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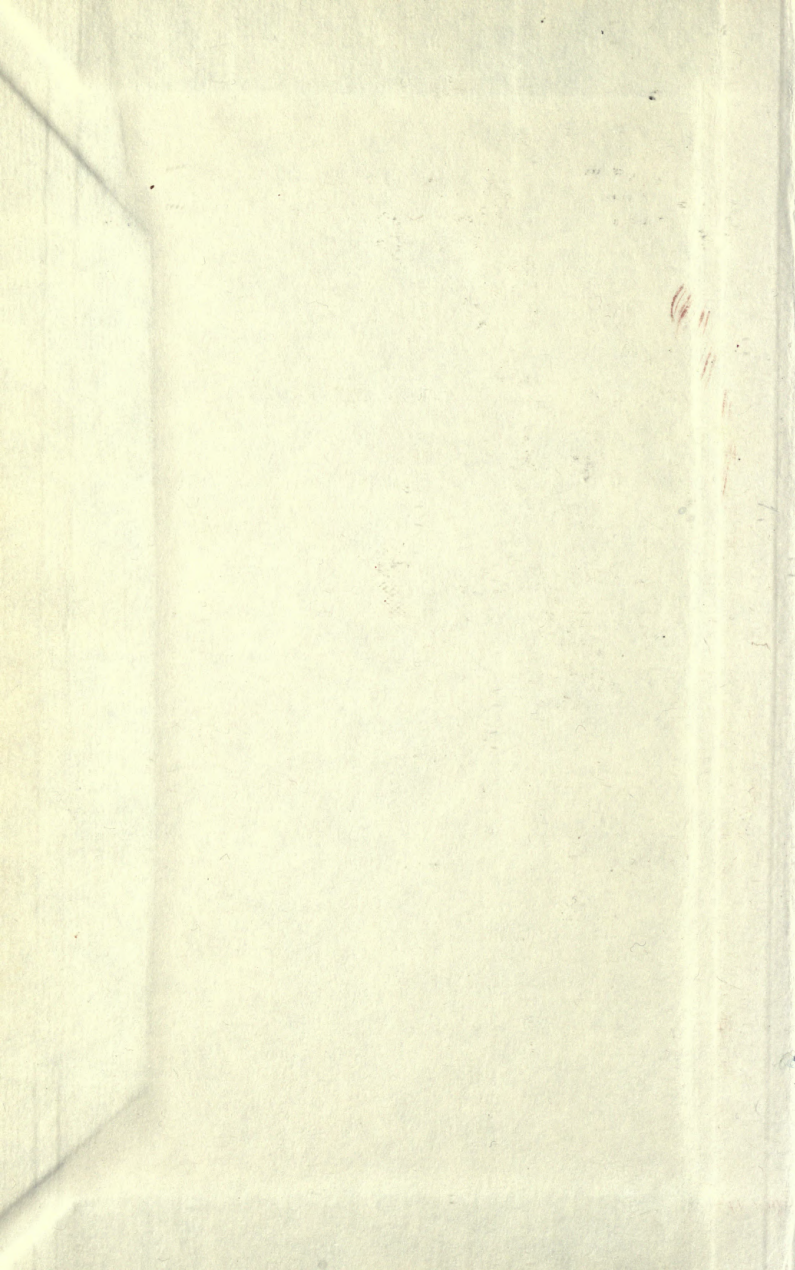
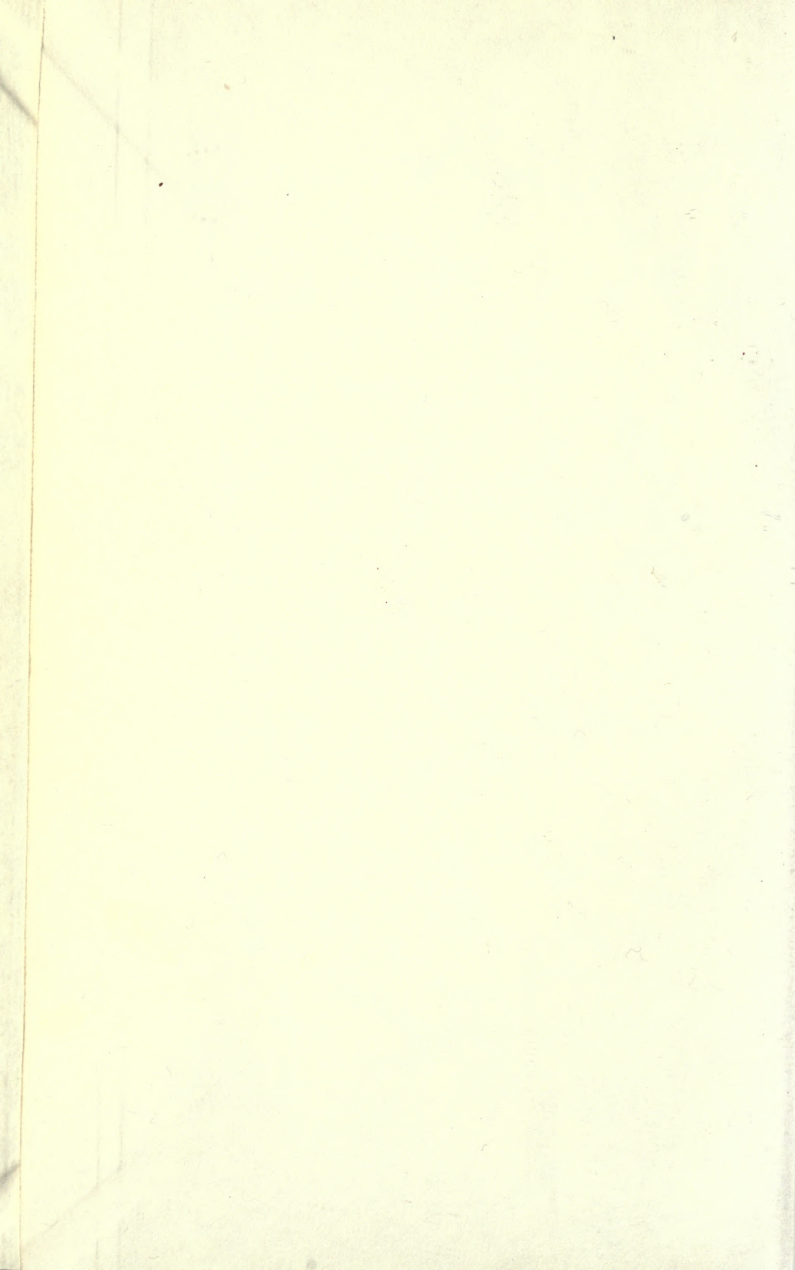
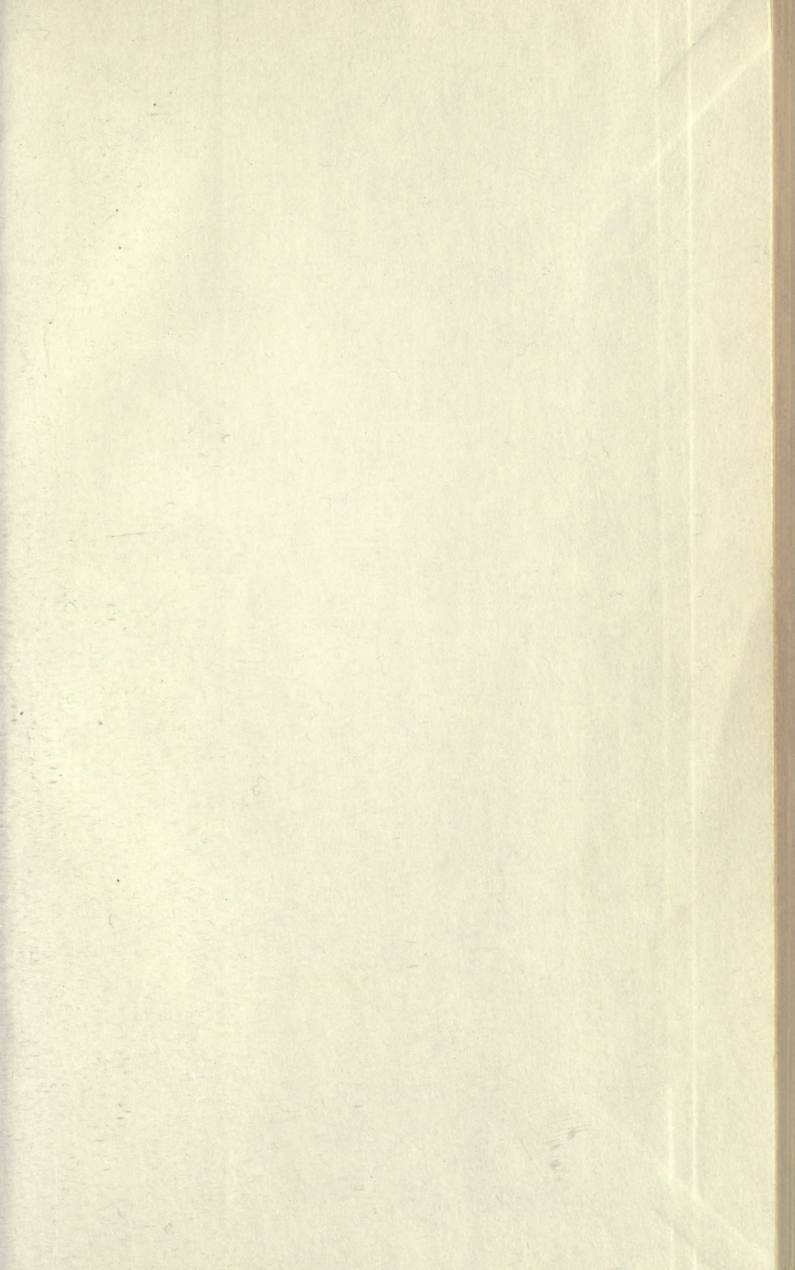


Fig. 12 -





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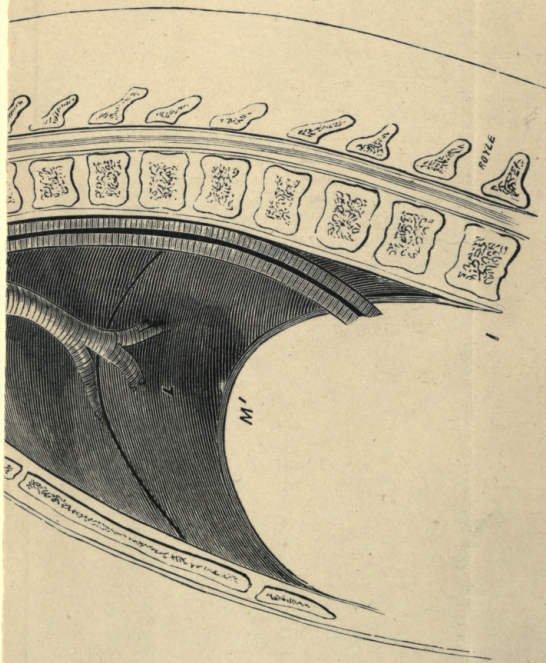


PLATE I.

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THE MECHANISM OF THE HUMAN VOICE.

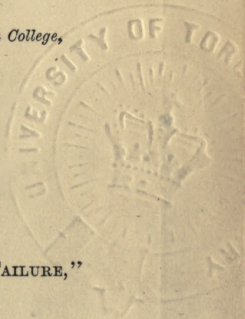
BY

EMIL BEHNKE,

*Late Lecturer on Vocal Physiology at the Tonic Sol-fa College,
Teacher of Voice Production.*

NINTH EDITION.

EDITED, WITH A NEW CHAPTER ON "VOICE FAILURE,"
BY MRS. EMIL BEHNKE.



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THE MECHANISM

OF THE

HUMAN VOICE

BY

EMIL BENKE

LONDON :

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1890

PREFACE TO THE NINTH EDITION

A ninth edition of this book having been called for, I take the opportunity to record my sincere thanks for the many kind expressions concerning its usefulness which have reached me since the lamented death of its author, my dear husband.

In carrying on his work, both my daughter and myself have felt the benefit of the plan and contents in instructions the book contains.

TO
MY DEAR WIFE
THIS ESSAY
IS
AFFECTIONATELY
DEDICATED.

We have also given the name of the author to the value of the thing, and we mean of which we to ourselves, and submit to the public, whether speaker or singer.

I hope that the new chapter on "Vocal Culture" which I have added by Mr. Curwen's death, may be of some use in preventing breakdown of voice, from which many students suffer.

H. PRITCHARD

18, Essex Court Square, E.C.4.

PREFACE TO THE NINTH EDITION.

A NINTH edition of this book having been called for, I take the opportunity to return my sincere thanks for the many kind expressions concerning its usefulness which have reached me since the lamented death of its author, my dear husband.

In carrying on his work, both my daughter and myself have felt the benefit of the clear and concise instructions the book contains.

We have also proved with our pupils the absolute truth and value of the BEHNKE SYSTEM OF VOICE TRAINING, by means of which we have obtained results most gratifying to ourselves, and surprising to the pupils, whether speakers or singers.

I hope that the new chapter on "Voice Failure," which I have added by Mr. Curwen's desire, may be of some use in preventing breakdown of voice, from which so many students suffer.

K. BEHNKE.

18, EARL'S COURT SQUARE, S.W.

PREFACE TO THE THIRD EDITION.

A THIRD edition of this little book has now become necessary, and I must again express my gratitude for the continued commendations bestowed upon my work both in the press and in private letters.

In response to many solicitations, I have added to this edition a few hints on teaching, deduced from physiological facts, which may prove useful by stimulating the advance of thought in a new direction.

These hints are extracts from a series of articles on "Science and Singing" which I had the pleasure of writing in the *Edinburgh St. Cecilia Magazine*; and I am indebted to the Editor, Mr. A. C. Miller, for kindly permitting me to reproduce them here.

PREFACE TO THE SECOND EDITION.

THE favourable reception and rapid sale of a large first edition has stimulated me to revise this little book, and without alteration of my original scheme of practical utility, to somewhat enlarge on one or two points which appeared to demand further elucidation.

In this, as in the former edition, I have received great assistance from my friend Mr. Lennox Browne, the eminent throat surgeon, who, by ever patiently discussing with me debatable points, and by giving me access to cases, interesting from a physiological point of view, both at the Central Throat and Ear Hospital, Gray's Inn Road, and in his extensive private practice, has afforded me opportunities of increasing my knowledge and experience which would not have arisen otherwise. I feel it a pleasure as well as a duty publicly to acknowledge my indebtedness to him, which I have, many times before, expressed in private.

My best thanks are also due to Mr. J. Spencer Curwen, for the help he has rendered me in many ways.

And finally, it would indeed be ungrateful on my part, if I did not place on record the obligation under which I consider myself to my reviewers for the uniformly favourable notice they have so kindly taken of my first effort, and for several useful hints of which I have duly taken advantage.

One objection has been made which strikes at the very root of the plan upon which I have proceeded in my little volume, and to which, therefore, I beg leave to say a few words in reply. A learned writer in the *Athenæum* finds fault with me for making use of popular instead of scientific terms, which, he says, may be the cause to the reader of great confusion if he refers to other works, and he adds that "Back Ring-Pyramid Muscle" is almost as hard a mouthful as "Crico-Arytenoideus posticus." I have asked several non-scientific friends of good general education to read this sentence to me, and they succeeded very well with "Back Ring-Pyramid Muscle," while they utterly collapsed when coming to "Crico-Arytenoideus posticus."

This is, however, in my humble opinion, of minor

importance. The great point is, that my terms—which by the way are not inventions, but simply translations—convey a meaning to the general reader, and the originals do not. This is a fact which I dared not ignore, because my essay is intended for the people and not for men of science. As I have taken care also, for the sake of those who might wish to consult other and more learned books than mine, to give the terms generally used by physiologists by the side of my translations, I do not think there is anything that could ever confuse my readers.

I conscientiously believe that these are good and weighty reasons for the plan I adopted in the first edition, and trust my reviewers, as well as my readers, will accept them as a sufficient justification of the same practice in the present volume.

E. B.

February, 1881.

PREFACE TO THE FIRST EDITION.

THE number of books bearing more or less directly on the Theory of Voice Production which have been published during the last few years is very large, and shows clearly the extraordinary interest taken in this subject, not only by professional singers and speakers, but also by the general public. If I am now about to add another contribution to this already extensive literature, it is simply because amongst all the many excellent works on the Human Voice there is not one which brings before the reader the whole subject from beginning to end. The student who really wishes to get a clear understanding of the matter is obliged to wade through a variety of scientific books, and to pick up here and there, by means of very hard reading, such little scraps of information as, with much labour and waste of time, he can extract from books which were, in

most instances, never written for the purpose for which he consults them.

To supply this generally-admitted want I have written these pages, in which I have endeavoured, to the best of my ability, to place before the reader in a simple and comprehensive form the Physiology of the Human Voice. I have, as far as possible, discarded all scientific terms, and it has been my aim to treat my subject in so simple and direct a manner as really to enlighten my readers instead of bewildering them. A treatise like this can, under no circumstances, be light reading; and I ask those who are truly anxious for information to give me patient study, accompanied by careful reference to the diagrams. For students who enter upon a perusal of these pages in such a spirit, this essay is specially intended; and if I have succeeded in making plain to such as these a really complicated subject, then my highest ambition will be satisfied.

E. B.

April, 1880.

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INTRODUCTION.

WE are living in an age which is singularly poor in fine voices, both male and female, and with regard to the tenors of the present time there is this additional misfortune, that, as a rule, their voices do not last, but are often worn out in a very few years; in many instances while their owners are still under training, and before they have had an opportunity of making their appearance in public. If we remember that there was a time when most beautiful and highly cultivated voices were so plentiful that even in comparatively small towns there were to be found Opera Companies consisting of excellent singers, we may well ask ourselves how this remarkable change for the worse has come about. People have attempted to account for it in various ways. Up to the middle of the last century women were forbidden by Ecclesiastical Law to take part in Church music. The voices of boys being available only for a very short time, means were taken to prevent their voices from breaking, and thus a class of male

soprani and contralti was created, who made their first appearance in Rome in the beginning of the 17th century, and to these singers the education of the female voices was soon almost exclusively entrusted. In the middle of the last century, however, when women were permitted to participate in Church music, there was no longer any occasion to procure artificial female voices, and these singers gradually died out, though there were still some of them living and teaching in the beginning of the present century. According to Rossini, who certainly was eminently qualified to give an opinion on the subject, the decline of vocal art in these latter years is mainly due to the disappearance of this class of singers, and if it be true that henceforth the training of female voices was undertaken by tenors, who, being of course unable to give a true pattern to their pupils, treated the female organ according to their own very different registers, then it can easily be understood that many voices must have been ruined by the process, and the scarcity of distinguished female singers would thus be satisfactorily accounted for. But I fail to see in what way the disappearance of male soprani and contralti could possibly have affected tenors and basses.

Again, it is asserted that the way in which modern composers write vocal music is the cause of the evil. Certain it is that in the compositions of the old Italian

masters the voice is studied, and nothing introduced which is hurtful or disadvantageous. Awkward intervals are avoided, no fatigue is caused, and everything is eminently *singable*; but the music is not always expressive of the sense of the words, which were clearly considered to be of minor importance. With our modern (and especially with the German) composers, it is just the opposite, their chief aim being thoroughly to enter, not only into the spirit of their text, but even into the slightest shade, the minutest detail of it, so as to make the music, as it were, a translation of their words into a higher kind of language. What, on the other hand, is possible or impossible for the voice is, since the time of Beethoven, but rarely considered; many composers, even the most distinguished ones, having evidently little knowledge of the most beautiful of instruments, for which they are nevertheless continually writing.

When one of the greatest living masters introduced the harp into his works, he wrote for it just as though it were a piano—*i.e.*, as though it were to be played upon with the thumb and four fingers. But it so happens that on that instrument the fourth finger is never used. Consequently, when it came to the point harpists could not play that gentleman's compositions: they had first to re-write them. Here the composer, of course, was found out immediately, and he or any

other man would have the same fate if he attempted to write for an instrument the properties of which he did not fully understand. But with the human voice the case is different. Every musician believes himself to be competent to write for it, though he may possibly be wholly unacquainted with its many peculiarities. It is to be feared, therefore, that modern composers must be held largely responsible for the sad state of affairs concerning vocal art at the present time, and well might they learn a lesson from Mozart, who, in spite of his genius, first carefully studied the human voice, and then wrote for it.

Another explanation of the decline of singing is this, that the gradual and very considerable rise of pitch during the last 150 years is at the bottom of all the mischief, as the vocal organ is unable to bear the strain to which it is subjected. With regard to tenors, however, the great evil is, that with very few exceptions, such as the celebrated Frenchman, Roger, they disregard, or at any rate did disregard for a considerable period, the falsetto register, singing everything, however high, in chest voice. I am afraid it cannot be said even that they have been beguiled into this serious mistake by the imperceptible rise of pitch just mentioned, but the truth is that they have committed this fatal blunder knowingly and wilfully, because they saw that it would pay. In support of this statement I will

quote a few lines from the publication called "The Opera and the Art of Singing," by Glogg-ner-Castelli :

"In the field of singing a new man arose, who, in spite of great personal attributes, worked destructively for the future, and whose influence upon the later manner of singing is seldom truly recognized. I mean the singer Duprez. Hissed off at first in Paris, he turned to Italy, where he stayed several years, and then returned to the French capital. When he came to use his magnificent vocal resources, as he did in the Fourth Act of *Tell*, where he brought out the high C in the chest voice with all the might of his colossal organ, it was all over with the fame of all his predecessors. Nourrit, till then the favourite of the Parisians, a distinguished tenor singer, recognized the rival's power. His day was over, and in despair over his lost and irrecoverable glory, he flung himself from an upper window upon the pavement, and so made an end of his life. Duprez may justly be considered one of the greatest dramatic singers of our time, and the main features of his method soon spread themselves all over Europe. After hearing of Duprez, and how the chest register could be cultivated even into the highest regions of the voice, the public were no longer contented with the use of the falsetto. Soon it became impossible to be engaged as an "heroic tenor" without at least possessing the high B \flat in the chest tone. The singers found it a more thankful task to humour the taste of the public than to pay extra regard to the intentions of the composer; for often Meyerbeer himself indicates, by a *pp*, his design that the falsetto and not the chest tone should be employed. That every tenor singer, whether such high pressure

suiting his natural compass or not, strove to screw his voice up and 'make effect' was very natural; for art goes after bread, and a high C with the chest voice often realizes an income of thousands to its fortunate possessor. Roger has made a laudable exception; his beautiful use of the falsetto certainly produces a more agreeable effect than the forced chest tones so unnatural to the organ of many a singer. How widespread is this mistaken notion, that the use of the falsetto is entirely contrary to art, we hear frequently enough in the expressions of individuals when some unlucky tenor happens to get caught on one of these tabooed falsetto tones. Thus the school founded by Duprez, important in itself, has called into life a manner of singing, the ruinous consequences of which we can see daily."

But whatever may be the true reason or reasons, the fact that we have very few singers of eminence as compared with former ages, and that vocal art in general has gone down, is undisputed, and men have set themselves to remedy the evil by trying to ascertain the actual process by which the voice is produced, thinking that if they could but find this out there would be a true scientific basis upon which to found a way of teaching singing—or as I should rather say, of training voices—which would be sure and unerring.

The experiments of the great physiologist Johannes Müller are well known, and they have been followed up by others. But they were made upon dissected

larynges, and as various teachers of singing started the most conflicting theories as to how the process shown by Müller was carried on in the living subject, and treated the voices of their pupils accordingly, these investigations have perhaps on the whole done more harm than good. Science was made responsible for the blunders of those who attempted to be guided by it. And thus it has happened that when at a later period further trials were made, but this time upon the living subject, and in the act of singing, they were received with indifference and distrust. Only very lately teachers of vocal music have begun to find out that here are facts put before them which cannot be gainsaid, and that if these investigations do nothing else, they at any rate make them acquainted with the exact nature of the vocal organ, and what it will bear and what it will not bear.

THE VOCAL ORGAN AS A MUSICAL
INSTRUMENT.

“PHYSIOLOGISTS,” says Dr. Witkowski,* “are quite at issue when they endeavour to determine what kind of instrument the vocal organ resembles; indeed, Galien compares it to a flute, Magendie to a hautboy, Despiney to a trombone, Diday to a hunting-horn, Savart to a bird-catcher’s call, Biot to an organ-pipe, Malgaigne to the little instrument used by the exhibitors of Punch, and Ferrein to a spinet or harpsichord. The last-named compared the lips of the glottis to the strings of a violin; hence was given the name *Vocal Cords*, which they have since retained. The current of air was the bow, the exertion of the chest and lungs the hand which carried the bow, the thyroid cartilages the *points d’appui*, the arytenoids the pegs, and lastly, the muscles inserted in them the power which tensed or relaxed the cords.”

* “The Mechanism of Voice, Speech, and Taste.” Translated and edited by Mr. Lennox Browne, F.R.C.S. London: Baillière, Tindall, and Cox.

It must be admitted that the human voice bears more resemblance to a reed instrument than to any other; but when the comparison is pushed to its legitimate consequences it is found to break down. We cannot resist the conclusion that the vocal organ is infinitely superior to any instrument made by human hands. Its mechanism is so wonderful as to excite the profoundest admiration, and the more we continue to study it the more we marvel at the wisdom of the Divine Maker who planned it. I shall, therefore, speak of it simply as a wind instrument composed of—

1.—THE BELLOWS.

Represented by the LUNGS. Pl. I (Frontispiece), L.

2.—THE WINDPIPE. Pl. I, W.

3.—THE VOICEBOX OR LARYNX. Pl. I, V.

4.—THE RESONATOR.

Represented by (a) THE UPPER PART OF THE THROAT, OR PHARYNX, pl. I, P; (b) THE MOUTH, pl. I, M; (c) THE NOSE, pl. I, N.

The Lungs are enclosed in the chest, which they fit exactly, and of which they occupy by far the largest portion, leaving but a small space for the heart. They consist of two halves (pl. II, R, L), each roughly resembling the upper part of a sugar-loaf somewhat flattened

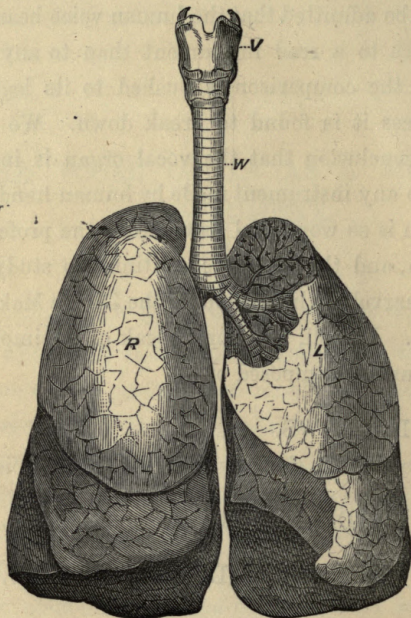


PLATE II.

THE LUNGS.

R. RIGHT LUNG. L. LEFT LUNG.

W. WINDPIPE (TRACHEA).

V. VOICEBOX (LARYNX).

The top part of the left Lung is represented as partly cut away in order to show the ramifications of the Bronchial Tubes.

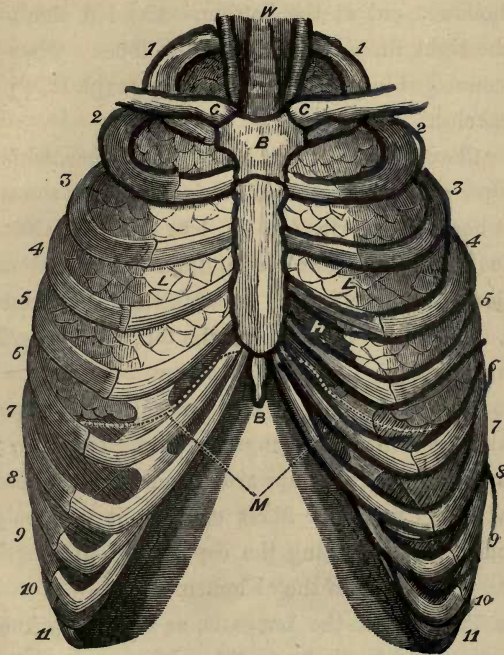


PLATE III.

THE CHEST.

B B. BREAST BONE.

C C. COLLAR BONES.

1 to 11. RIBS. (The twelfth not visible.)

M (curved dotted line). MIDRIFF (DIAPHRAGM)

L L. LUNGS. H. HEART.

W. WINDPIPE (TRACHEA).

and hollowed out at the bottom. The left shows two and the right three distinct flaps or lobes. They are only connected by means of the windpipe (pl. II, w) and its branches.

The Chest (pl. III) is an air-tight chamber, which is narrower above than below. It is formed by the spine at the back, twelve ribs (pl. III, 1 to 11, the twelfth not visible on the drawing), with their inner and outer muscles on either side, the breast-bone (pl. III, B B) in front, the root of the neck at the top, and the midriff or diaphragm (pl. I, m) at the bottom.

X The Midriff (pl. III, m) is a muscular and movable partition by which the lungs are separated from the abdomen. It is arched upwards like an inverted basin, but when its muscular fibres contract it flattens and descends, thus increasing the capacity of the chest at the expense of that of the abdomen.

The Function of the Lungs is, as everybody knows, respiration, which may be considered from a mechanical or a chemical point of view. In this little work we are only concerned with the mechanical part of the subject. If we examine the lungs of a calf, which are very similar to those of a human being, we find that they are soft and elastic to the touch, giving out when pressed a peculiar whizzing sound. We may increase their volume by blowing into them through the windpipe, so as to make them double their original size, and then

tie up the windpipe. On re-opening the windpipe the air escapes, and the lungs are gradually reduced to their former bulk. Now, by drawing a deep breath we produce the same result in ourselves as by blowing into the lungs of the calf; by holding the breath we produce the same result as by tying up the windpipe—that is to say, we keep the lungs in a state of expansion; and by releasing the breath we are, as it were, untying the windpipe, leaving the lungs to dwindle down gradually to their former size.

There is one very material point, however, in which the analogy ceases. It is this: we keep the air in the inflated calf's lungs by tying up the windpipe, and the corresponding act in ourselves would be to hold our breath by muscular contraction of the outlet in the throat. This is precisely what we do in straining, and in lifting heavy weights, &c.; but it should *never* be done in breathing for vocal purposes. Here it must, on the contrary, be our endeavour to train, to the highest possible degree, the powerful muscles of the chest and of the abdomen, instead of throwing the labour intended for them upon the comparatively weak and delicate muscles governing the outlet of the windpipe.

To make the way in which respiration is carried on clearer still, I quote the following interesting and lucid account from Huxley's "Elementary Physiology," fourth edition, p. 104. He compares the breathing apparatus

to "a sort of bellows without a valve," in which the chest and the lungs represent the body of the bellows, while the windpipe is the pipe; "and the effect of the respiratory movement is just the same as that of the approximation and separation of the handles of the bellows, which drive out and draw in the air through the pipe. There is, however, one difference between the bellows and the respiratory apparatus, of great importance in the theory of respiration, though frequently overlooked, and that is, that the sides of the bellows can be brought close together so as to force out all, or nearly all, the air which they contain, while the walls of the chest, when approximated as much as possible, still enclose a very considerable cavity; so that even after the most violent expiratory effort, a very large quantity of air is left in the lungs."

× Respiration, consequently, consists of two acts—namely, inspiration and expiration. Inspiration may be produced in three different ways—(1) By pushing the chest forward and flattening the midriff, so as to compel the lungs to *descend* and to increase in volume in order to fill the empty space created by this movement; (2) by extending the ribs *sideways*; and (3) by *drawing up* the upper parts of the chest—namely, the collar bones (pl. III, c c) and the shoulder blades. In scientific works the first is called diaphragmatic or abdominal, the second lateral or costal, and the third

clavicular or scapular breathing. As, however, these terms convey no meaning to the general reader, I prefer to speak of—

- (1) Midriff Breathing.
- (2) Rib Breathing.
- (3) Collar-bone Breathing.

In taking a full, deep inspiration, midriff breathing and rib breathing take place almost together and assist each other—that is to say, the midriff contracts and flattens, and immediately afterwards the ribs extend sideways; with this difference, however, that in men the action of the midriff takes a larger share in the work than the ribs, while in woman, on the contrary, the movement of the ribs is greater than that of the midriff.

By way of illustrating this curious difference of breathing in men and women, the following anecdote, which has the recommendation of being strictly true, may perhaps amuse the reader. Some time ago a troupe of "Female Minstrels," calling themselves, I believe, "The American Amazons," made a tour through this country. Their faces were blackened in the orthodox fashion, and they were in male attire, wearing tight-fitting garments of a peculiar kind. Two friends, both medical men, went to hear them (or perhaps to see them, I am not sure which), when Mr. A remarked that two of the performers were men. Mr. B did not see it, even when the individuals were pointed out to him, and asked his friend for the reasons for his opinion. "Why," said Mr. A, "I see it by their abdominal breathing!" And sure enough Mr. B now saw it too, and there was no mistake about it;

for, in the two suspected individuals the abdomen was evidently moving in respiration, while in all the others no movement was perceptible excepting that of their chests.

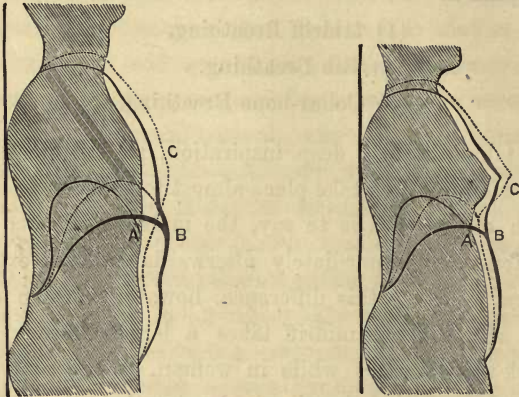


PLATE IV.

DIAGRAMS ILLUSTRATING THE VARYING CAPACITY OF THE CHEST, ACCORDING TO THE METHOD IN WHICH THE LUNG IS INFLATED.

From Mr. Lennox Browne's "Medical Hints on the Production and Management of the Singing Voice," by permission of Messrs Chappell and Co.

The front outline A of the shaded figure represents the chest after full expiration; the black continuous line A gives the increase in size of the chest, and the descent of the diaphragm, indicated by the curved transverse lines, in full abdominal respiration. The dotted line C shows the retraction of the diaphragm and of the abdominal muscles in forced clavicular inspiration. The varying thickness of the line B indicates the fact of healthy breathing in a man being more abdominal than in woman. The outlines of forced inspiration in both sexes are remarkably similar.

The combined forms of midriff and rib breathing are the right method of inspiration, while collar-bone breathing is absolutely wrong, and should never be made use of. The reasons of this are not far to seek. The lower part of each lung is large and broad, while the upper part is cone-shaped, and very much smaller. It is self-evident, therefore, that by downward and sideways expansion (enlarging the *lower* part of the lungs) you will inhale a much greater quantity of air than by drawing up the collar-bones. This consideration alone should suffice to prove the utter falseness of collar-bone breathing. Collar-bone breathing has also the additional disadvantage of causing much fatigue, because all the parts surrounding the upper region of the lungs are hard and unyielding, so that a great amount of resistance has to be overcome (the "*lutte vocale*" of French authors), while the very opposite is the case with the lower part of the lungs.

Mr. Lennox Browne, who was, I believe, the first to direct the attention of English readers to this matter, says,* "Clavicular [collar-bone] breathing is a method of respiration totally vicious, and to be avoided. By it the whole lower part of the chest is flattened and drawn in, instead of being distended; consequently the lower or larger part of the lungs is not inflated. It is

* "Medical Hints on the Production and Management of the Singing Voice," Fifth Edition, p. 15. London: Chappell and Co.

a method never exercised by nature in a state of health, but only when, from disease, either the abdominal or chest muscles cannot act; and it is the method least efficacious in filling, as it is the one calculated to most fatigue the chest; for it compresses the vessels and nerves of the throat, and this leads to engorgement and spasmodic action of the muscles."

We may well pause here and give another moment to the consideration of this most important subject. The lungs, as we have seen, are the bellows of our vocal organ; they supply the air which is the motive power on which the voice depends. Without air no tone can be produced. Nay, more, life itself must cease without it. Breathing goes on regularly while the voice is silent; but in speaking and singing both inspiration and expiration have to be regulated according to the nature of the phrases to be spoken or sung. If the speaker does not know how to take breath and how to control the expiration, his delivery will of necessity be jerky and uncertain. But in the singer it is even more important that he should be able to fill his lungs well, and, having done this, to have absolute command over his expiration; because while the speaker can arrange his sentences, his speed, and his breathing-places very much at his own pleasure, the singer is bound by the music before him. It must, therefore, be his aim to cultivate a proper method of breathing with the object

of first getting, with the least possible fatigue, the largest possible amount of air in the most scrupulously careful manner, so as to prevent even the smallest fraction of it from being wasted. Yet how seldom is breathing systematically practised as an indispensable preliminary to the production of tone! I have no hesitation in saying that the subject is, in many instances, dismissed with a few general observations. Pupils, of course, take breath somehow, and teachers are glad to leave this uninteresting part of the business, and to proceed to the cultivation of the voice.

It may be as well to add that what has been said so far about right and wrong methods of breathing is not by any means mere theory, but that any one can convince himself of the truth of the rules laid down by making a few experiments with the spirometer, an instrument for measuring the breathing power of the chest by indicating on a dial the exact number of cubic inches of air expelled from the lungs. This breathing power will be found to vary according to the way in which the inspiration has been accomplished. In my own case, for instance, the spirometer should register, according to the table of comparative height and breathing power compiled by John Hutchinson, 230 cubic inches. Having suffered from severe attacks of bleeding from the lungs, my maximum with midriff

and rib breathing is only 220, but with collar-bone breathing I barely reach 180!

During the Summer Session of the Tonic Sol-fa College I carefully tested the breathing capacity of ten students, and found that there was an average excess of midriff and rib breathing over collar-bone breathing to the extent of 25 cubic inches: the least amount of their increased power was 12 cubic inches, and the greatest was 45! I imagine that these figures are more eloquent than any words, and I think it superfluous to make any further comment on them.

I am strongly of opinion that breathing exercises, especially in the case of intending public singers, should always be carried on with a spirometer, because that instrument enables us with the greatest accuracy to check results which otherwise can only be guessed at.

If this suggestion were acted upon we should certainly no longer be distressed by that intolerable and never-ceasing tremolo which now so frequently mars many, in other respects, fine voices. It is a curious, and at first sight unaccountable, circumstance that this great fault is specially noticeable amongst French singers. But at the Conservatoire de Musique in Paris students are deliberately taught the wrong method of inspiration; for, as we gather from the "*Méthode de Chant du Conservatoire de Musique*," they are told to "flatten [or draw in] the abdomen" and to "bulge out the

chest." Thus the mystery is at once cleared up, because the tremolo arises almost invariably from a weakness of the muscles of the midriff or diaphragm, to which attention has already been called in these pages. Owing to the abdomen being drawn in, the midriff never properly contracts; the muscles are not sufficiently exercised, and consequently have not power enough to resist the pressure that is brought to bear upon them in singing. They tremble, and this trembling being communicated to the lungs, which are resting upon them, the stream of air they give forth loses its evenness and continuity, with the result I have just stated. It will be seen from the above explanation that this tremolo, one of the greatest vices besetting modern singing, and which has hitherto been held by many to be incurable, may be got rid of completely, though perhaps not very quickly, by the simple remedy of lung gymnastics on the right principle. The tremolo may certainly also arise from weakness of some muscles in the voicebox or larynx, by which the tension of the vocal ligaments is diminished and increased in rapid alternation. But this is a case for a medical man, which does not fall within my province to discuss, though I am justified in saying, on the authority of Mr. Lennox Browne,* that even in many of these cases the

* "The Throat and its Diseases," pp. 289, 290. London: Baillière, Tindall, and Cox.

effect is clearly attributable to faulty breathing, since there is seldom any local disease of the larynx; while exercise on a right method of breathing will cure the spasmodic action of the laryngeal muscles with but little or no medical treatment.

I need scarcely add that there is yet another kind of tremolo, which, being absolutely under the control of the performer, is one of the chief ornaments of song, and to which the observations just made in no way apply.

In addition to the involuntary tremolo there are a number of other afflictions, "Clergymen's sore throat" amongst them, which are admitted by eminent medical authorities to be due to collar-bone breathing, and which may be entirely cured by proper lung gymnastics, or, in other words, by breathing exercises on the right principle; that is to say, by calling into play the muscles of the abdomen and of the lower part of the chest. This is a subject which is little understood by singers and public speakers, many of whom would be amazed at the sometimes most wonderful results produced by such simple means. I will therefore quote a case in point which came under my notice quite recently, and which will give the reader an idea of the importance of proper breathing:

Mr. X, a tall thin young man, engaged in evan-

gelistic work, suffered from a "weakness of voice," which he found a great hindrance to his success. He therefore consulted Mr. Lennox Browne, who at once told him that he had no disease of any kind, and sent him to me for a course of breathing exercises. I found that Mr. X chiefly spoke in a child's voice, over which, moreover, he had very little control; and when I requested him to take a deep inspiration, he drew in his abdomen, bulged out his chest, and raised his collar-bones. The spirometer only registered 200 cubic inches instead of 260, which, according to Hutchinson's table, was his mean.

My course was, therefore, plain. I made him stand in an easy natural position, neither allowing him to bulge out his chest, nor to draw in the abdomen, and then instructed him how to acquire some control over his midriff and the lower muscles of the chest. It may be observed here, in passing, that we can, in a state of health, contract and relax these muscles at will, just as easily as we can bend a finger, and that this power, when lost through disuse, can be regained with little difficulty. In Mr. X's case this process was particularly speedy, with the result of increasing his breathing power in two lessons by 60 cubic inches. In one additional week I could dismiss him with a full sonorous man's voice, in place of the uncertain child's squeak with which he came to me. It is no exaggeration to

say that this young man left me with a *new* voice, and if people had heard him when he first came to me, behind a screen, and again after the last lesson, they would certainly not have believed that they were listening to the same person. What Mr. X and his friends think of his case may be seen from the following letter which he wrote me on July 6th, 1880 :—" Now that a week has passed since the last lesson I had from you, I write to bear testimony to the wonderful benefit to my voice obtained through the very short course I took. My friends are quite astonished at the marked difference, and I beg you will accept my most sincere thanks," &c.

Many similar cases might be mentioned, but the one just quoted is sufficient, and I will sum the matter up with a few remarks which Mr. Lennox Browne made as chairman at my lecture at the Aldersgate Street Literary Institution, on October 9th, 1880. He then said that, in his medical experience, he found that persons who suffered from their voices generally owed their ailments to bad habits of using the voice, and not to any defect in the larynx or resonance chamber. In several cases lately he had sent such patients to Herr Behnke, who had given them lessons in correct breathing, and who had thereby, and without any medicine, galvanism, or other aid, restored their voices in a remarkably short time.

From what has been said above about midriff and rib breathing *versus* collar-bone breathing, the folly of tight-lacing, or, indeed, of in any way interfering with the freedom of the waist, will be at once apparent. We pride ourselves upon our civilization; we make a boast of living in the age of science; physiology is now taught, or at least talked of, in almost every school; the laws of health are proclaimed in lectures and lessons innumerable all over the country, and we laugh at barbarous customs of other nations, such, for instance, as that of Chinese women preventing the growth of their feet by forcing them into boots of only half their proper size. And yet our ladies wear instruments of torture called corsets, altering the shape of their bodies, and positively driving the lower ribs *into the lungs!* Now which folly is the greater—that of doubling up the toes, or of crippling the body in its most vital parts? Let ladies answer the question, and let them further most solemnly consider that the girls of to-day are the mothers of to-morrow, and that upon the measure of their own health and strength depends the well-being of coming generations.

It is only fair to add, that if the practice of interfering with the freedom of the waist is reprehensible in the case of ladies, it is, in one sense, still more so in the case of the male sex, because, as has been shown before, men depend more for their breathing upon the

action of the abdominal muscle than women. They should, therefore, neither wear tight-fitting vests, nor suspend their pantaloons by means of waistbands, belts, or buckles. Loose garments and braces are the proper thing, though the latter are commonly, but erroneously, considered to be injurious. *Abdominal* belts may be worn with advantage by persons of either sex requiring their support; but these are very different from stays or waist-bands. I find that an enterprising firm is advertising corsets for gentlemen (!), and a woodcut may be seen in some papers representing a young Adonis laced up in regular ladies' fashion, so that, if it were not for his luxurious moustache, one would certainly take the drawing to be meant for a woman. It is almost impossible to imagine that a man could ever make such a fool of himself; on the other hand, it is clear that these advertisements would not continue to appear if they did not bring customers. But these poor creatures do not deserve to be called men, and I am sincerely sorry for them.

With regard to the question whether inspiration should take place through the mouth or through the nostrils, I must enter my most decided protest against making it a practice to inhale through the mouth. There are, of course, occasions when this is unavoidable, as, for instance, where the singer has rapidly to take what is called a "half breath." But complete

inflation, or, "full breath," is not the work of a moment; it takes time, and must be done gradually, steadily, and without the slightest interruption. This should *always* be done through the nostrils. The mouth was never intended for breathing, while the nose is specially and admirably adapted for this purpose. Not only can the lungs be well and quickly filled through this channel, but it is so cunningly devised that it acts at the same time as a "respirator," both purifying and warming the air before it touches the more delicate parts of the vocal organ. On the other hand, when inhaled through the mouth, the air carries with it, sometimes right into the voicebox, dust and other impurities, and its temperature is not materially altered. The consequence is that the throat and voicebox, when heated by singing or talking, or by hot rooms, are often exposed to cold, raw, and foggy winter air, and serious derangements of the respiratory organs are the natural consequence. If, moreover, this pernicious habit of breathing be once contracted, we shall soon also sleep with open mouths, thus parching our throats, and sowing the seeds of many a serious disorder.

On this point I quote a few lines from Dr. Louis Elsberg,* professor of laryngology in the University of New York: "The natural mode of quiet breathing

* "The Throat and its Functions." New York: G. P. Putnam's Sons.

is through the nose; mouth-breathing is an acquirement. A new-born infant would choke to death if you closed its nose; it does not immediately know how to get air into the lungs through the mouth until after, by depressing the tongue, you have once made a passage for it."

George Catlin, the celebrated traveller among American Indians, became so thoroughly convinced that the difference between the healthy condition and physical perfection of these people in their primitive state, especially their sound teeth and good lungs, and the deplorable mortality, the numerous diseases and deformities in *civilized* communities, is mainly due to the habit, common among the latter, of breathing through the mouth, especially during sleep, that he wrote a book entitled "Malrespiration and its Effects upon the Enjoyment and Life of Man." In this book he says, "If I were to endeavour to bequeath to posterity the most important motto which human language can convey, it should be in three words, 'Shut your mouth.' In the social transactions of life this might have its beneficial results as the most friendly cautionary advice, or be received as the grossest of insults; but where I would print and engrave it, in every nursery and on every bedpost in the universe, its meaning could not be mistaken, and obeyed, its importance would soon be realized."

He also says, "It is one of the misfortunes of civilization that it has too many amusing and exciting things for the mouth to say, and too many delicious things for it to taste, to allow of its being closed during the day. The mouth therefore has too little reserve for the protection of its natural purity of expression, and too much exposure for the protection of its garniture; but, *do keep your mouth shut* when you *read*, when you *write*, when you *listen*, when you *are in pain*, when you *are walking*, when you *are running*, when you *are riding*, and *by all means when you are angry!* There is *no person* but who will find and acknowledge *improvement in health and enjoyment* from even a temporary attention to this advice."

Again he says, "There is a proverb, as old and unchangeable as their hills, amongst North American Indians, 'My son, if thou wouldst be wise, open first thy eyes; thy ears next, and last of all thy mouth, that thy words may be words of wisdom, and give no advantage to thine adversary.' This might be adopted with good effect in *civilized* life; he who would *strictly adhere* to it would be sure to reap its benefits in his *waking* hours, and would *soon find* the habit running into his hours of *rest*, into which he would *calmly* enter; dismissing the nervous anxieties of the day, as he firmly closed his teeth and his lips, only to be opened *after* his eyes and his ears in the morning, the rest of *such*

sleep would bear him daily and hourly proof of its value."

Catlin regards the habit of sleeping with the mouth open the most pernicious of *all bad habits*. The horrors of nightmare and snoring are, according to him, but the *least* of its evil effects. He thinks "for the greater portion of the thousands and tens of thousands of persons suffering with weakness of lungs, with bronchitis, asthma, indigestion, and other affections of the digestive and respiratory organs," the correction of this habit is a *panacea* for their ills!

He insists that "*mothers* should be looked to as the first and principal *correctors* of this most destructive of human habits; . . . and the united and simultaneous efforts of the civilized world should be exerted in the overthrow of a monster so destructive to the good looks and life of man. Every physician should advise his patients, and every boarding-school in existence and every hospital should have its surgeon or matron, and every regiment its officer, to make their nightly and hourly 'rounds,' to force a *stop* to so unnatural, disgusting, and dangerous a habit! Under the working of such a system, mothers guarding and helping the helpless, schoolmasters their scholars, hospital surgeons their patients, generals their soldiers, and the rest of the world protecting themselves, a few years would show the glorious results in the bills of mor-

tality, and the next generation would be a *regeneration* of the human race."

The Windpipe (pl. I, w).—Having examined the bellows of our vocal organ, we next notice the windpipe, by means of which the air is carried into and out of the lungs. It is an elastic tube kept open by 18 or 20 rings which do not quite meet at the back. It enters the lungs by means of two smaller tubes, which in their turn branch out very much like the roots of a tree, until their ramifications end in the microscopic cells of the lungs. The windpipe is capable of being slightly elongated or shortened, and narrowed or widened, and its interior is covered with a mucous membrane, which, as its name implies, is continually kept in a moist state.

The Voicebox, or Larynx (pl. V) may be described as resembling a funnel, the upper part of which has been bent into a triangular shape. Its front corner (pl. V, 1) may be both seen and felt in the throat, and the general position of the voicebox is thereby at once indicated. The framework of the voicebox consists of five parts. 1st. The Ring cartilage (pl. V, 2) is so named on account of its general resemblance to a signet ring. It is narrow in front, and has the part corresponding to the seal behind; the upper border (pl. V, 3, 4) rises very considerably towards the back, where it is about an inch high. 2nd. Riding upon this, as it were, with its

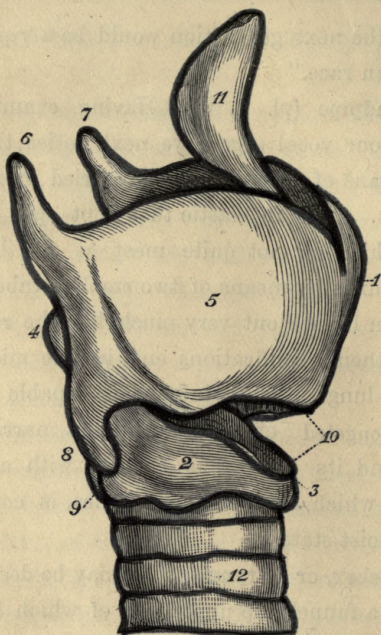


PLATE V.

SIDE VIEW OF THE VOICEBOX, OR LARYNX.

1. FRONT CORNER OF THE VOICEBOX (LARYNX).
2. RING (CRICOID) CARTILAGE.
- 3, 4. UPPER BORDER OF THE RING.
5. SHIELD (THYROID) CARTILAGE.
- 6, 7. UPPER HORNS OF THE SHIELD.
8. RIGHT LOWER HORN OF THE SHIELD.
9. POINT WHERE THE SHIELD MOVES UPON THE RING.
10. RING-SHIELD (CRICO-THYROID) APERTURE COVERED BY MEMBRANE.
11. LID (EPIGLOTTIS).
12. WINDPIPE (TRACHEA).

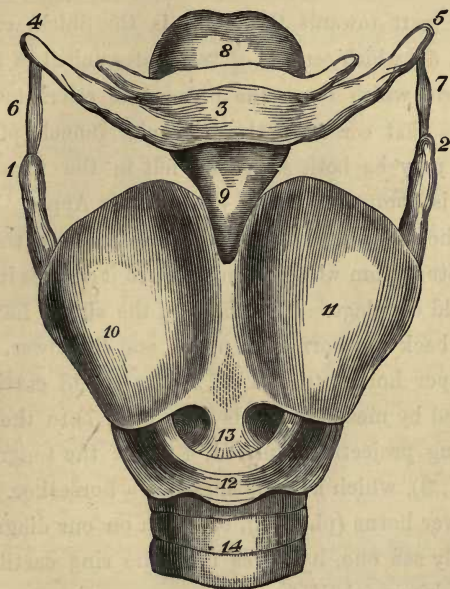


PLATE VI.

FRONT VIEW OF THE VOICEBOX, OR LARYNX.

- 1, 2. UPPER HORNS OF THE SHIELD.
- 3. TONGUE (HYOID) BONE.
- 4, 5. HORNS OF THE TONGUE-BONE.
- 6, 7. BANDS UNITING THE SHIELD WITH THE TONGUE-BONE.
- 8, 9. LID.
- 10, 11. PLATES OF THE SHIELD.
- 12. RING.
- 13. ELASTIC BAND UNITING THE SHIELD WITH THE RING.
- 14. WINDPIPE.

hollow part towards the back, is the Shield cartilage (pl. V, 5), which consists of two plates united in front at an angle which forms the prominence referred to just now as that corner of the triangular funnel (pl. V, 1) which may be both seen and felt in the throat, and which is commonly called the Adam's Apple. It protects the interior and more delicate parts of the voice apparatus, from which circumstance it derives its name of shield cartilage. The plates of the shield have each at the back two horns, the upper and the lower. With the upper horns (pl. VI, 1, 2) the shield cartilage is attached by means of bands (pl. VI, 6, 7) to the corresponding projections (pl. VI, 4, 5) of the tongue-bone (pl. VI, 3), which has the shape of a horseshoe. With the lower horns (pl. V, 8), of which on our diagram we can only see one, it moves upon the ring cartilage as upon a hinge (pl. V, 9).

This is a very particular point, and I beg the reader particularly to notice that if the shield cartilage (pl. V, 5) were gradually drawn downwards and forwards, the space which we now see between the shield and the ring (pl. V, 10) would get smaller and smaller, until at last it quite disappeared; and the distance between the front of the shield (pl. V, 1) and the highest part of the back of the ring (pl. V, 4) would be increased.

I may observe here that authorities differ as to whether the shield moves upon the ring, or the ring upon the shield, and that

some maintain the one is drawn down while the other is tipped upward. It is sufficient for our purpose, however, that a movement as upon a hinge takes place, whereby, as explained just now, the distance between the front of the shield and the highest part of the back of the ring is increased.

3rd. The Lid (pl. V, 11) is an elastic cartilage which serves to close the voicebox in the act of swallowing, in order to protect it against any intruding foreign substances. The food we take has to pass over it, and it sometimes happens, when the lid has not been pulled down tight enough, that a particle of food enters the voicebox, in which case we say it has "gone the wrong way," and there is then no peace until the intruder has been got rid of, generally by a violent fit of coughing.

The lid, it is true, is not the only means of protection which the voicebox possesses. Professor C. J. Eberth, for instance, mentions (*Archiv für pathol: Anatomie*, vol. lxxiii., p. 135, Berlin, 1868) the case of a woman who, upon dissection, was found to be entirely without the free upper part of the lid, which could alone cover the voicebox. She had never experienced any difficulty in swallowing, and it is therefore clear that with her the closing of some of the parts immediately below was sufficient to prevent the food from getting into the voicebox. But "the exception proves the rule," and in spite of this and other similar cases, the fact remains that the lid is obviously the first and most natural protector of the voicebox.

4th and 5th. We have thus far become acquainted with three cartilages out of the five. Let us now remove one plate of the shield, as though cutting it off

with a knife (pl. VII, 1 and 2), in order that we may look inside and see the remaining two cartilages which have hitherto been hidden by it. These are—

The Pyramids (pl. VII, 1 and 2), so called because of their shape. Their bases are triangular and hollowed out; their sides taper upwards and terminate in points which are bent slightly backwards, and they have each two projections, one pointing forwards (pl. VII, 3) and the other outwards and backwards (pl. VII, 4). It will be convenient to have a special name for the projections pointing outwards and backwards, which we will therefore call the *Levers*.

The Pyramids are attached with their hollow bases to the borders of the ring (pl. VII, 5), and they are capable of executing rotary movements with surprising freedom and rapidity. Their inner sides may be made to run parallel or to diverge. In addition to this they can be drawn towards each other, or away from each other, so that their summits may either be widely separated or brought close together.

The Vocal Ligaments are two ledges of elastic tissue covered with a very delicate membrane. Each one of them is connected along its whole length, on one side, with the shield cartilage. The vocal ligaments are attached by their hinder ends to those little projections of the pyramids which point forwards (pl. VII, 3, 3), and by their front ends to the centre of the shield

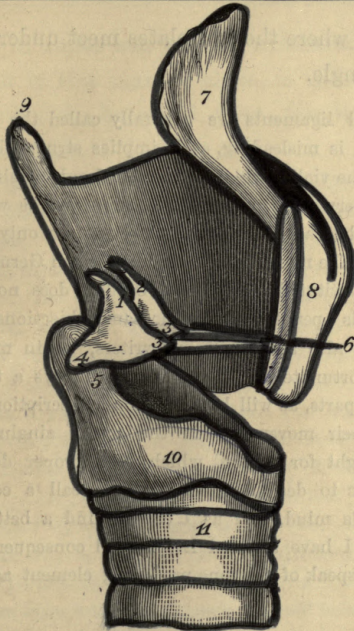


PLATE VII.

SIDE VIEW OF THE VOICEBOX, OR LARYNX, SHOWING THE INTERIOR OF IT, THE RIGHT PLATE BEING REMOVED.

- 1, 2. PYRAMIDS (ARYTENOID CARTILAGES).
- 3, 3. FRONT PROJECTIONS OF THE PYRAMIDS.
4. LEVER OF THE RIGHT PYRAMID.
5. UPPER BORDER OF THE RING.
- 6, 3, 3. VOCAL LIGAMENTS.
7. LID.
8. SHIELD.
9. LEFT UPPER HORN OF THE SHIELD.
10. RING.
11. WINDPIPE.

(pl. VII, 6), where the two plates meet under a more or less acute angle.

These vocal ligaments are generally called the vocal cords, but this term is misleading, as it implies strings like those, for instance, of the violin, which are attached only at either end and are free at every other point. This, however, as we have just seen, is not the case, the "Cords" being free only along their inner edges. The name "Vocal Bands," which German physiologists have substituted for "Vocal Cords," does not mend the matter, as it is open to exactly the same objections. The term "Vocal Lips," also used by some writers, is, in my judgment, the most unfortunate of all, because it conveys a totally wrong idea of these parts, as will be seen from a description in another chapter of their movements in the act of singing. I have, therefore, sought for a word which, as a proper description of the thing it is to designate, shall always call a correct image to the reader's mind, and as I cannot find a better one than "Ligament," I have adopted it. I shall consequently in these pages always speak of the tone-producing element as the "Vocal Ligaments."

The vocal ligaments, having met, are struck by the air blown against them from below, and being elastic they yield, allowing themselves to be forced upwards. A little air is thereby set free, and the pressure from below diminished, in consequence of which the vocal ligaments resume their former position, and even move a little more downwards. The renewed pressure of the air once more overcomes the resistance of the vocal ligaments, which again recede as soon as another escape of air has taken place, and this process

is repeated in rapid and regular succession. In this manner, and in this manner alone, is vocal tone produced, whether it be called chest, falsetto, head, or by any other name.

There are still some writers who teach a different doctrine. For instance, Miss Sabilla Novello, in her "Voice and Vocal Art," embodied in the "Collegiate Vocal Tutor," published by Novello, Ewer, and Co., says on p. 9, that "The head voice results from the upper [*i.e.*, the false] vocal cords" (these we shall see presently), and on page 13, that the falsetto tones "are created principally by the action of the trachea [windpipe] and not by that of the vocal ligaments." Another writer, Mr. Rumney Illingworth, in a paper "On the Larynx and its Physiology," read before the Royal Medical Society of Edinburgh, on March 3rd, 1879, and communicated to "The Students' Journal and Hospital Gazette" (Vol. IV., No. 91, p. 151), says that "The falsetto voice is produced by the laryngeal sacculi [the pockets of the voicebox, which will be described further on] acting in the same way as a hazel-nut can be made to act as a whistle, when the kernel has been extracted through a small hole in the shell; or as part of the cavity of the mouth acts in whistling." I shall refer to these theories again as the opportunity for their proper discussion arises; for the present I will quote a few authorities on the subject.

Dr. CARPENTER, in his "Human Physiology," eighth edition, page 914, says, "The true theory of the voice may now be considered as well established in regard to this essential particular that the sound is the result of the vibrations of the vocal cords," &c.

Professor MARSHALL, in his "Outlines of Physiology," page 255, says: "Experiments on living animals show that the vocal cords are alone the essential organs for the production of voice, for so long as these remain untouched, although all the other

parts in the interior of the larynx be destroyed, the animal is able to emit vocal sounds. . . . The existence of an opening in the larynx of a living animal, or of man, *above* the glottis [glottis means the vibrating element of the voicebox] in no way prevents the formation of vocal sound; such an opening if situated in the trachea [windpipe] causes total loss of voice, but by simply closing it, vocal sounds can again be produced. Such openings, in man, are met with, either as the results of accidents, of suicidal attempts, or of operations performed on the larynx or trachea for the relief of disease."

Dr. TOBOLD, Professor in the University of Berlin, in his "Laryngoscopie and Kehlkopf Krankheiten" (Laryngoscopy and Diseases of the Larynx), p. 131, says, "Soft palate, lid, pockets, and pocket-bands are not directly active in the production of either chest or falsetto tones; they only modify the tone produced in the glottis."

Dr. LUSCHKA, Professor in the University of Tubingen, in his great work "Der Kehlkopf des Menschen" (The Human Larynx), says in the introduction: "Only the vocal cords, with the slit they form, have specifically functional signification, in a narrower sense, of a voice apparatus, as the parts of the larynx which lie under and over them have no material and deciding influence on the production of sound."

I will bring my quotations to a close with the following, which seeks to prove the contrary. Dr. C. B. GARRETT ("The Human Voice," J. and J. Churchill, London, 1875, p. 17) says, "It is recorded that the larynx of a blackbird was removed by severing the windpipe just below it; that the poor 'thing continued to *sing*, though in a feebler tone.' This proves that notes can be formed *behind the instrument* and before the air reaches it." This argument, however, is of no value, because it so happens that birds have two larynges, one at the bottom and the other at the top of the windpipe. Dr. Garrett seems not to have been aware of this fact.

The vocal ligaments in the adult male are, in a state of rest, about three-quarters of an inch long, and in the female about half an inch. I pointed out before that the vocal ligaments are attached in front to the shield (pl. VII, 6) and behind to the pyramids (pl. VII, 3, 3). Let it now be borne in mind—1st, That the pyramids, in their turn, are fastened to the upper border of the ring cartilage; and 2nd, That by drawing the shield downwards and forwards upon the ring, the distance between the upper border of the ring (pl. VII, 5) and the front of the shield (pl. VII, 6) is increased, and it will be easily seen that this movement must of necessity have the effect of stretching the vocal ligaments.

This drawing of the shield downwards and forwards upon the ring is brought about by a pair of muscles ascending on either side, in the shape of a fan, from the ring to the shield cartilage (pl. VIII, 1, 2). These muscles we name the "Ring-Shield Muscles." In opposition to them there is another pair inside the shield, running parallel with the vocal ligaments (pl. IX, 1, 2, 3). They are attached (like the vocal ligaments) in front to the shield cartilage and behind to the pyramids. These muscles we will call the "Shield-Pyramid Muscles." They counteract the ring-shield muscles, and having overcome their resistance, pull the shield cartilage up again, thereby, of course,

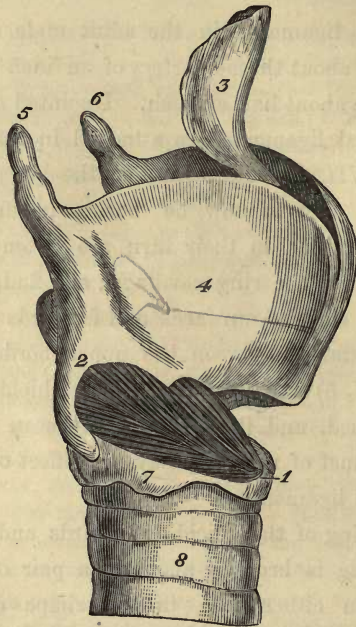


PLATE VIII.

SIDE VIEW OF THE VOICEBOX, OR LARYNX.

- 1, 2. RING-SHIELD MUSCLE (CRICO-THYROIDEUS)
3. LID.
4. SHIELD.
- 5, 6. UPPER HORNS OF THE SHIELD.
7. RING.
8. WINDPIPE.

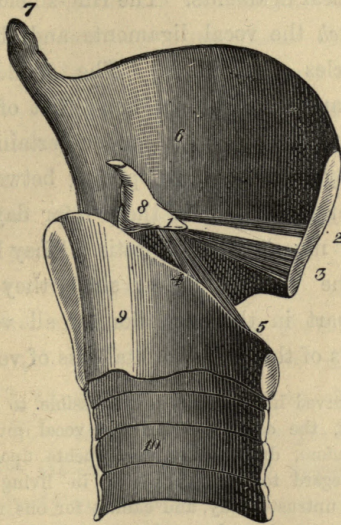


PLATE IX.

SIDE VIEW OF THE VOICEBOX, OR LARYNX, SHOWING
THE INTERIOR OF THE LEFT HALF.

- 1, 2, 3. SHIELD-PYRAMID MUSCLE (THYRO-ARYTENOIDEUS).
- 4, 5. RING-PYRAMID MUSCLE (CRICO-ARYTENOIDEUS).
6. SHIELD.
7. LEFT UPPER HORN.
8. PYRAMID.
9. RING.
10. WINDPIPE.

relaxing the vocal ligaments. The ring-shield muscles, therefore, *stretch* the vocal ligaments and the shield-pyramid muscles *relax* them. The shield-pyramid muscles have an additional function—that of pressing together the vocal ligaments, under certain circumstances, thereby narrowing the opening between them. They have therefore been, in these later days, called the Sphincter* muscle of the glottis. They have also been called the Vocal Muscles, since they play so important a part in the formation of all vocal tone that a paralysis of them causes total loss of voice.

It may be observed here that it is impossible to imitate, in the dead subject, the contraction of the vocal muscles. All conclusions, therefore, drawn from experiments upon excised larynges, with regard to tone-production in living man are necessarily quite untrustworthy, and cannot for one moment be admitted as evidence against observations made upon singers with the laryngoscope.

These two pairs of muscles, then, namely the ring-shield muscles (pl. VIII, 1, 2) and the shield-pyramid muscles (pl. IX, 1, 2, 3) by stretching and slackening and compressing the vocal ligaments, mainly govern the pitch of the tones produced by their vibrations. The ring-shield muscles receive some assistance in stretching the vocal ligaments from another quarter, of which we shall speak later on.

* *Sphincter* is an anatomical term applied to circular muscles which constrict or close certain natural orifices.³

We have now had a look at the vocal ligaments, and we have seen by what means they are put on the stretch. As, however, in a state of repose these ligaments diverge behind, they must be brought parallel to each other before they are ready for the production of sound. Let us, therefore, in order to explain how this is done, imagine that we have cut off that part of the pyramids which is standing out above the vocal ligaments (pl. VII), and let us now have a look at these parts from above. You see the ligaments (pl. XA, 1, 2), a section of the pyramids (pl. XA, 3, 4), and uniting these an elastic band (pl. XA, 5). The space between these parts is commonly called the Glottis, but as this appellation belongs more properly to the vocal ligaments, it is manifestly wrong to give the same name to the *space* which they inclose. This space should be distinguished as the "*Chink* of the Glottis" or the "*Vocal Chink*."

I have been blamed for making this distinction in the face of almost universal usage. But I can point to the great anatomist Professor Luschka as having set the example, and while it is true that in most physiological works "Glottis" is used for the *slit* between the vocal ligaments, yet the appellations "*Rima glottidis*" and "*Aperture of the glottis*" are also employed for the same thing. Medical men, moreover, speak of "*Spasm of the glottis*," and singing masters of the "*Shock of the glottis*," which terms are clearly quite meaningless when applied to a space.

Dr. Garrett says, on page 12 of the book quoted before, that "The upper portion of the larynx above

the false vocal cords is termed the glottis." He might as well say, "The upper portion of the face above the nose is termed the mouth." I really should not notice so astounding a statement were it not made by one signing himself an M.D., and published by so eminent a firm of Medical publishers as Messrs. J. and A. Churchill.

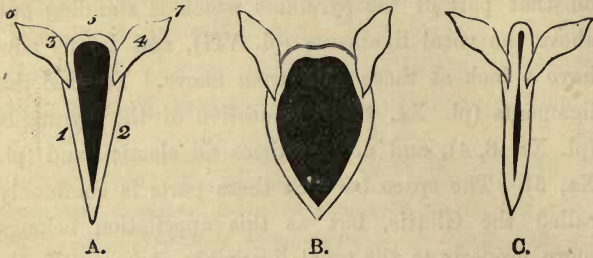


PLATE X.

- A. GLOTTIS IN REPOSE. B. GLOTTIS IN RESPIRATION.
 C. GLOTTIS IN THE PRODUCTION OF SOUND.
 A. 1, 2. VOCAL LIGAMENTS.
 3, 4. SECTION OF THE PYRAMIDS.
 5. ELASTIC BAND.
 6, 7. LEVERS OF THE PYRAMIDS.

On plate XI you see all parts in a state of rest. To the levers of the pyramids (pl. XI, 1, 2) a pair of muscles is attached, the bases of which are fixed upon the back of the ring cartilage below (pl. XI, 3, 6, 3). The action of these "Back Ring-Pyramid Muscles" (pl. XI, 4, 1 and 5, 2) is to contract as soon as we

take breath, thereby drawing together the pyramids *behind* and separating them *in front*, at the same time stretching the elastic band behind (pl. X, A, 5). By this movement the chink of the glottis is thrown *wide open* into the shape depicted on pl. X, B. During expiration these relax, the elastic band contracts, and the vocal chink resumes the shape as on pl. XI. These movements go on from the beginning of our lives to the end, whether we are asleep or awake, with more or less vigour, according as we take a slight or a deep inspiration. The back ring-pyramid muscles (pl. XI, 4, 1 and 5, 2), have consequently the all-important function of keeping open the gate through which the air we breathe enters the lungs. They have, therefore, been poetically called the "Guardians of the Portal of Life." By their action of pulling the pyramids backwards, they also assist the ring-shield muscles (pl. VIII, 1, 2) in stretching the vocal ligaments.

In opposition to these "Opening Muscles" there is another pair rising from the side borders of the ring (pl. XI, 3, 3) which are fastened to the front part of the levers of the pyramids (pl. XI, 1, 2), serving to draw together their front projections to which the vocal ligaments are attached, and which are thereby brought parallel with each other.

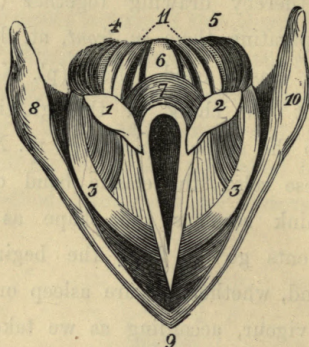


PLATE XI.

VIEW OF A SECTION OF THE VOICEBOX, OR LARYNX,
FROM ABOVE.

- 1, 2. SECTION OF THE PYRAMIDS WITH VOCAL LIGAMENTS AND ELASTIC BAND.
- 3, 6, 3. RING.
7. PYRAMID MUSCLE (ARYTENOIDEUS TRANSVERSUS).
- 8, 9, 10. SHIELD.
11. BANDS BY MEANS OF WHICH THE PYRAMIDS ARE ATTACHED TO THE RING.
- 4 & 5. BACK RING-PYRAMID MUSCLES (POSTERIOR CRICO-ARYTENOIDEI).
- 1, 3 & 2, 3. SIDE RING-PYRAMID MUSCLES (LATERAL CRICO-ARYTENOIDEI).

NOTE. — The shield-pyramid muscles (Thyro-Arytenoidei) which run parallel with the vocal ligaments are, for the sake of clearness, omitted from this diagram.

These "Side Ring-Pyramid Muscles" (pl. XI, 3, 1 and 3, 2; see also pl. IX, 5, 4) are assisted by a single muscle uniting the pyramids behind the elastic band which we have already noticed. This muscle we will call the "Pyramid Muscle" (pl. XI, 7). By the united action of the muscles which have just been described the vocal chink is thrown in the shape shown on pl. X, c, and the vocal ligaments are now in a proper position for the production of tone.

Before proceeding any farther it will be well if we once more glance at the muscles with which we have become acquainted, so that we may be quite sure about their functions.

MUSCLES :

I. GOVERNING THE SHAPE OF THE VOCAL CHINK.

The Back Ring-Pyramid Muscles	}	OPENING THE VOCAL CHINK.
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THESE ARE OPPOSED BY—

The Side Ring-Pyramid Muscles, and the Pyramid Muscles, assisted by the Shield-Pyramid Muscles	}	CLOSING THE VOCAL CHINK.
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II. GOVERNING THE PITCH OF THE TONES.

The Ring-Shield Muscles, assisted by the Back Ring- Pyramid Muscles	}	STRETCHING THE VOCAL LIGAMENTS.
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THESE ARE OPPOSED BY—

The Shield-Pyramid Muscles	}	SLACKENING THE VOCAL LIGAMENTS.
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The Pocket Ligaments (called "False Vocal Cords," pl. XII, 1 and 2) are a pair of horizontal projections running above and parallel with the vocal ligaments (pl. XII, 3 and 4). The pocket ligaments are, like the vocal ligaments, attached in front to the shield and behind to the pyramids. They may be described as two ledge-shaped pads mainly formed of glands. They are very sensitive and movable, and ready on the smallest incitement to meet with great rapidity in order to protect the vocal ligaments from any harm. They must, therefore, be chiefly regarded as safeguards of the vocal apparatus, though it is probable that by breaking the stream of air passing through the chink of the glottis, they also exercise considerable influence upon the *quality* of the tone emitted. It may be affirmed, however, without the slightest hesitation, that they have absolutely nothing to do with the *production* of tone. We shall see these glandular ledges again during our observations upon the living subject, and I shall therefore say no more about them at present.

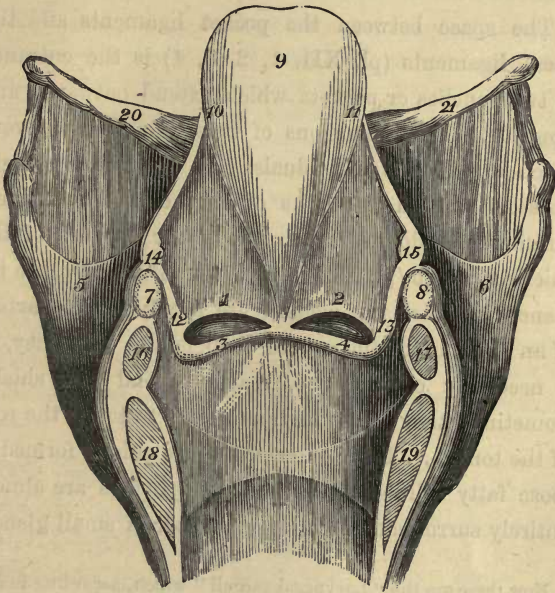


PLATE XII.

VIEW OF THE VOICEBOX, OR LARYNX, WHICH HAS BEEN CUT OPEN FROM BEHIND.

- 1, 2. POCKET LIGAMENTS (FALSE VOCAL CORDS).
- 3, 4. VOCAL LIGAMENTS (VOCAL CORDS).
- 5, 6. SHIELD (THYROID) CARTILAGE.
- 7, 8. CARTILAGES OF SANTORINI.
9. LID (EPIGLOTTIS).
- 14, 10 & 15, 11. FOLDS OF MUCOUS MEMBRANE (ARYTENO-EPIGLOTTIC FOLDS).
- 12, 13. WEDGES (CUNEIFORM CARTILAGES).
- 14, 15. CARTILAGES OF WRISBERG.
- 16, 17. PYRAMID MUSCLE (ARYTENOIDEUS TRANSVERSUS).
- 18, 19. RING (CRICOID) CARTILAGE.
- 20, 21. TONGUE (HYOID) BONE.

The space between the pocket ligaments and the vocal ligaments (pl. XII, 1, 2, 3, 4) is the entrance to two pouches or pockets which extend outwards and upwards. The dimensions of these pockets vary very much in different individuals. As a rule their height does not exceed two-fifths of an inch, so that their terminations do not reach the upper borders of the shield cartilage (pl. XII, 5 and 6). But there are instances in which the pockets are nearly three-quarters of an inch high, and where such is the case they, as a necessary consequence, reach beyond the shield. Sometimes they are so high as nearly to touch the root of the tongue. Their outer walls are chiefly formed of loose fatty cellular tissue, and the pockets are almost entirely surrounded by a large number of small glands.

Now these are the "Laryngeal sacculi" which, according to Mr. Illingworth, produce the falsetto voice by "acting in the same way as a hazel-nut can be made to act as a whistle, when the kernel has been extracted through a small hole in the shell," &c. I think, however, that the reader will, from the description given above, agree with me that the acoustic properties of the pockets of the voicebox cannot be very great, and that, at all events, there is a vast difference between their construction and that of a hazel-nut, either with or without the kernel. Then there is this additional difficulty, that even if one could whistle upon the pockets in the manner suggested, there are two of them, covered, let it be remembered, with a multitude of glands, continually producing moisture, and liable to enlarge or to diminish. How, I should like to know, could two such cavities be so tuned as under any circumstances to

produce exactly the same tones? Would not rather frightful discords be the inevitable result? And again, what provision is there in the pockets for the gradations of pitch? But quite apart from these considerations, this and other similar theories are completely disproved by the fact that every tone which the human voice is capable of producing can be produced by *inspiration as well as by expiration*. The tones sung by inspiration are, as might be expected, wholly devoid of beauty, because the vocal apparatus is, as it were, put upside down, and the position of bellows and resonator reversed. But that does not alter the question. The fact remains, and clearly proves that the pockets have no more to do with the falsetto than with the chest voice, because in inspiration the air strikes the vocal ligaments *after it has passed* the pockets, and yet the result is, beauty of tone apart, exactly the same.

The function of the pockets, in my opinion, is this: They are the means of isolating the vocal ligaments, thus enabling them to vibrate freely and without hindrance. They also allow the sound-waves to expand sideways, thereby materially adding to their resonance. Lastly, they with their many little glands produce and supply the vocal ligaments with that moisture without which, according to the investigations of J. Müller,* the production of tone cannot be carried on.

Above the pocket ligaments there is a kind of tube which is formed by the upper part of the pyramids (surmounted by two little bodies called the cartilages

* "Ueber die Compensation der physischen Kräfte am menschlichen Stimmorgan," p. 8. Berlin, 1839.

of Santorini, pl. XII, 7, 8) behind; the lid or epiglottis (pl. XII, 9) in front, and sideways by two folds of mucous membrane running up from the pyramids to the lid (pl. XII, 14, 10 and 15, 11). These folds are in many cases supported by two small cartilages, which we will call the Wedges (pl. XII, 12, 13). These, according to Madame Emma Seiler, are the chief factors in the formation of the highest register of the female voice. In some physiological works they are treated as of very little consequence, and in others they are not mentioned at all.

These wedges are two thin strips of cartilage running in front of the pyramids (pl. XII, 12 and 13) where they are embedded in a number of glands. Their upper ends terminate in the cartilages of Wrisberg (pl. XII, 14, 15), and their lower ends gradually dwindle away in the direction of the vocal ligaments.

Madame Seiler says that they "reach to the middle of the vocal chords, by which they are enveloped."* She comments in the same book on the fact that German anatomists have been reluctant to admit the existence of these cartilages; and she adds on page 61, "It was, therefore, a great satisfaction to me to find them described under the name of the cuneiform cartilages in Wilson's 'Human Anatomy.'" It must be confessed, however, that Wilson's description of them is totally different from Madame Seiler's. He says, "The cuneiform cartilages are two small cylinders of yellow fibro-cartilage, about seven lines in length and

* "Voice in Singing," p. 189. Philadelphia, 1875.

enlarged at each extremity. *By the lower end or base* the cartilage is attached to the middle of the external surface of the arytenoid (the pyramid), and by its upper extremity forms a prominence in the border of the aryteno-epiglottidean fold of membrane"* (*i.e.*, the fold running up to the lid). According to Seiler, therefore, the wedges reach from the pyramids to the middle of the vocal ligaments, but according to Wilson their bases are attached to the middle of the outer surface of the pyramids, so that they cannot even touch the vocal ligaments. As Madame Seiler assigns very important functions to these wedges in the formation of the highest register of the female voice, and as she quotes Wilson in a manner that must lead the reader to suppose he gave a similar description to hers of these cartilages, I have thought it right to give Wilson's statement in full.

But there is a description of these cartilages by Dr. Witkowski which corresponds very closely with Madame Seiler's. Speaking of some of the glands of the voicebox, he says in the work mentioned before, on p. 12—"They are arranged in the form of an L, whose vertical branch goes along the arytenoid cartilages (the pyramids), *the horizontal branch following the direction of the vocal cords. There is often found situated in the midst of this group of glands the cuneiform cartilage of Wrisberg, sometimes reduced to a mere cartilaginous granule.*"

Dr. Elsberg also describes them on p. 37 of the treatise before mentioned as "elongated nodules" in the hinder portion of the vocal ligaments, and says they are found "more often in the female than in the male sex." He calls them the "posterior vocal nodules," and gives on p. 36 a diagram which shows them most clearly and unmistakably. This point would therefore seem to be settled.

* "Anatomist's Vade Mecum." By Erasmus Wilson, F.R.S. London. Eighth edition, p. 596.

The Resonator.—We now come to the last part of our instrument, namely, the resonator, which is formed of (1) the pockets of the larynx; (2) the tube above the pocket ligaments; (3) the upper part of the throat; (4) the mouth; and (5) the nose. Before giving a description of the resonator, it will be necessary to make a few introductory remarks on certain laws of the philosophy of sound, which have been so clearly demonstrated that they admit of no contradiction.

Tone, as we have seen, is the result of rapid periodic vibrations.

The **Loudness** of tone depends upon the *amplitude* of the vibrations. This is easily shown by drawing a bow over the string of a violin: while the vibrations of the string are largest, the tone produced is loudest, and as the vibrations get smaller, so the tone becomes fainter.

The **Pitch** of tone depends upon the *number* of vibrations in a given period of time. The greater the number of vibrations the higher the pitch, and *vice versâ*.

The **Quality** of tone depends on the *form* of the vibrations, "which also determines the occurrence of upper partial tones." *

Now, to make the sound of any tone-producing element more intense, and to give it some special

* Helmholtz, "Sensations of Tone:" translated by Alexander J. Ellis, F.R.S., &c., p. 37.

quality, is the work of the resonator. If we simply fix a fiddle string at either end, and, after giving it a certain amount of tension, draw a bow across it, we shall certainly produce a tone, but a very poor and faint one. Put the same string with the same amount of tension upon a cheap violin, and the tone will be intensified, and its quality changed, though that quality may be of a very unpleasant kind. Repeat the experiment upon an Amati or a Straduarius, and not only will the tone be more powerful still, but it will also have a full, round, and beautiful quality. Something, it is true, depends upon the string and upon the bowing, but we are here supposing the same string and the same player, our object being to show how the *resonator*, which, in this case, is the body of the violin, intensifies the tone of the string, and affects its quality.

Illustrations exemplifying the same thing might be multiplied to any extent, but the one I have just given will suffice. As with the string, so with the vocal ligaments. Cut a larynx out of a dead body, put it in proper position on the top of a bellows, and force the air through it, and you will produce tone, but faint and poor tone. Now add a resonator to the larynx, and the tone of the vocal ligaments will be intensified, and its quality altered according to the kind of resonator you make use of.

It is clear, therefore, that the human voice does not

only depend upon the vibrations of the vocal ligaments, and the corresponding vibrations of the air passing between them, but also upon the resonator as defined on p. 9. According to the natural formation of our resonator, and according to the infinite variety of shapes which every one has it in his power to give to it, our voices will be, always supposing the conditions of the vocal ligaments to be the same, either full, round, sonorous, and *beautiful*, or they will be poor, cutting, muffled, guttural, nasal, and *ugly*.

As we have, or may easily acquire, absolute command over the resonator, or, at least, over the greatest part of it, it is a comfort to know that so very much depends upon it, and I trust my readers will now, with some amount of pleasure, look with me at this part of the vocal apparatus.

The 1st and 2nd divisions of the resonator—namely, the pockets of the larynx and the tube above the pocket ligaments—have been fully described on pp. 52, 53, and no more need be said on the subject here.

The upper part of the throat, called in scientific works the “Pharynx” (pl. I, P), is a cavity, the largest part of which may be seen through the arch at the back of the open mouth. Its hinder wall is formed by the spinal column, and it extends upwards as far as the Eustachian tubes (pl. I, E) which communicate with the middle part of the ear. Here it joins—

The Cavities of the Nose (pl. I, r), which have for their base the hard and soft palate (pl. I, n and s), and which are divided by a bone partition.

The only part of the Mouth which requires a particular description is the soft palate. This is a movable partition by means of which either the mouth or the nose can be completely separated from the throat. If the nose is to be shut off from the throat the soft palate is *raised*, and pressed against the back of the pharynx. If the mouth is to be shut off the soft palate is *lowered*, and rests closely upon the back of the tongue. This partition plays a most important part in vocalization. In the formation of all pure vowel sounds it is *raised*, thereby closing the nasal cavities, and it has been found that the closure is loosest for "ah" (as in "father") and tightest for "e" (as in "bee"), the intermediate vowels being "a" (as in "name"), "oh" and "oo" (as in "food"). This has been clearly shown by Czermak in the following manner. Lying down on his back, he had the nasal cavities filled with tepid water. He then uttered the various vowel sounds, and ascertained from the quantity of water required to force open the closure formed by the soft palate the degree of tightness for each vowel. He afterwards constructed a very ingenious little apparatus, by means of which, in one of his lectures, he demonstrated this fact to his audience. It will be easily understood from the above

explanation that, if the closure of the nasal cavities is sufficiently imperfect to allow any considerable amount of air to pass through the nose, the result will be a nasal tone.

I am aware that the very opposite is taught by some. There are those who maintain that nasal tone arises from the air *not* being able to get through the nose. I am even informed that in some parts of England where nasal tone seems to be a general affliction, it is the practice of teachers of singing to cause their pupils to bathe their noses in hot water in order to relax the muscles which are supposed by their contraction to produce nasal tone. I would, however, in support of my statement, draw attention to the following indisputable facts :—(1) It is quite possible to completely close the nostrils, and yet to produce pure vocal tone. (2) Persons who are either partly or entirely without the soft palate can *under no circumstances* utter a single sound without the most pronounced nasal quality. It seems to me that these facts sufficiently speak for themselves; but if any of my readers are not convinced by them, let them try this experiment: Take a thin mirror and hold it flat against the upper lip, with the glass upwards. Now sing a pure vocal tone, and the mirror will remain perfectly bright. Sing, on the contrary, with nasal quality, and the mirror will at once be completely dimmed. This shows conclusively that nasal sound is produced by singing *through* the nose, and this cannot be done without lowering the soft palate. Teachers of singing know well enough that guttural tone is caused by the obstinate arching up of the tongue, and if they understand their business they eventually succeed in teaching a pupil labouring under this disadvantage to get perfect control over his tongue. But nobody thinks of the soft palate, though that can be brought under subjection just as well as the tongue. Let singing masters see to it, and young ladies will no longer be laughed at for having to

put their noses into hot water before charming their friends with a song.

It now only remains to be added that the interior of the windpipe and of the voicebox, as well as that of the throat, the mouth, and the nose, is lined with a thin mucous membrane of a pinkish colour. This concludes my description of the Vocal Organ as a musical instrument.

DIFFERENCES OF THE VOICEBOX, OR
LARYNX, IN CHILDREN, WOMEN,
AND MEN.

THE voicebox of a newly-born baby is about one-third the size of that of a grown woman. It is therefore rather large in proportion to other parts of the body, with the exception of the head, which comparatively is larger still. The horizontal outline of the shield cartilage is a very gentle curve, and the upper horns are short, in consequence of which the voicebox is close to the tongue. The wedges, according to Merkel, are strongly developed; the vocal ligaments are short and thick, and the pockets deep. Up to the third year the voicebox grows very considerably, but no particular alterations take place from that time to the period of puberty, which generally occurs at the age of 14 or 15, rather earlier in girls than in boys.

This period of change lasts from six to twelve months, or sometimes even two or three years. During this time the vocal organs undergo a marked change. In boys, the angle at which the two plates of the shield meet becomes more and more acute, and the length of the vocal ligaments increases only in the proportion of five to ten. In girls, on the other hand, the horizontal outline of the shield does not lose its evenness, and the length of the vocal ligaments increases only in the proportion of five to seven. The cartilages would seem, especially in boys, to grow more rapidly than the muscles, so that the slowly-growing muscles do not, at first, control the newly-developed cartilages. This accounts for the unmanageable state of the voice at this period. The changes which take place in the female voicebox are very imperceptible, so that they do not materially affect the character of the voice. In the male voicebox, on the contrary, the alterations are very marked, and the result is that the high voice of the boy is changed into the tenor or the bass of the man. While, therefore, before the period of puberty the voicebox is materially the same in both sexes, there are, afterwards, considerable differences noticeable, not only with regard to size, but also with regard to shape. This seems, indeed, sufficiently obvious, and any one can see it by simply comparing the outside of the throat of a man with that of a woman.

Nevertheless we are told by Mr. Lunn* that "Anatomy teaches us that there is no difference between the male and female larynx save in size;" and by Dr. Garrett (on page 13 of the book quoted before) that "The male larynx does not differ anatomically in the least from that of the female, except in size."

My readers may judge for themselves whether these statements are borne out by facts or not.

It must further be observed that the whole upper part of the shield in the female voicebox is less developed than in the male. The upper horns are short, so that the voicebox is more closely attached to the tongue-bone, and its position in the throat is altogether higher in woman than in man. To show more clearly still the difference in the proportions of the male and the female voicebox, I give below some average measurements (taken from Luschka's great work on the Larynx) which I have, for the convenience of English readers, reduced, as nearly as possible, from centimetres and millimetres to inches.

	MALE.	FEMALE.
Height of the voicebox in front, with the lid raised	$2\frac{4}{5}$ in. (7 cent.)	$1\frac{9}{10}$ in. (4·8 cent.)
Greatest width between the plates of the shield cartilage	$1\frac{3}{5}$ in. (4 cent.)	$1\frac{2}{5}$ in. (3·5 cent.)

* "Philosophy of Voice," 2nd edition, p.19. Baillièrè, Tindall, and Cox.

Depth between the lower border of the shield carti- lage, and the opposite point of the ring cartilage.	1 $\frac{1}{5}$ in.	1 in.
	(3 cent.)	(2.4 cent.)

Length of the vocal chink ...	1 in.	$\frac{3}{5}$ in.
	(25 mm.)	(15 mm.)

According to this eminent anatomist, therefore, the differences between male and female larynges are as follows: In height, $\frac{2}{10}$; in width, $\frac{1}{5}$; in depth, $\frac{1}{5}$; in the length of the vocal chink, $\frac{2}{5}$ of an inch. As it is plain that if there were "no difference between the male and the female larynx save in size," all their proportions would be alike, I think I may safely assume that I have proved my point, which is a rather important one, as the reader will see when the registers in the male and female voice come up for discussion.

We will now consider the question how the various classes of voice—*i.e.*, Sopranos, Contraltos, Tenors, and Basses—are to be accounted for by corresponding differences in the voicebox. We know that tone is produced by the vibrations of the vocal ligaments. It is clear, therefore, that a voice will be high or low according to the number of vibrations which the ligaments are capable of producing, or in other words, according to their dimensions and their tension. This difference is easily seen by comparing the

voicebox of a soprano with that of a bass, because there the proportions are so manifestly smaller in the one than in the other. There are similar distinctions between soprano and contralto on the one hand, and between tenor and bass on the other, but they are not so striking. Neither can they, for various reasons, be demonstrated with the laryngoscope; but they exist nevertheless.

It is true that the vocal ligaments of a soprano are sometimes longer than those of a contralto, just as the ligaments of a tenor are occasionally longer than those of a bass. But I maintain that the longer ligaments of sopranos and tenors are correspondingly thinner, and that their tension is greater, owing to the ring-shield or stretching muscles being more powerful than their opponents—the shield-pyramid muscles. Where this is the case the ligaments are more slanting than they would be otherwise, and the consequence of this is that less power of blast is required to make them speak. With this mechanism the higher registers are very readily united with the lower ones, and the voices so produced are of a light and flexible kind. Where, on the contrary, the vocal ligaments of contraltos and basses are comparatively short, they are also thick in proportion, and the shield-pyramid muscles are more powerful than the opposing ring-shield muscles, so that there is less tension. I shall

be asked how I can prove this tension theory, and my reply is this: The diameter of the vocal ligaments depends in a large measure on the magnitude of the shield-pyramid muscles. If, therefore, the ligaments are exceptionally thick, the muscles just named must of necessity be very powerful, and can easily resist the pulling of the ring-shield muscles. If, on the contrary, the ligaments are exceptionally thin, it is equally certain that the shield-pyramid muscles are weak in proportion, and then the stretching muscles can easily overcome their resistance.

I may add that I came to the above conclusions about the various classes of voices years ago, when commencing the study of this subject. Not only have I never since seen any reason to alter my views—although I have not failed to notice and carefully examine the theories of others denying my doctrine—but I am more than ever convinced that my explanations are correct. I have now the gratification of seeing my theory confirmed by so great an authority as Dr. Merkel, of Leipzig, who most elaborately explains the subject in his latest work on the larynx, to which I have already alluded in these pages.

Besides the factors enumerated above, there are, no doubt, others which are also of consequence in determining the particular kind of voice to be produced by

this vocal apparatus or by that; as, for instance, the windpipe, or the resonator, or both. The capacity of the chest—nay, the structure of the whole body, may have a more or less direct influence upon it. But there are absolutely no statistics to proceed upon, and in the absence of these it is vain to indulge in any speculations on the subject.

MOVEMENTS OF THE VOICEBOX, OR
LARYNX, WHICH CAN BE SEEN
OR FELT.

THE voicebox in a man is situated almost exactly in the middle of the throat; in woman its position is, for reasons partly explained on page 64, considerably higher. It moves downwards in inspiration, and upwards in expiration; and the more vigorously we breathe, the more marked are these movements. In the act of swallowing the voicebox rises quickly, and in yawning it goes down so completely that the whole windpipe may vanish into the chest, and even the part of the ring cartilage may disappear.

When singing in what is called chest-voice the voicebox rises gradually with each higher tone. Changing the mode of tone production, and singing—say an octave higher—in falsetto, the voicebox makes quite a leap upwards, and then again rises gradually with each

higher tone, just as in chest-voice, but in a lesser degree. The voicebox, however, does not stand so high for the lowest falsetto as for the highest chest tones.

It is possible, of course, to limit these movements to a minimum, but a teacher who insists upon his pupils keeping their voiceboxes perfectly still commits a serious mistake, because it is always injurious to do violence to nature. It is one thing to keep the voicebox steady, thereby facilitating the working of some of those muscles which act immediately upon the vocal ligaments; it is quite another thing, as will be seen below, to attempt to prevent movements which have to serve a great purpose.

In *whispering*, the voicebox occupies a different position in the throat for each vowel. I invite the reader to try the following curious experiment. Let him take the larynx gently between the thumb and the first finger, and then *whisper* OO (as in "food,") OH, AH, A (as in "name,") and E (as in "bee"). He will find that the voicebox rises with every succeeding vowel until at last it has completely slipped away from between the finger and thumb. Each one of these *whispered* vowels has, as first ascertained by Helmholtz, its exact pitch, whether uttered by a little child or by an old man, and the effect of the rising of the voicebox is to shorten the resonator, whereby the raising of the pitch is produced.

I stated on page 41 that the vocal ligaments were capable of being stretched by the ring-shield muscles, and that the pitch of the tones produced by their

vibrations depended mainly on their tension. As we are now taking note of such movements of the voice-box as may be either seen or felt in the throat, we will take the opportunity of trying whether my statement can be verified. Let the reader, therefore, do as follows:—(1) Place the finger on the shield cartilage, and press it vigorously backward. (2) Sing loudly any high tone that is well within your compass. Hold this tone steadily, and *be quite sure you do not alter its pitch.* (3) Now suddenly remove your finger, continuing to sing as before. What is the result? Your tone is raised by a third, or even more, according to the amount of pressure you exercised on the shield. And how did this result come about? In this way: By pressing the shield backwards you elongated the ring-shield muscles, thereby counteracting their stretching influence, and at the same time slackening the vocal ligaments. The tone you sang while doing this was, we will say C'. By releasing the shield you enabled the ring-shield muscles to contract again, thereby putting the vocal ligaments on the stretch as they were at first. That changed your C' to E', or higher still. Have I proved my assertion?

Now one more test, if you please. I pointed out to you on page 34 an opening between the shield and the ring. You will see it on plate V, No. 10. Please sing a low tone; place your finger gently on the shield, and

move it downwards. You will soon discover a little hollow which corresponds with the opening I just mentioned, and into which you can easily put part of the tip of your finger. Now sing up the scale, and take care to keep the tip of your finger in the hollow. Remember that in singing up the scale your voicebox will rise, which movement you must follow, or you will lose the place. If you do this carefully, you will find that the hollow gets smaller and smaller by degrees until at last it closes entirely, and you can no longer find a trace of it. Now sing down again, keeping your finger on the same spot. You will soon notice the hollow again, and it will continue to get larger and larger until you arrive at the bottom of your scale.

This, of course, is but another way of showing the mechanism by which the pitch of your tones is raised or lowered, and we have proved the same thing by our preceding experiment. But I asked you to try this chiefly because it will enable you to put a check upon my statements with regard to the registers of the voice, a subject which I propose to discuss in another chapter.

THE LARYNGOSCOPE, AND HOW TO USE IT.

THE Laryngoscope in its simplest form is a thin circular mirror, about three-quarters of an inch in diameter, set in a metal frame, and fastened at an angle of 120° to a piece of wire from three to four inches long, which is put into a small wooden handle not much thicker than a pencil, and about the same length as the wire. By help of the laryngoscope we can either see our own larynx or that of another person. The easiest experiment is upon the larynx of some one else. In this case, the person to be operated upon sits facing the sun, the head slightly bent backwards, and the mouth wide open. If he has not sufficient control over his tongue to prevent it from arching up, he must gently hold its protruding tip with a pocket handkerchief between his thumb and forefinger. The mirror is now slightly warmed to prevent its becoming dimmed by

the moisture of the breath, and then, holding it like a pen, the operator introduces it into the throat so that it touches the uvula. This must be done lightly yet firmly, care being taken not to bring the mirror into contact with the base of the tongue. The rays of the sun falling upon the mirror are reflected downwards into the voicebox, the image of which is clearly visible in the mirror. In making observations upon oneself, a second mirror in the shape of an ordinary hand looking-glass is necessary to reproduce the image in the small mirror. This is the way in which the renowned professor of singing, Senor Manuel Garcia, made those famous "Observations on the Human Voice," communicated to the Royal Society by Dr. Sharpey, on May the 24th, 1855. Similar attempts had been made before; for instance, in 1827 by Babington, in 1838 by Baumès, in 1840 by Liston, and in 1844 by Warden and Avery. But they had all ended in failure, an occasional glimpse of some parts of the voicebox being the only result obtained. Garcia, however, brilliantly succeeded where all his predecessors had failed, and was the first not only to see the vocal ligaments, but to see them in the act of singing, and to see them so clearly as to be able to give an account of their minutest movements. The instrument has since been greatly improved, and the process of investigation has become a science. Medical men all over the world have laid hold of it, and suffering

humanity is daily benefited by it. But Garcia is the man who produced the first results, and to him, therefore, is due the credit of being practically the inventor of the laryngoscope.

It is almost incredible, but it is true, that this splendid invention was received coldly and with distrust in this country, and had it not been for Dr. Johann N. Czermak, Professor of Physiology at the University of Pesth, the matter would, in all probability, have been forgotten. But this gentleman recognized the value of Garcia's invention, and he at once went enthusiastically to work, and pushed on vigorously in the way which Garcia had opened for him. He constructed an apparatus which enabled him, by making use of artificial light, to work without interruption and without waiting for the sun to shine. He then made his first attempts on himself in order to become acquainted with the conditions which have to be fulfilled by the observer as well as by the person to be operated upon. In this way he soon became a master of the new process, which he immediately brought under the notice of the profession by giving lectures and demonstrations in the chief towns of Europe.

More than twenty years have passed since then, and the laryngoscope has, during that time, been made excellent use of, not only for the alleviation of suffering, and the cure of disease, but also for its original purpose

—*i.e.*, the exploration of the mechanism of the human voice.

My own connection with the matter has arisen through my desire to sift contradictory statements made by various observers. Having read many English, German, and French books on the subject, I was in position to pick up a hint here, and to get some good advice there, and the consequence was that I was able to pursue a course which made me familiar with the use of the laryngoscope in a very short time. As my experience may be useful to others, I will briefly relate how I proceeded.

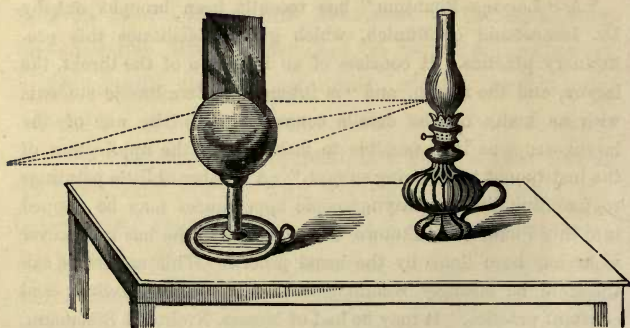
I made my first attempts upon a skull, to which I attached a plaster-of-Paris model of the voicebox, the whole being fastened to an iron stand. The instrument I used was a concave reflector on a spectacle frame. The reflector had a hole in the centre, and was capable of being moved in various directions. The next thing was the little mirror described on page 73, and lastly, a gas lamp on the principle of the well-known "Queen's" reading lamps, which can be raised or lowered at pleasure. I placed the skull to the left of the lamp, and looking with my right eye through the hole in the centre of the reflector, practised throwing the light swiftly and with certainty into the upper part of the throat. I then introduced the little spy mirror, and tried to see and to recognize the various parts of

the voicebox, which, let it be remembered, present a somewhat different appearance in the looking-glass from what they do if seen without it. Then I got a friend to mark my artificial voicebox, unknown to me, in various ways, and endeavoured quickly to discover what he had done. In this way I soon acquired a considerable amount of skill in handling the instrument, and also became thoroughly familiar with the image of the voicebox in the mirror.* Having thus to a large extent mastered the mechanical part of my work, I proceeded to make observations upon myself. I placed to the left of the lamp an ordinary bedroom looking-glass, in which now appeared my own face instead of the skull which hitherto occupied this place. I opened my mouth, and by the help of the reflector directed the light into the image of it in the looking-glass. I then

* A "Laryngo-Phantom" has recently been brought out by Dr. Isenschmid of Munich, which greatly facilitates this preliminary practice. It consists of an imitation of the throat, the larynx, and the mouth, and "is intended to familiarize students with as many of the details connected with the use of the laryngoscope as it is possible to learn before the application of the instrument to the living subject." A number of little paintings representing different laryngoscopic appearances may be slipped into this Phantom, unknown to the student, who has to discover what has been done by the usual process. This apparatus can therefore be strongly recommended as affording excellent and constant practice. It may be had of Messrs. Krohne & Sesemann, 8, Duke Street, Manchester Square, W., price £2 2s

continued in every way as I had done with the skull, with this difference, however, that I had first, as pointed out before, to warm the little spy mirror in order to prevent its becoming dimmed in the throat.

An instrument has since been designed by the late Dr. G. D. Foulis, of Glasgow, which for simplicity, general excellence, and cheapness, far surpasses the above contrivance, and which I strongly recommend to intending students of laryngoscopy. It consists of a plain stand on which is placed a glass globe filled with water, the whole being surmounted by a small square mirror. The rays from a lamp or candle, placed behind the globe, are concentrated into the open mouth of the observer, who is seated in front of it, enabling him, by the use of an ordinary throat mirror, to inspect the movements of his own vocal ligaments.



This apparatus, as shown in the annexed drawing, including a throat mirror, and safely packed for transmission, may be had from Messrs. W. B. Hilliard & Sons, 65, Renfield Street, Glasgow, for the very small sum of 5s. 6d.

Let not the reader who tries laryngoscopic investigations be discouraged if, at first, violent retching is the result. It does not so much arise from sensitiveness of the parts touched, as from awkwardness in introducing the mirror. If he perseveres he will soon be rewarded by a view of the pearly white vocal ligaments, and a little repeated practice upon himself will enable him also to operate upon others without causing them discomfort.

I close this chapter by again reminding amateur laryngoscopists that in the vast majority of cases where the touch of the mirror causes retching and gagging, it is due less to the sensitiveness of the person operated upon than to the want of skill on the part of the operator. He should in that case renew his experiments upon himself, and continue them until he has fully mastered the use of the instrument, as it is not fair to make others suffer for his own clumsiness.

THE TEACHINGS OF THE LARYNGOSCOPE.

On introducing the mirror into the throat we first see the back part of the tongue, which has a very uneven surface, and which is, as a rule, covered with greyish phlegm. We next notice a hollow space between the tongue and the lid, which is divided by an elastic band forming a little bridge between the two. Next comes the upper free part of the lid, the shape of which greatly varies in different individuals. It hangs over the voicebox, which it almost completely hides from view; but during the production of a high tone on the vowel A, as in "sad," it takes an almost perpendicular position. When the lid is so raised (pl. XIV, L) we can see right down to the bottom of it, where we observe that it bulges out a little. Extending from either side of the lid to the pyramids are two folds of mucous membrane, in the hinder part of either of which are to be observed two little elevations representing the cartilages of Santorini (pl. XIV, s s), and the upper

points of the wedges, called the cartilages of Wrisberg (pl. XIV, w w). Looking down the kind of tube which is formed by the parts just enumerated, we next notice two horizontal projections running from front to back, which are the pocket ligaments (pl. XIV, p p). Everything we have seen so far is of a pinkish colour. Below the pocket ligaments, right at the bottom of the tube described above, we see the main object of our investigation, namely, the vocal ligaments (pl. XIV, v v). These, being almost of a pearly white, form a strong contrast to all their surroundings, and it is quite impossible to mistake them.

In quiet breathing the vocal chink is of a triangular shape, of which, however, we can only see the hinder part, the front part being hidden by the lid (pl. XIII). In exaggerated efforts at breathing this space gets considerably larger, so that, with a well-directed light, we can see into the windpipe, of which the rings are plainly noticeable. It is even possible to see the lowest part of the windpipe, where it is divided into the two branches entering the lungs.

For the purpose of studying the movements of the vocal ligaments in the act of singing, the vowel A, as in "sad" will be found the most favourable, because the formation of the mouth, and the position of the tongue which it necessitates, enable us to get a complete view

of the interior of the voicebox, which during the emission of other vowel sounds is more or less hidden.

Mr. Lunn objects that all investigations with the laryngoscope are valueless on account of the supposed necessity of holding the tip of the protruding tongue. He says, in a letter to the "Orchestra" (January, 1880): "One of our most promising singers told me he could not rightly produce his voice when under laryngoscopic investigation. It is a moral impossibility for all!" (A physical impossibility would be more to the purpose.) "Let the reader pull his tongue out with a napkin as far as he can, and sing, and he will get some notion of the tone producible." There is no foundation for this objection, because if a singer has his tongue under proper control there is not the slightest occasion to put it out and to hold it. As to pulling it out as far as one can, that should not be done under any circumstances, and no man having the slightest knowledge of laryngoscopy would suggest such a ridiculous proceeding. In my own case the vocal ligaments can be seen from one end to the other while I keep my tongue in its natural position, and I am willing to demonstrate this fact to any one who has any doubt in the matter.

As soon as we produce a tone, the pyramids, and with them the vocal ligaments, meet, so as to touch each other more or less closely, while there still remains a large space between the pocket ligaments above. Every time we take breath, the pyramids with the vocal ligaments recede, to meet again as before, every time we strike a new tone. The vocal ligaments, thrown into vibrations by the stream of air passing between them, cut, as it were, this stream of air into regular waves, and thus (as more fully explained on p. 38) tone is produced.

We notice here that this tone-production may be originated in three different ways:—(1) The vocal ligaments may meet *after* the air has commenced to pass between them. Of this an aspirate is the result. (2) The vocal ligaments may meet *before* the air has commenced to pass between them. This causes a check or a click at the beginning of the tone. (3) The vocal ligaments may meet just at the very moment when the air passes between them. In this case the tone is properly struck. There is nothing to make it indefinite as in case No. 1, and nothing to impede it as in case No. 2. Production as in case No. 3 causes the tone to travel much farther than production as in cases Nos. 1 and 2, and it is this way of striking a tone which is known under the name of “Coup de Glotte” or “Shock of the Glottis.”

“But it is not a shock of the glottis at all,” says Mr. Lunn, on page 68 of the book quoted before. “It is an audible result arising from the false cords [pocket ligaments] releasing condensed air imprisoned below them, which air in its release explodes.” I beg leave to observe that condensed imprisoned air thus released could produce a puff, but not a musical tone. The matter is, moreover, capable of being demonstrated to the eye. The process takes place as described above, and I am ready at any moment to show that the pocket ligaments *never* meet in singing. There can, therefore, be no possibility of condensed air being imprisoned below them, and we need not enter into any further argument on the subject.

We now proceed to study the Registers of the human

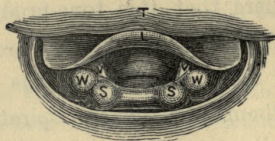


PLATE XIII.

LARYNGOSCOPIC IMAGE.
BREATHING.

- T. TONGUE.
L. LID.
V. V. VOCAL LIGAMENTS.
W. W. CARTILAGES OF WRISBERG.
S. S. CARTILAGES OF SANTORINI.

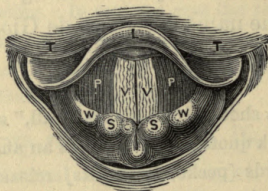


PLATE XIV.

LARYNGOSCOPIC IMAGE.
UPPER THICK.

- T. T. TONGUE.
L. LID.
P. P. POCKET LIGAMENTS.
V. V. VOCAL LIGAMENTS.
W. W. CARTILAGES OF WRISBERG.
S. S. CARTILAGES OF SANIORINI.

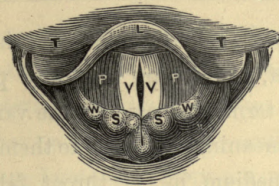


PLATE XV.

LARYNGOSCOPIC IMAGE.
UPPER THIN.

- T. T. TONGUE.
- L. LID.
- P. P. POCKET LIGAMENTS.
- V. V. VOCAL LIGAMENTS.
- W. W. CARTILAGES OF WRISBERG.
- S. S. CARTILAGES OF SANTORINI.

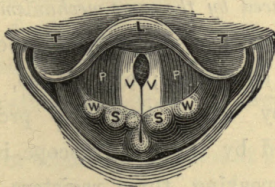


PLATE XVI.

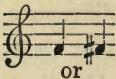
LARYNGOSCOPIC IMAGE,
SMALL.

- T. T. TONGUE.
- L. LID.
- P. P. POCKET LIGAMENTS.
- V. V. VOCAL LIGAMENTS.
- W. W. CARTILAGES OF WRISBERG.
- S. S. CARTILAGES OF SANTORINI.

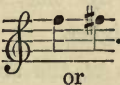
voice. A very Babel of confusion exists on this important subject, and we are not only perplexed by a multiplicity of terms, but also by the various and often contradictory meanings attached to them. Thus people talk of chest, medium, mixed, throat, falsetto, and head registers, and these terms being utterly unscientific—*i.e.*, being based upon sensations and fancies instead of physiological facts—no one can give a clear and satisfactory definition of any one of them. To bring order into such chaos is an almost hopeless undertaking, and the first step in this direction is obviously to ask ourselves, What is the meaning of the word "Register?" My reply is this: *A register consists of a series of tones which are produced by the same mechanism.* Then comes the question, Can any such registers be demonstrated in the vocal apparatus; and if so, what are the mechanisms by which they are produced? The answer supplied by the laryngoscope is, Yes. There are, broadly speaking, three registers in the human voice, and the mechanisms are plainly visible, as follows:—(1) During the lowest series of tones the vocal ligaments vibrate in their entire thickness (pl. XIV). (2) During the next series of tones the vocal ligaments vibrate only with their thin inner edges (pl. XV). (3) During the highest series of tones a portion of the vocal chink is firmly closed, and only a small part of the vocal ligaments vibrates (pl. XVI).

In accordance with these physiological facts, Mr. Curwen, in his admirable book "The Teacher's Manual," calls the registers *the Thick, the Thin, and the Small*. These names have a scientific basis, and their meaning cannot be misunderstood. They are already familiar to thousands who study music by Mr. Curwen's method, and I have myself made use of them in my lectures at University College and at other places. I shall, therefore, also adopt them in this little work, and hope they will soon find general acceptance among teachers and learners, as thereby a great many misunderstandings will be avoided.

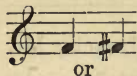
Our next business will be to ascertain how these registers are divided among various voices, and the result as revealed by the laryngoscope is rather startling. It consists in this, that the break between the

Thick and Thin occurs *in both sexes* at about 

In order to realize the full meaning of this, the reader must bear in mind that music for tenors is generally written an octave higher than it is sung, so that the tones we are now speaking about would, as a rule, in

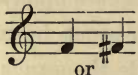
a tenor part be expressed by . My assertion,

therefore, amounts to this, that everything below



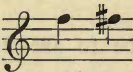
whether sung by soprano, contralto, tenor,

or bass, is produced by one mechanism—that is to say, by the vocal ligaments vibrating in their entire thickness; and that the series of tones above



whether sung by bass, tenor, contralto, or soprano, is again produced by one mechanism (although a different one from the last), that is to say, by the vocal ligaments vibrating only with their thin inner edges. Then there remains the small register, which belongs almost exclusively to sopranos, and which represents the series

of tones above



or

I thus maintain, not only that the great break between the thick and the thin occurs (individual differences apart) at the same place in both sexes, but that (leaving for the moment sub-divisions out of consideration) the male voice has but two registers—*i.e.*, the Thick and the Thin, while the female voice has three registers—*i.e.*, the Thick, the Thin, and the Small. From this it follows that the female voice is *not*, as supposed by some, simply a reproduction of the male an octave higher.

I have spoken of the above results of the investigations with the laryngoscope as startling, because the

female voicebox is generally imagined to be exactly like the male, save in size, and the inference that the female voice must be exactly like the male, save in pitch, is, therefore, a very natural one. Neither am I surprised that those who hold an opposite view to mine are never tired of advancing this argument.

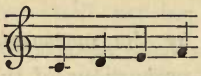
Mr. Lunn says, in the book quoted before, on page 24, "Consequently it may safely be asserted that the vocal cords are subject to the same laws as all sounding bodies, and as the sole difference between the male and the female larynx is one of size alone, the voice from the latter is a reproduction of the former on a higher scale."

I have, however, shown by the measurements of Luschka, on p. 64, that the proportions of the female voicebox are materially different from those of the male, and I have also pointed out differences in shape noticeable to any observer. Now, although I do not pretend that I have by these facts and figures sufficiently accounted for the difference in the registers of the male and the female voice; yet these facts and figures are nevertheless greatly in my favour, and they are certainly a sufficient answer to the above argument of those who differ from me.

My case is further strengthened by the testimony of that eminent physiologist, Dr. Merkel, who says,* "In the male organ there are only two materially different registers to be noticed, the chest and the


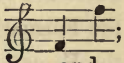


* "Der Kehlkopf," p. 153. Leipzig, 1873. J. J. Weber.

falsetto, . . . on the other hand, in the female organ there are clearly to be distinguished three registers—a low, a medium, and a high.” (From Dr. Merkel’s definitions on pp. 148, 149, and 152, it will be seen that low, medium, and high, are but other names here employed for Thick, Thin, and Small.) Dr. Merkel, speaking of the chest (thick) register, goes on to observe, on p. 148, “It ceases, very curiously, in both sexes on one of the first four tones of the one-lined octave (der ein-gestrichenen

Octave)  so that it is about one octave longer [deeper] in man than in woman.”

Let it be observed above all things that I am not propounding a theory, but explaining a fact; a fact, moreover, which I have before now demonstrated to men holding opposite opinions, thereby convincing them, and which I am willing at any moment to demonstrate again. A very striking proof that the distribution of the registers is in accordance with my explanations may be further found in the circumstance that it is often impossible to distinguish a male voice from a female when (other things such as power and quality being equal) both sing in the same registers. The similarity is, of course, greatest between tenor and contralto, and in case of a trial they must confine

themselves to the compass easily belonging to both ; neither should the singers be seen by the listeners. I have frequently by these experiments convinced sceptics ; and it has happened more than once when the female voice was slightly more robust than the male, that, to the great amusement of those present, the judges emphatically and without the slightest hesitation pronounced the lady to be the tenor and the gentleman the contralto.

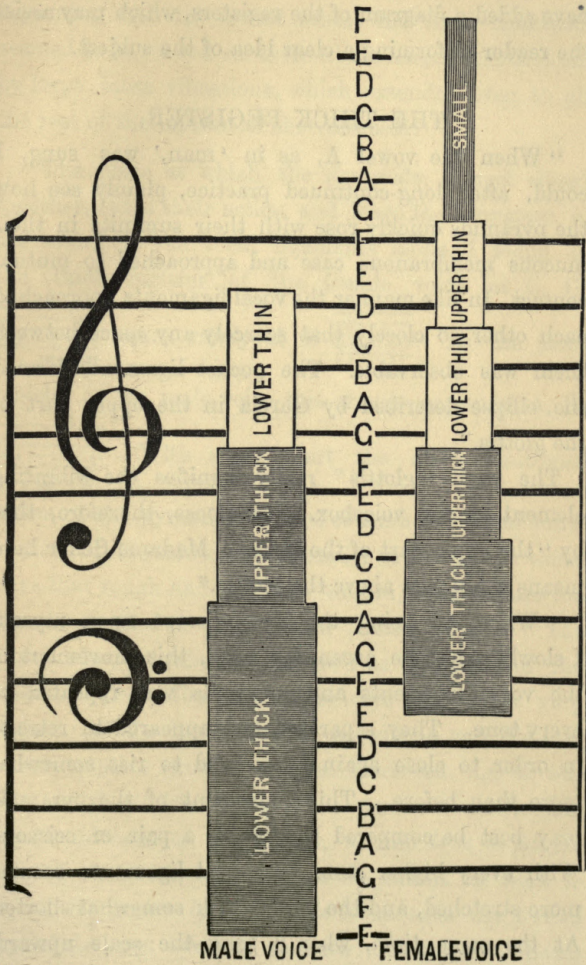
We have so far only spoken of three registers, the Thick, below  ; the Thin, between  and  and the Small, above . The distinguishing

features of these are so very clear as to make any mistake impossible. But now we come to sub-divisions, and with regard to these the matter is not so simple. Singers know very well that other breaks occur in the human voice besides those hitherto mentioned, and the question arises how they are to be accounted for by corresponding changes in the vocal organ. The evidence furnished on this point by the laryngoscope is, in my opinion, not sufficient, because the alterations in the vocal ligaments are so exceedingly minute as to be capable of being differently interpreted by different observers. I have consequently come to the conclusion

that they cannot be accepted as indicating changes of mechanism unless corroborated and amplified by other signs.

In order to place the whole subject before the reader in a comprehensive form, I cannot do better than quote the elaborate description which Madame Emma Seiler gives of the registers in "The Human Voice in Singing" (Philadelphia, 1875). Madame Seiler, to whom Mr. Lunn is pleased to refer, on p. 65 of his treatise, as an "ignorant person," assisted Professor Helmholtz, of Heidelberg, in his essay upon the Formation of the Vowel-tones and the Registers of the Female Voice. He says he thus had "an opportunity of knowing the delicacy of her musical ear, and her ability to master the more difficult and abstract parts of the theory of music." The Professor further speaks of her as "a very careful, skilled, and learned teacher." Professor Du Bois-Reymond, of Berlin, also describes her as "a lady of truly remarkable attainments." With such recommendations I make no apology for quoting at length from Madame Seiler's writings; and it will be readily understood that whenever I differ from her, I do so with some diffidence, and only after careful conviction of the accuracy of my own independent observations.

I shall substitute the terms hitherto used in these pages for others employed by Madame Seiler, and I



have added a diagram of the registers, which may assist the reader in forming a clear idea of the subject.

THE THICK REGISTER.

“When the vowel A, as in ‘man,’ was sung, I could, after long-continued practice, plainly see how the pyramids quickly rose with their summits in their mucous membranous case and approached to mutual contact. In like manner the vocal ligaments approached each other so closely that scarcely any space between them was observable. The pocket ligaments formed the ellipse described by Garcia in the upper part of the glottis.”

The word “glottis” really signifies the vibrating element in the voicebox. I suppose, therefore, that by “the upper part of the glottis” Madame Seiler here means the “part above the glottis.”

“When, in using the laryngoscope upon myself, I slowly sang the ascending scale, this movement of the vocal ligaments and pyramids was repeated at every tone. They separated and appeared to retreat, in order to close again anew, and to rise somewhat more than before. This movement of the pyramids may best be compared to that of a pair of scissors. With every higher tone the vocal ligaments seemed more stretched, and the vocal chink somewhat shorter. At the same time, when I sang the scale upward,

beginning with the lowest tones, the vocal ligaments seemed to be moved in their whole length and breadth by large, loose vibrations, which extended even to all the rest of the interior of the voicebox.

“The place at which the pyramids, almost closed together, cease their action and leave the formation of the sound to the vocal ligaments alone, I found in the thick register of the female voice at C, C \sharp

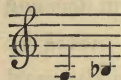


more rarely at B



In the thick


register of the male voice this change occurs at A, B \flat

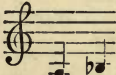


With some effort the above-mentioned


action of the pyramids may be continued several tones higher. But such tones, especially in the female voice, have that rough and common timbre which we are too often compelled to hear in our female singers. The glottis also, in this case, as well as the parts of the voicebox near the glottis, betrays the effort very plainly; as the tones ascend, the glottis and the surrounding parts grow more and more red. *As at this place in the thick register there occurs a visible and sensible straining of the organs, so also is it in all the remaining transitions, as soon as the attempt is made to extend the action by which the lower tones are formed beyond the given limits of the same.* These transitions,

which cannot be extended without effort, coincide perfectly with the places where J. Müller had to *stretch* the ligaments of his exsected voicebox so powerfully in order to reach the succeeding half-tone. Garcia likewise finds tones thus formed disagreeable and imperfect in sound.

“ Usually, therefore, at the note C# 

in the female voice, and A, Bb  in the

male voice, the vocal ligaments alone act in forming the sound, and are throughout the register moved by large, loose, full vibrations. But the instant the vocal ligaments are deprived of the assistance of the pyramids they relax, and appear longer than at the last tone produced by that aid. But with every higher tone they appear again to be stretched shorter and more



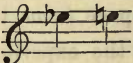
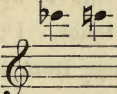
powerfully up to F, F#  the natural tran-


sition from the thick to the thin register, as well in the *male* as in the *female*. The voicebox is perceptibly lower in all the tones of the thick register than in quiet breathing.”

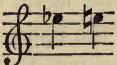
I confess my inability to understand how the vocal ligaments can get *longer* by relaxing and *shorter* by stretching. But apart from this I assert that there is

no relaxing of the vocal ligaments at the break between the Lower Thick and the Upper Thick at all. This is clearly proved by the ring-shield aperture, which would open immediately if such were the case. I also doubt whether the action or inaction of the pyramids determines the break between the Lower Thick and the Upper Thick, as they are cartilages—*i.e.*, pieces of gristle—and cannot, therefore, by any vibrations of their own assist in the production of tone. The tension of the vocal ligaments increases as we sing up the scale until the ring-shield aperture has quite disappeared. But while it remains so closed, and without the vocal ligaments being any further stretched, we can yet sing higher still. The gradations of tone are now no longer formed by the action of the ring-shield muscles (see p. 34), but by the shield-pyramid muscles which press the vocal ligaments more and more closely together, until at last scarcely any trace of a slit remains between them. Another result of this action of the shield-pyramid muscles must also be to narrow the space *below* the vocal chink, which, as we know from the experiments of J. Müller, has the effect of raising the pitch of tones. I think it very likely, therefore, that the change from the lower to the upper thick is really brought about by the shield-pyramid muscles coming into play after the ring-shield muscles have done their share.

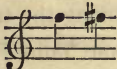
THE THIN REGISTER.


“All the tones of the thin register are produced by vibrations only of the fine, inner, slender edges of the vocal ligaments. In this action the vocal ligaments are not so near together, but allow of a fine linear space between them, and the pocket ligaments are pressed further back than in the production of the tones of the thick register. The rest of the action of the glottis is, however, entirely the same. With the beginning of the thin register at F#  the whole vocal chink appears again longer, and the vocal ligaments are much looser than in the highest tones of the thick register. The united action, already described, of the pyramids and the vocal ligaments in forming the deeper tones of the thin register, extends to C, C#  in the female voice, and in the male voice to Eb, E  commonly written thus, Eb, E  but which only rarely occurs in composition, and then is sung by tenors as I have given it; that is, one octave lower.



“With the C#  in the female voice, and the

Eb, E  in the male voice, the pyramids

cease again to act, and, as before, in the Upper Thick, leave the formation of the sounds to the vocal ligaments alone, which at this change appear again longer and looser, but with every higher tone tighten up to

F, F#  in the female voice, and in the

male voice to G  or as it is commonly written,

  In the thin register the voicebox preserves its natural position as in quiet breathing.”

I must say here that I have never had any very clear conception of Madame Seiler's meaning when she speaks of the action or inaction of the pyramids in the formation of the registers. In the lower thick register there is, as a rule, a small triangular space between them which gets gradually smaller as the tones ascend, until it is quite closed in the upper thick. Dr. Merkel, also, has made the same observation. So far, therefore, we are agreed. But even of this I can find no trace in the thin register, where I have always noticed that the pyramids are quite close together. On this

point, my assertion is borne out by Dr. Merkel, who insists upon the same thing. I also demur to Madame Seiler's statement that in this register again the vocal ligaments relax at the beginning of the upper division, and I invite the reader to test the matter by reference to the ring-shield aperture. The evidence furnished by this experiment is conclusive, because the vocal ligaments cannot possibly relax without a corresponding enlargement of the ring-shield aperture. A very striking illustration of this occurs during the transition from the Upper Thick to the Lower Thin. During the highest tones of the Upper Thick, when the tension of the vocal ligaments is greatest, the ring-shield aperture, as we have seen before, completely closes, while immediately opening very widely during the lowest tones of the Lower Thin, when the vocal ligaments are quite relaxed. Nothing of the kind takes place during the change either from the Lower Thin to the Upper Thin, or from the Lower Thick to the Upper Thick. It appears to me that Madame Seiler has rather exaggerated the importance of these minor breaks, while she does not make enough of the great break between the Upper Thick and the Lower Thin. If there is straining anywhere, it is during the attempt to carry the mechanism of the Upper Thick beyond its natural limit. In this case the tension of the vocal ligaments, as indeed of all surrounding

parts, becomes so tremendous that at last the whole thing looks as though it were literally going to fly to pieces in every direction. Now change into the Lower Thin, and the relief is wonderful. Let tenors make a note of this. If they *will* violate Nature, they must pay the penalty!


As regards the transition from the Lower Thin to the Upper Thin, I would suggest the following explanation:—The vocal chink is at first, as Madame Seiler says, linear, and the gradations of tone are caused by simple tension of the vocal ligaments, which is proved by the diminution of the ring-shield aperture. While this goes on we are in the Lower Thin. Now the laryngoscope reveals another method of still further raising the pitch, which consists in a gradual shortening of the vocal chink. This is caused by the shield-pyramid muscles pressing together the ends of the vocal ligaments, thereby giving the vocal chink a slightly elliptic shape. When this mechanism comes into play we are in the Upper Thin.

THE SMALL REGISTER.

“When in the observation of the thin register I had sung upwards to its highest tones, and then sang still higher, I became aware, with the F#



of a change in the motions of the organ of singing, and the tones thus produced had a different *timbre* from those of the *Thin*. It required long and patient practice before I finally succeeded in drawing forward the lid so that I could see the glottis in its whole length. Not until then was I able to observe the

following: With the F#  the vocal ligaments

suddenly closed firmly together to their middle, with their fine edges one over the other. This closing appeared as a fine red line extending, from the pyramids at the back, forward to the middle of the vocal ligaments, and leaving free only a third part of the whole glottis, immediately under the lid, to the front wall of the voicebox.

“The foremost part of the glottis formed an oval orifice, which, with every higher tone, seemed to contract more and more, and so became smaller and rounder. The fine edges of the vocal ligaments which formed this orifice were alone vibrating, and the vibrations seemed at first looser, but, with every higher tone, the ligaments were more stretched.”

I have repeatedly had the opportunity of observing the mechanism of the small register, and I only differ from Madame Seiler in this, that I did not notice that “with every higher tone the ligaments were more

stretched." It appeared to me, on the contrary, as though the raising of the pitch was produced by a contraction of the vocal ligaments. In all other respects I entirely agree with the above description. According to Madame Seiler the small register is formed by the action of the wedges, as described on p. 54.

We have thus become acquainted with the mechanism of the registers of the human voice. We have also seen that it is possible to carry these up beyond their natural limits, though the process is accompanied by visible signs of straining. The practice of teachers, therefore, whose aim it is to "extend" voices upwards, and who are very proud, especially in tenors, of their "made tones," is strongly to be condemned, and is sure to have disastrous results. It is, on the other hand, equally possible to carry the registers down several tones below the places called the breaks, so that at the limits of each register there are a number of tones which may be produced by two different mechanisms. The carrying down of a register causes no fatigue, and though its volume is weak as compared with the corresponding lower register, it is surprising how soon it can, by judicious practice, be made to acquire fulness and power.

In order to prevent misunderstandings, it may be well to add that the breaks as indicated in the pre-

ceding pages are intended only to show the average compass in the great majority of voices. As, for instance, there are basses who have an exceptional extension of the Lower Thick downwards, so there are, undoubtedly, tenors who have an exceptional extension of the Upper Thick upwards. It must, therefore, be the voice trainer's business very carefully to ascertain the exact limits of the registers in every single case. In choral singing, however, where individual attention is impossible, the breaks as given above may be implicitly relied upon. Not only should the registers never be carried above these points, but if the teacher is wise he will insist upon his pupils forming the habit of changing the mechanism a tone or two below.

NEVER "EXTEND" LOWER REGISTERS UPWARDS, BUT STRENGTHEN THE UPPER REGISTERS, AND CARRY THEM DOWNWARDS, THUS EQUALIZING THE VOICES FROM TOP TO BOTTOM, AND ENABLING YOUR PUPILS TO SING WITHOUT STRAINING. That is the great lesson taught by the investigations described in these pages. I have seen a singer pull himself together, and with a tremendous effort shout a high A in the thick register. His neck swelled out, his face became blood-red, and altogether the "performance" was of an acrobatic rather than of an artistic nature. The general public, of course, loudly applauded, but people of taste and refinement shuddered. Such exhibitions are, unfortunately, not

rare. If this little book should contribute, however remotely, to discourage them, it will not have been written in vain.

APPENDIX TO THE THIRD EDITION.

It has been suggested to me that the usefulness of my little book would be enlarged if I were to add an appendix containing some application to practical work of the physiological laws already explained. This I have endeavoured to do in the following chapter, and I trust the simplicity of the directions will enable the reader to carry out my instructions, to vary them, and to enlarge upon them according to circumstances.

HINTS ON TEACHING.

One of the most important lessons taught us by the study of Vocal Physiology is the correct method of breathing and of obtaining control over the respiratory muscles. I will now give a few exercises for this purpose.

Divest yourself of any article of clothing which at all interferes with the freedom of the waist. Lie down flat on your back. Place one hand lightly on the abdomen and the other upon the lower ribs. Inhale, through the nostrils, slowly, deeply, and evenly, without interruption or jerking. If this is done properly the abdomen will, gradually and without any trembling movement, increase in size, and the lower ribs will expand sideways, while the upper part of the chest

and the collar-bones remain undisturbed. Now hold the breath, *not* by shutting the glottis, but by keeping the midriff down and the chest walls extended, and count four mentally, at the rate of sixty per minute. Then let the breath go *suddenly*. The result of this will be a flying up of the midriff, and a falling down of the ribs; in other words, there will be a collapse of the lower part of the body. This collapse may not at first be very distinct, as the extension has probably been insufficient; but both will become more and more perfect as the result of continued practice.

Let it be clearly understood: The *inspiration* is to be slow and deep, the *expiration* sudden and complete. In *inspiration* the abdomen and the lower part of the chest expand, and in *expiration* they collapse.

The time of holding the breath is not, at the outset, to exceed four seconds, and the student must never, on any account, fatigue himself with these exercises; they may, however, be frequently repeated at intervals. It will be found by occasional trials upon the spirometer that the breathing capacity increases with these exercises. The process of abdominal respiration becomes easy and no longer requires constant watchfulness, and the student will soon be able to carry it on, not only lying down, but while he is standing or walking, though not at once with the same ease. He must now, for a time, be careful to see that he has the

same physical sensations in breathing which he noticed while making his first experiment when lying down ; and he must exercise special care when running, going upstairs, &c., and, of course, in speaking or singing.

The criterion of correct inspiration is, as I have said before, an increase of size of the abdomen and of the lower part of the chest. Whoever draws in the abdomen and raises the upper part of the chest in the act of filling his lungs does wrong.

Meanwhile, in continuing the breathing exercises, the time of holding the breath may be increased at the rate of two seconds per week ; so that the student who, during the first fortnight, limited himself to four seconds will, at the end of six weeks, hold his breath during twelve seconds. I have, in some instances, with students of mine, gone as far as twenty seconds ; but I desire very earnestly to warn my readers to be cautious and not to go to extremes. Nothing will be gained, but infinite harm may ensue by over-doing these lung gymnastics, and persons at all inclined to bleeding from the lungs should not undertake the exercises at all, except with the sanction of their medical adviser, who will limit the practice according to circumstances.

The second breathing exercise is the exact opposite of the first, and consists in taking a rapid *inspiration* and making the *expiration* slow, even, uninterrupted

and without jerking or trembling. My musical readers will at once see the importance of this exercise for the purpose of singing sustained tones and florid passages ; but it would be quite useless to attempt it before No. 1 has been sufficiently practised.

The third and last breathing exercise consists in taking the *inspiration* as in No. 1, and the *expiration* as in No. 2. After the two preceding ones have been fully mastered this last is easy enough ; and the student who has persevered so far will now have overcome one of the greatest difficulties of a vocalist, namely, the proper management of the breath, an accomplishment which seems to become more and more rare in our go-ahead times of electricity.

I feel that my description of these breathing exercises is far from complete, and what is worse, that it may lead to misunderstandings, the results of which will hereafter be laid to my charge. But writing, however lucid and careful, can never take the place of *vivâ voce* instruction ; and I wish it to be distinctly understood that the explanations here given are not by any means intended to supersede the aid of a competent and painstaking teacher.

I will take leave of this part of my subject by warning my readers against the mistake, which may be caused by a superficial perusal of these pages, that it is the chief aim of the above breathing exercises to

enable the singer or speaker to cram as much air as possible into the lungs. I have pointed out some of the evils which are likely to arise from exaggerated breathing efforts ; yet I wish to say again, most emphatically, that it is quite possible to *overcrowd* the lungs with air. This is a matter of every-day occurrence, which is not, however, on that account any the less reprehensible ; for, as I have already mentioned, it is sure to lead, sooner or later, to forcing and inequality of voice, and to congestion of the vessels and tissues of the throat and of the lungs.

Now we come to the question of the production and cultivation of the voice, including the nature and the proper treatment of the registers. In this connection I shall endeavour to explain a series of exercises based upon physiological facts, which will enable the reader to strike out a safe and direct path, avoiding much useless drudgery, and leading to eminently satisfactory results. As it is not my object to supply a singing manual, but simply to point out the way of treating the voice upon scientific principles, I shall not attempt to deal separately with the different classes of voices, or to go into minute details ; but it will rather be my aim to lay down general principles, leaving my readers to carry them into practice, and to elaborate them according to individual circumstances. It must also be borne in mind that the

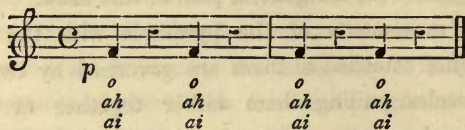
exercises I am going to recommend will here be taken as they suggest themselves, while passing in review the various parts which unitedly form the mechanism of the human voice. Therefore, in the actual process of training a voice, they will have to be taken in a different order from that in which they are discussed here, in accordance with the general plan of this book.

The movements of the pyramids with the vocal ligaments attached to them are governed by two sets of muscles pulling them either together or away from each other. These have been fully described under the names of the "Closing Muscles" and the "Opening Muscles;" and the reader will at once see the importance of devising a set of exercises which shall call these opening and closing muscles into play, thereby making them powerful, and bringing them under the control of the will.

This is, fortunately, a very simple matter; for all we have to do is to sing a series of short tones, each tone to be followed by a short inspiration. We have learnt that every time we strike a tone the vocal ligaments are made to approximate; by so doing we therefore exercise the closing muscles. Every time we take an inspiration the vocal ligaments are separated; by so doing therefore we exercise the opening muscles. It is plain from these explanations that, by practising in the manner just indicated, we shall gain the same results in five

minutes which it would take us half an hour to obtain by singing sustained tones after the usual method of teaching.

Let me now give as clear a description of the exercise as possible. Find the pitch of your speaking voice, which we will say is *F*. Then sing the following :—



Strike the tone firmly and clearly, avoiding alike the *check* of the glottis and the *glide* of the glottis. This is often a matter of great difficulty, requiring much patience and perseverance on the part of the teacher as well as on that of the student. The glide of the glottis is particularly hard to eradicate, and in many instances the case seems to be hopeless. Do not, however, despair, but try this: Pronounce vigorously the word "Up." Then *whisper*, but still very vigorously and distinctly, three times the vowel *u*, as you just had it in the word "up." Immediately afterwards *sing* "Ah." Thus—

UP! *u, u, u,* Ah.
 (*spoken*) (*whispered*) (*sung*)

I recommend this device from extended personal ex-

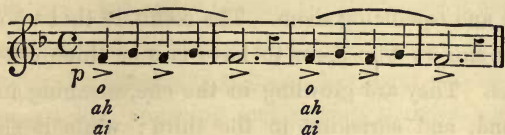
perience, and hope my fellow-teachers may find it as useful as I have found it myself. Another point of importance in practising the exercise for strengthening the opening and the closing muscles is the breathing after every tone; and this must be done gently and without effort, the only perception which the singer should have of it being a slight movement of the midriff. When you can sing the exercise in this manner on *F*, your supposed speaking tone, then go up the scale, semitone by semitone, to *B* or *C* above, and down again, semitone by semitone, to *B* or *C* below. Of the quality of tone I will say nothing here, because that part of the subject will be discussed later on in connection with the tongue and the soft palate.

The next thing in connection with the physiology of the vocal organ from which we can deduct a practical lesson is the action of the muscles governing the pitch of the voice. This process is a very complex one, and can be made clear only by *vivâ voce* explanations, with the help of good models and moving diagrams, by demonstrations with the laryngoscope, and by carefully watching external signs. There is no doubt, however, that a set of muscles, described as the "Stretching and Slackening Muscles," play the most important part in this matter, and I advise the reader to study carefully the chapter on "The Movements of the Voicebox," and try the experiments mentioned in it.

It will thus be seen that the flexibility of the voice depends in a great measure upon the control we have over the muscles governing the pitch; that is to say, upon the readiness and exactness with which we are able to allow them to contract or to relax.

Performers upon various instruments, as for instance the piano and the violin, know that certain exercises are indispensable to brilliant execution, because they strengthen the muscles of the wrist and of the fingers, and make them obedient to the will. It has even been found that simple finger gymnastics, exercising separately different sets of muscles, and making them independent of each other, are of the greatest value, and save long hours of tedious and wearisome practising. In a similar manner we may spare ourselves much trouble and gain our end most readily by vocal gymnastics, calculated to bring into play the stretching and slackening muscles of the larynx. There is no difficulty about it. Sing F, the same tone from which we started when exercising the opening and the closing muscles, and add to it G. The alteration of the pitch is brought about by a contraction of the stretching muscles overcoming the resistance of the opposing slackening muscles, thereby tensing the vocal ligaments. If you again sing F, the case is reversed, and the new alteration in pitch is brought about by a contraction of the slackening muscles overcoming the resistance of the

opposing stretching muscles, thereby *relaxing* the vocal ligaments.

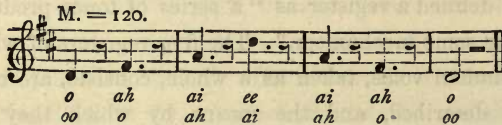


The above is an example. Take great care to render it perfectly. Sing every tone clearly and distinctly, but without jerking, at the same time *uniting* all the tones, but without drawing. Do not try how quickly you can sing, but rather how distinctly. Commence slowly, and be in no hurry to increase the speed. Raise and lower the exercise semitone by semitone within the medium part of your voice. A variety of exercises founded upon the same principles may be introduced, and will serve to increase the flexibility of the voice in a very short time.

Now we come to the “Registers” of the voice. I have defined a register as “a series of tones produced by the same mechanism.” The five registers of which the human voice, taken as a whole, consists, are carefully described, and the means by which they are formed minutely explained in a former part of this book. These registers, nevertheless, continue to be a stumbling-stone to many, and the fact of the existence in the throat of different actions for the production of different series of tones has led some teachers into

the deplorable mistake of developing and exaggerating them, instead of, on the contrary, smoothing them over and equalizing them. The result is that we often hear singers who seem to have two or three different *voices*. They are growling in the one, moaning in the second, and shrieking in the third; while it should have been their aim so to blend and to unite the registers as to make it difficult even for a practised ear to distinguish the one from the other. Such singing is outrageous, and I protest against the opinion expressed in some quarters that it is the natural outcome of the teachings of the laryngoscope.

In developing and strengthening the registers I base my first exercises upon the fact that the "Vowel Scale" goes from low to high in this order; oo, oh, ah, ai, ee, so that consequently the highest tones will be produced most readily when singing the vowels in the order just given.



Sing this exercise quite softly, strike each tone clearly and distinctly, and take a *slight* inspiration after every tone. Be careful to take a full inflation only at the beginning, and afterwards to inhale *less* air than has been consumed in every preceding tone, or you will

after a while overcrowd the lungs, and experience a sensation of being choked. This is a thing to be avoided in any case; but under present circumstances it should be remembered that the short inspirations are not taken for the purpose of re-filling the lungs, but simply to compel the "opening and closing muscles" to do their work. By so doing we give them six times more exercise than by breathing only once at the beginning; and, what is more important still with regard to our immediate object, we greatly facilitate the task of the vocal ligaments to arrange themselves in different ways according to the registers they are to produce.

It is self-evident that the danger of carrying the mechanism of a register beyond its proper limit is greater if the vocal ligaments are kept together, than it would be if they were made to separate, thereby being enabled to close again under different conditions. It will be seen, therefore, that the slight inspirations after every tone are an essential part of the exercise, and must on no account be omitted. The exercise is to be taken at a convenient pitch, and then to be raised semitone by semitone in accordance with the requirements of individual voices. It may, after some time, be taken right through upon the vowel *ah*, and finally *legato*, gradually increasing the speed, to the Italian word *scala*, singing the syllable *la* to the last note.

The change from one register to another should

always be made a couple of tones below the extreme limit, so that there will be at the juncture of every two registers a few "optional" tones which it is possible to take with both mechanisms. The singer will be wise, however, to avail himself of the power of producing an optional tone with the mechanism of the lower register only on rare occasions. To force the register beyond its natural limit is, of course, infinitely worse, and should never be tolerated. The practice carries its own punishment, as it invariably ruins the voice; and tones so produced always betray the effort (frequently in a most painful degree), and are consequently never beautiful.

It is to be observed that the exercise given above may be varied to any extent, so long as it is based upon the principle which has been explained. The beneficial results in the development of the voice will speedily be noticed, and then sustained tones may be sung through the whole compass after the orthodox fashion.

This brings me to the consideration of the "mixed voice," which is essential in bridging over the break between the "upper thick" and the "lower thin" of the tenor, and which is also frequently made use of by baritones and basses in the production of their highest tones.

The "voce mista" is "mixed" in this sense, that

it combines the *vibrating mechanism* of the "lower thin" with the *position of the larynx* of the "lower thick;" that is to say, while the vibrations are confined to the thin inner edges of the vocal ligaments, the larynx itself takes a lower position in the throat than for the "lower thin," and the result is a remarkable increase of volume without any corresponding additional effort in the production of tone. A few trials before a looking-glass will at once prove the correctness of this explanation, and, what is of more practical consequence, will enable the student with a little practice to overcome the serious difficulty of singing high tones without straining, yet with a fulness capable of being increased or diminished at pleasure.

The last thing we have to consider is the "resonator" of the human voice, namely, the upper part of the throat, the mouth, and the nose. Whether we sing *ah, ai, ee, o, or oo*, the original tone produced by the vibrations of the vocal ligaments is in either case absolutely the same, and it takes the form of one vowel or another, solely according to the shape which the "resonator" assumes, and which may be described as a mould into which the tone is cast. The quality of the voice also—its throatiness, its nasal twang, its shrillness, harshness, and ugliness, or its purity, roundness, fulness, and beauty—depend mainly upon

the nature of the resonator, and upon the way in which we work it. It is, therefore, a matter of the highest importance to be fully acquainted with this part of the vocal apparatus, and I hope my readers will follow me in a brief consideration of it with the more pleasure, as we are now speaking of parts which are directly under the control of our will, and upon the proper management of which so much depends.

There is a most able, most painstaking, and most instructive work upon this subject, "Pronunciation for Singers," by Alexander Ellis, Esq., F.R.S., &c., published by J. Curwen and Sons, to which I would call the attention of all who desire to make the best use of their voices. To be really understood this book requires that the student should conscientiously carry out all the experiments Mr. Ellis suggests. But any one doing so will, I venture to assert, rise from the study of this subject with a deeper conviction of the immense importance of the "resonator," and with a clearer perception of the best way of managing it than he ever had before. I obtain better and quicker results with my pupils since I have learnt the lessons Mr. Ellis teaches, and I have no doubt my fellow teachers will derive similar benefit from their study.

One of the few points upon which "doctors" do not differ is that the tone, in order to be pure, resonant, and far-reaching, must be allowed to come well

to the front of the mouth. It should, as the phrase goes, be directed against the hard palate just above the front teeth. But this is an unfortunate way of putting it, as the tone fills the whole cavity of the mouth, and cannot be "directed" like a jet of water upon any given point. Nevertheless the idea sought to be conveyed by the injunction is good, for it is certainly essential to good quality that the tone should be brought well forward in the mouth. This is frequently prevented by several circumstances which we will now consider :—

The "soft palate" may be in the way. This is the movable partition shaped like an arch with the little pendant called the "uvula" hanging down in the centre. It acts like a curtain. If we lower it, it hangs upon the back of the tongue, shutting off the mouth from the throat, thereby compelling the tone to pass through the nostrils, and thus giving it a nasal quality. This nasal quality increases the more the passages through which the tone has to travel are impeded; but the first and indispensable condition for its existence is the lowering of the soft palate. Raise this, and you may completely shut the nostrils and yet produce a pure vocal tone. The reason is that, with the soft palate *up*, the nose is shut off from the throat, thereby compelling the tone to pass through the mouth.

But more, the soft palate is never still for a moment while we are singing or speaking, as it assumes a different degree of tension for every vowel and also for every pitch of the voice. We see, therefore, that this curtain has great influence upon the management of the voice, and we should do all we can to get it under our control. In order to accomplish this, arrange a mirror so that you get the light reflected upon the back of your throat without bending the head, stretching the neck, or otherwise assuming an awkward position. I recommend reflected instead of direct light, because with the latter it is almost impossible to get a perfect sight of the soft palate without making any contortions, and these, however slight, are fatal to success. The management of the light will, no doubt, offer a little difficulty to those not practised in these matters, but once made it is easily rearranged, and the gain is great.

The mirror mentioned above is to throw the light into your mouth; you will require another one in which to see the image. Now try the following: Open your mouth and breath through the nostrils; the soft palate will immediately drop upon the tongue. Sing while it is in this position, and you will produce nasal tone. Now breathe through the mouth, and the soft palate will rise. Raise it higher still, by attempting to yawn, till the uvula almost disappears. Sing

again with the soft palate in this position, and if nothing else interferes you will produce pure vocal tone. If you sing up and down the scale you will perceive that the soft palate to some extent rises and falls with the pitch of your tones. You will also notice that the tension of it increases as you approach the the limit of one register, and that it diminishes as soon as you change into the next register above. All these things, and a great many besides, you will notice if you observe carefully, and by a little steady practice you will acquire easy control over the movements of your soft palate, the beneficial results of which will soon be manifested in the improved quality and the better management of your voice.

This leads me to remark that the soft palate should, as a matter of course, be in a perfectly healthy condition, or it cannot perform the infinite variety of movements required from it. In many cases however, it is in a very different state, the arch being congested, the uvula elongated, and the tonsils greatly enlarged. People with a soft palate like this are handicapped. They might as well try to run a race with a heavy weight on their shoulders as to sing or speak with such impediments in their throats. They should at once put themselves in the hands of a properly qualified medical practitioner, who may probably recommend clipping of the uvula or excision of the tonsils. Either

operation is a slight one, and in suitable cases nothing but good can follow from it.

Another obstacle to the forward production of tone is often caused by that great movable plug called the tongue. We have it on the highest authority that the tongue is an "unruly member." It is sometimes difficult to keep it under proper control, and with some people it is continually running away altogether. As under ordinary circumstances, so in singing. Instead of peacefully assuming the position necessary for the production of the various vowels, the tongue rises in rebellion; it arches up, stiffens and defies all attempts to keep it in order. The tone is consequently more or less impeded and shut in, with the result of making it guttural or throaty. Here again singing before the mirror as described above will enable the student to master his tongue and to improve his voice to a wonderful extent. All voice trainers, as I have said before, agree that tone should be allowed to come well forward, and the best plan to bring about this desirable end is to sing *oo*, then to allow *oo* to dwindle into *o*, and finally to allow *o* to dwindle into *ah*.

In some cases these *oo-o-ah* exercises are insufficient because the throatiness of tone is partly brought about by a stiffening of the throat in general. The *oo-o-ah* must then be preceded by staccato exercises upon the syllable *Koo*, which have the effect not only of throw-

ing the tone forward, but also of making the throat
supple. Make the experiment before a mirror and you
will see the reason.

I should have pointed out in the course of this
chapter that one of the great secrets in the production
of fine resonant and far-reaching tone consists in using
as little air as possible; and I conclude by advising all
those who want to be heard to open their mouths, a
thing which, curiously enough, many people in these
islands seem to be determined not to do.

VOICE FAILURE.

A NEW CHAPTER, WRITTEN FOR THE NINTH EDITION, BY
MRS. EMIL BEHNKE.

THE large and ever increasing number of professional voice users of all classes and of all grades who break down in voice is matter for serious and earnest consideration. Innumerable students of singing of both sexes, in England and abroad, suffer shipwreck of their hopes and ambitions in the loss of their voices during the process of training, long before the period arrives for professional and public voice use. In some of these cases general delicacy of constitution has been the principal factor in the failure; in others weakness of throat or lungs may have been a cause. But after making ample allowance for such physical contributories, we are still face to face with the fact that voice failure, accompanied by throat ailments, more or less serious, occurs with startling frequency, and no other reason is assigned for it than the irresponsible, indefinite one that the voice broke down under training. Of the infinitesimal number of successful students—that is to say, of those who, having completed their studies, come before the public as professional singers—so few escape the common lot that it would almost appear as if a

fatality attended the following of the vocal art; yet from a health point of view, singing is an admirable exercise, and abundant medical testimony has been adduced in proof of this statement.

There are, of course, other causes of non-success in vocal students besides break-down of voice. A fine voice and good musical knowledge are but parts of the equipment of the singer; if he have not the soul of an artist he will never rise above mediocrity. With musical and artistic failures this chapter has nothing to do, but only with preventible causes of break-down, such as have come under my personal observation from close association with the work of my late husband, and also in my own and my daughter's work since his lamented decease.

In the establishment of a rule or law founded upon general truths, a number of examples bearing upon the subject under consideration are relied on as conclusive evidence, and by their use we are enabled to analyse reasons and deduce conclusions.

From the examination of a large number of cases of vocal failure in singers and in speakers who have placed themselves under my tuition for recovery of voice, I have found that among the most frequent and most injurious mistakes are:—

- ✱ 1st. Wrong methods of breathing and of breath management.

- 2nd. Loud singing and shouting.
- 3rd. Neglecting to cultivate the resonators.
- 4th. Forcing: (a) the registers; (b) the top notes.

INCORRECT BREATHING.

As regards methods of breathing, the descriptions and instructions given in this volume require no addition, and if carefully followed will prove of inestimable advantage both hygienically and vocally. It is, however, a fact that, not only in England, but also on the Continent, pupils are taught to breathe clavicularly, in opposition to Nature's method, which is diaphragmatic—*i.e.*, the combined forms of rib and diaphragm breathing. The following is a striking example of the evil of clavicular breathing.

During last summer an American lady, who had been studying singing in Milan for three years, came to me in great distress. She had expected to appear in Grand Opera in London, but, alas! her voice broke down, and serious throat troubles manifested themselves. She had lost all the upper notes of her voice from C in alt. down to D in the stave, and what was left of it was thin, reedy, and tremulous, like that of an old woman instead of a girl of 24. Her master had insisted on clavicular breathing, the result being that when her lung capacity was tested it registered only 80 cubic inches instead of 240. In addition to faulty

breathing, she had been allowed to force up the registers of the voice to such an extent as to bring on serious congestion, with varicose veins in the vocal ligaments and in the pharynx. After several lessons the breathing capacity increased to 200 cubic inches, the voice regained some of the upper notes, and lost the "cracked," tremulous sound. In time, with great care, the majority of the notes will come back, but probably C in alt. will never be reached again, and the general deterioration of voice may never be fully overcome.

Numerous similar instances, in men's voices as well as in women's, could be adduced, but the foregoing suffices; the results of incorrect breathing and of forcing being much the same in all cases, differing principally in degree.

In the "Treatise on the Art of Singing" by the late Signor Lamperti, occurs the following passage, which fully bears out the necessity for diligent acquirement of correct methods of breathing:—"Masters of the present day, instead of obliging pupils to make a severe study of the art of respiration, as a rule, omit it altogether, and take them through the greater part of a modern opera at every lesson, to the certain ruin of their voices, and often at the expense of their bodily health. How many young singers come to Milan or to Paris with beautiful voices, musical talent,

and every other natural gift, who, after putting themselves under the guidance of a master for two years, study modern operas; how many of these unfortunately find at the time of their *début* that their voices, instead of being fresh and improved by education, are already worn and tremulous, and that, through the ignorance of their master, they have no longer any hope of success in their artistic career, which was finished before it was begun." A sad but an "over true" description, applicable to other centres of voice-training besides Milan and Paris.

It is scarcely possible to over-estimate the importance of correct methods of breathing and of breath management to all voice users, whether they are singers or speakers. As breath is the motive power of all voice it needs but little consideration to arrive at the conclusion that the best method of supply and control of this motor power is of vital necessity to those who depend upon their voices for success in their vocation, whether it be that of singer, clergyman, lecturer, or actor.

Some of the worst descriptions of stammering owe their origin to improper breath management, and numbers of such cases which have been under my care have been perfectly cured by specially designed breathing exercises, adapted to the requirements of each individual case, combined with training of the various muscles

employed in articulation. As no two persons stammer alike there can be no universal panacea for the cure of this terrible affliction; it is, therefore, necessary to study the peculiar idiosyncrasies of each case before formulating a plan of treatment; and this makes it impossible to write rules for self-cure suited to every case.

LOUD SINGING.

The practice of always singing loudly is greatly to be deprecated, leading as it does to undue strain, to coarseness of the voice, and to utter inability to modulate it into softness and purity of tone. Anyone can shout and bawl, but not every one can sing softly—therefore always practise softly until the voice be well formed, when it will be easy to increase the volume of sound. Constant shouting causes the muscles of the larynx to lose their contractile power, and a condition is brought about which is analogous to writer's cramp. Sometimes no voice can be produced, while at others it is given forth in a series of uncontrollable jerks. Singers deficient in resonance, and who have not acquired the best use and control of the various parts of the resonator, resort to the objectionable practice of forcing their voices, relying upon power of blast and vigour of shout instead of cultivating resonance. A loud, big voice, produced with effort, is a manifestation of a certain amount of physical power; but such voice-

production is not singing, it is mere shouting. Tones so produced will ultimately show their bad origin by the effect left behind on the misused muscles.

CULTIVATION OF THE RESONATORS.

The resonators of the human voice, about which years ago Emil Behnke lectured and wrote, are only just beginning to receive the attention which their important functions deserve. Over some of the resonating cavities we can obtain no voluntary control; but over the whole of the buccal cavity, and over part of the pharyngeal we may, by education, gain as much influence as over the fingers of the hand, and the results obtained by such training are frequently astonishing. A student at one of our colleges came to me recently whose first question was "Can you teach me how not to sing with a 'squeezed' throat?" "Nothing easier," was my reply. On his singing a few notes to me, the tone of the voice revealed that owing to want of knowledge of the action of the resonators, he was closing his throat in such a manner that the voice sounded as if he were singing through the teeth of a comb. Without looking in his mouth, I drew on a piece of paper the position in which were his soft palate, the pillars of the fauces, the uvula, and the tongue, telling him that was the picture he would see on looking at his throat while singing.

This proved on examination to be the case; and great was his wonderment to find that, after a little practice he could voluntarily remedy this squeezed position until it gradually disappeared altogether, and with it the unpleasant quality of voice which had caused him so much trouble.

The inherent quality of tone is reinforced by the vibrations of the air in the resonance cavities, the greater fulness of the sound being caused by the increased quantity of air which is set into vibration. The slightest alteration in the shape of these cavities affects the quality of vocal tone by altering the direction and size of the air columns.

There is for every tone an air column of a certain size which most powerfully reinforces that tone; and every resonance cavity answers to some particular note better than to others. Timbre in the voice depends largely upon the echoing and re-echoing of these resonance chambers; and it needs but little reflection to see that the shape given to the mouth in pronouncing speech sounds—more especially vowel sounds, with all their various shades—interferes more or less with the purity and quality of tone. Hence the necessity in singing for modifying vowel pronunciation to suit the various tones and pitches of the voice. Every shade of vowel has a certain pitch of its own which is best produced by certain positions of the mouth, tongue,

and soft palate. It is, therefore, necessary, carefully to shape the mouth so that, on notes of different pitches, the configuration of the mould may be that which gives the best quality of the particular vowel tone. There must be an unimpeded passage for the voice from the larynx to the lips, and this cannot be obtained if the same vowel shades are maintained in song as in speech. The vowels which require the greatest alteration in position of the mouth are A, E, and U; E being quite the most difficult, because, contrary to the opinion of some teachers who consider it the best for forward production of tone, it keeps the sound farther back in the throat than any other vowel, shutting it up and making the sound thin and poor. Diligent practice before a mirror is necessary in order to acquire the best position of the buccal resonance chamber; its attainment will well repay the trouble taken, for not only will the voice gain in timbre, in resonance, and in ease, but pronunciation will become pure and clear.

The vowel "ah" is frequently chosen as the best one for vocalising, because in its pronunciation it is easy to put the mouth in a good position; and voices are trained on it exclusively, with the result that no other vowel, or vowel shade, is perfectly produced. Actual false intonation often arises from want of practice in adjusting the cavity of the mouth to that shape required for producing the best tone and resonance on the different notes; the absence of co-ordination

between the fundamental tone and the overtones preventing perfect tune.

The absolute truth of the foregoing remarks may easily be proved by singing the vowels at either extreme of the "vowel scale of nature," viz., "oo and ee," over the whole compass of the voice, having regard to the beauty of tone. Although the singer may be quite unaware of the science underlying the fact, it will be found that the quality of the voice at the bottom of its range as these vowels are sung is very different from that at the top of the range, the alterations taking place in almost imperceptible gradations. By reference to the foregoing pages of this book it will be seen that the late Emil Behnke attached great importance to vowel training, and exemplifications of his methods are to be found in "Voice Training Exercises" and "Voice Training Studies" written in conjunction with C. W. Pearce, Mus.Doc. The subject is also fully explained in "Voice, Song, and Speech," by Lennox Browne, F.R.C.S., and Emil Behnke; and the whole matter is most ably discussed in "Pronunciation for Singers," by the late Dr. A. J. Ellis, F.R.S., published by Messrs. Curwen & Sons.

In thus strongly advocating education of the resonator in the production of vowel sounds in singing, let me not be supposed to ignore the necessity for also cultivating pronunciation of consonants, which have been termed the checks and stops of sound.

Clearness of enunciation and purity of pronunciation, which are great aids to the voice, and possess a charm all their own, depend upon both vowels and consonants being accurately rendered.

The English are the worst enunciators of all European peoples, and their custom is to lay the blame on the language, than which none other is deemed by them so unvocal. There is, however, a vast amount of sonority and musical charm in our grand and noble language, second only to the Italian, when properly spoken.

The cultivation of pure, accurate, and refined pronunciation in speech will greatly facilitate good enunciation in singing, and should be sedulously acquired; for there are numbers of vocalists who leave us in doubt as to whether the words they sing are English, French, Italian, or German; while the number of those who mispronounce words in a deplorable manner is legion.

FORCING THE REGISTERS.

The next factor which has much to do with voice failure is forcing the registers beyond their proper point of change. The erroneous belief appears to exist that, by carrying up the registers a few notes beyond their natural limits, the tones thus produced are fuller and richer. But if in training a voice this practice be followed the result will be serious injury to the vocal organ.

This is not a theoretical statement; we can easily see with the laryngoscope the great amount of congestion of the vocal ligaments immediately caused by thus forcing up a register; and not only are these affected by the strain put upon them, but the whole interior of the throat becomes blood-red, and looks irritated and inflamed. As soon as the change to the right register is made the vocal apparatus returns to its normal state.

Now we all know the effects of undue strain on muscles in other parts of the body, and have felt the pain and weakness arising therefrom; but far worse results follow the damage to the throat caused by the strain of forcing up the registers, by both speakers and singers. The quality of the voice becomes impaired, and actual loss of notes follows. In some extreme cases which I have had under my care, there has been entire absence of voice both in speaking and in singing, and much suffering has been experienced from granular inflammation of the throat brought on by this faulty voice use.

Another method of forcing the voice is the almost universal endeavour to acquire "top notes" which do not belong to the singer's compass. Because of the high notes in some voices exceptionally endowed by nature, it seems as though all singers, no matter what their natural range, have made it the one object of their training to strive after a vocal attainment whose rarity appears to be almost its only justification to be

considered as an artistic merit. Why should these ever vanishing "top notes" be so much craved and striven for? Can it be said that, as regards each individual voice, these notes are higher in a scale of excellence than the rest? What merit does their acquisition promise as a set-off to the deterioration of the voice and its inevitable ultimate failure? A high note, *per se*, is not necessarily "a thing of beauty" to the listener, while the result of its attainment is often the converse of a "joy for ever" to the singer; for in those cases of forcing up the voice above its natural compass, violence is done to the throat, which in time results in some of the many ailments peculiar to singers who use faulty methods. The middle range of the voice becomes proportionately weaker and thinner as the cult of the extra "top notes" becomes greater, until the anomalous position is reached of a voice with two ends and no middle; while these superadded, artificial, high notes are wanting in timbre, in purity, in strength, and in ease. It is easily demonstrable by the laryngoscope that the forced and strained action of the vocal ligaments, and of other laryngeal and throatal muscular action, exercises an injurious influence upon the voice. The endeavour to sing notes beyond the extreme of the compass, or notes which do not naturally lie within any one register—particularly the chest register—causes great fatigue of the tensor muscles of the vocal

ligaments, and serious congestion, extending to the windpipe and pharynx has, in many cases, followed this practice.

More time and energy are devoted to the acquirement of what the late Emil Behnke called "mere acrobatic skill" than is given to the purely artistic side of voice use, and it follows that we get "the survival *not* of the fittest" but rather of those with exceptionally strong physical organisations, instead of refined artists.

The deterioration throughout the whole compass of the voice is often painfully noticeable during an entire song, but the forcible shouting of a full, high-pitched note at its close seems to be intended to compensate for all the misery previously endured by the sensitive listener.

Now the maintenance of a healthy condition of the vocal muscles depends to a great degree upon the right use of those muscles in the formation of tone. There should never be any feeling of fatigue, strain, pricking, tightness, aching, or of pain in the throat, nor yet of huskiness after vocal practice. The method of voice use which produces such results, or any one of them, is wrong. Nature is pointing out as forcibly as possible the injury which is being done. Her warning should be heeded before conditions, getting worse, lead up to the sad ailments from which so many suffer, and which are disastrous to both voice and health.

The foregoing facts and illustrations force upon us the conclusion that the large majority of throat affections from which both speakers and singers suffer might be entirely prevented by correct methods of voice use. As prevention is proverbially better than cure, it must be infinitely more advantageous to acquire correct methods than to unlearn bad ones which exercise a deleterious influence, always recognisable even when entire voice failure has not followed their practice.

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Opinions of the Press and the Medical and the Musical Professions on the Author's Book, Lectures, and Teaching.

SIGNOR GARCIA writes to the Author:—

DEAR SIR,—Very many thanks for the copy forwarded to me of your most interesting work. It will prove of an inestimable advantage to students, being, in my humble estimation, one of the clearest and most practical treatises on the subject which contemporary literature has produced. Accept also my sincere thanks for the description contained in your work of the origin of the laryngoscope, and believe me, dear sir, yours most sincerely,
M. GARCIA.

THE ATHENÆUM.

Herr Behnke has followed the example of Dr. Holmes and Mr. Lennox Browne in discussing simultaneously and in a popular manner the biological and the artistic aspect of the subject forming the title of his work, but, unlike the two latter writers, he does not enter into medical details, and his little manual is interesting, compared with those previously published, as being written by a musician and not by a medical man. Hence we are not surprised to find purely musical questions discussed here with great ability. The author has not been very successful in popularizing the hard names of the structures found in the larynx. Any vocalist really interested in the scientific study of the organ of the voice will readily learn such names as larynx, thyroid, cricoid, and arytenoid cartilage, &c., and the terms "voicebox," "shield," and "ring" may be the cause to him of great confusion if he refers to other works,

or to diagrams where the former and more scientific synonyms are employed. "Back-ring pyramid muscle" is almost as hard a mouthful as "*crico-arytenoideus posticus*;" but we admit that Herr Behnke has had to face a difficult question never yet satisfactorily arranged by any authority. The essential object of his manual is well maintained. He defines the somewhat mysterious "register" as "a series of tones which are produced by the same mechanism." There are three registers in the human voice: the "thick," expressing the vibration of the entire vocal ligaments (*i.e.*, cords) during the lowest series of tones; secondly, the "thin," the vocal ligaments vibrating only with their thin inner edges; and lastly, the "small register," where a portion of the glottis is firmly closed, only a small part of the vocal ligaments vibrating, which occurs during the highest series of tones. Mr. Curwen was the first to employ these terms. Herr Behnke believes that a register may be carried down without fatigue to the voice, though its volume then becomes weak compared with the corresponding lower register. On the other hand, he strongly condemns the extending upwards of a lower register, since this must involve visible straining and fatigue of the organ of the voice. The straining of the vocal ligaments is "visible," of course, by means of the laryngoscope. The practice of extending voices upwards and cultivating "made tones" is most disastrous to the voice, though popular among teachers ignorant of the subject with which Herr Behnke endeavours to make them conversant.

NATURE.

The object of this little book is to give singers a plain and comprehensible view of the musical instrument on which they perform. The author seems to have succeeded in this attempt remarkably well. He has evidently had much practical work himself, and has especially set himself the task of examining the action of the vocal organs during singing by means of the laryngoscope; and his record of his own experience in acquiring the use of that beautiful instrument is not only interesting, but of much practical value. The last section of the book is devoted to the teachings of the

laryngoscope as to the action of the vocal ligaments in producing voice, with especial reference to the so-called registers. "A register consists of a series of tones which are produced by the same mechanism," is his definition (p. 71), which is new and complete, and he proceeds to explain the different mechanism of each kind of register as actually observed on singers. There are some good remarks on breathing (pp. 17-22). All information is given throughout in clear, intelligible language, and illustrated by fourteen woodcuts (not all original), which are purposely rather diagrammatic in character, in order not to confuse the eye with too many details at a time, but every essential point is gradually introduced. The author seems to have been diligent in the consultation of the authorities as well as in practical work of his own, and the book may be safely recommended to all singers, and others who are desirous of knowing how vocal tones are produced.

SATURDAY REVIEW.

On the important question of the different registers of the voice and their proper use, Mr. Behnke practically breaks new ground. He has carefully gone over the whole subject of the production of the voice as far as the larynx is concerned, and worked it out anew by a long and careful series of experiments and observations with the laryngoscope. . . . Mr. Behnke's book is clearly written, and the plates well drawn and printed; while the anatomical details are made clear to the general reader by the use of English names for the different parts. . . . It is a very valuable book, and ought to be read and thought over by all who have the training of young singers, and indeed by all musicians.

MEDICAL PRESS AND CIRCULAR.

The proper method of using the voice is a subject which is, of course, of paramount importance to singers and others who get their living by their vocal organs. As in everything else, there is in singing a right and a wrong way. Thoroughly to comprehend the right way it is necessary to have an acquaintance with the mechanism of the organs concerned, and many books have been written with this end in view. The latest, and in some respects

one of the best, is one by M. Emil Behnke, Lecturer on Vocal Physiology at the Tonic Sol-fa College, entitled "The Mechanism of the Human Voice." In clear and untechnical language the author gives an accurate account of the construction and mode of action of the human larynx, its differences in men, women, and children, and the teachings of the laryngoscope, notably with respect to the "registers" of the voice. In some points M. Behnke is at variance with the opinions of other authors—as, for instance, in respect to the production of the falsetto voice, and of nasal tones. These are points, however, which require further investigation for their absolute settlement. M. Behnke is evidently an accurate observer and a logical reasoner, and a study of his work side by side with Witkowski's "Movable Atlas of the Throat and Tongue" must be advantageous to any one desiring to make the best use of his voice.

THE SPECIALIST.

This useful little book is the outcome of the author's large experience and careful research. It is written concisely, in clear and untechnical language, and frequent references are made to such authorities as Huxley, Lennox Browne, Eberth, Carpenter, Marshall, Luschka, &c. That Herr Behnke thoroughly understands his subject no one who reads his book can doubt, and if those who wish to know the right way to sing and avoid the wrong way will carefully study this little manual they will not go far wrong. For all who are dependent on the right use of their voices for their daily bread, Herr Behnke's book will be most opportune.

MUSICAL STANDARD.

Professor Behnke has written his book for the sake of those who wish to study the mechanism of the vocal organs without the trouble of wading through large books which contain an amount of matter on other subjects which they do not wish to study. The various organs employed in the production of voice are described with great clearness. There is a useful chapter on "The Laryngoscope, and how to use it," and another on "The teachings of the Laryngoscope," both of which contain a good deal of very useful

matter. The engravings are drawn on a large scale, and cannot fail to serve their purpose. The four pages on "Movements of the Voicebox which can be seen or felt" furnish an excellent specimen of a familiar way of putting unfamiliar truths.

MUSIC TRADES REVIEW.

Works on vocal physiology have appeared in quick succession in recent years. But whatever may have been the intention of their authors, they have appealed more directly to the anatomical student than to the learner in the art of vocalization. There are excellent reasons why singers should possess an intimate knowledge of the structure and functions of the various organs concerned in the production of the voice, and this knowledge they are likely to gain more easily and effectually from the present treatise than from any other with which we are acquainted. Mr. Emil Behnke writes in a singularly clear and lucid manner, and if his book be not exactly light, it is very interesting reading. Much of the information conveyed is invaluable. For example, the reason wherefore French vocalists trained at the Paris Conservatoire are victims to the horrible *tremolo* is clearly explained, and one very popular error with respect to the human voice is refuted. Many instruction books on singing declare that the tenor voice is an octave below the soprano, and the bass an octave below the contralto, the fact being that the three registers known familiarly as the chest, the falsetto, and the head are absolutely identical with the male and female as regards the lines of demarcation. Garcia's work takes note of this, but it is more fully set forth in the present volume, which we cannot too strongly recommend to the perusal of vocal students.

MUSICAL EDUCATION.

After carefully reading the book we are at no loss to understand how it is that there is such a demand for it amongst the members of the musical public. The style is admirably simple and lucid, and every statement made is in accordance with the latest views on the subject held by physiologists and anatomists of acknowledged eminence.

THE VOICE.

This book is clear and plain, and gives just the information that every singer and speaker should have. It is the ablest and most practical treatise on the voice we have seen.

THE INQUIRER.

Men have set themselves to try and ascertain the actual process by which vocal sounds are produced, and thus to form a scientific basis on which to found a way of training voices. Herr Behnke, in a singularly clear and lucid manner, brings the whole subject before the reader, and, to make it readily understood by non-scientific people, gives a translation of the Greek terms used by physiologists side by side with the originals. We cannot too strongly insist upon the necessity of forming a scientific basis for teaching singing, and, indeed, for training the voice for public speaking, &c. We congratulate Herr Behnke upon the patience and perseverance with which he has pursued his investigations with the laryngoscope.

FIGARO.

Messrs Curwen and Sons have published from the pen of Herr Emil Behnke, late of Birmingham, and now Lecturer on Vocal Physiology at the Tonic Sol-fa College, a work on "The Mechanism of the Human Voice." A gentleman who has lectured on these subjects at University College, the Tonic Sol-fa College, and the Musical Association has a good right to be heard, and there is reason to believe his facts and his conclusions are endorsed by at least one eminent throat and ear surgeon. Many books have, of course, been written on the theory of voice production, but the object at which Herr Behnke aims is, first, to bring before the reader the entire subject from beginning to end, and secondly, to do so in an easy and homely manner, all technical and medical phrases being either amply explained or discarded altogether, and the whole being illustrated by clear diagrams. . . . He first gives a very clear description of the voice-producing apparatus, quoting extensively from Huxley, from the admirable works on the subject written by Mr. Lennox Browne, from Professor Eberth, Dr. Carpenter, Professor Marshall, Dr. Luschka, and

others, and illustrating his subject with numerous diagrams. He next deals with the difference of the voicebox in children, women, and men, and with the "break" of the voice at a certain age. The movements of the voicebox which can be seen or felt are next treated, and the book concludes with a copious description of the laryngoscope and an essay on its teachings. The book is written in very clear language, and in a way that can be easily understood by those who feel interested in the physiology of the voice without comprehending the abstruse or scientific language frequently used in medical and other books which have dealt with this subject. Professional and amateur vocalists will be specially interested in Mr. Behnke's work on "The Mechanism of the Human Voice," and it is, perhaps, in view of its adoption by the general public that the publishers have fixed the price of the book at the moderate sum of three shillings.

MUSIC.

Mr. Emil Behnke has already made himself known to the leading members of the musical and medical professions by his learned lectures on "The Theory of Voice Production," and has gained the esteem of those interested in the subject by the masterly manner in which he deals with the matter, as well as his unaffected and, as far as possible, untechnical treatment of it. Mr. Behnke has done much to popularize the study of the human voice, and his book (which abounds in admirable plates) deserves to be widely known.

EDUCATIONAL TIMES.

It is but rarely that science figures as the handmaid of art, yet this book is a signal instance of it, for it is one of the first attempts, if not the very first, at an investigation, on strictly scientific principles, of the normal and the abnormal development of the voice, both in speaking and singing. Herr Behnke, who is both a musician and a physiologist, has brought to bear upon this subject his knowledge as a musician, and the results of several years of patient and careful scientific experiments. Several of his conclusions have been arrived at by other eminent physiologists; but these have not had his special aim in view—to clear up

the difficulties of singing and speaking. . . . Many hitherto prevalent notions on the treatment of the voice are shown to be erroneous, and much new light is thrown on some of the more abstruse and debatable points of the mechanism of the voice. We cannot too highly commend this little work to the attention of all those interested in so important a subject.

BIRMINGHAM DAILY GAZETTE.

The special purpose of the author of this little book is to furnish a simple and comprehensive treatise on the physiology of the human voice. Hitherto students who have wished to obtain a knowledge of the subject have had to wade through a number of books, and, unfortunately, the statements of different writers have been so much at variance that it has been a difficult task to determine what to accept as truth. Herr Behnke's theories are based upon carefully-conducted experiments with the laryngoscope, and have the support of positive facts. His statements are made clearly and sequentially, so that there is no fear of misunderstanding on the part of the reader. The first part of the book is devoted to the description of what is called the vocal instrument. The second part treats of the differences of the voicebox in children, women, and men. The third part is on the movements of the voicebox which can be seen and felt; and the concluding chapters are on the laryngoscope, and how to use it, and on the teachings of that instrument. The text of the book is supplemented by a large number of engravings, and throughout there are remarks which all who essay singing or public speaking, and all who undertake the teaching of singing, should carefully consider. Since Herr Behnke's removal from Birmingham to London he has become an accepted authority on the subject of voice production, and we are glad to see the results of his studies presented in the useful way in which they are in this little volume. Earnest and conscientious students of the vocal art need not be reminded that the production of fine tone is not the all-in-all of the excellences of singing, but they will certainly know better how to employ their gifts after mastering the secrets Herr Behnke reveals.

FROM THE ANNUAL ADDRESS OF THE PRESIDENT OF THE
PHILOLOGICAL SOCIETY,

ALEXANDER J. ELLIS, ESQ., F.R.S.

The especial requirements of the singer led to Garcia's laryngoscope, which in the hands of Czermak, Merkel, Madame Seiler, and Herr Behnke, has quite recently thrown new light upon some of the obscurest problems of speech sounds, by making the actual motions of the glottis visible. Herr Emil Behnke has twice lectured on this subject before the Tonic Sol-fa College, once to the medical students of University College, and once to a musical audience there. He has the rare power of showing his glottis reflected in the laryngoscope while he is in the act of singing, and of hence demonstrating the meaning of the *registers* of the human voice.

ABERDEEN UNIVERSITY, 23rd February, 1881.

I heard Herr Behnke give two lectures this winter in Aberdeen on the Anatomy and Physiology of the Larynx, and on the management of the voice, and he also spent some time with me at the Anatomical Rooms, discussing with me the uses of the parts, with the dissections of them before us. Herr Behnke's lectures were in all respects excellent, such as could not fail, I should think, to interest every one, and to be of great practical use to public speakers and singers in the management of the chest and voice. He has that sound acquaintance with the anatomy and physiology of the parts, without which no one can speak of the voice with edification.

I have no hesitation in recommending Herr Behnke as a lecturer whose services are well worth securing.

JOHN STRUTHERS, M.D.,
Professor of Anatomy.

GLASGOW UNIVERSITY, 8th March, 1881.

MY DEAR HERR BEHNKE,

Will you accept my thanks for the opportunity I have had of learning the method which you so successfully follow

in your London work? My inquiries regarding your teaching were satisfactory as to the painstaking thoroughness of your work, and my talk with you had proved your full acquaintance with the anatomy and physiology of the organ of voice. But it was not till I heard your lecture that I appreciated the full value of your teaching. Then I realized the influence for good which your remarkably clear and graphic expositions were calculated to exert. I wish that teachers of singing would avail themselves of your knowledge: it would be to the benefit of music; while many a preacher and public speaker would be spared the suffering which neglected teaching has entailed on *me*. Wishing you success in your valuable work,

I am, yours very truly,

JOHN YOUNG, M.D.,

Professor of Natural History.

GLASGOW UNIVERSITY, 9th March, 1881.

I have much pleasure in stating that I have heard Herr Behnke deliver two lectures on the Physiology of the Larynx and on the Human Voice, and that I was impressed both by his profound and accurate knowledge of the subject and by his skill as a lecturer and demonstrator. His explanations are lucid, pointed, and thorough; his manner is interesting and fitted to enlist the sympathies of his audience; while he is able, by his practical knowledge, to show the value of an acquaintance with the mechanism of the organ of voice to all engaging in vocal music. Such lectures as those of Herr Behnke cannot fail in being useful, as they show the powers and capabilities of the organ of voice as a musical instrument, and the principles on which it must be trained so as to enable it to do its work with the greatest amount of efficiency.

JOHN G. M'KENDRICK, M.D.,

Professor of Physiology.

UNIVERSITY COLLEGE.

The medical students of University College assembled to the number of about 200 to hear a lecture which Professor Sharpey

had specially asked Herr Behnke to deliver on "The Human Voice." . . . When the demonstration was over, Professor Sharpey moved a vote of thanks to the lecturer, which was carried in the hearty style for which medical students are noted. The perfect silence and attention which prevailed during the lecture hour was the best proof of the interest awakened.—*Choir.*

UNIVERSITY COLLEGE.

On the 7th inst. Herr Behnke gave his demonstration of the vocal organs, in Professor Foster's theatre at University College, kindly lent for the occasion. The audience was composed of about 100 professional teachers of singing, professional singers, and students of the Royal Academy of Music. Mr. Henry Leslie occupied the chair, and among those present were Miss Banks, Miss Julia Derby, Mrs. Sydney Smith, Madame Caradori, Miss Elizabeth Philp, Mr. W. H. Cummings, Mr. Maas, Mr. Lansdowne Cottell, Mr. Dudley Thomas, Mr. Walworth (Professor of Singing, R.A.M.), Mr. Henry Lahee, Mr. Goddard, Mr. Handel Gear, Mr. G. W. Martin, Mr. G. W. Rush, Mr. Sydney Baird, Mr. John Courtney, Mr. Elton Glover, &c. Sir J. Benedict wrote, regretting his inability to attend, owing to an engagement at Brighton. Mr. Leslie, in introducing the lecturer, said that the number of distinguished musicians he saw around him testified to the interest felt in the subject. It was especially important to all connected with large choral bodies. Herr Behnke then proceeded to give his lecture, which occupied about an hour, and was listened to very closely, and much applauded. The audience then gathered around Mr. Behnke, and watched the action of his vocal cords.—*Tonic Sol-fa Reporter.*

THE MUSICAL ASSOCIATION,

HARLEY STREET.

There was an influential audience at the meeting of the Musical Association on the 3rd ult., to hear Herr Emil Behnke's lecture on the Mechanism of the Voice. Amongst those present were Mr. W. H. Cummings (in the chair), Mr. Otto Goldschmidt and

Madame Goldschmidt (Jenny Lind), Drs. Lennox Browne and Llewellyn Thomas, Mr. E. Prout, Rev. T. Helmore, Mr. C. E. Stephens, Mr. James Higgs, &c. Herr Behnke's demonstration was illustrated by his working models. The lecture was delivered throughout with an earnestness and confidence—the latter the fruit of prolonged investigation—which fixed and held the attention of the audience, and stirred them into frequent applause. The whole lecture was a masterpiece of exposition, and fully deserved the remarkable compliment of Dr. Lennox Browne, who said that the greatest living physiologist, even Professor Huxley, could not have made the subject clearer than Herr Behnke had done. Madame Goldschmidt, Mr. Orlando Steed, Mr. Helmore, &c., took part in the discussion. We understand that Herr Behnke is prepared to deliver his lecture for literary societies, &c. It cannot fail to be of interest to singers, and to the general public.—*Tonic Sol-fa Reporter.*

COLLEGE OF ORGANISTS.

Herr E. Behnke has just completed a most able and valuable course of lectures on the "Physiology of the Human Voice," with moving diagrams, &c. These lectures have secured the interest of discriminating and musical audiences. A hearty vote of thanks was offered to the talented lecturer, upon the proposal of Mr. E. H. Turpin, on the completion of the course, as arranged for by the Council of the College of Organists.—*Musical Standard.*

TRINITY COLLEGE.

On the 13th ult. a paper entitled "The Human Voice: its Mechanism and Management," was read by Herr Emil Behnke, who illustrated his remarks by large working diagrams of the larynx, &c. A large number of the College Licentiates, Associates, and other musicians were present, and testified by their attention and applause how thoroughly they entered into the spirit of the talented lecturer's discourse. A hearty vote of thanks to Herr Behnke was proposed by the chairman, Mr. E. J. Hopkins (Organist of the Temple Church), and seconded by Mr. C. W. Pearce, Mus. Bac. Cantab.—*Tonic Sol-fa Reporter.*

LITERARY INSTITUTION,

ALDERSGATE STREET, E.C.

The first monthly meeting of the season, promoted by the Tonic Sol-fa College, was held on the 9th ult., at the Literary Institution, Aldersgate Street, when Herr Emil Behnke gave a demonstration and lecture on the physiology of the voice. Dr. Lennox Browne presided, and there was a large attendance, Mr. Behnke's moving diagrams, accompanied by his clear explanations, being watched with much interest. Frequent applause showed the success of the lecturer in explaining his difficult subject. At the conclusion of the lecture, Dr. Lennox Browne said that Herr Behnke was well known personally to many of those present, and by repute he was known to a still wider circle. He himself esteemed it an honour to preside that evening, and to be a witness, not for the first time, to the happy way which Mr. Behnke had of bringing his subject home to all. He was quite in accord with Mr. Behnke in what he had said about breathing. He remembered that on the first occasion on which he had heard Herr Behnke, Madame Goldschmidt, who was present, remarked that she had always breathed near the collar-bone. But this was a bad method of breathing, and was not to be defended because great singers had used it. The true way of breathing was at the diaphragm. He (Dr. Browne) was also prepared to support Herr Behnke in his rejection of scientific terms, or rather his translation of Greek words into English, which conveyed a meaning to all who heard them. There was present that evening a physician from New York, Dr. Elsberg, who had done much to popularize the study of the larynx in his own country, and was president of the Laryngological Society of New York. Dr. Elsberg and Mr. Behnke had worked independently, but had come to the same conclusions. The study of the voice had been a part of the programme of the Tonic Sol-fa College long before it had been taken up by Trinity College or other musical institutions, and it was now becoming general among musicians, Signor Garcia having led the way. Madame Dolby had recently told him that it was much better that singers should be taught by a teacher possessing

their own class of voice — sopranos by soprano, &c; Madame Sherrington, he believed, was of the same opinion. He (Dr. Browne) thought that a gentleman with a tenor voice could teach voice production to any pupil, but that the highest degree of finish was best imparted by a teacher with a similar class of voice to the pupil. In his medical experience he found that persons who suffered from their voices generally owed their ailments to bad habits of using the voice, and not to any defect in the larynx or resonance chamber. In several cases lately he had sent such patients to Herr Behnke, who had given them lessons in correct breathing, and had restored their voices to them in a remarkably short time. Singers and speakers would soon acknowledge universally the value of physiology in the practice of their arts. It was a great mistake to point to great singers who possessed no knowledge of physiology, and to conclude from that that physiology was of no use. There was no doubt that the control and management of the voice might be taught by rule and practice, and from skilled students artists would easily be developed. The voice, however, was a delicate organ, and should be subjected only to skilled treatment. He (Dr. Browne) held in his hand a recent work by a clergyman on the voice and public speaking which was full of false and dangerous physiology, calculated to ruin the voices of all who obeyed its injunctions. The chief advice of the author might be summed up in the words "take plenty of breath, and shout." In olden times books of dangerous tendency were burnt or chained up, and it would be a good thing if some modern books were treated in the same way.—Dr. Elsberg, of New York, being called upon by the chairman, rose to endorse Herr Behnke's doctrine and facts. Of course the larynx must not be spoken of as the entire factor of voice. The mouth had much to do in the production of tone. Dr. Elsberg pleaded for more attention on the part of musicians to the physiology of the voice.—Mr. J. S. Curwen moved, and Mr. A. J. Ellis, F.R.S., seconded a vote of thanks to Herr Behnke and Dr. Browne, the latter remarking how glad he was that Herr Behnke was making a profession of his subject.—*Tonic Sol-fa Reporter.*

Some Opinions on Mr. Emil Behnke's Work and Method.

THE MUSICAL HERALD.

Mr. Ben Davies went to Mr. Emil Behnke, and a few lessons did him more good than all his years of study, simply because, as Mr. Davies says, Mr. Behnke gave him a practical illustration at once of what he ought to do. He never found anyone until then who could explain and show what the "mixed voice" really meant. Mr. Behnke did not attempt to teach him songs, but for voice-production he considers that Mr. Behnke is the most competent professor in London. . . . What is the result of this training? A naturally good voice, gradually spoiling, was saved in time; the upper G, A, and even higher notes are sung without any strain; and the volume of voice is so much increased that Mr. Davies is able to fill the theatre till it rings. Mr. Davies, as may be expected, is a warm friend of Mr. Behnke, but it is from conviction rather than friendship that the successful pupil recommends young singers to go to his singing-master before learning style and culture. Mr. Behnke, he says, will put them in the right way of producing the voice, and when they can do that half the battle is won. The worst feature of the cases with which Mr. Behnke has usually to deal is that he has to unteach the bad plans of others. The way would be easier if solo singers went early to him, and then allowed the voice to develop in the right way.

THE TIMES.

He was universally considered as a leading authority on the voice.

FROM A TEACHER OF SINGING IN MANCHESTER.

MANCHESTER, 1892.

During the last few years I have given up an organist's post value £80 per annum, and the teaching of the pianoforte and harmony, to follow your system. I have achieved excellent results with your methods, musically and financially, and have always a good complement of pupils. My own voice has wonderfully improved in quality, compass, and power, thanks to your admirable lessons.

CINCINNATI, OHIO, *March*, 1892.

It is now several years since I spent a winter in London in vocal work under your invaluable instruction, and I look forward with pleasure to pursuing it again some day. Every day I recall some suggestion you have made to me in some lesson on voice-training. Your exercises and various text-books have been in constant use in my work and that of my friends and pupils. There are no works on the voice which stand so high, and are regarded as such high authority as yours. I hear them quoted on all sides.

FROM A TEACHER OF SINGING.

I have for several years been engaged in singing and teaching (principally in Australia), and have found from experience that no method is as good as yours.

DUNEDIN, NEW ZEALAND.

It is my duty and pleasure to tell you how effective I have found your exercises. . . . I thank you for the valuable artwork which you have accomplished, and once again add my testimony to the long list of other testimonies which you must have received as to the scientific and physiological accuracy of your investigations, and of the exercises based thereon.

OXFORD.

I am an American, and have begun your method of vocal training, and enjoyed it very much indeed. There are few vocalists in America or elsewhere who do not know of, and speak highly of, yourself as an instructor.

COLERAINE.

The lessons I had from Mr. Behnke were not only most profitable but most enjoyable. I shall always look upon them as a rich intellectual treat. I am sure he will be glad to hear that the members of my family at once, when I came home, observed a great improvement in my voice.

DEWSBURY.

I cannot find language that will properly express my thankfulness to you. . . . But for you my voice would have been irretrievably ruined. . . . I have made a grand improvement in both voice and style since I had your tuition.

FROM AN AMERICAN LADY ELOCUTIONIST.

I have written to my husband, asking if I may remain abroad one year instead of three months, so that I can remain in London until October. . . . I feel now as if I really had a voice. I am going to work very hard, so that I can give drawing-room recitals and lectures.

“THE VICARAGE,” ESSEX.

Let me thank you for your kindness to me during the time I was under you. You will be glad to hear that I have received very much benefit. I feel I can speak much easier, and all my friends tell me my voice has much improved.

In case it may interest you to know the effect your teaching has had I write this letter. I have waited some time before so doing, that experience might test the value of your lessons. . . . I have not had the slightest trouble since I left you, and my voice has had a good deal of use, but I have not felt my throat in any way tired. I think I may fairly say your cure is complete, and I write to tell you how glad I am I went to you, and how grateful I am for the good you have done me.

Opinions of Mrs. Emil Behnke's Pupils.

VOICE TRAINING.

FROM AN OLD PUPIL.

GRESHAM HOTEL, DUBLIN.

DEAR MRS. BEHNKE,—It is indeed regrettable that Mr. Behnke was not spared to reap to a greater extent the reward of his wonderful work. You, I know, must have acquired an adequate knowledge of his magnificent system of teaching to enable you to continue on the same course, and so perpetuate his memory. This is a source of comfort to your many friends.

FROM A LADY LECTURER.

EDGBASTON, *May 11th*, 1893.

MY DEAR MRS. BEHNKE,—I feel I must write to tell you how much better I am, and how greatly indebted I am to your treatment. . . . I can take two or three meetings a week with ease, thanks to your training, and the deeper and fuller tone of my voice has been remarked upon by many.

LARNE, IRELAND.

I have no hesitation in saying that, under God, you were the means of curing my voice.

FROM A CLERGYMAN WHO HAD BROKEN DOWN IN VOICE.

LONDON, *July*, 1893.

My voice gives me no trouble now; it is indeed very much fuller and more resonant. I can fill my church without the least effort.

FROM A CLERGYMAN WHO HAD SUFFERED FROM "CLERGYMAN'S SORE THROAT."

BRIGHTON, *26th June*, 1893.

DEAR MRS. BEHNKE,—I take this opportunity of thanking you very much for what you have done for my voice. I shall try to keep up your exercises, and hope to receive more lessons later on in the year.

FROM A CLERGYMAN WHO STAMMERED, AND WHOSE VOICE WAS WEAK.

"THE PARSONAGE," *Feb. 7th*, 1893.

DEAR MRS. BEHNKE,—I told the Rev. Mr. S. of the great benefit I had derived from your instruction. He proposes to bring the subject of your work, and the importance of it to young clergymen, before the Bishop, with a view to something being done for ordination candidates.

FROM A TEACHER OF SINGING.

SCARBOROUGH, *Jan. 6th*, 1894.

DEAR MRS. BEHNKE,—For some years I have been teaching successfully on the lines laid down in your late husband's publications and his own "Voice Training Exercises;" and have put into the hands of some of my pupils your "Voice Training Primer." One of them has just passed Trinity College Senior Singing Examination with honours (84 marks out of 100). My own experience is that no exercises I have ever used have so helped to produce "forward" and to cure "throaty" tone, and I have long felt I owed to Mr. Behnke a debt of gratitude for his works. May I be permitted to acknowledge it to you?

THE LANCET.

Review of "Voice Training Primer," by Mrs. Emil Behnke and C. W. Pearce, Mus.Doc. Chappell, 50, New Bond St. 2s.

Mrs. Behnke is well known as a most excellent teacher of singing upon thoroughly philosophical principles, whilst Dr. Pearce holds a distinguished position as a professor of music. The little book they have published, though written in the somewhat unengaging style of questions and answers, is quite a model of compression, and gives a great deal of information even to those who may be proficient in reading and rendering music. Everyone who loves the concord of sweet sounds should read it through. Beginning with a short anatomical and physiological description of the organ of voice and the general mechanism of respiration, the mode of exercising the voice to the best advantage is given. This is followed by a catechism of musical theory, which Dr. Pearce, from whose pen it proceeds, hopes will furnish vocal candidates at examinations with all the theoretical answers to the questions likely to be asked. It is a very useful and well-arranged book, which those of our profession who have little time to study larger treatises may read with advantage.

STAMMERING.

THE TIMES.

Pre-eminent success in the education and treatment of stammering and other speech defects.

THE BRITISH MEDICAL JOURNAL.

DR. F. L. NICHOLLS writes:—"This infirmity is so great a drawback to almost every walk in life, and for public speaking so complete a hindrance, that a cure is of the utmost importance. It may therefore be of interest, and possibly of some use to members of the medical profession having a case of this nature in their practice, and desiring assistance for its cure, if I mention that I have recently had the most satisfactory experience of the cure of such a case. The father, a minister, was very anxious for his son to follow in his own footsteps, while the

lad stuttered so badly it was not to be thought of, unless a cure could be effected; and for this purpose he was sent to Mrs. Behnke, of Earl's Court Square, London. Mrs. Behnke was chosen from high recommendations, and very thoroughly has she proved worthy of them. The lad has just returned home, and speaks without the slightest impediment. I should state that previously to going under Mrs. Behnke's hands we had tried various rules and recommendations without the least success."

"Stammering: its Nature and Treatment." Price 1s., of
Mrs. Emil Behnke.

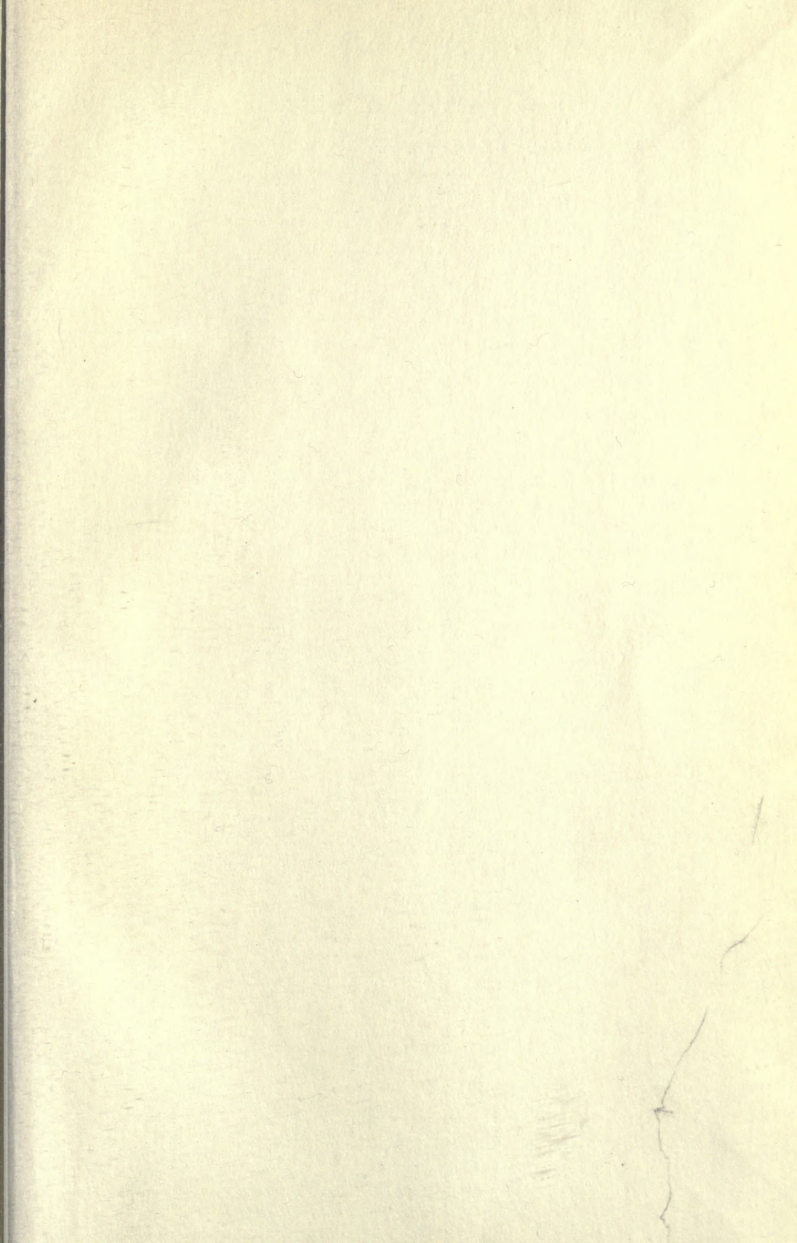
THE MEDICAL TIMES.

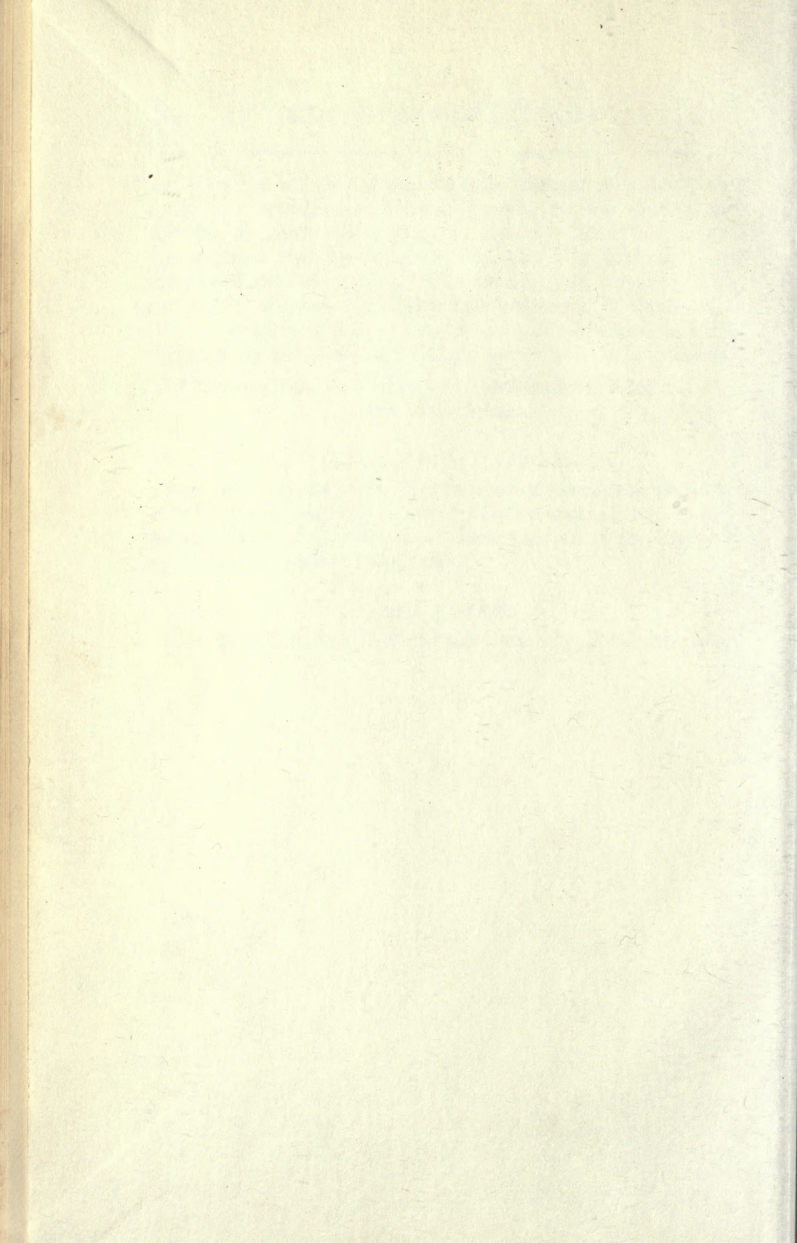
Mrs. Emil Behnke, who for a number of years was associated with her late husband in the work of voice training, and also the cure of stammering, gives a very clear account of the organs of respiration and voice production.

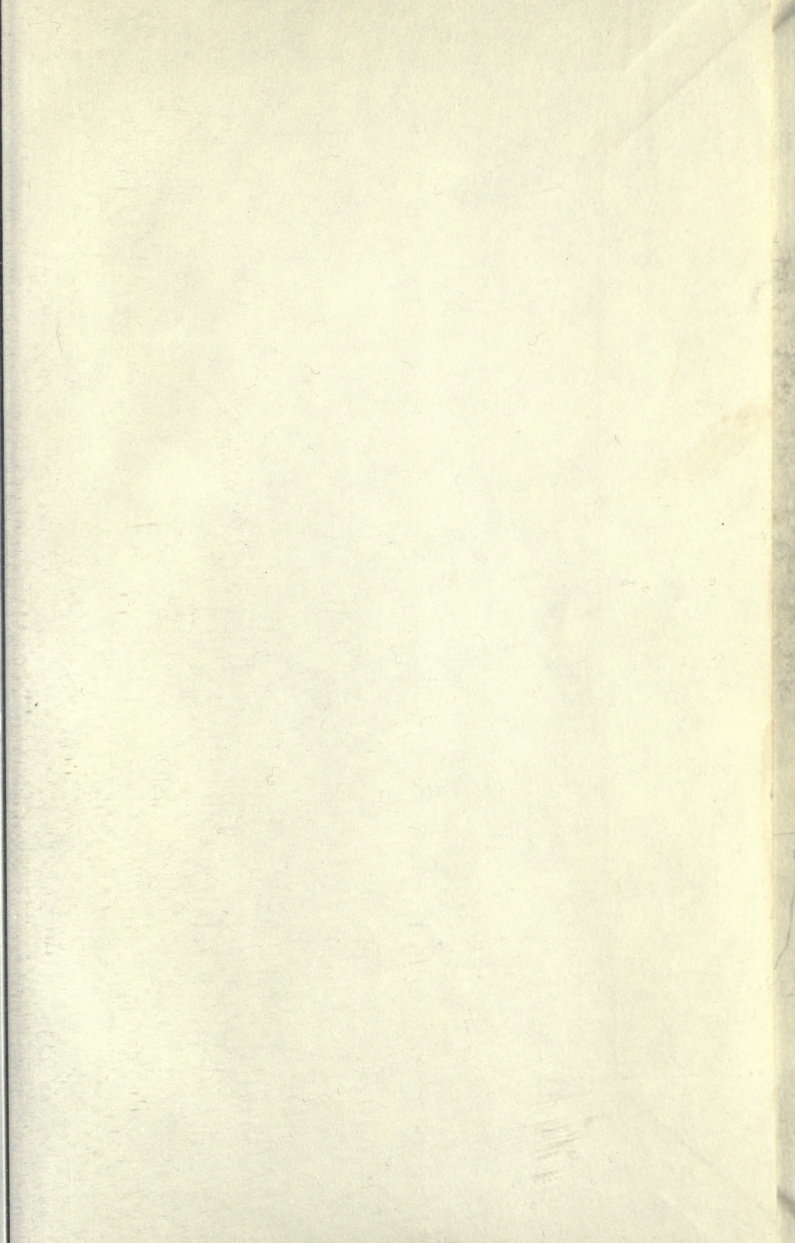
THE QUEEN.

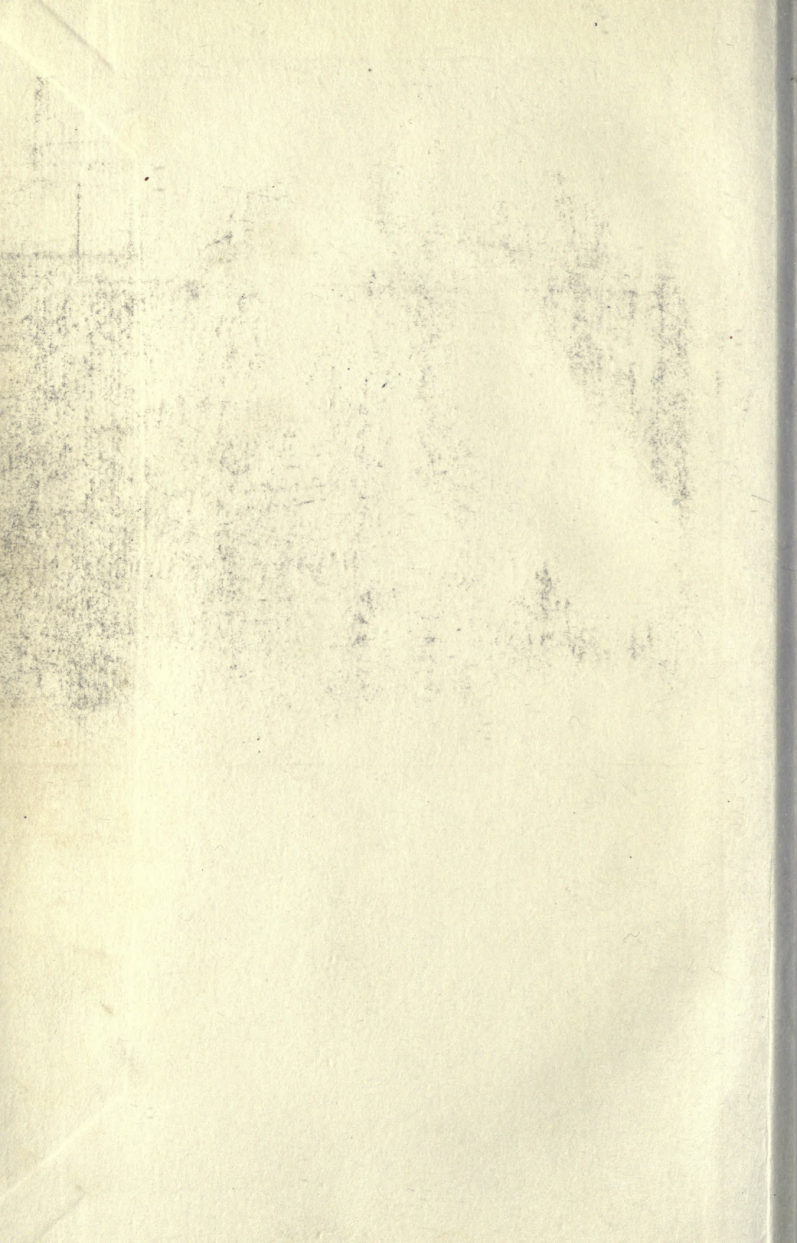
Mrs. Emil Behnke is a recognised authority on vocal training.

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Behnke, Emil
The mechanism of the
human voice 9th ed.

Music

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