

investigations on the subject may be briefly mentioned, especially respecting what has improperly, I think, been called the *drum* of the ear. Scientific men seem now to be agreed that this organ does not act as a drum, but in some other manner: for if it acts merely as a drum by producing a noise, we must be furnished with another ear by which it may be heard, and this ear must of itself be another such drum, which must have another, and so on *in infinitum*. Those, therefore, who were of opinion that the ear does not act as a drum, minutely examined its structure; the result of which examination was, that they perceived a wonderful unfolding of its auditory nerve, which is curiously distributed through every part of this cavity, lining its sides, being hung across like a curtain, and sending off fibres in all directions, in such abundance as to leave scarcely a point of it uncovered.—But my limits forbid me from entering further into the various *theoretical* opinions entertained on the subject of hearing, and I therefore proceed to give an account of some of the *practical* results of an attentive consideration of the facts above stated.

The first invention for the comfort and

accommodation of those labouring under either malformation of the ear, or confirmed disease, which I shall mention, is the latest contrivance of the kind, namely, an Acoustic Chair. This chair is intended for the benefit and use of the incurable deaf. A somewhat similar chair was constructed in 1706 by M. Duguet, who likewise invented some acoustic tubes. But one of the great advantages possessed by my Chair over his consists in this, that the person sitting in it hears at the opposite side from that at which he is addressed; thus avoiding the unpleasant and injurious practice of the speaker coming so close as to render his breath offensive and at the same time detrimental to the organ of hearing, by causing a relaxation of the membrane of the tympanum. This is an effect commonly produced by the use of short flexible tubes,* no less than by hearing trumpets, which

* Instances are on record in which very baneful and injurious effects have resulted from the practice of speaking into the ear, more especially where the breath of the person is tainted. One case I may mention, which is related by Lord Herbert. Cardinal Wolsey, he tells us, towards the latter part of his life, was in the habit of whispering into the ear of his sovereign, Henry VIII.; and the serious indisposition of the king has been many times attributed to this cause, and certainly not without reason.

latter are as often, perhaps, employed for *speaking*, through, as for the purpose for which they were designed; and it is a certain fact, that many persons, after having used a trumpet for half an hour, are quite deaf, from the action of the breath impelled against the membrana tympani.

My Acoustic Chair is so constructed, that, by means of additional tubes, &c., the person seated in it may hear distinctly, while sitting perfectly at ease, whatever transpires in any apartment from which the pipes are carried to the Chair; being an improved application of the principles of the speaking pipes now in general use. This invention is further valuable, and superior to all other similar contrivances, as it requires no trouble or skill in the use of it, and is so perfectly simple in its application, that a child may employ it with as much facility and as effectually as an adult. It is, moreover, a very comfortable and elegant piece of furniture.

This Chair is of the size of a large library one, and has a high back, to which are affixed two barrels for sound, so constructed as not to appear unsightly, and at the extremity of each barrel is a perforated plate, which collects sound into a paraboloid vase from any part

of the room. The instrument thus contrived gathers sound, and impresses it more sensibly by giving to it a small quantity of air. The convex end of the vase serves to reflect the voice, and renders it more distinct. Further, the air enclosed in the tube being also excited by the voice, communicates its action to the ear, which thus receives a stronger impression from the articulated voice, or indeed from any other sound. What first induced me to invent this Chair was the fatigue I sometimes experience in talking to deaf persons.

I have also lately constructed a trumpet with two apertures, one to be inserted into the meatus, and the other into the mouth; by which means a twofold advantage is gained, as the deaf person at the same time receives the sounds by the external auditory passage and by the Eustachian tubes. This idea was first suggested to me by my friend Sir Edward Stracey, Bart., to whom I am under many obligations.

Among other useful inventions of a similar nature may be mentioned the artificial ears*

* Signor Vorley, of Florence, when a very old man, in the beginning of the last century, was the original inventor of the artificial ear; he also constructed an artificial eye: both of which were highly creditable to his talents.

introduced into this country from France, where they were originally manufactured. By being closely fitted to the ear, they increase the collection of sound; but besides that, there is an additional force wanted to transmit it through the passage. In this respect the French invention is imperfect: to remedy the defect, I have added a small tube, which, by contracting the meatus, causes the sound to enter with greater impetus. This invention is found very convenient, in consequence of the substitutes being applied over the natural ear, which they resemble in appearance.*

The ears made of shells, also, answer very well: but, at the same time, I must remark, that these mechanical contrivances, although found to be more serviceable than any other means in general use, yet do not apply with equal success in all cases; and there are, in fact, instances in which no mechanical contrivance can be of use.

When at Amsterdam, a short time since, I was struck with the appearance of some very

* The Spanish soldiers were, it seems, formerly practically acquainted with acoustics; for we read that, by means of a long ear-trumpet placed on the ground, they were accustomed to listen to the conversation of the enemy's sentinels stationed at a great distance from them.

ingenious small acoustic tubes, about three quarters of an inch long, which, on being inserted into the meatus, increased the collection of sound: but, except in slight cases, very little benefit could result from their use.

With some patients, the German silver ears answer better than any others; but they are objected to by many on account of their weight, and from being more conspicuous than the French ears: it is also necessary that they should be fixed by a spring, which goes over the head.

Another valuable mechanical aid, of recent invention, namely, a flexible tube, I may here notice,—an apparatus constructed under the direction of my friend Mr. Hoblyn, Vice-President of the Society of Arts. This contrivance has been found very serviceable in many instances. Its peculiar merit consists in the entire absence of the friction caused by the spiral wires, and of all electrical properties. Mr. Hoblyn thinks it best adapted, however, for nautical purposes, either in steam or sailing vessels, where, from its being, as just stated, a non-conductor of electricity, it might be beneficially employed as a substitute for the common speaking trumpet.

I have also invented a hearing trumpet,* forming a parabolic conoid, on the same principle as the speaking trumpet used at sea, which is so well known to answer the purpose, by extending the impression of sound. It has this convenience, that it shuts up into a small case for the pocket.

Many other instruments in my possession might be noticed, some of them of complex construction; but I have found none to answer the purpose better than my Acoustic Chair and Hearing Trumpet.

* In addition to the facts previously stated in other parts of this treatise, relating to the knowledge possessed by the ancients in the science of acoustics, there is contained, in a MS. found some time since in the Vatican, entitled "Secreta Aristotelis ad Alexandrum Magnum," an account of a circular trumpet, *five cubits in diameter*; by means of which Alexander could convey his orders with his own voice to his generals stationed at the distance of a hundred stadia from him, which is nearly equal to twelve miles. The power of this trumpet must therefore have been greatly superior to that invented by Sir John Moreland, which only conveyed sound, on the open sea, to the extent of about two miles, even when the wind was favourable.

CONCLUSION.

I HAVE thus, in the preceding pages, treated of the various diseases of the Ear, and laid down the general principles of cure best adapted to each: but it is to be observed, with regret, that few attempts have yet been made by anatomists to trace the morbid changes or affections to which this organ is liable. On this subject we are almost destitute of information, while the diseased appearances of the other members of the body have been examined with great minuteness and attention; and the symptoms accompanying them, having been accurately ascertained, are recorded with precision and care.

And here, it must be confessed, that the difficulties which obstruct our inquiries are great; indeed, some of them appear, at first sight, to be almost insurmountable. Nature, as we have seen, has placed the chief and most important part of the ear beyond the