

HOW THE AIR-PASSAGES ARE EXPLORED.

By F. SEEGER, M. D.

ONLY a few years ago physicians were absolutely in the dark when applied to by those afflicted with disease in the throat; and that where then all was darkness, there now is clear light, thanks to the zeal and scientific devotion of Prof. Türk, of the University of Vienna, who, in 1857, was the first to successfully use the laryngoscope as a means of determining the nature of a disease in the throat of a patient then in the wards of the General Hospital of Vienna, of which latter Türk was physician-in-chief.

Fig. 1 depicts the laryngoscope, or laryngeal mirror. At the left end we see the mirror, which is set in a silver frame and back; this in turn is attached to a metal stem, and the stem itself is set in a wooden handle, which latter is merely a matter of convenience by which the physician is enabled to handle it with more ease and facility. The mirror is made of various sizes, from that of a cent to that of a silver half dollar, and is so attached to the stem as to describe an angle of 120° to 125°.

Prior to the discovery of the laryngoscope, the great obstacle to the diagnosis and comprehension of disease of larynx lay in the fact that this organ was so placed as to be at an almost direct angle to the line of vision. If we look into the mouth of another person, we see the back of the mouth; but if we wish to see the larynx, or organ of tone and voice, we are unable to do it, even though its position is just back of and below the root of the tongue. And, even though we press down the tongue, we derive no aid. Nor are we enlightened by symptoms of pain or discomfort in the throat, for these are not only insufficient, but may be absolutely deceptive. A patient may complain of aches and pains, and may imagine them in the larynx, and all the while the organ may be in a perfectly sound state; and, on the other hand, again, grave forms of throat disease may exist, and with so little of actual pain as to cause the victim hardly any uneasiness. The revolution in this department of the medical art may perhaps be best illustrated when I refer to the fact that ere the introduction of the laryngeal mirror, barely twenty years ago, there were but two or three forms of laryngeal disease recognized or treated of in the text-books on the practice of medicine. At the present time, the study of the numerous and varied diseases of this wonderful little organ, the larynx, has made such strides that laryngology has, like ophthalmology, otology, and gynecology, demanded and received recognition as a separate and distinct department of medical practice, and has its special practitioners in almost every city of size and population. Whereas, formerly, the two or three recognized forms of throat disease were dismissed in a scant dozen of pages in the medical text-works, we now have exhaustive and elaborate treatises in all of the great languages of the civilized world.

The rhinoscopic mirror, or rhinoscope, is practically but a laryngeal mirror of a smaller size. The stem and handle are the same, and attached in the same manner, at about the same angle, but there is the difference of a much smaller size as compared to the laryngoscope, the mirror being usually about the size of a silver three-cent piece. Its use is to enable us to see the back or inner parts of the nose (posterior nares), and the upper part of the pharynx or vault of the back of the mouth. Its discovery, which occurred soon after that of the laryngoscope, is due to the patience and genius of Czermak, and was a direct result of the discovery of the laryngeal mirror. The parts which it enables us to see are hidden behind and above the palate, and the office of the rhinoscopic mirror is simply to so reflect the light as to illuminate these parts, and in turn enable their image to become visible in the mirror. In the first instance the little mirror is placed at the back of the opened mouth of the patient.

At the same time a powerful and clear light from an illuminating apparatus is directed into the patient's mouth, and the rays striking upon the mirror are so reflected upward and forward as to illuminate the parts we seek to examine, and these are then, as just remarked, made visible in the mirror. And in this principle lies the entire secret of the art of making a laryngoscopic or rhinoscopic examination. It is simply a dexterous management of mirrors to secure proper reflection of light, and the consequent illumination and examination of hidden recesses.

The rhinoscope also enables us to examine the nasal or pharyngeal orifices of the Eustachian tubes. These latter are passages leading from the inner side of the drum of the ear, and opening, as already indicated, at a point situated in the posterior nasal parts. It is not the province of this article to enter into minute or precise detail, and therefore we shall merely add that these tubes bear a very important relation to the faculty of hearing. If the nasal orifices of these tubes become swollen by disease or choked with diseased mucus, greater or less impairment of the hearing-power results. Consequently, the rhinoscope has rendered no small service to us for determining causes of deafness, and of curing them, which formerly were but guessed at or remained unknown.



FIG. 1.

But to make the laryngeal and rhinal mirrors available, the artificial illumination of these parts is necessary. To depend upon the sun's rays, as was the case with the original experiments, was too uncertain. Czermak, as we have seen, substituted artificial light, and thus enabled an examination to be made at any hour of the day or night. Tobold, of Berlin, after a time, brought forward an apparatus which is depicted in the following cut, and which embodied the most perfect apparatus of the time. The cut also shows us the position of the patient and of the examiner.

As introduced by him, it consisted of a common study-lamp: *a* is a brass tube, or light-condenser, in which are convex lenses, *c, d, g*. The lenses *c* and *d*, it will be observed, are close together, while the third, *g*, is at the distal extremity of this brass tube. At *f* this brass tube can be unscrewed, thus enabling the cleaning of the lenses. The lens *g* can also be removed at *h*. *m* is a brass arm having three joints, and fastened to the lamp. At the extremity of this arm is a perforated knob, *s*, through which the handle of the reflector, *i*, is passed, and which is fastened by a screw. At *o* is a single *charnière* joint, which permits of the forward or backward motion of the reflector—the illuminating agent being oil. By substituting gas burned through an Argand burner, and fed from any ordinary burner, the

apparatus has been made more available, and better light obtained.

It is not necessary to dwell upon the changes. Suffice it that by these the apparatus has been made much more ready and simple in management, and less liable to derangement of focus at important moments when a steady light is needed for intra-laryngeal operations. It is here that we should call a brief attention to the vast strides which, under the influence of the laryngoscope, have been effected in the operative procedures upon this organ. All of these are now made by means of instruments curved at a direct angle to the line of vision, and in none of these operations does the operator directly see the objective point. His operations are all made under the guidance of the image which he sees reflected in the laryngeal mirror, and are comparatively bloodless and accompanied by little or no pain.

A laryngoscopic examination is made as follows: In the second cut we see the positions of the examiner and patient. The patient opens his mouth as widely as possible, and at the same time protrudes his tongue. The examiner then with a small napkin takes the protruded tongue

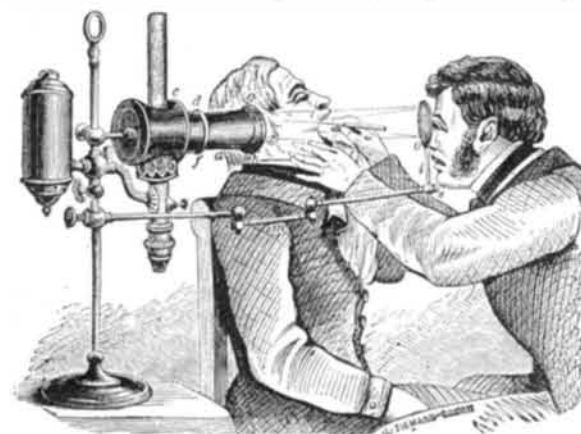


FIG. 2.

THE RHINOSCOPE.

between his tongue and forefinger, thus gently steadying it and preventing its slipping back into the mouth. The object in thus protruding the tongue is to enlarge the cavity of the mouth as much as possible. The laryngeal mirror is next warmed, either over the chimney of the illuminator or in some warm water, so as to prevent its becoming obscured or dimmed by the breath. It is then quickly and dexterously carried to the back of the mouth. A bungling manner of doing this, by causing great irritation of sensitive parts of the mouth, causes gagging and even vomiting, and, this once excited, all further examination is either very difficult or impossible at this sitting. It is not to be taken for granted, however, that examinations can readily be made in all cases, nor even in the larger majority of the patients. With many there is no trouble, but there are also quite a number of patients whose throats are so irritable from disease as to prevent the introduction of the laryngoscope. In other cases the patient's tongue has an almost irresistible tendency to keep rising up toward the roof of the mouth and thus obstruct the view. Enlargement of the tonsils according to the degree of their enlargement makes an examination either very difficult, or else, if so much enlarged that they meet and almost close up the throat, makes it impossible until the enlargement has been reduced. For the overcoming of mere irritability of the throat or fauces when this pertains to a degree sufficient to be troublesome, various means have been resorted to, to produce local anesthesia of the fauces. A piece of ice held in the mouth, the water being swallowed, is one plan. Another is to drop twenty drops of chloroform on a handkerchief and let the patient inhale it for a minute. With most cases of irritable throat this is quite sufficient, and without at all rendering the patient drowsy or uncomfortable. Bromide of potash has been used, but has not given satisfaction practically.

The examiner, having avoided touching the back of the tongue and of the pharynx with the mirror, carries it, as already said, to the back of the mouth to an oblique position below the soft palate and with the uvula or "drop" of the palate at its back. The rays of light from the illuminating apparatus, striking the laryngeal mirror, are then reflected in a downward direction and light up the parts (the larynx) below. These, being illuminated, are in return depicted upon the laryngeal mirror above. The process may be compared to that of the management of toilet-mirrors to enable us to see the back of the head. In the latter proceeding it is not the back of the head which we see, but, as it is hardly necessary to add, merely its reflection in the mirror.

And at this point we should remark that, while the laryngeal examination to one versed in the art is comparatively easy, the rhinoscopic examination, on the other hand, is a very difficult matter, and calls into play no small amount of skill and ingenuity. The reasons for this are mainly because of the unruliness of most palates, which have a tendency to bob up and down in a very provoking manner. We shall not dwell further upon this point, but briefly add a few remarks as to what this instrument has done for us. Where we can apply it we are no longer in the dark as to whether a case of disease is that of a chronic catarrh, nasal tumor, simple inflammation, swelling or ulceration. In our climate, in which diseases of the nasal cavities, and particularly catarrh, are so prevalent that it has been estimated that 10,000,000 of our people have the disease called catarrh to a greater or less degree, every advance by which we are enabled the more successfully to combat these complaints is of general interest and importance. How potent our climate is in causing catarrh is illustrated in the case of Charles Dickens, who contracted it so rapidly and severely as to necessitate his abandoning many engagements and compel his flight from this country. Interesting is the fact, which Darwin records in his "Descent of Man," that the *Cebus azaræ*, a species of Paraguayan monkey, is liable to catarrh with all of the symptoms found in his more human relatives, and which, when often recurrent, leads in them to consumption.

The higher animals, like man, are endowed with an organ of voice and sound, but man alone has the supreme gift and faculty of expressing the ideas and thoughts which his intellectual endowments and powers give rise to, or, plainly speaking, he alone has an articulate language equal to the expression of most of his feelings and sentiments. How

wonderful, then, it becomes to us when we study the little organ which has the great task of placing man in direct communication with his fellow beings! And how wonderful fully this little organ modulates its tone in accordance with the varying degrees of emotion and earnestness! And when we consider that each voice has its own peculiarities and characteristics which distinguish it from all others, our interest deepens. And yet there is little or in fact no difference in the mechanism of the various kinds of voice, the variations in pitch being due chiefly to the greater length of the vocal cords in the low-pitched voices and to their shortness in the high voices. Tone, whether in speech or song, is simply a result of the action of a volume of air in a quantity which is regulated by the will of the speaker or singer, which, coming up from the lungs through the windpipe, passes up through the larynx, where it causes the elastic vocal cords to be put upon the stretch to a greater or less degree according as the intended note is high or low, to vibrate, and thus is produced the tone which upon its entrance into the pharyngeal cavity and mouth becomes articulated, and the sound of which is variously and essentially modified according to the varying peculiarities of structure and formation of the larynx, pharynx, and mouth. It is also changed or modulated according as the various parts of the mouth, tongue, palate, teeth, and lips assume different positions. Cultivation of the voice also impresses its stamp. The tone-waves, as they rush out of the open mouth, communicate their vibrations to the air, which conducts the sound onward until it reaches our ears, provided we are within the reach of these atmospheric vibrations. The difference between a cultivated voice or note is soon detected in the purity and regularity with which its sounds reach us as compared to the harsh, irregular, discordant waves impelled by one not so cultivated. Johannes Müller places the extreme range of the human voice at four octaves, but it is quite seldom that the range exceeds two and a half octaves. In some phenomenal voices, like those of the gifted Parepa-Rosa, Peschka-Leutner, Mara, Farinelli, and other great singers, we meet with astounding range and power. Parepa-Rosa had a voice ranging full three octaves, from sol₂ to sol₅; and Flint, the learned and indefatigable physiologist, tells that at the World's Musical Festival at Boston, in 1869, she gave the most astounding exhibitions of the wonders which this little organ, the larynx, is capable of. In some of the solos by Madame Rosa, accompanied by a chorus of 12,000, with an orchestra of more than a thousand, and largely composed of brass instruments, Prof. Flint distinctly heard the pure and just notes of this remarkable soprano, standing alone, as it were, against the entire choral and instrumental force; and this in an immense building containing an audience of 40,000 persons! Mara's voice had compass, with equal fullness of tone, of three octaves, and she possessed such power of musical utterance that she imitated the most difficult passages of the violin and flute with perfect facility. Farinelli on one occasion competed with a trumpeter, who accompanied him in an aria. After both had several times dwelt on notes in which each sought to excel the other, they prolonged a note with a double trill in thirds, which they continued until both seemed exhausted. At last the trumpeter gave up, entirely out of breath, while Farinelli, without taking breath, prolonged the note with renewed volume of sound, trilling and ending finally with the most difficult roulades.

But these wonderful displays of the power of the larynx must not be ascribed entirely to the intensity of the tone, but are in no small measure due to the absolute mathematical equality of the sonorous vibrations and the comparative absence of discordant waves. By the degree of tension of vocal cords which is required for the pitch of a prescribed tone, and which, as we have seen, is greater in the higher and less in the lower notes, the muscles of the larynx really become the determining forces of the ability to sing, and a great deal depends upon securing for them the necessary practice, as for instance for the execution of rapid successions of tones. And herein lies the difference in the voices of singers, the purity of the tone depending upon the accuracy with which they put the vocal cords upon the stretch, while in those whose tones are impure and faulty, the difficulty lies in their inability to give the requisite tension, and of course the muscles take part in the shortcoming. A correct idea of the sound, height, and depth of the tone which the singer intends to communicate, enables him to strike the correct tension as by intuition, and carries him along its continuance and through its purity of modulation until it has ceased.—*Popular Science Monthly*.

NEAR-SIGHTEDNESS.

Is the Human Eye Changing its Form and Becoming Near-Sighted Under the Influence of Modern Education?—At the recent annual meeting of the Medical Society of New York County, Dr. E. G. Loring, in his valuable paper, answered the above question in a very satisfactory manner, as far as his observation and experience went. He said that hereditary influence was an important element in the production of myopia, and, although statistics did not strongly indorse that view, he still held that legendary information should receive much credence. In regard to the influence of modern education, it was found that a larger proportion of those living in cities were near-sighted than those in country districts; and, moreover, in those cities where intellectual pursuits were greatest, the largest number of myopes were found. In savage nations near-sightedness was very infrequent, and it would seem, in some respects, that it was a result of education. While the intellectual classes in Germany showed a large proportion of myopia, it was not so found in those artisans who used their eyes on fine objects, as watch-makers and wood-engravers. In England, where there has always been great intellectual activity, by no means as large a ratio of near-sightedness had been detected as in Germany, and it became necessary to seek for other factors to explain the prevalence of myopia. Impaired nourishment, imperfect ventilation, together with a sedentary life, had a marked tendency in producing laxity of the tissues in general, including of necessity the coats of the eye balls; and, with the tension which resulted from close application of the sight, there was a great probability of lengthening of the eye, or myopia, resulting. In New York the German children were found more often near-sighted than those of other nationalities. Dr. Loring said that undoubtedly myopia was hereditary, but that in all probability it could under certain circumstances be developed; but he did not believe that of necessity it must increase in a nation engaged in literary pursuits. In the United States the normal eye predominated, and he thought it was due to the fact that the young were more in the habit of indulging in out-door sports than in Germany. The same was true of England. From a careful analysis of the myopic cases, it was found that between the ages of ten and fifteen the majority developed; or, in other