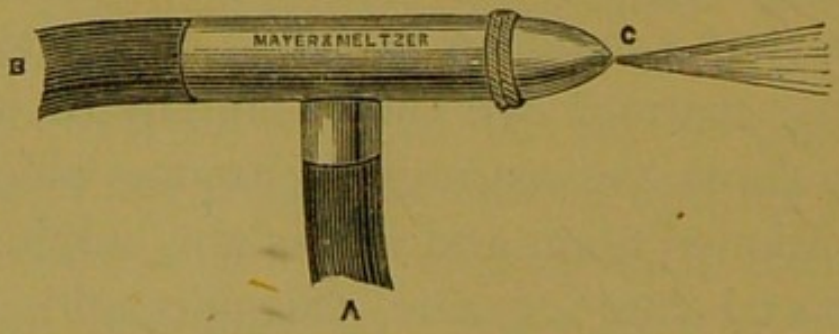


FIG. 4.

be directed at any angle; it is consequently applicable to both nose and throat. At A, an india-rubber tube is connected, which dips into the bottle containing the lotion. An inflating apparatus, as in Fig. 3, is attached at B, and the jet of spray issues at C. Fig. 5 shows the instrument with the jet removed; D represents the tube which conveys the liquid, and which

sometimes becomes choked, requiring the insertion of a fine wire to clear it. The lotions which may be used in the form of spray are the same as those just enumerated.

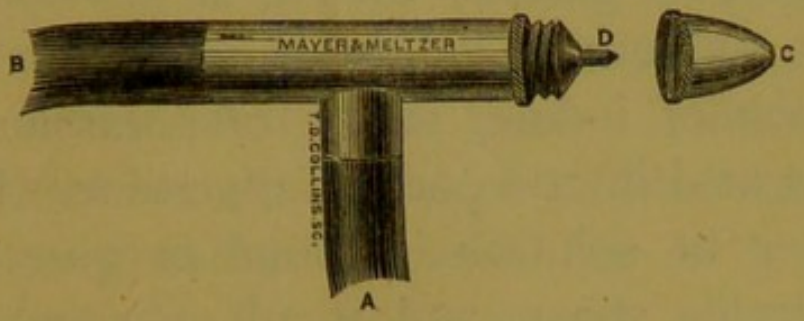


FIG. 5.

When it is considered undesirable to extend the effects of a remedy to the larynx, the current of spray should be stopped during inspiration. This will be most effectually guaranteed, when using the method through the nose, by substituting the lungs of the patient for the inflating bellows. In this way the jet being produced by the expiratory effort, will naturally cease during inspiration. If the tube of the apparatus is long enough to reach beyond the posterior nares, the spray may be directed on the parts contained in the naso-pharynx.

More concentrated solutions are better applied with a brush, which should be fixed on a handle in such a manner as to form with it a right angle. This kind of brush is intended to be passed by the mouth under the velum palati to the naso-pharynx, and to the orifices of the

Eustachian tubes. The solutions which are used in this way are chloride of zinc, 15—30 grains to the ounce; perchloride of iron, 60—120 grains; carbolic acid, 30 grains; sulphate of copper, 15 grains; nitrate of silver, 10—60 grains; tincture of iodine or a solution of one part each of iodine, iodide of potassium, and carbolic acid in 100 parts of glycerine. Nitrate of silver in solution is found to give rise to considerable spasm and cough in some cases; it is, therefore, preferable to use it in the solid form. For this purpose it may be fused on a stem of wire, bent at a right angle, and fixed into a wooden handle similar to that of the brush just described.

Chronic catarrh affecting the naso-pharynx may sometimes be rapidly cured by first using a nasal douche of salt and water, so as to remove the thick mucous secretion which adheres to the parts, and then applying a strong solution of nitrate of silver, 60 grains to 1 ounce, in glycerine, with a brush. This treatment, though sometimes severe, is not so infallible as its proposer, Dr. Mann, would lead us to suppose.

The application of vapour to the nasal air-passages is of very great utility in the treatment of disease of these parts, and deserves more extensive development. By this means we are enabled to use any of the gases, as well

as a large number of volatile substances, both solid and liquid. Several methods have been devised for the employment of vapour, the most familiar of which are, perhaps, the ordinary inhalers. In them the volatile substance is mixed with hot water, and may be inhaled either by the mouth or by the nose. This method necessitates the admixture of steam, which it is sometimes desirable to avoid.

Another plan by which vapour may be employed to the nasal air-passages is by passing a stream of air through a volatile liquid placed in a bottle. The cork of this should be pierced by two tubes—one terminating immediately inside the cork, the other extending nearly to the bottom of the bottle. In using the apparatus air should be propelled through the liquid by the longer tube, when it will pass out by the shorter one charged with vapour.

A third plan is that of placing a few drops of volatile liquid on a sponge enclosed in a box from each of the two opposite ends of which passes a tube. One of these is for the entrance of air, which, becoming charged with vapour in its passage through the sponge, emerges by the second tube. This form possesses the advantage of being applicable to the Politzer bag, and so enables us to inflate the middle ear with a medicated atmosphere.

The reason why remedies in the form of vapour have not been largely employed in the treatment of disease of the nasal air-passages appears to be due to the difficulty experienced in limiting their action to these parts. Many substances which act beneficially on the naso-pharynx produce considerable irritation of the glottis when employed by inhalation. For the purpose of avoiding this evil, I venture to recommend a simple and inexpensive contrivance, which will be found very effectual. It consists of a **U**-shaped tube made of glass.

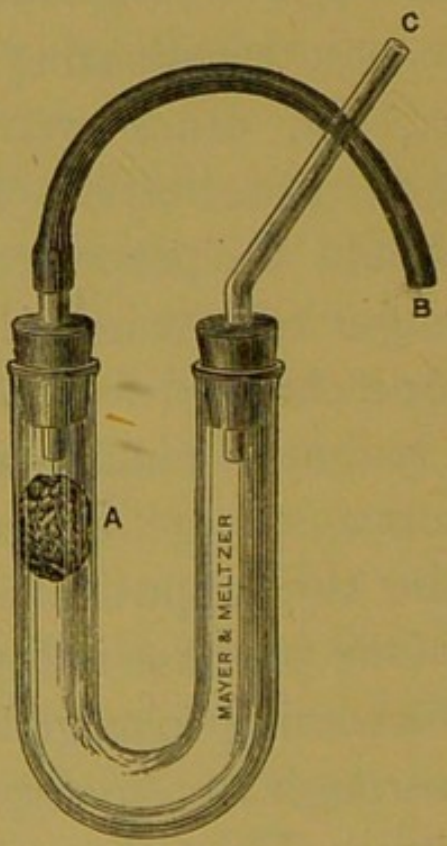


FIG. 6.

To each open extremity of this is fitted a cork, through which passes a tube. One of these

tubes (C) is bent at an obtuse angle, for the mouthpiece, the other is straight, and is prolonged by a few inches of india-rubber pipe (B). This is soft and flexible for insertion into the nose, or nose-pieces of various form may be attached if desired. Inside the cork of this side of the instrument is a piece of coarse sponge (A), which may either be charged with the volatile liquid, or it will serve to prevent any solid or liquid, placed in the bend of the **U**-tube, being blown into the nose. When the remedy requires warming, in order to disengage its volatile principle, the tube may be dipped in hot water or in a sand-bath.

To use the apparatus, the patient should introduce the nose-piece into one of his nostrils, he should then blow through the glass tube, placed in his mouth, and a stream of air, charged with vapour, will enter his nose. Inspiration should be performed through the open mouth, and thus none of the volatile principle will enter the wind-pipe. In this manner camphor, chloroform, carbolic acid, kreosote, ammonia, and several essential oils may be employed, and will prove useful stimulants to the mucous membrane.

The tendency of catarrhal affections to produce chronic enlargement of the glands contained in the nasal air-passages, points to iodine

as the remedy *par excellence* for these diseases. The metalloid, placed in the bottom of the **U**-tube, will, under the influence of slight heat, give off vapour, or we may employ it in the form of tincture.* In either way it will often prove of great advantage, and patients may be directed to use the apparatus once or twice daily.

Catarrhal affections of the nasal air-passages are benefited by general as well as by local treatment. Thus sudorifics, stimulants, narcotics and diuretics if administered within twenty-four hours of the commencement of acute catarrh, will often cut short the attack. The chronic form, which comes more particularly within the domain of aural surgery, generally demands tonic treatment. By this I do not mean tonic medicine only, but equal, if not greater importance should be attached to hygienic methods. Habitual use of the cold bath is of great service, by promoting action of the skin, and so relieving the mucous membrane. Active exercise in the open air, the avoidance of close crowded rooms, and the proper ventilation of sleeping apartments, are also matters well deserving our attention in the

* The tincture should be a saturated one, that is, 40 grains of iodine to the ounce of rectified spirit, no iodide of potassium being needed.

management of these cases. The sympathy which exists between the stomach and nasal air-passages, points out the necessity of regulating the digestive system, both by medicine and dietetics. Tonics and chalybeates will often prove of service, and in the scrofulous delicate children who so commonly suffer from catarrh of the nose and throat associated with deafness, cod-liver oil will likewise be called for.

Acute inflammation of the nasal air-passages is best treated by steam inhalation, or by the hot nasal douche. Vapours reach the naso-pharynx and orifices of the Eustachian tubes more readily if inhaled through the nose, which may be done by stretching an india-rubber teat over the mouthpiece of an ordinary inhaler. A teaspoonful of compound tincture of benzoin, or two teaspoonfuls of succus conii with twenty grains of dry carbonate of soda, form soothing additions to the steam inhalation. A nose douche of hot water, to which may be added a teaspoonful of borax, phosphate of soda, or chlorate of potash to the pint, is likewise very grateful in some cases.

Guaiacum in the form of lozenges* is of very

* These formulæ, and many others mentioned in preceding pages, will be found in the Pharmacopœia of the Hospital for Diseases of the Throat.

great utility in the treatment of acute or sub-acute inflammation of the fauces, tonsils, and pharynx, and if employed before suppuration has taken place will generally prevent its occurrence. Such is my opinion of the value of this remedy in acute tonsillitis, that I always recommend persons who are subject to recurrent attacks of quinsy to keep the lozenges by them. Immediately the first symptoms appear one lozenge should be taken every two hours, until relief is manifest, when the dose may be taken less frequently. Saline purgatives are likewise of considerable service in these cases, and should be administered three or four times during the day at the onset of the attack. Tincture of aconite in frequently-repeated small doses also appears to exert a very marked influence over this, as over many other inflammations. If carefully watched it is quite free from danger, though it cannot, like the Guaiacum lozenge, be safely entrusted to patients themselves.

It was, at one time, supposed that enlarged tonsils exerted direct pressure upon the orifices of the Eustachian tubes ; and, with this belief, it became quite fashionable to remove the glands for the cure of deafness. More accurate observation has taught us the incorrectness of the theory upon which the practice was

founded; and, in consequence, tonsillotomy has fallen into disuse in these cases.

If, however, the tonsils have become so enlarged as to impede respiration; if they are so hard as to have lost their glandular structure, or if they are riddled with sinuses full of thick offensive smelling matter, they, undoubtedly, give rise to, and maintain an unhealthy condition of the naso-pharynx, and so operate injuriously on the mucous membrane of the middle ear. Under such altered conditions the organs no longer serve any useful purpose in the economy, but have become hurtful and offensive appendages, consequently their removal is desirable as well for the benefit of the general health as for the treatment of defective hearing.

In scarlatinal inflammation of the throat, which is so insidiously fatal to hearing, acetic acid inhalations are most useful. The inflamed sore throat of syphilis requires general treatment by iodide of potassium, with or without the addition of mercury. Local applications of nitrate of silver or of sulphate of copper to any ulcerated parts, and inhalation of kreosote or carbolic acid, will likewise form useful adjuncts to the constitutional remedies.

The prolonged action of chlorate of potash and of chloride of ammonium seems to exert a

beneficial influence on the throat in some cases. These salts are, however, very unpleasant to most persons, and therefore any method by which they can be rendered less objectionable, without lessening their good effect, is well worthy of our attention. I am in the habit of prescribing these drugs in the form of effervescing lozenge, prepared according to Mr. Cooper's process. In this shape these otherwise nauseous preparations are rendered as little objectionable as possible. Astringent lozenges of Eucalyptus or Rhatany are also of great utility in relaxation of the throat, and in the effervescing form are quite pleasant to take. In giving steel to children I not unfrequently recommend the phosphate of iron lozenges, and find that they are generally relished by patients, both little and big.

CHAPTER IV.

Treatment of Disease of the Ear.

It will be observed that a considerable space in this paper has been devoted to diseases of the nasal air-passages. I have done so because they are so very frequently at fault in cases of ear disease, and because we can only hope to cure defective hearing by restoring the nose and throat to a healthy condition. Having given an outline of the treatment to be adopted for this purpose, let us consider what should be done when the affection extends to the middle ear.

The first portion of this, commencing from the naso-pharynx, is the Eustachian tube, which, as I have already explained, becomes closed by relaxation or tumefaction of its lining membrane. In these cases impairment of hearing results from the non-admission of air into the tympanic cavity. If the disease be catarrhal, and have not extended further into the middle ear than the Eustachian tube, an occasional inflation of the drum by Valsalva's or Politzer's method will usually suffice, together

with applications to the throat, to restore hearing. In recent cases, more particularly with children, the effects of this treatment are very striking. The vacant, stupid appearance commonly observed in these patients will often be made to vanish by a single inflation, as if by magic. The face lights up, and hearing is restored, to the no small surprise and delight of the patient, and of any of his friends who may be present. This improvement, marked as it is at the time, will be but transient, however, unless measures are adopted to maintain the perviousness of the Eustachian tube. For this reason inflation will require to be practised once or twice daily until air is normally admitted into the tympanum by the act of swallowing.

In the treatment of tubal obstruction among children, it is often desirable to instruct their parents in the mode of inflating the tympanum with a flexible tube. Although they do not succeed thoroughly, I am satisfied that an attempt made two or three times daily will expedite the cure in most instances. Even if it is productive of no further benefit, little patients become gradually accustomed to the use of the instrument, and so become more manageable, because less alarmed. A form of inflating tube, which I often recommend in these cases, is

represented in Fig. 7. It consists of a piece of

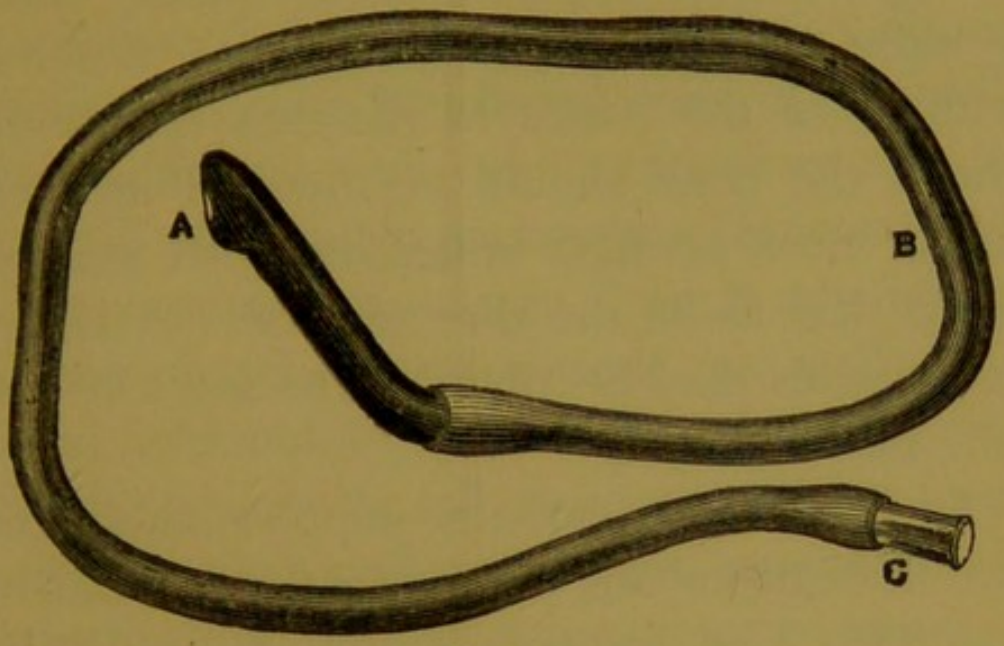


FIG. 7.

india-rubber tubing (B), about eighteen inches in length. Into one end of this is inserted a glass mouthpiece (C). The nose-piece (A), at the opposite extremity of the tube is of vulcanite; it is conical, and flattened from side to side so as to be easily introduced into the nostril without giving pain. The direction of the opening is almost backwards, and the lumen of the tube, which passes through it, is as large as possible, in order that it may offer no impediment to the passage of air. The hooked termination of the nose-piece lodges on the floor of the nostril, and serves to retain the instrument in position during inflation. For some time I have been using a nose-piece of this form with Politzer's bag, and find it answer

admirably. It is shaped after the model of the tip of the index finger which so readily enters the nose. One special advantage which it possesses in the hands of patients is that the point of the cone should be inserted upwards, because most persons unfamiliar with anatomy believe that to be the direction of the nostril. Various sizes may be obtained to suit the nose of the patient.

The Eustachian catheter supplies us another very efficient means of overcoming tubal obstruction. The instrument, though much less frequently employed than previous to the introduction of Politzer's method, is called for when that has failed. It will generally enable us to inflate the tympanum, and so relieve the symptoms due to closure of the Eustachian tube. When skilfully introduced the catheter should give no pain, and by its means we can apply medicated vapours and lotions to the Eustachian tube and tympanum.

I have pointed out how tubal obstruction causes displacement of the ossicles and contraction of the tensor tympani muscle; from this result pressure on the contents of the labyrinth, defective hearing, and tinnitus. Before the parts have become fixed in their altered position by long habit, the treatment I have described will suffice to restore them to their

normal position and function. Unfortunately, however, in many of the cases which come before us tubal obstruction has been allowed to continue unchecked for too long a time to be thus readily relieved. As a result of this, the handle of the malleus may often be seen resting on the promontory, where it is firmly held by the contracted tensor muscle, as well as by altered ligamentous structures. Forcible inflation will frequently fail to move the bone from its position, but will sometimes temporarily increase the tinnitus, and even cause giddiness.

In some instances, when the malleus handle continues drawn inwards towards the promontory after the Eustachian tube has become pervious, I have found improvement result from exhausting the air in the meatus externus. In this manner the membrana tympani is drawn outward, and traction is necessarily made on the manubrium. Frequently, however, no permanent benefit results, because the membrane has become too much thinned and relaxed by prolonged indrawing. Weber-Liel and Gruber advocate division of the tensor tympani tendon, and have recorded some cases in which it has proved of service. The results are not sufficiently striking, however, to warrant us in performing the operation, until after other measures have been tried and have failed.

Though further evidence of the permanent effects of tenotomy is needed, it seems probable that by its means relief may be afforded to the distressing tinnitus which is sometimes present.

If the Eustachian tube has become closed by plastic inflammatory products within or around it, and we cannot succeed in rendering it pervious by Politzer inflation, or by catheterism, the employment of bougies may be called for. In this manner laminaria introduced through the catheter will sometimes be serviceable in dilating stricture. Bougies are, I think, very rarely required, they should only be introduced for a short distance, and may be allowed to remain for ten minutes at a time. Their employment may be repeated two or three times during the week, and inflation of the tympanum should be carefully avoided for twenty-four hours afterwards.

The principal points to be remembered in the treatment of tubal obstruction are—1st, to reduce the tumefaction of the throat which induces it, and 2nd, while this is being effected, to inflate the tympanum regularly but effectively. The Valsalvian method being the simplest, should be tried first; if this fail, Politzer's should be employed, and in the event of this also proving unsuccessful, it will be necessary to have recourse to catheterism,

and possibly to bougies. This rule, like many others in medical practice, has its exceptions; for instance, if our patient has passed middle life, and we find that Valsalvian inflation causes congestion of the head and conjunctivæ, it will be well not to advise this method, lest the strain upon the cerebral vessels should cause their rupture. The extreme simplicity of the method is very liable to lead to its abuse, and it sometimes happens that patients produce excessive relaxation of the membrana tympani in this way. The use of Politzer's method is much less liable to objection, because the fact of having to use an apparatus will cause this mode to be less frequently resorted to.

Before leaving the subject of tubal obstruction, I will describe a modification of Politzer's method of inflating the tympanum, lately suggested by Gruber. In the new plan, the swallowing of water is replaced by lifting the root of the tongue against the posterior portion of the palate, which thus shuts off communication between the nasal and buccal cavities. In order to obviate the difficulty which would be met with in teaching patients to perform this manœuvre, Gruber has found that it can be effected by pronouncing any one of the words hack, heck, hick, hock, huck, hch. The force with which inflation takes place varies accord-

ing to the word pronounced, being stronger as this approaches the last of the series. I have found this method very successful in private practice, but it is not so with hospital patients, because the letter h, which must be aspirated, does not enter into the vocabulary of many of those who attend. It is certainly a great advantage to be enabled to dispense with the use of water, and, as far as my experience has gone, inflation of the drum is more forcible than by Politzer's method.

When disease of the throat has spread to the tympanic cavity, we must extend the influence of our remedies to the part. Unless the membrane of the drum be perforated, this can only be done through the Eustachian tube. Having therefore adopted measures for securing the perviousness of this channel, let us see how we should treat affections of the drum cavity.

Acute catarrh of the tympanum, occurring as I have mentioned, with the same affection of the nasal air-passages, is little likely to come under special treatment. In fact, unless we chance to observe the disease in our own persons, or in those of our friends, we shall probably never meet with a case until it has arrived at the chronic stage. This form, however, which constitutes one of the most frequent

causes of defective hearing, we are constantly called upon to battle with.

Although catarrh of the Eustachian tube is met with without the cavity of the tympanum being implicated, the converse is rarely the case. For this reason, the treatment recommended for the tubal affection requires to be continued when the disease has extended to the cavity of the drum. Repeated inflation affords us the best means of driving mucus from the interior of the tympanum, after which its lining membrane will often return to a healthy state.

If we consider for a moment the narrowness of the Eustachian tube, and the fact that this is the only opening into the cavity of the drum, we shall readily understand the difficulty of clearing the tympanum by inflation. The expulsion by this means of mucus, often thick and tenacious, and adhering to the ossicles, is frequently impracticable, whether by the method of Valsalva or Politzer, or by the catheter. Under these circumstances the secretion should be rendered more fluid by the use of solvent solutions injected into the tympanum. A simple way of doing this, if the Eustachian tube be pervious to Valsalvian or Politzer inflation, is to inject about a drachm of the lotion through the nose into the naso-pharynx, the head being

so placed that the side on which we wish the liquid to enter is downwards. Two or three inflations should now be performed, and the fluid from the pharynx will enter the tympanum, where it may sometimes be observed resting against the membrane. The patient will generally be conscious of the presence of liquid in the ear, and deafness will often be temporarily increased. When this operation is entrusted to patients to perform for themselves, they should be admonished to use great caution, as considerable pain may be caused by forcing too much fluid into the tympanum. It is better, therefore, not to prescribe this plan of treatment, unless we can rely upon every minute direction being rigidly carried out.

When the Eustachian tube is impervious to inflation by the simpler methods, these must be replaced by catheterism, by which means we shall rarely fail to inflate or inject the tympanum. The solvent most frequently used for injection is solution of carbonate of soda, ten to twenty grains to the ounce, of *warm* water. From two to four grains of carbolic acid are sometimes added with the object of restoring the mucous membrane to a more healthy condition. This may be advantageously followed in some instances by the use of a solution of sulphate of zinc, with or without the addition of carbolic acid.

Fluids injected through the Eustachian catheter into the tympanum reach that cavity in the form of spray, and are thus diffused over the surface, extending even to the mastoid cells. In some cases the injection of vapours is found more efficacious, and may be employed by means of the bottle with two tubes, already described. If this is placed in the circuit of the tube leading from the inflating-bag to the catheter, the air which passes through it becomes charged with the volatile principle contained in the bottle, and so enters the middle ear. The remedies most frequently employed in this manner are simple steam and the vapour iodine, acetic ether, carbolic acid, and some volatile essences.

Whenever the condition of the lining membrane of the tympanum is such as to requïre the application of remedies by the catheter, it is important to bear in mind that the treatment to be successful must be regularly followed up. If this is not done, we shall utterly fail to give satisfaction to our patient or to do justice to ourselves. A chronic catarrhal or inflammatory affection of the tympanum requires the application of remedies just as similar affection of the conjunctiva. And I ask if any surgeon would be satisfied with the use of lotions, in these cases, once in a week or ten

days, or at longer intervals? Although the eye is so placed that the treatment may be carried out by patients without requiring frequent assistance from the surgeon, that is no reason why the ear, which is a more intricate organ, should yield to treatment which would not suffice for the eye. It is true that, in the majority of cases of ear-disease, particularly if not of too long standing, catheterism is not necessary, but when it is called for, the only chance of success depends upon its application at regular and short intervals.

The treatment by solvents is likewise the one most suitable when mucous accumulation within the tympanum has become inspissated. Should we fail in this manner to soften and remove the secretion, it may become necessary to puncture the membrana tympani, in order to wash out the middle ear by passing the soda solution through it. This operation is a very trivial one, it rarely causes much pain, and I am not aware that it has ever produced permanent injury, even when it has failed to do good. There can be no doubt, however, that it has been often performed without any benefit resulting, even in cases which seemed to promise best, whilst in others, much less favourable apparently, wonderful improvement has followed.

The operation will not be frequently required,

and it will always be well to try the less formidable methods first, only having recourse to paracentesis if these fail. Politzer's method of inflation should be practised immediately after the operation, and will not unfrequently blow masses of mucus into or through the incision. After this, a warm solution of soda should be injected through the middle ear, either by way of the meatus externus, the Eustachian tube, or both, and should be repeated daily until the puncture has closed. As this can rarely be kept open for more than three days, paracentesis sometimes requires to be repeated once, twice, or even oftener, but in favourable cases it will prove of real and permanent advantage.

When it is deemed advisable to maintain an opening in the membrana tympani for some time, the perforation should be made by the application of concentrated sulphuric acid instead of with a knife. Thus produced, a perforation will remain open for three or four weeks, and afford frequent opportunities during this period of washing out the drum cavity, and of applying remedies to its lining membrane. The operation requires even more care in its performance than paracentesis in the ordinary way, lest too large a portion of the membrane be destroyed.

For the purpose of avoiding the necessity for

puncturing the membrana tympani, it has been proposed to introduce into the tympanum a fine flexible tube, through which the mucous secretion can be drawn out. This, no doubt, sounds less formidable than the use of a cutting instrument, but when we consider the narrowness of the Eustachian tube at the isthmus, and that the tube which is to pass through it must be still narrower, we shall understand the impossibility of removing by this means masses of consolidated mucus. The operation of paracentesis, as I have already said, is not very painful, possibly less so than the passage of the flexible tube, which is by no means painless, and not nearly so effective.

In the treatment of perforation of the membrana tympani from disease, the clearing away retained secretion should form an important part. It is often surprising to find how perforations, even of large size, will heal by the simple use of the syringe. On the other hand, if this is neglected, or imperfectly carried out, an opening in the tympanic membrane will not unfrequently resist all treatment; discharge from the ear continues and may lead to the formation of polypus, or to disease of the bones. The solution of zinc and carbolic acid already mentioned, is very useful after the above indications have been fulfilled, and serves to check

excessive secretion. When the lining membrane of the tympanum, seen through the perforation, appears tumid, it may be advantageously touched with solution of nitrate of silver.

In some cases of perforation, striking improvement of hearing as well as diminution of discharge, follows the use of Yearsley's artificial membrane. This simple contrivance consists of moistened cotton-wool, adjusted at the bottom of the auditory canal, and probably acts by affording support to the ossicles, and thus maintaining a proper tension of the labyrinthine fluid. This explanation is confirmed by the fact that the artificial membrane will sometimes improve hearing when no perforation is present. A case lately under my care well illustrates this. After removing a plug of cerumen, the membrana tympani was observed to be thinned and relaxed: finding after two or three weeks, that this condition persisted, and that hearing was not much improved, I adjusted the artificial membrane with the best results. The patient, who could not hear my watch, unless in contact with the ear, was enabled with the cotton-wool to hear it at ten inches, ordinary conversation being audible at several feet.

Some care is often required, to adapt the artificial membrane in such a manner as to afford

the greatest amount of benefit obtainable. Patients will soon learn to do this better than the surgeon, if the mode of adjustment is properly explained to them. It is often advisable to moisten the wool with an astringent or antiseptic lotion, and the addition of a small quantity of glycerine will prevent too rapid drying.

If, as a consequence of perforation and prolonged suppuration a polypus has formed, and this is the manner in which they mostly originate, our first object should be to remove the growth. When this is of some size, it should be pulled away with forceps or with the snare. After which, or when the polypus is small, the frequent application of caustic will be necessary. I have found caustic soda fused on metallic wire very effectual, and at the same time very manageable for the purpose, and I generally prefer it to other caustics. The sticks may be obtained as small as required, and may be preserved for a considerable time if the points are covered with caustic lime to prevent deliquescence. When only small granulations remain, nitrate of silver, fused on the end of a probe, answers very well, though this is not sufficiently potent in the first instance. The patient may render some assistance in destroying the growth by dropping strong liquor plumbi into the ear every morning, after having removed all discharge, and

carefully dried the meatus. In this manner, running from the ears, even of long standing, may be cured; the perforation closes, and very useful, if not perfect hearing, returns. We must bear in mind, however, that the thorough destruction of polypus requires much patience, and must not be abandoned until perfectly effected, or the growth will most probably return.

The suffering which accompanies acute inflammation of the tympanum demands prompt and decisive treatment. From two to four leeches should be applied in front of the tragus and below the meatus auditorius, and will usually afford considerable relief. Hot water should be poured into the auditory canal, where it may be allowed to remain for ten minutes at a time, or we may recommend a gentle stream of hot water to be applied with the douche. This treatment should be repeated at short intervals while the pain continues severe, sleep being procured by the aid of narcotics and sedatives. In addition, much benefit will be experienced from steaming the throat, together with the use of a hot nose-douche, as recommended for the naso-pharyngeal affection. Poultices, though often recommended, and undoubtedly grateful to the patient, seem to promote profuse and destructive suppuration, and must consequently

be prohibited in these cases. The same objection applies, but in a smaller degree, to fomentations, and still less to hot dry applications, which may, therefore, be employed if they afford relief.

When suppuration has been detected in the middle ear, whether the matter is situated inside the membrana tympani, or points over the mastoid process, it should be evacuated without delay. Although the late Mr. Hinton expressed a doubt on the necessity of this practice, I fear that the suggestion of doubts can only conduce to a line of practice, which will prove dangerous to life, and detrimental to hearing. Considering the extreme severity of the symptoms in most cases of acute inflammation of the tympanum it will be gratifying to learn, that by judicious management, the termination will be satisfactory. Indeed, it is the rule rather than the exception, for patients to recover almost perfect hearing.

One of the principal points of distinction between catarrh and inflammation of the tympanum, in a pathological sense, is that in the latter disease a periosteal tissue is implicated. We must bear this in mind in the treatment of the sub-acute and chronic forms of the affection. The objects which we should have in view are to limit, as far as possible, the

effusion and organisation of plastic material, which tends to lessen the capacity of the tympanum, diminish the mobility of the ossicles, and produce rigidity of the fenestral membranes. These consequences will be best averted by the administration of iodide of potassium, as well as by the injection of a solution of the salt into the cavity of the drum. At the same time it will be necessary, by frequent inflation with Politzer's bag, to maintain the mobility of the ossicles. I need hardly state that the results of treatment will depend upon the extent to which the disease has attained. If seen early, much may be done to restore the ears to their normal condition ; if however the disease have already progressed to such a degree that the ossicula are firmly fixed by dense fibrous tissue, or by true bony anchylosis, we cannot expect by any treatment, to bring back normal hearing.

It will hardly be deemed orthodox to conclude a paper on defective hearing without alluding to blisters and the syringe among curative agents. These must undoubtedly be regarded as the sheet-anchors of routine practice, and consequently, a word or two concerning their use and abuse will not be out of place.

Though almost discarded by the modern school of aural surgery, it cannot be denied

that blisters sometimes have the credit of doing considerable good. The discomfort and annoyance of the treatment are palpable enough, though it is often difficult to satisfy ourselves of its real advantages. The indiscriminate use of blisters must undoubtedly be condemned, but we ought not to set them aside as altogether useless, because we are unable to explain their modus operandi. In some cases of chronic catarrh of the tympanum counter-irritation behind the ear is beneficial, probably by stimulating the sluggish circulation within the drum. The effects are so uncertain, however, that it will be impossible to say in any particular instance whether or not advantage will result, consequently the practice is purely empirical.

Syringing is only justifiable for the purpose of removing something from the ear; therefore it should never be resorted to until we have ascertained that there is something which requires removal. These observations may be deemed sufficient for the simple operation of syringing an ear, but simple as the proceeding may appear, serious errors prevail concerning it, and it is very frequently found to fail.

Syringing is called for when *by an examination of the ear* it is found to contain inspissated cerumen, hardened epidermis, parasitic growths,

discharge, or any other foreign body. The operation should be continued, within moderate limits, so long only as any of the substance we seek to remove can be seen within the auditory canal. It is, therefore, necessary to make repeated examinations during the operation, or we shall incur the risk of either leaving it partially completed, or of continuing after it has ceased to be useful, and when it will consequently do harm.

Of both these errors we see almost daily examples. It is of very common occurrence to find in the meatus of patients masses of hard cerumen or epidermis, though we are assured that the ear has been recently and perhaps repeatedly syringed. On the other hand it is by no means unusual to hear of syringing being performed without the smallest justification. Nothing having been removed from the ear and nothing being there to remove.

Impacted cerumen, or epidermis pressing against the membrana tympani will not unfrequently give rise to severe deafness and tinnitus as well as giddiness, consequently its removal is urgently called for. This is often a matter of no small difficulty after such a mass has been retained for a considerable period in the auditory canal. Even with the best appliances at our command it is not always possible

to succeed at the first sitting and therefore it is by no means surprising that syringing as ordinarily practised should prove unsuccessful. In cases such as these, judicious syringing is called for, but as a matter of routine it has repeatedly injured the delicate organs of hearing, and must be unhesitatingly condemned.

I have attempted in this paper to give a brief *résumé* of the principal affections of the ear, which constitute the most frequent causes, as well as the most curable forms of defective hearing. Within limits like the present, it is impossible to do more than indicate the most salient points of this important subject. I hope, however, to have succeeded in showing that the study of ear disease is not only one of considerable interest, but one which, with a little pains, may be readily mastered.

Such are the aims of this little book for which I now ask the indulgence of the reader.

APPENDIX.

An improved method of introducing fluid remedies into the tympanum.

EVERY surgeon who is in the habit of treating diseases of the ear will admit the utility of topical applications to the tympanum, and few will deny that patients frequently forego these advantages rather than submit to the treatment as at present practised.

In common with most aural surgeons I have experienced complications attending the introduction of fluid remedies into the middle ear, by the catheter; and the object of this paper is to show how the proceeding may be rendered easier to the operator, and more tolerable to the patient.

In recommending the instrument about to be described, I may mention that having employed it in hospital and private practice for nearly two years I have found it answer every requirement.

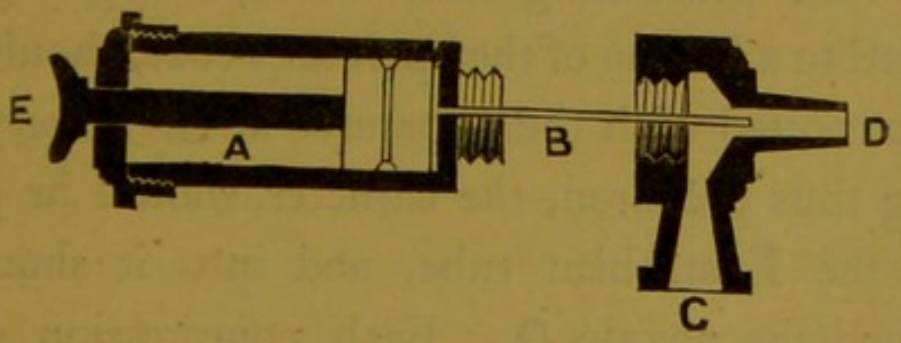
Before entering upon a description of the apparatus, I will briefly refer to the methods in general use.

The Eustachian catheter, having been intro-

duced in the ordinary way, is connected with the inflating apparatus, and the surgeon assures himself by auscultation, that air passes into the tympanum. When this test is satisfactory the catheter is disconnected, and a few drops of the liquid intended for injection are introduced into it by means of a syringe. The connection between the catheter and inflating apparatus must now be re-established so that the lotion may be blown into the middle ear. This proceeding often requires to be repeated more than once at each operation, connecting and disconnecting the apparatus to the no small discomfort of the patient. Though by constant practice all this is more easily effected than described, it is evident to every one who witnesses the performance, however dexterously managed, that there is room for improvement.

Some surgeons place the fluid into the catheter before it is introduced, and no doubt this is exceedingly simple, but in my opinion it is not effective. One objection to its use is the necessity for unerring precision in passing the catheter into the Eustachian tube, because it is impossible to verify this without driving the fluid out of the instrument into the patient's throat. Whenever this happens the catheter requires to be recharged, either by removing it and commencing *de novo*, or by having recourse to the syringe, as in the first method.

Even when the instrument is accurately introduced, it not unfrequently happens that air, coming from the inflator, does not at once penetrate into the cavity of the tympanum. The sounds conveyed through the otoscope to the ear of the operator, may indicate that the Eustachian tube, offering resistance at first, requires clearing before it yields to the passage of air. In such a case the fluid does not enter into the cavity of the drum, but is expended on the orifice of the Eustachian tube. Supposing, however, that everything succeeds in the best manner possible by this method, and that the catheter contains a sufficient quantity of fluid, this is forced at once into the middle ear instead of being gradually introduced in the form of spray. These objections, manifest enough in practice, I have endeavoured to remove by employing the instrument here depicted in section of the full size.



A is a small vulcanite syringe, made to contain about fifteen minims of fluid. B is a capillary gold tube, through which the contents of the syringe are conveyed to the catheter connected to

the adapter at D. A tube from the inflating apparatus enters at C. The external diameter of D being equal to the internal diameter of C, the tube which fits into C will also fit the catheter. By this arrangement no alteration need be made in the instruments generally employed, and the syringe may be used or not in any particular case according to its requirements.

When the portions separated by the letter B are screwed together, a current of air from the inflator will enter at C, and pass out at D into the catheter. In its passage over the end of the capillary tube the air gradually exhausts the fluid contents of the syringe, which are converted into spray before entering the tympanum.

In order to use this instrument the syringe should be charged with the liquid intended for injection. This may be done without unscrewing, as the capillary tube B is made to project beyond D. The tube proceeding from the inflating bag, suspended to a button of the operator's coat, should then be connected with the apparatus at C. Everything being thus prepared, the catheter should be passed into the Eustachian tube, and into it should be inserted the nozzle D. Each compression of the bag will now drive through the catheter air charged with spray, which may be heard to enter the tympanum by means of the otoscope previously introduced. If the instrument is held in such a

manner that the index finger is free to compress the the piston E, the quantity of spray ejected may be increased whenever this is considered desirable during the operation. Should the surgeon discover by the sounds conveyed through the otoscope, either at the commencement of the proceeding, or at any time thereafter, that the catheter is not in the Eustachian tube, he may, even without disconnecting the apparatus, rectify the error before the lotion in the syringe has been wasted.

These are the principal advantages afforded by this method; and, in conclusion, I will only remark that, although cases requiring Eustachian catheterism form but a very small proportion of aural patients, so long as the operation cannot be dispensed with it is of importance to facilitate its performance as much as possible.