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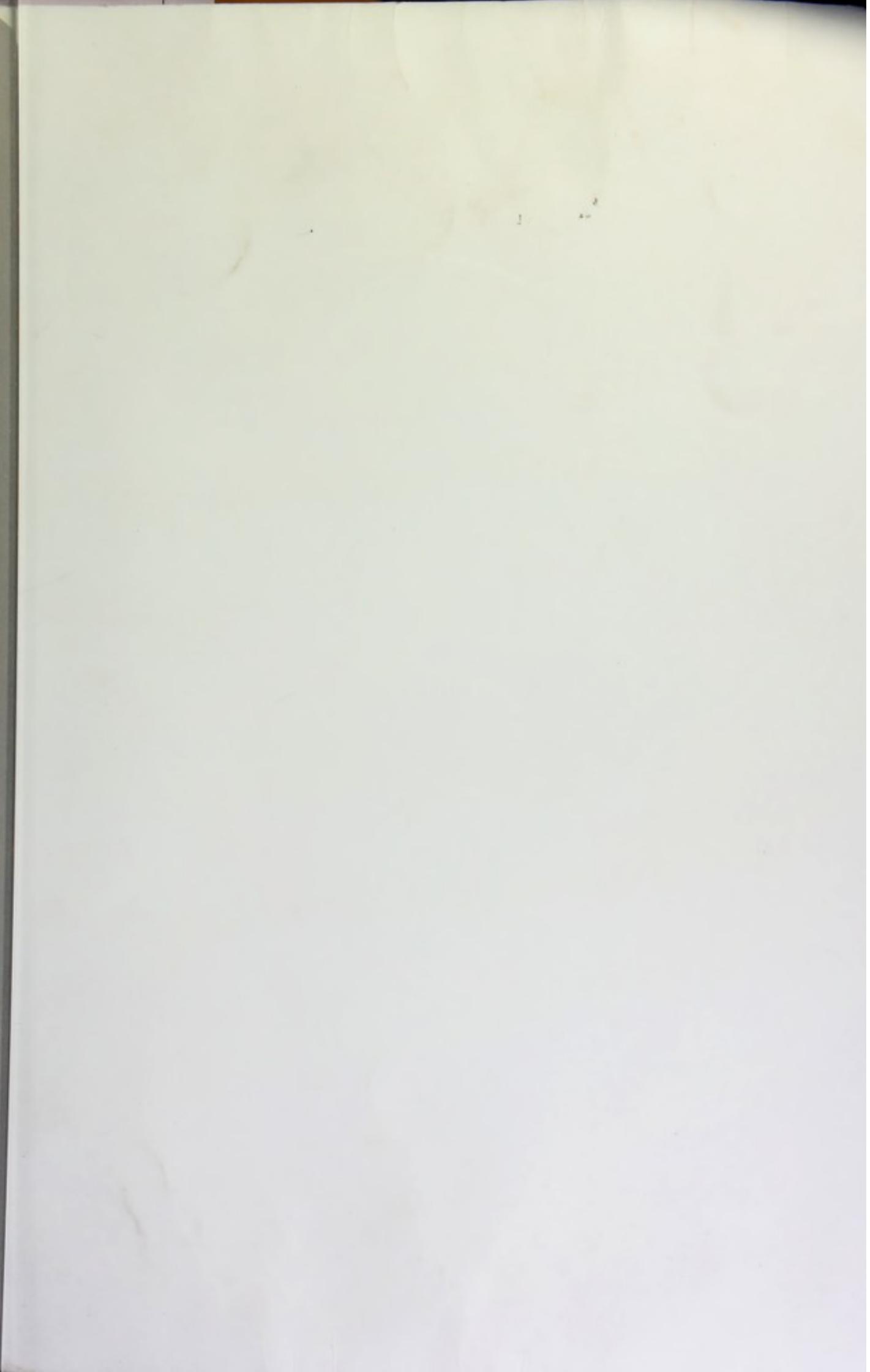
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VOLTA BUREAU.

Tracts 74.

Defective Conditions of the Vocal Organs
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Training the Deaf;
The Tongue.

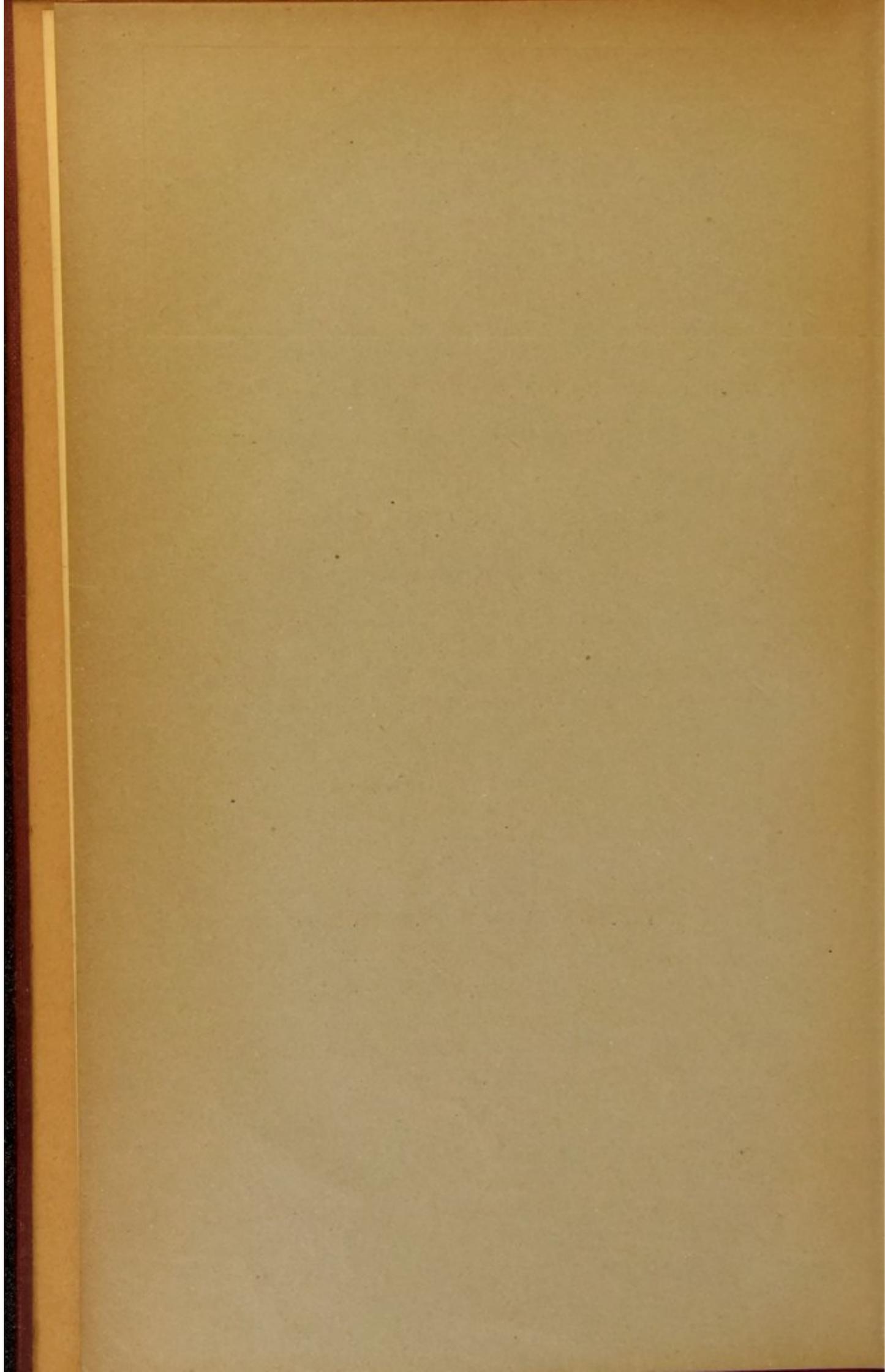
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the Teaching of Speech to the Deaf, at its Second
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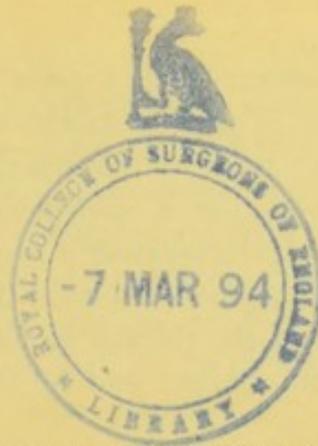


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LECTURE I—THURSDAY, JUNE 30.

MR. PRESIDENT, LADIES AND GENTLEMEN OF THE ASSOCIATION :
As I stand here this morning I am reminded of the young lawyer, who in the course of a trial intended delivering an address to the jury when he was interrupted by the judge to the effect that the address was unnecessary since he, the judge, was prepared to charge the jury without it. The young man then said : " At least, your honor, you will allow me the privilege of concluding by making a few preliminary remarks." If I could so conclude it would be doubtless the best thing for me. I assure you that the material I have brought with me is not the kind I would have selected had I known, as I now do, of the spirit actuating your association. Since I have listened to the proceedings of yesterday, since I have conversed with the principals of your institutions, and more particularly since I have glanced at the report of the proceedings of your body of the last year, I would be greatly pleased if I could return home and prepare other addresses. In a word, I have recast many of my impressions. Instead of following the order announced on the programme I will call your attention in this my first lecture to
SOME OF THE DEFECTIVE CONDITIONS OF THE VOCAL ORGANS
STUDIED IN CONNECTION WITH QUESTIONS OF THE ORAL METHOD
OF TRAINING THE DEAF.

The study of the organs of speech is pursued by the articulation-teacher and the physician in methods which are practically the same. Both are walking on parallel paths on different sides of the same hedge. Are they not in need of each other? The articulation-teacher is surely needed by the physician. Habits in children often persist after the causes for them are removed. Thus a patient upon whom a cleft palate has been closed is apt to talk almost as badly as though nothing had been attempted for his relief. A nasal quality to the voice may remain after a chronic disease of the nose and throat which originated it is cured.

Let me assume that a growth, the so-called third tonsil, or adenoid growth, is present in the naso-pharynx, by which term is meant the space back of the nasal chambers and above the soft palate. The voice in a subject so characterized is of a peculiar quality. Writers denominate it the "dead voice." It is interesting to know that Dickens in "Oliver Twist" gives the "dead voice" to Barney, one of the thieves in Fagin's den. Now take away the third tonsil from Barney and he still will be apt to talk with the "dead voice."

When we recall the fact that in such children the organs of speech have been trained from the beginnings of articulation on an imperfect model, and that every muscle fibre, even if it retains its normal tonicity, which it is not always sure to do, is falsely adjusted to every other, the cause for these bad habits is not difficult to ascertain, and the training must be conducted as systematically by the methods of the articulation teacher as though the pupils were deaf. Unfortunately teachers are not always easy to obtain. They are fully occupied with specific duties. I have no doubt that in time, our large cities will have thoroughly equipped persons to take care of these cases. Trainers of the singing voice are indeed prepared to undertake the work. In one instance, which I now recall a teacher of articulation in Paris, who was engaged in training vocalists, secured excellent results in a patient of my own, after some care had been given at the hands of an articulation-teacher for the deaf in this country.

In no less degree should the articulation-teacher rely upon medical science. Not that the teacher should understand medicine as a physician understands it, but that the signs which tell when medical care is necessary should be known. You tell me that medical men are already engaged in all appropriate work in your institutions. I may be wrong, but I believe physicians are engaged to look after the general health of the pupils rather than to fix any relations existing between teacher and pupil. False relations are often present I believe between teacher and pupil because of the difficulties which are in themselves medical. Let me illustrate my meaning by reverting to the subject of the third tonsil. Besides giving the intonation to the voice already mentioned it tends to prevent air from reaching the wind-pipe by way of the nose. It is apt to create a nasal discharge, and, from the fact that the phlegm or mucus is disposed to fall from the upper to the lower parts of the throat, all the vocal organs are kept in a state of excitement. We have two evils here to contend with, first, the evil of mouth-

breathing, and second, the evil of intractable vocal organs. The pupil is placed at a disadvantage from the general effects of the first, and of the mechanical conditions resulting from the second.

The habit of mouth-breathing interferes with normal diaphragmatic breathing—the lower part of the chest does not expand, the lower ribs do not move perfectly, as a result the labor is thrown on the upper part of the chest, or remains in too great a degree abdominal. The signs which we rely on to detect this condition are the following: The lower ribs, namely, the last seven, are directed in a marked degree obliquely downward at the side of the chest, and lie so near each other that the depressions at the intercostal spaces are practically obliterated. The lower end of the breast bone is very narrow and more or less grooved longitudinally, and at the lower half of the chest, where the ribs and cartilages meet, there is marked on each side shallow saucer-shaped depressions. Higher up at the level of the second rib the breast bone shows a ridge extending directly from side to side. This ridge answers to the line of union between the two of the three main divisions of the breast bone, namely, the handle (manubrium) and the blade (gladiolus) of the Roman sword-like figure. The chest does not expand normally in any direction, for while the upper ribs exhibit intercostal spaces which are too wide, the shoulder-blades have projecting tips ("angel wings") indicating that these bones, growing as they do at a normal rate, appear too large when compared with the stunted chest.

You have mentioned, Mr. President, in your paper in your first report* the importance of gymnastic training of the throat muscles. You spoke particularly of the peacock-sound, the result of too close adaptation of the posterior half arches (palato-pharyngeal folds) and the importance of instructing the pupil to learn to release the tension on these folds and place them measurably under the control of the will. But, sir, in many clinical conditions, and chief among these I place an unrelieved distress caused by the presence of an overgrown third tonsil, I find these folds in the position you describe. They are persistently adducted, teased, and intractable. I venture to state that when a pupil exhibits intractableness in overcoming the peacock voice that a laryngologist should be requested to make a careful examination, for in my judgment it is probable that a faulty method of breathing, neglected catarrh, or both, with a growth in the upper throat passage would be found

*Proc. Am. Ass'n to Promote the Teaching of Speech to the Deaf, 1892, 135.

to be cause. When the treatment is completed, then renew the appropriate gymnastic exercise.

The connection between congested states of the nose and naso-pharynx, especially when associated with mouth-breathing, and mental condition is of first importance. No child who does not breathe through the nose can be said to have a normal brain. The power of attention, the tenacity of the memory, the control of the emotions are all weakened. The disposition is apt to be sullen, occasionally intractable and in rare instances the child appears actually to be mentally defective. The hearing is often impaired, and this taken with the other states, takes the pupil at a great disadvantage with other children. With children entirely deaf you can understand better than I how serious are the obstacles which stand in the way of the pupil becoming trained to speak, and how severe the tax on your own resources of tact and industry in endeavoring to secure any good result from such unpromising material. But I would speak twice for the child and once for you. Can one conceive of a more pitiable situation than to have in addition to absolute deafness, these superimposed distresses, all of which must add up to the sum of unhappiness? How many children are held as stupid, inattentive, if not imbecile, who are simply suffering from a congested brain? A brain whose inflow of venous blood from the nose is greater than it can accommodate and whose delicate cell structure is kept in an unnatural state. Let me illustrate these remarks by a case. It is a rare one I acknowledge, but children of the same kind may at any time appear in your classes. A girl ten years of age was brought to me last fall for deafness, associated with nocturnal mouth breathing. The hearing was much impaired, but sufficient was left to permit the child to be trained by the voice. The intelligence was of low grade, the child was quite at home with playmates of half her years, but did not associate with children her own age. The memory was very poor and the temper uncertain. The removal of an enlarged third tonsil from the naso-pharynx improved all the conditions. The mental improvement indeed was greater than the aural. The delight of the parents can well be imagined, for instead of having their child possessed of a brain of naturally poor quality, they found her with one whose functions had been simply in abeyance. A brain of retarded development, if you prefer so to express it, and not one which was blighted and could never develop. It is likely that in this child the avenues by which the blood returns from the face to the brain-case were either more numerous or larger than usual,

so that the coverings of the brain, receiving as they do normally some of the blood from the nose, received in this instance, owing to the diseased state of the nasal chambers and naso-pharynx, too much. It must be borne in mind that the cavities within the brain also send important tributaries which cannot flow in any but the one way to the blood-tracts of the coverings of the brain. Now, if these tracts are already overfull by reason of the morbid states of the nose, the return blood from the interior of the brain can scarcely escape at all. Is it not reasonable to infer that under these conditions the brain ceases to expand? It is not going too far, I believe, to make a yet larger inference, namely, that children who are really defective in intelligence, whose brains cease to grow, and yet do not have disease of the nasal chambers or of the naso-pharynx, may have as an essential cause some persistent interference with the return flow of blood from the interior of the brain. However, this may be so far as you are concerned, the relation between cause and effect is sufficiently exact to serve as a guide in watching the condition of your pupils.

In connection with imperfect development of organs I wish to make a few remarks on the so-called "change of voice." It is well known that in the transition period of youth the voice loses its treble quality and somewhat irregularly assumes the qualities of the adult. It is a critical period in the history of the voice and its musical training is conducted with risk. Many a fine voice has been lost by disregard of this fact. Is it not probably true that since the training of the voice for song and for speech have much in common that it might be well to relax on rigid methods of vocal gymnastics during early puberty? May not some phases of intractableness which you notice at this time be considered as due to this change, and is it not wise to treat the situation conservatively?

I have been surprised to hear that little or no distinction is made between pupils who are congenitally deaf and those who have become deaf by disease. Of course, we may have disease affecting the ears before birth. But after excluding the small group of cases which might possibly be placed under this category there remains the essential grouping, viz., a morbid condition which is congenital or acquired. A congenital peculiarity is almost never isolated. A defective brain is apt to be associated with defective arrangement of the muscles of the extremities. If the defect determining congenital deafness lies in the brain, at the origin of the nerve of hearing, it may be expected that something other than this defect exists, if not in the brain then in some other region of the economy.

Would it not be well to have made careful studies of the physical and mental peculiarities of this class of subjects? I believe that if this were done facts of interest might be elicited. It is true the facts when obtained might have no practical application to your work. They would be, nevertheless, warmly welcomed by scientific men, and it is not improbable that they might prove to be of value to both teacher and scientist. To be conclusive, the observations desired must be conducted by students who are familiar with the methods of anthropometry and embrace many hundreds of subjects. I would expect pupils who were congenitally deaf to present few difficulties in training, for the reason that the vocal organs have never been impressed by disease. It is not likely that the ravages of diphtheria, scarlet fever, etc., are limited to periods before you begin training, especially since the disposition now exists for training to begin at a tender age. As is well known, diphtheria often leaves the soft palate and pharynx greatly enfeebled—the time during which this enfeeblement lasts is not definitely known, and may be prolonged into the stage at which you ask much of the muscles. Is it not possible that a child who has never heard, thus losing the stimulus to practice these weakened muscles, might have the period of enfeeblement prolonged? On the other hand, since the ground appears to be unbroken, some phases of interference with laryngeal and lingual movements may be due to faulty nerve supply to these parts, since the nerves of the larynx and tongue arise from the same general region with the nerves of hearing.

Respecting the condition of all children, whether deaf or hearing, and if deaf, whether suffering from congenital or acquired forms, the essential question arises, are the vocal organs in a normal state at the time the oral training is being conducted?

During the past two years I have seen a number of the pupils of the Pennsylvania Institution for the Deaf and Dumb. These children have been referred to me by the physician, Dr. H. W. Wharton, on account of disease of the throat, nose or ear. I was so impressed with their condition that I suggested to Mr. Crouter, the able principal of the institution, that a systematic examination of all the pupils be made. Consent having been obtained, my assistant, Dr. Arthur Ames Bliss, undertook this really arduous labor, and has just completed an elaborate study of all the children in the Manual Department. I have been permitted by Dr. Bliss to make this statement: Out of three hundred and twenty-four pupils examined, nineteen were found who

had been sent to the Manual Department from the Oral, on the ground of being intractable. Is it not significant that every one of this group of nineteen pupils should have been found by Dr. Bliss to be suffering from some form of disease of nose or throat? It is not time to attempt to draw any percentages from this series of examinations. It is enough for my purposes to invite attention to the fact that disease of the vocal organs in the various forms may thwart your efforts and withhold from the pupil advantages to which he is entitled.

In reply to a question, Miss McDowell stated that there were one hundred and eight pupils in the Oral Department and not quite all of them, I think, had been examined.

DR. ALLEN: I was much struck by some statements in the report of Mr. Crouter of the last meeting.

DR. GREENE: Is it your opinion that the throat troubles are the result of attempting to train pupils? Do the articulation exercises irritate their throats?

DR. ALLEN: I do not know. My assistant undertook the work and the facts come to me, in a sense, at second hand. He made notes and among them I find this statement, and it is, I think, a correct report of what he found.

DR. GILLET: You say nineteen were in need of surgical treatment?

DR. ALLEN: No, sir; not in need of surgical treatment, but were sent back.

THE PRESIDENT: I may say that in the January *Annals* the number reported present in the year 1891 at the Pennsylvania Institution was four hundred and ninety, and of these, one hundred and thirty were taught articulation.

MISS McDOWELL: That comprehends all in the Oral Department.

DR. ALLEN: Can any one refer to Mr. Crouter's statement?

MISS McDOWELL: Do you mean the statement of Mr. Crouter here last year?

DR. ALLEN: I do. I regret very much that Mr. Crouter is not here, as it is unfair to comment on these statements in his absence, but as they have passed under his supervision they have received his authority.

DR. WILLIAMS: I would like to ask what proportions of pupils there are in the Oral Department that had to be transferred to the other department, that is, the Manual Department, and what was found in relation to their progress therein?

DR. GILLETT: What bearing has that upon the voice?

DR. ALLEN: The physical condition of these pupils is unknown. That is to say, those which cannot be trained in the Oral Department. Dr. Bliss has found all of these children diseased. That is, the nineteen which could not be trained in the Oral Department. I inferred from Mr. Crouter's statement in the report of your proceedings of 1891 that something more was being done in the Manual than in the Oral Department. Do the mouth and teeth show any peculiarities? Why should not you get a certain proportion of these defective children in these institutions, and is it not more difficult to detect this, as they cannot speak? I cannot draw any conclusions as I have not any figures, and had not Miss McDowell been present I could not have answered any of them, but I would suggest that you obtain all the statistics that you can.

MISS McDOWELL: Of the nineteen children there were several, if not feeble-minded, of very low mental ability. There is a difficulty of these children to grasp things properly; they have a loose, limp hand, in going up and down stairs in the way they do.

DR. ALLEN: I will conclude my lecture with some remarks on "Stammering."

While the correction of faulty diaphragmatic breathing is undoubtedly an important part of the training in stammering, it is as certainly true that it may arise from a defective condition of the organs of speech. I have had one case of stammering which was cured by simply increasing the diameters of the nasal chambers. I have two cases in which the cause lay in faulty movements of the tongue, which were corrected by appropriate apparatus. All three cases were reflex in origin. By this term is meant an action determined by a stimulus to motor action, through an impression made on some part of a sensory nerve. Thus, if the sole of the foot of a sleeping person be tickled, the limb moves away from the point of irritation; this movement is determined by the muscles of the limb being induced to contract by reason of a stimulus conveyed to the spinal cord from a sensory nerve, and thence reflected from the spinal cord to the muscles and exciting them to act. The will has nothing to do with such an act. Now, in the first mentioned case, the narrowed diseased nasal chambers excited the diaphragm to faulty and irregular action, and stammering resulted. The faulty action was relieved by removing the causes by which the sensory nerves were kept in an excited state. At all events this person who had had every advantage in training to overcome the stammering, had it disappear by itself after a simple surgical procedure.

The other two cases were examples of defect in the size of general efficiency of the tongue, and resultant failure in reaching the roof of the mouth at its anterior part. The causes of the excitements here were in each instance obscure, for the sensory nerves of the tongue were not known to be in an abnormal state. The subject of reflex action is complex, and I cannot with advantage say more about it. Suffice it to say, that "strain" is a fertile cause of reflex actions which are not in themselves physiological. Thus a "strain" on the little muscle in the eye, whose function it is to change the shape of the crystalline lens so as to adapt it for a near vision, may bring on many disturbances in parts of the body remote from the eye. The "strain" in the muscles of the vocal apparatus in attempts to force a badly shaped tongue to do its work may be felt in the entire region of the mechanism of speech, and particularly in the diaphragm, which happens to be a most important factor. But whatever terms may be used to explain faulty associated muscle-movements, there remains no doubt that the two cases mentioned were relieved by enabling the tongue to more easily strike the hard palate, by *bringing the arch of the palate downward*. This was easily accomplished by securing the services of a dentist in each instance who adapted a vulcanite plate to the roof of the mouth. One of the two cases is imperfectly known and is no longer under observation. The other has been more carefully studied and the narration is herewith given with some attention to detail :

A young man aged twenty years, who had been a bad stammerer from early childhood, came under my care in October, 1891. The lad was prevented from being trained in class. Every effort had been made to correct the defect by training at the hands of the best professionals. Examination revealed several physical peculiarities. Almost a man in years the subject retained the larynx and tongue of a boy. That is to say, the parts, *in a measure*, were stunted. I say in a measure advisedly for the parts as seen by the laryngoscope appeared normal. But the thyroid and cricoid cartilages were small, as examined by the finger from the neck, and the tongue was short, falling back to near the molars when the mouth was opened, quite as it does in children. The lower jaw was massive, and especially so when measured from the crowns of the lower molars to the lower border of the side of the bone. This placed the small stunted tongue at a disadvantage in reaching the roof of the mouth. The arch of the hard palate was high and without the broad shoulder so often seen at its abutments near the molars. This increased the difficulties of the already badly-

equipped tongue, since the articulating plane for such sounds as *l* and *s* were rudimentary.

It occurred to me that although the tongue, with the exception of its small size, presented no peculiarities in its attempt to become efficient in speech, became subject through some of its muscle fibres to a strain, which had become habitual and served as an exciting cause to the stammering. Acting on this supposition, I requested Dr. J. Atkinson McKee, an ingenious dentist of Philadelphia, to adapt a vulcanite plate to the roof of the mouth. This apparatus being in position, and Dr. McKee present, I coated the free surface of the plate with a little chalk and water and asked the patient to make an attempt at articulation. The spots from which the tongue removed the white color of the chalk from the plate defined the palatal surface which had been reached by the tongue. (Dr. N. Kingsley's method.) After repeated trials it was seen that the left side of the tongue, between the lip and the part directly in front of the base did not reach the plate, since the left side of the normal U-shaped figure defined by the tongue in the pronunciation of *l* was absent.

I then had Dr. McKee build up on the left side of the plate with a firm composition material, so as to imitate a palate whose sides normally presented broad palatal abutments, and again subjected the patient to a repetition of the linguo-palatal consonantal sounds. This having been accomplished, speech was found to be improved. He was told that now he had a means of practice, in nothing more, and that he must use the plate habitually, and remember that he had before him the task of a new articulation, which could only be obtained by labor and care. The results have been most encouraging. He was able in a short time to attend recitations in class. He gained confidence in the ability to pronounce all sounds, thus avoiding that hesitancy which is so distressing in stammerers who are constantly coming up against combinations they cannot attack and as constantly trying to flank them. In illustration of the value he places on his plate, he found one day just before going into the class-room, that he had left his plate at home. He did not venture to begin his recitations without his plate, but returned to his home, a distance of two miles to procure it. This young gentleman is now being carefully trained with the plate in position, at the hands of an expert in articulation-teaching. I have lately heard that his progress is encouraging.

MR. ELMENDORF: Was his articulation improved without the plate?

DR. ALLEN: No; except that he had more confidence in himself.

MR. ELMENDORF: From your remarks I infer that the boy reached for his plate as Webster reached for his button, of whom it is said that while at school no boy could ever get at the head of the class until the boy next to him cut off the button, and as Dan was being quizzed he reached for the button and missed it, and missed the question, and the boy got up to the head.

DR. ALLEN: That shows how far defects can be overcome by training. There is an Italian saying to the effect that there are one hundred rules to make a good singer; ninety-nine of them are that the pupil must be born with a good voice, and the other rule need not be mentioned. If a pupil has a grave physical defect he must always have crutches; if a slight one, training may overcome it.

THE PRESIDENT: Do you not often find that stammering is acquired by imitating other stammerers? I remember, when a boy, that my father had a few pupils in his household who were stammerers under his care. My father was called away, and when he returned he found his own son stammering too. I well remember the teaching in my own case before I overcame it, and I know that my father did not have stammerers in his own family after that.

DR. ALLEN: Dr. Greene alluded to the fact of bad habits. I would suggest that there is no such thing as bad habits without cause; it does not matter whether they were always bad or not it only means that the physical basis for them is present. There is absolutely nothing new in what I have said about the mouth; it is as old as Demosthenes who put a pebble in his mouth to overcome a defect in speech.

THE PRESIDENT: While Dr. Allen is reading his telegram, I will read one just received from Northampton:

"Greetings to the Association. May the Second Summer School be as successful as the first. (Signed)

HARRIET ROGERS."

I am sure there must be many present who have questions to ask Dr. Allen on this subject, and if there are any I will be glad to hear them.

DR. GREENE: In conversation with Dr. Allen yesterday, I remarked to him that the medical profession has treated articulation-teachers in the same way that it has treated the undertakers. When a child becomes hopelessly deaf and is turned over to one of our schools, then the physician does not care any more about him than when one of his patients has been handed to the undertaker.

The next time I have to make that reproach I shall have to except Dr. Allen. He has given us a great many valuable suggestions. His lecture has given rise to an idea in my mind that it would be well to have our charter amended; I think it should be made one of the principal objects of this association to induce the medical profession and men of science in general to give more attention to articulation teaching than they have done. We have been thrown on our own resources until now, and I hope that we will be able to benefit by them. Dr. Allen has asked the question whether there is any difference between children congenitally deaf and those who become deaf later. I suppose he speaks of cases where deafness has been acquired before the child has learned to speak. Mr. Hill, the well-known German teacher and writer, remarks in one of his books that he has noticed such a difference. He says that there is a great difference between the voices of children who at one time had spoken and those who never spoke.

LECTURE II—FRIDAY, JULY 1.

THE TONGUE.

LADIES AND GENTLEMEN: You may remember that yesterday I described an instance in which stammering was relieved by bringing a part of the plane of the hard palate near to the tongue, thus enabling the contacts between the two parts to be accomplished with advantage. With your permission I will speak to-day particularly of "The Tongue."

It is likely that some features embraced in the study of the case mentioned are capable of yet wider application. It is of interest to remember that vocal organs are those which have been adapted from others that have functions pertaining originally to the acts of breathing and those in preparation of food for digestion. If we reflect for a moment we will be convinced that the parts of the mouth are primarily used for coarse purposes. The teeth cut, tear and grind food; the lips seize food, as a horse picks up grains of corn, or lumps of sugar from its master's hand; the tongue at least at its tip is also prehensile, as is seen well developed in the giraffe where it is used in bringing down boughs and twigs to the upstretched mouth. In ourselves the parts named keep the teeth supplied with food. They might be compared with millers whose business it is

to see that the hopper is kept filled with grain. When the tongue and cheeks are palsied this work must be done by the fingers.

But the coarse use of organs adapted for speech is not confined to the mouth. The muscles at the orifice of the larynx are constricting in function; that is to say, their use is primarily to narrow, if not to close, the orifice as one closes the mouth of an old-fashioned purse by a string. The object of this is to prevent food from being squeezed into the wind-pipe when in the act of swallowing it is being forced into the gullet.

The glottis is surmounted, as you know, by the leaf-shaped cartilage—the epiglottis. It is customary to describe this as a trap-door which the bolus of food forces over the glottis at the time of swallowing. Yet when the projecting part of the epiglottis is lost by disease, cut through by the knife of the cut-throat, lacerated by bullets or otherwise absent, the subject is able to swallow both solids and liquids. How is this to be accounted for? The answer is found in the muscle-bundles which tend to pull the lips of the glottis against each other. While it must be acknowledged that the epiglottis may be pulled down so as to close the glottis, its muscles suggest that it is constricted much as is the glottis itself for the two constricting sets of bundles are closely related, that is to say, tend to pass into each other and are supplied with nerves much in the same manner.

There is a disposition in the lower animals for the epiglottis to be narrowed and to project upward, so as to rest on the posterior surface of the soft palate. The object of this appears to be to enable the air entering the nostrils to pass directly into the windpipe, even when the mouth is closed from the throat, as is seen in feeding under water, in the prolonged grip of carnivorous animals in securing prey and in many similar acts. Is it not fair to conclude that in man also the upward and forward trend of the epiglottis is in reminiscence of its ancient use? The single peculiarity in man's case lies in the fact that the face has developed in a remarkable manner in a vertical direction, and has widely separated the soft palate from the epiglottis, thus permitting air, on occasion, to pass freely through the mouth into the throat. At all events we find in man the epiglottis to be rudimental and probably to perform indifferently, if at all, its primary functions.

In view of these statements how unimportant become the speech values of the epiglottis! At best the cartilage is but an accessory and the vocal adaptations to this end which are within its range appear to be of the same character as are those of the base

of the tongue, namely to assume varying degrees of concavity with the base in the act of formation of some of the vocal sounds.

I will dwell for a moment longer on the subject of the muscle fibres which constrict the orifice of the glottis. When a true constriction or pursing takes place, no distinctions between a right and left function is discernible. Yet in the body we find the muscles arranged into rights and lefts for the most part. Certainly, most of the highest forms of muscle, namely those which are most responsive to the will, are arranged in pairs, one member of which is on the right and the other on the left side of the body. In a general way it can be said that the muscles about the tubes are constricting and single and act imperfectly under the control of the will, and those about the skeleton non-constricting and are disposed in pairs. The former are involuntary, that is to say, without control of the will; the latter are voluntary, that is to say are under such control. One cannot determine by the will what the size of a given blood-vessel or bronchial tube shall be; but one can within known limits determine whether a finger shall move or be at rest. In the throat and mouth the involuntary and voluntary muscles appear to merge. The constrictors of the glottis and pharynx are not as good examples of their kind as are those of the blood vessels or the intestines; the right and left muscles of the throat as in the muscles passing between the palate and the tongue, or palate and the pharynx, again, are not as good examples of the paired kind as are those in the hands. Hence they are called semi-voluntary muscles. The tongue is notoriously an unruly member. Any one endeavoring to control its motions in inspecting the throat will be convinced of the truth of this statement. Movements of the muscles of the larynx are quite beyond our control in cough. Is it not curious that it is in a region under such imperfect control that most of the essential organs of speech should lie? How precise becomes the study by which the derangements of an adjustment so delicate are to be corrected!

In order to understand the use of the tongue in speech, one must remember the fact that it is composed of muscles in pairs as the genio-hyo-glossus; the hyo-glossus, as well as fibres which belong to those which are imperfectly paired, as the lingualis and transversalis. It is an assumption that some of these are more under the control of the will than others, but none, I am sure, to state that the tip is certainly more precise in its movements than the base and is much less unruly, and that while we have nerves which control the tongue and supply it from the sides and therefore in

pairs, that none are supplied as definitely to those which are toward the centre and are not in pairs.

The distinctions between the right and the left sides of the tongue are certainly greater toward the base than at the middle or the tip of the organ. The U-shaped or V-shaped median depression which is conspicuous in the mechanism of some of the vowels may be referred to in evidence of this symmetrical disposition of the dorsum. The convexities on the sides of the dorsum answer to the right and left values, while the median depression corresponds to the neutral territory between. But the front part is not so grooved in any lingual act. The tip and the region directly back of it never act as rights and lefts but always as a unit, hence no groove or other depressed interval is seen on this part of the dorsum.

If I am correct in making these statements, is it not likely that articulation teachers may have an entirely distinct group of errors in the mechanism of speech, in which the basal part of the tongue enters, as contrasted with those in which the tip and associated regions enter?

From the statements just made the terms "base and tip of the tongue" are not exact, for the part at which the disposition for the groove to be well defined and where it ends is not sharply limited. It is certainly desirable that terms should bear a relation to use and that organs should be studied when practicable in connection with the work that is done by them. The terms "base of the tongue and tip of the tongue" leave the intermediate surface of the dorsum a *terra incognita*. I will venture upon this ground and attempt to outline it. I assume that between the base and tip are two regions which I name the *pre-base* and the *post-tip*. So that there are four regions of the dorsum.

The *tip* is the hem which unites the two borders. It extends from the anterior end of the tongue a short distance only backward.

The *post-tip*, which extends from the tip for about an inch, and is usually distinguished by a median linear depression when the tongue is at rest.

The *pre-base* lies, of course, in advance of the base and ranges from the circumvallate papillæ to the end of the linear groove of the *post-tip*. It is often furnished in the centre by an oval clump of coarse papillæ, as is here shown. (The figure of the tongue from Sappey's "Anatomy" was here referred to.)

The *base* lies between the circumvallate papillæ and the frenum, between the tongue and the epiglottis.

As I have said, in order to determine the significance of these or any other parts of the economy, the parts themselves must be seen at work. In the case of the tongue they must be seen in action. Thus, the tip and the post-tip are the parts which are prehensile, and it is the prehensile part which is adapted to strike the lips, teeth and hard palate directly back of the teeth. The *post-tip* can be made separately from the tip to strike the hard palate back of the teeth, as indeed it habitually does in infants in the beginnings of speech, and probably takes the place of the tip in the acts usually performed by this region, and probably enters into the mechanism of the lisp, since when the tip is developed but not used it is thrust forward, so that the strike is falsely made by the post-tip while the tip lies between the teeth.

The *pre-base* is the part which is actively depressed in the centre at the time of the formation of vocal sounds.

The *base* is not seen and its action is obscure, though it is likely that from the pitcher-lip form of the epiglottis that it lies in a broad, shallow concavity at the lingual base.

If one looks in the mouth of a child (care being taken that attention be not directed to the observation that is intended), it will ordinarily be seen that a play of little dimples will follow one another on the tongue. They are more common in the region back of the tip than toward the base and *near the borders* than the centre. The tip and borders of the tongue in advance of the prebase create the positions seen in *l* and *r*, the *l* being the tip and borders raised and in contact with the palatal vault, plus vocality, while the *r* is the tip and sides raised, but not in contact with palatal vault, plus vocality. One cannot fail to notice the manner in which *l* and *r* are often substituted, especially in the speech of some Germans, and of the difficulty with which Chinese pronounce the English *r*, always substituting as they do the English *l*. How the study of speech defects may confirm the affinity between these speech sounds I must leave to your judgment. Certain it is that *r* may substitute for *l* in some conditions into which fatigue enters.

Notwithstanding the intimacy of the ear with the sounds of the human voice, it is a rare thing to see the tongue, during the acts of speech, other than in the foreshortened views of the tip and the undersurface to a point near the frenum. Should the mouth be open, the mechanism is at once destroyed, while the observation of the intra-laryngeal actions, unsupplemented by consonantal mechanism, is of scarcely any value.

Sometime ago I had an opportunity of studying the motions of the tongue under peculiar circumstances. Through the kindness of Dr. Bliss a man came under my observation who had lost the cheek tissues on the left side from cancer. The interior of the mouth was exposed, while the lips remained intact. The following are some of the general statements I can make respecting the motions of the tongue and soft palate in this case: The disease has destroyed a portion of the hard palate, but a pad of cotton being placed in the opening, articulation was perfect. When the pad and the dressing are removed, the voice lacks resonance, and some of the consonant sounds are merged. Thus *t* and *d* become *g*, etc. But the vowel sounds can be readily determined, and the play of the tongue and velum in producing them to be physiological. The hard palate being destroyed on the left side caused the tongue in many movements to ascend higher than on the right.

The following embrace the forms of the tongue which correspond to the production of definite sounds:

A—First sound as in *father*. The tip of the tongue is in contact with the lower teeth. The portion immediately back of the tip slightly raised above the plane of the tip and concave. The remainder of the tongue, as far as could be seen, was concave and shallow. The sides of the groove were defined by a broad rope-like eminence, which appeared to answer to the linguales fibres, lateral border, this eminence with quivering depression. The first sound of *a* was produced in one trial, by withdrawing the tip of the tongue from the teeth, the remainder of the tongue not being modified from the form as above described. The velum is slightly raised and the space between it and the tongue is slight. The uvula lies within the concavity, but does not touch its sides. No forward motion occurs at any of its parts, but the entire organ is depressed, the tip most so, and the basal parts least.

In the second sound of *a* as in *fate*, the tip recedes slightly, if at all, the part directly back of the tip becomes abruptly convex, and moves slightly forward. At the beginning of this sound the concavity at the base resembles that of the first sound. As the mechanism of the sound progresses the concavity deepens and narrows and the base ascends. The palate also ascends and the uvula is farther above the concavity than in the first sound.

In the first sound of *e*, as in *feet*, the tip remains in contact with the lower incisors, the part directly back of it becomes sharply convex and it with the rest of the tongue almost touches the hard palate, and the hinder concavity becomes greatly narrowed and

deepened. The shape in this sound is the same as the shape at the end of the second sound of *a*; thus confirming the views announced by Dr. James Rush, in his work on the voice. The uvula is raised and the space between the base of the tongue and velum large. Thus the tongue touches the palate in front but not behind.

In the second sound of *e*, as in *get*, the mechanism is the same as in the first sound; the expulsive power of the outgoing current of air is however greater and excites vibration in the uvula.

In the first sound of *o*, as in *old*, the entire tongue recedes and the tip is therefore carried back from the lower incisors, and the curved base is less distinctly seen than in the above-named sounds; indeed, the tongue appears to be raised in the middle of the groove. The portion back of the tip as well as the base become concave in the centre. The velum is raised as in the first sound of *a*.

In the second sound of *o*, as in *boot*, the tongue recedes to a greater extent than in the first and becomes to a corresponding degree difficult to analyze. The base, however, is concave and the sides of the tongue more elevated than in the first sound.

In a second trial of *o*, as in *old*, the tip not carried from teeth, yet the base goes back, the velum is abruptly raised and the uvula moves forward somewhat as *e* in *get*. The *o* in *old* certainly does at times recede from the teeth.

In a second trial of *o*, as in *boot*, the tip recedes more than in *o* in *old*. The tongue recedes.

THE PRESIDENT: I am sure that Dr. Allen will be glad to answer any questions.

DR. GREENE: I should like to ask Dr. Allen whether he has ever had an opportunity of observing a person who had no tongue at all.

DR. ALLEN: I never have, and I very much regret that I never had such an opportunity.

DR. GREENE: I remember having read somewhere about a patient in a French hospital having been observed in that condition and he could talk.

DR. ALLEN: This goes back to the time where cutting out the tongue was done for heresy.

MISS WARREN: I called myself on Dr. Dreer to find out whether it was true that he had such a patient and he said it was not. He said that articulation was not plain or distinct.

DR. ALLEN: The tongue can never be entirely removed except by an operation, taking out much more than the tongue. If this

were done it would destroy much of the breathing apparatus and has never been attempted. Amputation of the tongue means cutting off a part of the tongue, and speech will be retained if it is cut off in front of the prebase, and if behind that point speech is lost.

DR. GREENE: Have you ever had a case where the point of the tongue was gone?

DR. ALLEN: I never have. In this man of whom I have been speaking, in fatigue for the *t* and *d* to become *g*, he did not throw the tongue up and somewhat back.

I would like to make a few additional remarks. I find it difficult to make series of statements, which will be succinct and at the same time sufficient, without either under- or over-stating. I have said that the groove on the surface of the tongue is always present. *As a rule* it is present. I am afraid I often put specimens on the lecture table and forget to say anything about them afterwards.

I brought this skull from Philadelphia and I have not said anything about it. I thought it would be a good thing to illustrate what I have been talking about. In this skull we find the bones of the nose projecting and within there are two chambers. We speak habitually of a right and left nasal chamber as defined by a wall between, and yet no one would think of using the expression of right and left nose for the external nose. Another point, there is in the lower jaw directly back of the chin a little tubercle; man is the only animal that has it, and as man is the only animal who has speech I would ask is there not some connection between the presence of the tubercle and speech? The tubercle gives origin to two muscles, the geniohyoid muscle and the geniohyoid glossus muscle, the latter extending into the substances of the tongue. This diagram represents the muscle, some of the fibres go to the tubercle and some arise from it, and I think that there must be some connection between the spine and the muscles of speech. I know that some children who have oral respiration have these muscles in a tense state. If this be true that there is connection between these muscles and speech it may be a cause of some of the defects, and it is a good sign to call your attention to; if you find the floor of the mouth drawn well down on the neck, it is not in a normal condition.

THE PRESIDENT: There are two vowel sounds which teachers of articulation have difficulty in teaching—sounds of *oo* and *o*. Deaf children are rarely given them correctly, on account of the small

aperture between the lips; the child cannot see the interior of the mouth, and I shall be glad if you can tell us anything about the lingual position of these sounds.

DR. ALLEN: I have nothing to add to the remarks already made. I regret that I have nothing more definite to say. Permit me, sir, to make a suggestion. Could not the phoneidoscope be used in connection with articulation work? The wave-marks on a soap-bubble film can be thrown on a screen and shown to the class. A very beautiful play of colors is produced for each sound produced by its voice. The teacher can train the pupils how to say *oo*; the child can practice until the characteristic play of color is secured. I will be glad if this will be an answer to your question. The mechanism of the sounds used in pronouncing *oo* lies so far back that it cannot be seen.

THE PRESIDENT: In regard to these vowels, can you observe any elevation of the back part of the tongue in *oo*?

DR. ALLEN: The sides are raised; in the photographs they are elevated; that is to say, the concavity is more marked.

DR. GREENE: Dr. Allen was kind enough to explain why the skull was on the table; I would like to know why he borrowed my larynx.

DR. ALLEN: I think I wanted it for the following reasons: The hyoid bone is U-shape in perfectly developed children; in those whose voice should be undergoing change but is retarded, I find that the ends of the posterior arms (cornua) are drawn toward each other. I believe that a careful study should be made of the hyoid bone; it can be done by pressing the index finger and the thumb on it; this can be done without difficulty, and you can tell whether the bone is normal or not. Sometimes it is exaggerated. Instead of being U-shape it is bell-shaped, the arms extending outward (diagram on blackboard showing different shapes). I have found this of great use. Sometimes when the cornua are thrown out there is loss of voice.

DR. GREENE: Will you please tell us something about the laryngeal parts when the voice is changing?

DR. ALLEN: I have not made any observations on that point. Dr. F. R. French, of Brooklyn, has made some excellent observations on the positions of the vocal cords in the singing voice; he is a leading authority; he has made some beautiful photographs. I refer you to his papers.

DR. NOYES: Please give the name of the instrument throwing bubbles.

THE PRESIDENT: The phoneidoscope was invented by Sydney Taylor, of England; the instrument consists essentially of a pipe of large diameter, about the size of a telephone mouth-piece, and a film of soap bubbles is made so as to cover them with a flat film. There is a speaking tube, so that the vibrations of air goes on the side of this film, and this is thrown in vibration as you speak. If you reflect the light from this film on a screen, you get a most brilliant display of color and the character of the color, depends upon the thinness and form of the film while the film is in vibration.

MR. RAY: Is it necessary to have the room darkened?

THE PRESIDENT: Yes, it is advisable to have it dark. The film is apt to break and we have not obtained any constant patterns of definite designs. It is an interesting apparatus. I saw it when it was first devised and was present at some of the earlier experiments, but it has since been improved. I am not well acquainted with these improvements.

MR. BOOTH: I suggest the possibility of inventing an instrument by which the deaf could read speech, not upon the lips, but upon the instrument itself. Is that possible?

THE PRESIDENT: It may be. That is the idea I had many years ago, and which led naturally to the invention of the telephone, and the telephone was suggested to me from that. That was the direct attempt to put in execution your idea. I had hoped to employ the manometric capsule of Kernich, which consists of a cavity in a piece of wood divided into two parts by a membrane; one part of the membrane is filled with gas from a gas pipe, and one part is burned so that you have a flame produced about one-half to three-quarters of an inch in height, and the other half connects with the speaking tube through which you speak, so you have connection of vibration through a membrane to the gas and through the gas to the flame, and you have vibration of the flame as often as you have vibrations of the membrane,—the vibrations of the flame being magnified by looking at the reflection in a series of mirrors arranged around a support and caused to rotate rapidly,—you see the reflection as a band of light and every vibration of the flame appears as a wave or undulation of that light, and when you speak through the mouth-piece you have most beautiful vibrations, and it was by the study of the shapes and forms of these vibrations that I was led by the different steps to the invention of the telephone. How far the apparatus can be used in the instruction of the deaf is problematic; further acquaintance with the vibrations and characters of sound leads me to be more doubtful about it now than then.

MR. CALDWELL: Dr. Allen spoke of nineteen pupils transferred from the oral to the manual department; I should like to know whether they were operated on.

DR. ALLEN: One was. As I said yesterday that report is just completed. Dr. Bliss placed it in my hands just before I left the city, and I have not had an opportunity to analyze the cases, and I intend when I return to go over the pupils with care. At present I cannot say anything in addition to Dr. Bliss' report. I accept it as one in every way reliable. The children I treated were selected by Dr. Wharton, the general physician, and I am not informed whether they belonged to the oral or to the manual department. It is evident that the pupils in the oral should be carefully studied. It must be remembered that of the pupils Dr. Bliss examined he found these nineteen which had been sent back from the oral to the manual department, and no proportions had been given as to how many of these untrainable cases were in the oral department.

MR. CALDWELL: I think it would be interesting to know whether these nineteen pupils have undergone any improvement mentally, if they have been operated on.

DR. GILLET: I do not rise to ask any questions, but to propose what I am sure will meet with most hearty approval. Dr. Allen has not only entertained us delightfully on two occasions, but has certainly instructed us and has given suggestions which we will carry to our homes. I move a vote of thanks to him for his interesting addresses.

MR. RAY: I arise to second the motion, and I would like to emphasize it in a peculiar way, if I knew how. I believe, sir, that I will move an amendment to the motion by asking that a rising vote be taken. I have not only been entertained, but exceedingly highly instructed.

DR. GREENE: I second the motion that we have a rising vote for the most charming and valuable instructions he has given.

THE PRESIDENT: It gives me great pleasure to put this motion. I am sure that none of us have ever listened to a more important and instructive lesson than we have received from Dr. Allen. It is a pleasure to have met him here and to have listened to his remarks. I will ask the audience to carry it by a rising vote of thanks.

DR. ALLEN: I assure you it has been a great pleasure to me to be present at this meeting, and I must thank you for the very courteous manner in which you have listened to my remarks.

