

EDUCATION OF DEAF-MUTES.



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EDUCATION
OF
DEAF-MUTES:

A MANUAL FOR TEACHERS.

BY
THOMAS ARNOLD.

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PREFACE.

THE necessity for such a work as this will be at once admitted if it is remembered that deafness is followed by dumbness and other special conditions which must be specially treated. To educate deaf-mutes, methods had to be discovered or invented which were unknown to the teachers of the hearing. With these every one who would devote himself to the work ought to be well acquainted and capable of selecting those that are best adapted to the purpose. Probably there is no department of education in which so many conflicting theories and methods are found as in this, and their professors are both earnest and eloquent in support of their exclusive claims to recognition, but none of them deserve adoption unless they can be proved to be in accordance with science, and sustained by well tested results. The cause of this diversity does not, however, lie in the inherent difficulties of the work, but in the oversight of the natural laws and conditions which must be known and complied with if deaf-mutes are to be educated. Their relations to the material world are widely different from ours, for the exclusion of sound from the mind as the vehicle of thought is the exclusion of our language, so that to sight and touch the function is left of supplying the primary elements of thought. This peculiar mental attitude has been lost sight of by many

who unconsciously transfer their own modes of thinking to the deaf and dumb, without reflecting that their medium of thought must ever be different from ours. But instead of this we ought to do our utmost to realise their exact relations to the material, see through their eyes, feel through their touches, and live their mental life, that we may learn how to reach them and find out the methods best fitted to act in harmony with their special cerebral conditions. There would be only one method did we thoroughly understand their state. A closer following of nature would lead to its discovery. She does not deceive any who will be guided by her, for she reveals the works of God and blesses all her ministers and interpreters with more light.

The writer of this work can safely aver that it has taken shape and order under the influence of these principles. By endeavouring to describe the actual state of the scholar he has anticipated the teacher's principal difficulties, shown him how to deal with them, directed his attention to points of greater importance, and led the way step by step from the first exercises of the senses up to their full development as the instruments of thought and its intelligent expression. It was a bold attempt, and would not be blamable were it even to fail; but he humbly hopes that he has added something to the forces which in time will redeem and restore deaf-mutes to society and put them in full possession of their lost inheritance. Not that for a moment he harbours the vain fancy that what he has done is either perfect or complete. The way is rough and ill defined, but there are many true-hearted toilers whose united efforts will in time make it smooth and straight, for they will have the confidence of men who know that the means they employ are right. Their work will, therefore, be lighter, and their steps more assured. Others will also join them, and never

rest till they have heard the last syllable that nature has to utter for the relief of deaf-mutes. Those who read the work will not find in it any harsh or uncharitable criticisms of the theories of others, or of the value of their labours, but on the contrary a desire to discover and honour sincerity and earnestness wherever they can be found, and a willingness to learn from the humblest as well as the most distinguished, for the Author holds there is a divine vocation and a true brotherhood of all those who are consecrated to the relief of human suffering and privation, and therefore seeks to estimate every one at his greatest worth and to grasp his hand in loving salutation.

The work owes its inception to a conversation with the Examiners of the College of Teachers of the Deaf and Dumb, London, at their Meeting, in July, 1886. They then stated that they were in some difficulty from not being able to recommend, to the candidates preparing for Examination, any one text-book or manual that contained a full exposition of all the subjects of whose knowledge they would be required to satisfy them as to their competency to instruct deaf-mutes. From the suggestions and encouragements then and afterwards received, the writer undertook to provide them, if possible, with a suitable manual, at the same time engaging to submit the manuscript for their approval, and when in the press to let them have the first proofs for review and criticism. In due time the work was written and the manuscript presented and approved of; but in addition to this a guarantee fund was then raised to secure its publication, a moiety of which was from the funds of the College, and the remainder subscribed by the members of the Committee, who were then Dr. R. ELLIOTT, Head Master of the Old Kent Road and Margate Deaf and Dumb Institution;

Messrs. JAMES HOWARD, Head Master of the Yorkshire Institution; S. SCHÖNTHEIL, Principal of the Jews' Deaf and Dumb Home, London; WILLIAM SLEIGHT, Head Master of the Brighton Institution, and Rev. Dr. W. STAINER, Superintendent of the Deaf and Dumb Classes, London School Board. A closer acquaintance with the work has confirmed the first impressions of these gentlemen, and it is therefore issued with their full approval, and recommended to all teachers of deaf-mutes, whether actively engaged in their education, or preparing for examination.

But in addition to the sympathy and support of the Committee, the Author has received most valuable assistance from H. N. DIXON, Esq., M.A., F.L.S., his successor in the School in Northampton, and from A. FARRAR, Esq., Junr., F.G.S., the former contributing the drawings for the illustrations, with their descriptions; the latter, criticisms on subjects with which, as an educated deaf-mute, he was prepared to deal; and from both in collecting and arranging the materials for the Historical part.

Perhaps some will complain of the fulness of the part on Language, or its form, but the Grammar is for the teachers, the exercises for the scholars, and as the work will be in the hands of some who have had fewer educational advantages in their prior training, it is necessary to provide for them also in the elementary forms of language.

The omission also of organic defects, and other natural impediments, with the best methods of treating them, may be complained of, but they are not only outside the scope of this work, but require special treatment in a work devoted exclusively to themselves. It was to show how a deaf-mute, having all his other faculties in a healthy and

perfect state, could be educated to speak, converse, acquire knowledge, and share in all our social, intellectual, and moral advantages, and this he has not only done, but can refer to living evidences of the efficiency of the methods.

Twice during the composition of the work the health of the writer failed, and he had reasons for concluding that he might not live to see its completion. But now he would record with thankfulness that his heart's desire has been granted, that he might be spared to see the work in the hands of teachers, and through them permitted to advance the education of the class to whom he has devoted his best thoughts and endeavours for thirty years.

And to this he would add his grateful recognition of the sympathy manifested here and elsewhere by many ladies and gentlemen who have interested themselves in his work.

NORTHAMPTON,

August 24th, 1888.

N.B.—The work will be supplied on order at the office of the College, Stainer House, Paddington Green. As it is the property of the College, this mode has been adopted to avoid the usual expense of publication, and enable the Committee to dispose of it at a reduced rate to teachers, as well as to the public. And it is hoped that the expense of printing and advertising will be at least covered, the guarantee fund being repaid, and a small balance remain to

purchase works on the education of deaf-mutes for the College Library. At present their number is very limited, and the teachers who wish to make themselves thoroughly acquainted with the subject cannot procure the requisite books. Contributions of such works would not only enrich the library, but make them much more useful and secure than on the shelves of private collectors.

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¹ N.B.—In the above statement of the principles of Lip-Reading, and afterwards in the practical analysis of the phonetic elements, though alluded to, it was not adequately shown that the action of the facial muscles in most of the sounds can be felt by applying the finger to the precise parts, and that it would be helpful to the learner to put him in possession of the fact, as it is when he gets his first perception of sound in the larynx. This gives these motions an intuitive relation to himself, whilst his attention is more closely directed to a speaker, in order to discover them in reading. Touch and sight more fully co-operate in such exercises, and this to their mutual benefit.

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ORIGIN AND PROGRESS OF
DEAF-MUTE EDUCATION.

PRIOR to the History of Herodotus, there is no reference made to this unfortunate class except what we find in the Scriptures. No doubt they then bore the same proportion to the population as at present, but they were concealed, or looked upon and dreaded as smitten by the gods for the crimes of their parents, or feared from the mystery that shrouded their fate and their supposed possession of supernatural powers. The Spartan law consigned them to the great pit in Taygetus into which the deformed were cast as useless to the state. The Athenians treated them no better. "For they were without pity put to death without a single voice being raised against the monstrous deed." The Tiber, too, at Rome was to receive them, had not parental affection sometimes proved stronger than the laws. Their presence in the family was felt to be a disgrace and a calamity. Destitute of education, and hardly understood, even in expressing their wants by signs, they lived in deplorable isolation, looked upon as useless, a burden, and often cruelly treated and neglected. No other class suffered so much. Nature had endowed many of them with superior gifts, but they fared no better than if they were insane or imbecile. Feeling themselves to be outcasts, is it any wonder that they abandoned themselves to vicious habits?

Moses is the first historian who refers to them, or rather records what God Himself says of them when Moses refused to undertake the leadership in the emancipation of His people from Egypt, saying, "O my Lord, I am not eloquent . . . for I am slow of speech, and of a slow tongue. And the Lord said unto him, Who hath made man's mouth? or who maketh

a man dumb, or deaf, or seeing, or blind? Is it not I, saith the Lord?" (Ex. iv. 10, 11.) This, it is true, is a reference in a reproof, but it is rich in meaning and blessing for the deaf and dumb and the blind. Not fate, nor the displeasure of the gods, nor blindly directed laws of nature have brought this blindness and dumbness, but God Himself has done or permitted it for His own glory. These words make them specially His. They are His seal upon them, and our business is not to inquire too closely for His reasons, but to do our utmost to alleviate their privations. The same spirit reappears in the legislation of Moses, and he enacts, "Thou shalt not curse the deaf nor put a stumbling block before the blind, but shalt fear thy God." (Lev. xix. 14.) The fear of God, if not their pity, was to restrain them from cursing the deaf, for God is their creator and protector. Other allusions are also found, but Solomon the wisest of men speaks a divine word of sympathy for them, "Open thy mouth for the dumb, in the cause of all such as are left desolate." (Prov. xxxi. 8.) Speak for those who cannot speak for themselves. Stand up for the desolate. In a glowing song by Isaiah, about Messiah's reign, are prophetic words which were literally fulfilled in the ministry of the Son of God. "Then shall the lame man leap as an hart, and the tongue of the dumb shall sing." (Is. xxxv. 6.) They were not to be passed by as hopeless but share in the blessings which embraced the whole nation. In Hebrew they are called *illām*, silent or dumb from natural causes, and *chârāsh* also meaning deaf, hence dumb, but this might be voluntary. In the Septuagint, *duskôphos*, or stone deaf, and *kôphós*, deaf, dumb, also *mogilálos*, dumb. This last is the term used in Isaiah, and in the New Testament. In the Apocryphal Book of Wisdom there is a remarkable passage in praise of the wonderful works of wisdom. "For wisdom openeth the mouth of the dumb and maketh the tongues of infants eloquent." (Ch. x. 21.) Does this refer to what some wise man had done in making the dumb to speak? If so, it is the first on record. Or is it only a poetic form of telling what wisdom has done as a teacher of the ignorant and illiterate? Possibly the latter. This humane and enlightened spirit of Hebrew legislation

and literature is admirable while classic nations were passing laws for their destruction. The spirit lives in their descendants. It is said that the Egyptians and Persians treated deaf-mutes humanely and strove to ameliorate their sad state, but the accounts are so scanty that little more can be said on the point. ✓

HERODOTUS.

HERODOTUS is the first of the Greeks who refers to them. His account of the deaf and dumb son of Cræsus, King of Lydia, B.C. 557, is deeply interesting. "Cræsus," says he, "had two sons, one blasted by a natural defect, being deaf and dumb (*kôphós*), the other, distinguished far above his comrades in every other pursuit." Of the first he says: "He was a worthy youth, whose only defect was that he was deaf and dumb. In the days of his prosperity Cræsus had done the utmost he could for him, and among other plans which he had devised, had sent to Delphi to consult the Oracle on his behalf. The answer which he had received from the Pythoness ran thus:—

"Lydian, wide ruling monarch, thou wondrous simple Cræsus,
Wish not ever to hear in thy palace the voice thou hast prayed for,
Uttering intelligent sounds. For better thy son should be silent!
Ah! woe worth the day when thine ear shall first list to his accents."

Afterwards, "when the town—Sardis—was taken in the war, one of the Persians was just going to kill Cræsus, not knowing who he was. Cræsus saw the man coming, but under the pressure of his affliction did not care to avoid the blow, not minding whether or not he died beneath the stroke. Then this son of his, who was voiceless (*"aphôn os*), beholding the Persian as he rushed towards Cræsus, in the agony of his fear and grief burst into speech, and said: 'Man, do not kill Cræsus.' This was the first time that he had ever spoken a word, but afterwards he retained the power of speech for the remainder of his life." (Bk. I. ch. lxxxv., Rawlinson's translation.) This was written about B.C. 447, or at least 100 years after the events; its accuracy may therefore be doubted. Herodotus, like most patriotic Greeks, favoured the oracle for political as well as religious

reasons. If the youth had been really deaf, nothing but a miracle could have supplied him with words he had never heard. It is more likely that he was one of the few who hear, but cannot speak from organic debility. The Greek term, being ambiguous, decides nothing. The fact, therefore, seems to be that from the unwonted excitement and force of feeling, the organs acquired the necessary energy, and he uttered the words that saved his father's life. Either this is the solution of the difficulty, or the tale is a myth. Its value lies more in what it implies than expresses. It says that "Cræsus had done the utmost he could for him." His power and great riches gave him the command of whatever could be done by Greek physicians and philosophers who were, at that age, in advance of all others in skill and science, but not one was found to treat the case successfully. They were helpless to teach or restore.

Gellius, lib. V., c. ix., also tells of a Samian athlete called Aigles, who had not previously spoken, having recovered his speech from a similar cause. But Gellius thinks he never could have done so unless he had heard and learned speech previously.

HIPPOCRATES AND ARISTOTLE.

HIPPOCRATES, the "Father of Medicine," born B.C. 460, and died B.C. 357. He was the first to place medicine on a scientific foundation, as the result of observation. He practised at Athens, Pella, and other places, where he was held in great reverence, and called the "Divine Old Man." His authority on medicine was supreme in the Greek Schools. The authenticity of many of his works has, however, been warmly contested by scholars.

In his "Peri Sarkôn," or "About the Flesh," ch. xviii., is the following passage on the voice, in which a reference to deaf-mutes is found. "Articulation is caused by the appulse of the tongue; it renders the words distinct, by intercepting them in the throat, and striking against the palate and the teeth. If the tongue did not articulate every time by striking, man would not speak distinctly; and he would only utter each of the single natural sounds. A proof of

this is the case of deaf-mutes from birth, who not knowing how to speak, utter only simple sounds. We succeed no better if we try to speak after an expiration. In fact a man who wishes to make himself loudly heard, inhales the external air, and drives it forth, crying loud, so that the air may reverberate. Afterwards the sound grows feeble and dies away." (E. Littré's Transl.) This observation states only a fact, and does not reflect on the capacity of deaf-mutes. But, unfortunately for them, Aristotle, the great philosopher (born B.C. 384, died B.C. 322), and whose doctrines and opinions exerted an unbounded influence on human thought for many centuries, spoke of deaf-mutes in a manner which was interpreted to their prejudice. The passage is found in his "Hist. Anim.," lib. IV., c. ix. (Becker), "Those who are born deaf all become speechless, they have a voice, but are destitute of speech." The Greek, *ἐνεοί*, rendered speechless, may also mean senseless, destitute of reason, so that if the latter meaning was adopted, they were classed with idiots and incapables, and received the same treatment. From the absence of every attempt to educate them, till in later Roman times, they seem to have been considered hopeless, and this in the face of the fact that they were in possession of the average amount of natural endowments.

Four more centuries have to run their silent rounds before the dawn appears. True, C. Pliny, the elder, in his "Natural History" tells of a deaf and dumb person, named Q. Pedius, who had learned to paint and make respectable progress. Still more, B.C. 70, the orator and author M. V. Massala Corvinus had a deaf and dumb relative instructed in painting. While these are sufficient recognitions of the possession of ability in art by deaf-mutes, they are destitute of any reference to their mental or moral education.

CHRIST.

THE Day Star, long desired and waited for, at last arose. He "made the deaf to hear, the dumb to speak, and the blind to see." St. Mark gives us the history of his first miracle of this order, ch. vii. 33—37 (N.V.): "They bring unto him one that was deaf (*kōphon*), and had an im-

pediment in his speech" (*mogilálon*), a stammerer. "And he took him aside from the multitude privately," so that his attention could not be distracted by the people, "and put his fingers into his ears, and he spat and touched his tongue." His ears wanted opening, the Lord put his fingers into them; his tongue wanted loosing, the Lord anointed it with his saliva. Both are expressive signs, and no doubt were read by the dumb man.

"And looking up to heaven he sighed, and saith unto him, Ephphatha, that is, 'Be opened.'" The upward look is believing prayer, and the sigh which nature revealed by the heaving breast is his sorrow for the afflicted deaf-mute, so that all is done which can be done to awaken faith and hope, before "His ears were opened and the bond of his tongue was loosed and he spake plain." This miracle is wonderful as such, but it is concealed, inscrutable; more wonderful still from the manner in which the Lord used the deaf-mute's own language in those touches of his ears and tongue with his own fingers to excite his attention. Thus he unites himself with him and "carries his sorrows" that he may restore his speech. Verily the deaf and dumb are his own special charge as well as the blind. The education of the deaf and dumb springs out of this miracle.

ROMAN LAW.

BEFORE noticing the first successful attempts to teach the deaf and dumb, it will be well to learn how they were dealt with by Roman legislation. There are many references to them in the Pandects and Decrees of the Emperors; but there are also special enactments for them in relation to property and rights. In all they are treated as children incapable of managing their own affairs, of giving evidence in a court of law, or of disposing of their property. Guardians were appointed over them who were responsible to the State. Pliny, in his "Natural History," X., 69, affirms anew the dictum of Aristotle, and says "The man to whom the sense of hearing has been denied, is thereby deprived of the power of speech. There is no one deaf from birth who is not at the same time mute."

In the laws of Justinian ("Codicis" lib. vi., tit. xxii., cap. x.) some light is thrown on their condition by the manner in which the Roman Jurists and Philosophers discussed the causes of their dumbness, and the classes into which they were divided.

"Maintaining the distinction between the deaf and dumb, since the two defects are not always combined, we ordain (1) That if one is afflicted with both diseases at once, that is to say, if from natural causes he can neither hear nor speak, he shall neither make a will nor any form of bequest, nor shall he be allowed to grant freedom by manumission nor in any other way. And this decree is to be binding on both males and females. (2.) But where in either male or female, the same condition has been brought about by calamity, not from birth, voice and hearing having both been lost by subsequent disease, then in case such a one have received an education, we permit him to do of his own act, all that in the previous case we prohibited. (3.) But if this further misfortune, which so rarely occurs, is to be considered, we should allow a man who was only deaf, supposing the affliction to be from natural causes, to do everything of the nature of making a testamentary bequest, or granting freedom. For where nature has bestowed an articulate voice, there is nothing to hinder him from doing as he wishes; for we know that certain juriconsults have made a careful study of this, and have declared that there is no one who is altogether unable to hear if he is spoken to above the back of the head; which was also the opinion of Jubentius Celsus. (4.) But those who have lost their hearing by disease can without doubt do everything without hindrance. (5.) Supposing, however, the ears are perfect, but though there is a voice the tongue is tied (although on this subject there is considerable difference of opinion among the old authors), yet supposing such a one to be well educated, there is nothing to prevent his doing anything of this nature, whether the misfortune be congenital or the result of disease, without distinction between males and females."

By this edict they are divided into the following five classes: 1. Those who congenitally, or from disease, can neither hear nor speak. 2. Those who were educated before they lost their hearing and speech from disease. 3. Those who, though deaf, were not dumb, but who could hear when spoken to at the back of the head. 4. Those whose hearing alone had been lost through disease. 5. Those who could hear well, but speak imperfectly or not at all from some organic defect. Opinion had differed widely about the third class. They evidently possessed enough hearing to know the use of words, yet seemed deaf to those who addressed them in the usual manner. Such cases are known

among ourselves, and probably the organ, though imperfect, is still capable of distinguishing sounds very distinctly uttered.

This law does not permit us to assume that education had then done or could do anything for the congenitally deaf and dumb, or for those who had early lost their speech through the loss of hearing. But when this occurred later on in life after they were educated, their speech was still retained; or if partially lost, writing supplied its place, and they retained their rights. The divided opinions of the jurists and the absence of accurate information about the causes of dumbness from the low state of medical science, as well as the observed fact of dumbness invariably following deafness in childhood, are expressed in the text, and evince an increasing interest in their condition. But there are two manifest errors. First, the existence of a class who were deaf and yet not dumb, to whom nature had given speech; and second, of another who could hear through the cranium. *Jub. Celsus* was a great authority on such subjects, and his opinion, as cited above, on the possibility of hearing independently of the ear, would be held conclusive.

ST. AUGUSTINE.

NEXT to the dictum of Aristotle, the dogmatic assertion of St. Augustine was most adverse to the interests of deaf-mutes, for his influence, in many points just, as a theologian, was as great as that of Aristotle, as a philosopher. Speaking of dumbness, he says: "But this very defect itself hinders faith, for one who is deaf from birth cannot learn the letters by whose knowledge he would attain to faith." ("Quod vitium ipsum impedit fidem; nam surdus natu litteras quibus lectis fidem concipiat, discere non potest.") The allusion is, no doubt, to the passage, "Faith cometh by hearing, and hearing by the word of God." Now, if at the time deaf-mutes had been taught to speak, or read and write, St. Augustine would never have uttered such a dogmatic anathema, and it therefore furnishes indirect evidence that they were still destitute of education. Christian benevolence does not wait for the decisions of philosophers and theolo-

gians, but at once assails the evil which has excited its sympathy, and to this deaf mutes chiefly owe the efforts that have almost emancipated them.

But Jewish benevolence was not hampered by authority. They were still under the humane influence of their law, and therefore we find this striking passage in the Talmud "Tractate Chiaggia," p. 3: "You must not relegate the deaf and dumb to the category of the idiot and the infant as being morally irresponsible, because they can be taught and rendered intelligent." And the following facts are related in support of this declaration: "There were two dumb lads dwelling in the neighbourhood of Rabbi Judah, the Prince. They were the grandsons of the Rabbi Jochanan, son of Gudgada—according to another version his nephews—and whenever the Rabbi went to his house of learning they followed him, and sat opposite to him when he expounded the law, and shook their heads intelligently, and moved their lips. The Rabbi prayed for them. They were healed of their infirmity, and it was found that they had mastered the whole body of Talmudical learning." In their case, as in that of the son of Cræsus, the defect was not in the hearing, but in the organs of speech, so that they could hear and remember what the Rabbi had taught. Had they been deaf also the thing is inconceivable, for all the elements were wanting which could lead to such attainments. The reference to the motions of their lips implies an attempt on their part to pronounce the words as they heard them. (Dr. Adler, the chief Rabbi, London, has kindly contributed this interesting passage from the Talmud.)

ST. JOHN OF BEVERLEY.

AFTER the fall of the Roman Empire, the new order of things founded on its ruins was most unfavourable to works of benevolence. The barbarians had to be Christianised and civilised before they could attend to anything but war and conquest. In England the Saxon conquest had swept away the British churches, and Christianity found a refuge only with the Britons who had escaped. But after the conversion of the Saxons learning revived, schools were founded, the

Scriptures were read and taught to the people, and that missionary zeal for the conversion of the heathen, which has characterised the Anglo-Saxon race ever since, had its birth. Roman law and the opinions of the learned found their place, but the spirit of our religion was stronger than they. St. Cuthbert, Alcuin, Aldhelm were famous in their day for piety, devotion and apostolic zeal. St. John, Bishop of Hexham and founder of Beverley Minster, was famous in the north. Of him the Venerable Bede—born 673, died 735—in his “Hist. Eccl.,” lib. V., c. ii., relates the following intensely interesting anecdote:—Now there was in a village not far distant a certain deaf and dumb youth, who was well known to the Bishop, for he had been in the habit of coming frequently before him for the purpose of receiving alms. The youth could not utter a single articulate sound, and, moreover, had such a scurvy and such sores on his head that no hair could ever grow on the upper part of it; and what remained seemed to stand out in a circle like bristles. The Bishop gave orders that he should be brought to him, and that a small hut should be built for him in the grounds of his own palace, where he might dwell and receive a daily allowance from his own attendants. At the end of a week in Lent, on the next Lord’s Day, he ordered the poor fellow to come into his presence. When he had come, he ordered him to thrust forth his tongue out of his mouth, and show it to him. Then, taking hold of him by the chin, he made the sign of the holy cross on his tongue. This done, he told him to draw it back again into his mouth, and to speak. ‘Say some word,’ said he; ‘say Gae or Yea.’ That is a word expressing affirmation, in the language of the English, I consent, that is, it means ‘Yes.’ Immediately his tongue was loosed. He said what he had been ordered. The Bishop then added the names of the letters; ‘say A;’ he said ‘A’; say ‘B;’ he said this, too. And when he had repeated the names of the letters as the Bishop said them one by one, the latter went further and gave him syllables and words to say; and when, in all these instances, he at once replied, he told him to say longer sentences, and he did so. Nor did he, through the whole of that day and the following night, as long as he could keep awake—so they

report who were present—cease saying something, and revealing to others the secret of his mind and heart as he never could before; like that man long lame, who, when cured by the Apostles Peter and John, ‘leaping up, stood and walked, and entered with them into the temple, walking and leaping and praising God,’ glad, of course, to have the use of his feet, of which he had been deprived for so long a time. The Bishop also shared his joy at his cure, and gave orders to a doctor to devote his attention to curing also the scurvy on his head.”

This account was written by Bede, who heard it from some who were present, a number of years after.^a We may safely assume that the accuracy of their memory was not absolute, and that they were more or less under the tendency of the age to ascribe to supernatural whatever they could not account for by natural causes. In their eyes it was a miracle. But in ours who know more of what can be done by the oral instruction of the deaf, it is the primary instance of a successful attempt made to give speech to the deaf. He had the youth near him in a hut for some time. He very probably visited him frequently, and inspired to make the attempt by his strong sympathy, succeeded so well that the youth could not only speak but understand what was said. Afterwards, “on a Sunday in Lent,” he introduced him to the people and showed them what he had done. But the most convincing evidence of his employment of artificial means is found in the manner in which he proceeds. For he begins with the simple phonetic elements and advances in the usual order to syllables, words and sentences, as an oral teacher would do. The young man, too, knows by the motions of the Bishop’s lips what he tells him to do. It is, therefore, in the opinion of many, a veritable instance, and the first on record, of the successful oral instruction of deaf mutes. Why should it be questioned? The same intense benevolence, centuries afterwards, led Ponce, Bonet, Pereira and Wallis to do still greater things. “At the time,” says Walther, “all who saw it concluded it

^a Bede was ordained to the priesthood by the Bishop when he was thirty, but it does not appear that he had the account from himself.

was a miracle, and that the result was obtained solely by the laying on of the Bishop's hands. Of the way in which the Bishop had discovered how to teach the deaf to speak they knew nothing. Nevertheless, we have here to do with one of the first attempts made to teach the deaf and dumb to speak" (Geschichte, p. 11). True, it was done and afterwards recorded by Bede to be a fruitful seed in some other great heart. Up this rugged and pathless steep climbed this divine man leading the deaf-mute step by step till the top was reached, "and he spake plain." Let us feel the inspiration of the fact, that an Anglo-Saxon was the pioneer in this work of emancipation, and do our part well. ✓

But Bede did not confine his studies to divine things only, he meddled with all the arts and sciences of his age, for he longed to lead his countrymen to higher pursuits than fighting and hunting. Among his minor works there is a short tractate on the expression of numbers by the hands and fingers. There are four copies of this tract, "*De computo vel loquela per gestum digitorum*," in the British Museum. But the one in Grævius' *Thesaurus Antiquitatum*, Tom. xi., 1669, is more valuable from the notes. There is also another tract published at Ratisbon in 1532: "*Abacus atque vetustissima veterum latinorum per digitos manusque numerandi (quin etiam loquendi) consuetudo ex Beda cum picturis et imaginibus*," etc. This is, however, not Bede's, but an account of it, and an illustrated description of his method as recited in the tractate. In carefully examining the fingersigns used for numbers, it struck us as being very much like in principle that now in use in some of our Institutions, only Bede begins with the open hand and turns down the little finger to the palm for one instead of the closed hand and the thumb alone opened, for one. Different positions of both hands are used for the tens, and for higher numbers as indicated in the extracts below.

Thus, "when you say one, use the little finger of the left hand, turning down the joint into the middle of the palm.

"For two, set the second finger from the little one similarly turned down.

"For three, turn down the third in the same way.

“For ten set the index finger of the left on the middle joint of the thumb of the right.

“For one hundred do the same on the left hand that you have done for ten on the right.

“For one thousand do the same on the right hand as for one on the left hand.

“For ten thousand place the left hand flat on the chest with the fingers quite straight forward.”

He next proceeds to construct a “manual speech” as he calls it. This is best described in his own words. “I think that from what I have just made known (that is, his mode of reckoning numbers by the fingers) some kind of manual speech can be formed for the purpose quite as much of exercising ingenuity as for amusement, by means of which any one, when he has expressed the letters one by one, may convey the words contained in these letters to another, who had learned this art, however far away he may be placed, so that (the words) are read and understood. The order of this play or speech, is as follows: When you wish to signify the first letter of the alphabet use the sign for the number one, when the second then that for two, and so on with the others in order.” He refers to the Greeks and Latins using letters as signs of numbers, but he preferred the Greek, because they had a literal sign for each of the digits. This alphabet differs from Bonet’s, in which there is an evident design to express the letters in positions of the fingers bearing some resemblance to the characters with which they are associated. And this is still more evident in the English two-handed alphabet. No such resemblance can be traced in Bede’s. It is said that Ponce and Bonet used an alphabet known to the Romans, only improved for their special work. The French manual alphabet is not Bede’s, but Bonet’s. There is no evidence that Bede ever intended his alphabet for the use of deaf-mutes, but he prepared the way.

✓ The good Bishop had no successor in this benevolent work. Seven more centuries had to roll along over the myriads who were born and died.

“But knowledge to their eyes her ample page
Rich with the spoils of time did ne’er unroll”

till the fifteenth century. Rudolph Agricola, 1443-85, a

learned Dutchman and Professor at Heidelberg, tells us that "he saw what seemed to him to rise almost to the miraculous—a man deaf from his earliest years, and consequently mute, who nevertheless had so learned that he understood whatever another wrote, and himself, also knew how to speak, and that he could reveal all the thoughts of his mind." "*De inventione dialectica*," lib. iii., c. xvi. But by whom or how he had been instructed Agricola does not say. We are quite in the dark on this essential point. Ludovic Vives, a learned Spaniard, in his work, *De anima*, treats the account as a myth, because he thought it impossible. Cardan refers to it in his "*Paralipomenon*," bk. iii., ch. viii., where he says, "Georgius Agricola, in the third book of his '*De inventione dialectica*' says, 'he had seen a man born deaf and dumb who had learned to read and write so that he could express whatever he wished.'"

JEROME CARDAN.

THE light was gradually spreading, but it touched the hill-tops only long before it filled the valleys. Here and there a solitary thinker and seeker, whose curiosity led him to wherever there was a hope of finding new truth, saw, heard, and learned enough to convince him that deaf-mutes could be taught to read, write, and converse. They were professors, students, and travellers, who thus wandered over Europe. Many supposed they knew too much, others, that they were infidels or magicians. Of these Jerome Cardan was one of the most distinguished. Born at Pavia, in 1501, he was in due course highly educated, and grew to be a distinguished philosopher and mathematician. Endowed with a penetrating genius, inquisitive, restless, and unwearied in his researches, he went wherever he hoped to find the knowledge that he coveted. At first he was a physician by profession, but he would not be bound at home, and visited many lands, coming to England in the reign of Edward the VI. Afterwards he returned to Italy and taught mathematics at Milan and Bologna. His early studies in anatomy had drawn his attention to the organs of speech and the loss of their use by the deaf and dumb. In the work already quoted (l. iii., c.

viii.) he says, "We can make the dumb hear by reading, and speak by writing. For the memory, after a course of thinking, comprehends, for example, that 'bread' signifies what is eaten. In this way the dumb reads by his reason, as it were in a picture, for by means of this faculty, though nothing is referred to sound, not only objects, but actions and results are made known to him. And just as after seeing a picture we may draw another picture, guided simply by a conception of the objects represented, such also is it with regard to letters. For as differences in sound are used by agreement to signify different things so also are the various figures of objects and of words."

In his work, "*De Subtilitate*" l. xiii. "*de Sensibus*," he speaks of the sounds of a lyre being heard through a lance when one end of it is held by the teeth, and the other touches the lyre.

In book xiv., "*De Anima et Intellectu*," of the same work, he also says, "It has been satisfactorily ascertained by us from experiment, that when hearing boys learn to read, they repeat the words from a mental reproduction of the sound; hence those who are naturally deaf are necessarily dumb. For though these boys do not perceive the sound of the words, yet they have the knowledge of the sounds.

In "*De Utilitate ex Adversis capienda*," cap. vii. *De Surditate*, after describing the different classes of deaf-mutes, he goes on to say, "But if he become deaf before he has learnt to read and write"—and after he has learned to speak—"what must such an unfortunate one do? This to be sure would be a disgraceful thing, because reading and writing ought to be taught simultaneously with speech. But what is now to be done if it be the fault of his parents? He ought to learn to read and write, for that can be done, as well as in the case of the blind, as I have elsewhere taught. It is a difficult thing but, nevertheless, one which even a congenital mute can do. . . . If you have learnt to speak you can inquire so that the secrets of the arts shall be made known to you. There are, as I have said, many secrets in every art. But they may be explained to you by signs as well as by words. It is a well known fact that there were at

Rome pantomimic actors who expressed everything so well to a barbarian king by means of gestures, that, when he had begged two of them from the emperor, he considered their acquisition as a very great boon. But both objects themselves and written signs of vocal sounds, may be represented in hieroglyphs, as was done long ago.

“But to speak also of the first class of deafness, that which begins at or soon after birth, I would ask, whether during our whole infancy we too are not deaf-mutes, and less perfect in our senses than in vigour and strength of mind? And yet there is no one so unhappy in this respect, that he cannot learn appropriate arts. And so deaf-mutes reverence and worship God, and since they have mental power there is nothing to prevent them from executing the more delicate works of art; and to live in greater self respect, for they are held in greater esteem by all on account of their polished manners. I remember that I well knew some deaf and dumb people, who being in the service of certain of the nobility, were most acceptable to them, and who went about the house without creating the least confusion, nor were they molested by others.

“And now in general to him who has mental power there is nothing whatever which seems so great as not to be achievable by mental effort.”

Did these stirring reflections reach the eyes of Pedro de Ponce, in Spain, and rouse him to the noble attempt? Or did he read what Bede had related of St. John of Beverley's success? Possibly the latter, for Abelard in A.D. 1121, said on a controverted point, “The authority of Bede, whose writings are followed by all the churches, appears preferable to me.” Were his works in the monastery of San Salvador? It is impossible to say. We would not detract from the glory of Ponce. Cardan had enquired and speculated but never taught deaf-mutes. Ponce did the first that he might do the second. Alone, unassisted, suspected of knowing too much, he toiled on, hoping, fearing, often weary but never despairing, and contended with nature till she yielded up her secrets. His difficulties were immense for he had to be his own teacher. Possibly, too, they were increased by the manner in which the young nobleman had been previously treated by a

multitude of domestics willing to gratify his every caprice. Ponce's patience was equal to his benevolence, and the veneration of every lover of humanity is his crown of glory.

PEDRO PONCE DE LEON.

THE best account we have of Don Pedro Ponce de Leon is probably that supplied by Hervas y Panduro, translated from the Spanish and annotated by Valade-Gabel, 1875. The work of Père Hervas was written in two volumes octavo, of more than 700 pages, and contains not only a history of the art but also a course of instruction theoretical and practical, followed by an abridgment of Christian doctrine. The title of the work is "Escuela Española de Sordo-mudos, ó Arte para enseñarles á escribir y hablar el idioma Español," 1795. (B. M.)

There is another work by Père Juan Andres, but this is only in the form of a letter addressed to the Marchioness de Llano, wife of the Spanish Ambassador at the court of Vienna, in 1793. The title is "Del Origine e delle vicende dell' arte d' insegnar a parlare ai sorde-muti." There is a copy of Hervas' work in the Bibliothèque Nationale, Paris, and another in the British Museum. Both works were written to claim for their country the glory, too exclusively attributed to de l'Epée.

Pedro de Ponce was of a noble family and probably received the best education that could be secured for him. But he was more attracted by the cloister than the world, and entered the monastery of San Salvador at Oña, where he became a monk of the Benedictine order.

Of his life there, or what led him to undertake the education of deaf mutes, nothing is known. Probably like Bonet, he was induced to make the attempt by seeing the sad state of the deaf and dumb young nobleman whom he afterwards educated; or by reading the passage in Bede's "History," of what John of Beverley had done. In speaking of himself, he says "Thanks to the talents I have received from God in this holy monastery. . . I have had for my scholars, mutes, deaf from birth, children of nobles or men of mark; taught them to speak, read, write, reckon, pray, serve at the

altar, know Christian doctrine, and confess with a loud voice I have taught them all this. Some attained to a knowledge of Latin; others, taught Latin and Greek, acquired the knowledge of Italian. One who entered the priesthood and undertook a charge and a benefice of the Church, was also able to recite the canonical hours; and several others attained to know and understand natural philosophy and astrology. Another, heir to an estate and a marquisate, and led afterwards to embrace the military profession, learned, in addition to the knowledge above referred to, every kind of exercise, and became a noted horseman. Much more, my pupils studied history, and were able to trace the annals of their own country, and also those of other lands. Better still, they proved by the use they made of them, that they were possessed of the gifts which Aristotle had denied to them." "Cartas eruditas y curiosas," par D. F. Benito Feyjoo, Benedictine, Madrid, 1753.

"We should," says Panduro, "scarcely credit such an account had it not been confirmed by eye-witnesses, whom we proceed to quote. It demonstrates the degree of perfection to which Ponce had carried the art he had invented of teaching the deaf and dumb to speak, and to write, and of instructing them in all kinds of science."

Of the genuineness of Ponce's work, we have satisfactory evidence from the men best capable of forming a correct judgment, as well as from the account given by one of his pupils. The first were Ambrosio de Morales and Francisco Valles, distinguished writers. The former in "Les antigüedades de las ciudades de España," 1575, p. 33, says, "Another celebrity—a man of extraordinary talent whom we should refuse to credit had we not seen his works—is the Spaniard who has taught deaf-mutes to speak by means of a rare method, of which he was the inventor. This is the Père Don Pedro Ponce, monk of the order of St. Benedict. He has given speech to two brothers and a sister of the Constable, of which they had remained deprived, and now renders the same service to one of the daughters of the supreme judge of Aragon. And to crown this prodigy, the scholars of Ponce retained the profound deafness from which their dumbness had arisen. The teacher addresses them, either by

signs or by writing, and the spoken reply immediately follows the question. They can write a letter throughout, or any other kind of composition with great order. One of the brothers of the Constable, Don Pedro de Valasco—God be gracious to him!—hardly attained to his twentieth year, and at this age his learning was certainly astonishing, for in addition to Spanish he spoke and wrote Latin almost free from solecisms.” Morales was also in possession of a piece of his composition, being his reply to the question, how Ponce had instructed him? which had previously been spoken.

“Your Grace knows that when I was a child and that I knew nothing, like a stone—*ut lapis*,—I commenced by learning to write the copies which my master gave me; and then to write all the Spanish words in a note book made for me. Afterwards with God’s help I began to count, and then to pronounce with all the force of which I was capable, a great quantity of saliva escaping at the same time. Then I began to read history, so that at ten I had read the histories of every country in the world; and afterwards I learned Latin.”

This is what Valles says of Ponce in his “*De sacra Philosophia liber singularis*,” 1587. “Natural order does not demand that we should first learn to speak and afterwards to write. This is the most facile, as it is usually followed, but the inverse order is possible, as my friend Pedro Ponce, the Benedictine, witnesses, who—admirable thing!—has taught deaf-mutes to speak. The unique device employed by him consists in teaching them first to write, indicating the objects, corresponding with the written words, with his finger; then teaching them the movements of the tongue corresponding with the written characters. If we commence with speech to the hearing, we commence equally well by writing with deaf-mutes . . . The class deprived of hearing can substitute writing for speaking. The latter by means of their eyes, as the former by their ears, can acquire religious ideas. This I have personally verified in the pupils of my illustrious friend.”

It has been confidently asserted that Ponce did not commit his method to writing, but the evidence to the contrary is

satisfactory, for Juan de Castañiza, a monk of the monastery of Oña, where Ponce died, in "La Vida de san Benito," after stating what he had done, adds "These points will be found well established in a work written with his own hand." He, therefore, did leave a written account of his method. But the Abbé Antonio Perez, of St. Martin's, Madrid, in an approving notice of Bonet's new work, says "That Spain waited impatiently for the appearance of Bonet's book, of which the matter is so important and so difficult, after that our brother monk Pedro Ponce de Leon had accomplished his marvellous work of making the dumb to speak, and that he had seen his miraculous talent celebrated by the learned at home and abroad. Nevertheless he had not occupied himself in making others acquainted with his methods of teaching." Allowing that it is more meritorious to form good masters than to show himself to be a good master, the publication of Bonet's work appears to us so much the more worthy to see the day. But Panduro replies, "Ponce was a master, and occupied himself in making other masters by this work which he had written on the deaf and dumb, and which was probably under the eyes of Castañiza, and referred to at the time." We should also say that the work on which Ponce was engaged is different from that published by Bonet in 1620. In the "Bibliothèque Espagnole de Nicolas Antonio" and the article Joannes Paulus Bonet, we read, "It appears that Bonet had published the method of the monk, Pedro Ponce. But any one acquainted with the instruction of deaf mutes, reading the 'Reduccion de las letras y arte' of Bonet, would decide, most certainly, that these methods do not constitute the work of Ponce, that they would have been insufficient to give deaf-mutes an instruction so advanced as to teach them languages and sciences, and to make them articulate so clearly that they could minister at the holy mass and read the canonical hours. To achieve similar results recourse must necessarily be had to methods as perfect as those employed in the actual schools of the deaf and dumb, which are widely different from the mode of instruction related by Bonet."

But this conclusion is far from correct. Once in possession

of the vernacular, and the elements of primary education, deaf mutes can advance like the hearing to the highest attainments.

Ponce's writings were lost, but his methods were remembered. There can be little doubt that Bonet and others had heard of them, perhaps learned about them from his pupils. The ideas were in the air and awaited the right soil to produce a greater harvest. Bonet may, or may not, have seen the book, but he knew the thing had been done and this is enough for genius.

"Pedro Ponce de Leon, a Spaniard of illustrious birth," says Panduro, "is worthy of eternal glory for his memorable discovery of the beneficent art of teaching the deaf and dumb to speak and write. He deserves to have statues simultaneously erected to him in all their schools and in public places—the true temples of humanity."

In the old necrology of his monastery of Oña the following inscription is found:—

"Brother Pedro de Ponce, a benefactor of this holy home, has fallen asleep in the Lord. (He had added a chapel.)

"Distinguished for eminent qualities, he excelled all in that which brought him great renown in all the world—he taught the dumb to speak. He departed in August, 1584."

In 1603, Fabrizio di Acquapendente, so called from his native place, who was a physician, published two celebrated works. In these he described the laws of sight, and then turning his attention to the organs of speech and to hearing, he was the first to discover the true nature of the voice. He also treated on languages and the instruments employed for teaching deaf-mutes.

JUAN PABLO BONET.

BUT the man who did most to perpetuate the work of Ponce was Bonet, another Spaniard, well educated, capable as a man of business, and employed in official services. He was private secretary to the Constable of Castile, and there came into contact with the deaf youth whose sad condition touched his heart and made him a teacher of deaf-mutes. In the introduction to the work he

published on his methods, he tells us "That which has determined me is the attachment I feel for the family of the Constable, my master, and the obligations which bind me to them. One of the brothers of His Excellency had been smitten with this affliction—not at his birth, but at the age of two years. I could not endure the sorrow of the Duchess, his mother, who had had recourse to all possible means to remedy the defect in his hearing. To whom would she not apply, before what expenses would she hesitate, so as not to abandon so noble a seigneur to his sad fate!"

Bonet undertook the task and succeeded. The young nobleman was a scion of the same house as the nobleman taught by Ponce, and, therefore, Bonet was charged with appropriating to himself the honours due to another. But happily it is not sustained. Morales published the work in 1575, in which he tells us of what Ponce had done. Bonet published his work in 1620, forty-five years after. Fifty years at least must, therefore, have intervened. Ponce educated two brothers and a sister of the then Constable, Bonet only one, not of the same Constable, a most unlikely thing, but of his successor. One of the two brothers taught by Ponce died before he attained his majority. "It follows," says Panduro, "from these proofs that the deaf-mute instructed by Bonet could not be any of those who had received their intellectual culture from Ponce. He belonged to another generation; without doubt he was their nephew." Sir Kenelme Digby's account confirms this.

Bonet followed Ponce in beginning the education of his pupils by teaching them to write and distinguish the letters of the alphabet. He reduced the letters, in the first part of his work—"Reduccion de las Letras y Arte para enseñar á hablar los Mudos"—to their phonetic value. In the second part he treats on the means of instruction. "The scholar," says he, "is dumb because he is deaf, and cannot by any means have his hearing restored. But by sight he can acquire the knowledge lost by deafness. Nature indicates this path. The language of action is a natural language. Deaf-mutes who have never seen one another, when they find themselves together will agree together to use the same signs." (Lib. II. c. ii.) "They have great facility in receiv-

ing all instruction which is given to them through the medium of sight, for by this they search after the means of supplying the defect of hearing. This is the instrument which ought to be employed for their instruction to take the place of the sound which the letters express by their form." In teaching speech he "exercised the scholar in placing his tongue, teeth, and lips, in the positions suitable to the articulation of each letter; then he made them exhale the air necessary to the production of voice. As to the manual alphabet, already well-known to the ancients, its employment is as simple as facile." Then he says, the manual and written alphabets "should be associated with speech, by pointing to the letter as written with the finger corresponding with the same letter in the manual alphabet and the articulated sound. These different exercises will serve mutually as tests. People residing with deaf-mutes will learn the manual alphabet in order to converse with them and ask questions; to correct their pronunciation and lead them to find the same letters in a book which they pronounce and which they make on their fingers." (Ch. iii.)

With his manual alphabet Bonet now joined a description of the positions and movements of the vocal organs necessary for the pronunciation of each letter. He takes care to anticipate that this exercise would present numerous difficulties, which demand great patience. He tells the teacher the means he should employ, either in showing the pupil his own mouth open when he pronounces, or in making an artificial tongue of leather to undergo inflections which that of the learner should imitate. To form the letters he traced in detail the process which should be employed for each letter in particular. With a little variation, this is the course which Wallis and Amman followed in after times, and of which they considered themselves the inventors. (Ch. v. and vi.) Bonet recommends delay in teaching the guttural alphabet till the learner be made very familiar with the manual alphabet. After having armed him with this instrument he occupies himself in giving him a knowledge of Castilian, and in teaching him the rules of grammar.

He reduces the elements of discourse to three principal kinds: The nouns, that is to say, the words that receive a

gender and a number; the verbs, those which have modifications of persons, times and numbers; and the conjunctions, or those which do not receive any kind of modification. "The names of real external sensible objects, which affect the sight were taught while pointing out the objects themselves, pronouncing at the same time the words which express them. In respect to the names of objects which could not be seen—except those which appertained to moral order and the affections of the mind—the master would make them understand their value by the assistance of the language of action, the most capable of explaining them by analogy. The choice of these pantomimes should be left to the sagacity of the master. But everything which belongs to the order of moral and religious ideas demands a much greater care and a more vigorous exposition. "To teach the names of the different passions and mental emotions, we should wait till they experience them, or rather, when it can be done with safety, we should attempt to make them experience them, and then lead them to observe what they feel in themselves." (Ch. ix.)

Bonet had recourse to repeated use, but to a use directed with intention to what he called the conjunctions, including the prepositions, adverbs, and interjections. He supposes that the conversations, in which the deaf mute shall be interrogated and in which his questions are answered with accuracy and precision, and the exercise of reading, will suffice to put him in possession of the ability to employ this element of language in a suitable manner. (Ch. x.)

He would also trust to a well directed use to teach the genders and numbers, as well as the terminations of the names which they affect; but by always employing examples from the objects known to the scholar and reproduced before his eyes.

He says, "Verbs denote the actions done by one or many persons which take place, in the past, present, or future." To lead the deaf mute to know the action expressed by the verb, it should be reproduced at the moment in his presence, if it belongs to the class of visible things, but his own inner experience ought to be appealed to if it refers to moral feelings. For the remainder, the conjugations will be taught

by degrees in the manner practised by grammarians." (Ch. xiii.)

"The tenses should be at first related to the three absolute times, of which an idea can be given with precision and certitude. For this purpose we can resort to the distinctions of the days of which the week is composed; the contrast between day and night will be pointed out to him; the days that are passing and succeeding will be remarked; later, he will learn by their use to employ the different secondary or relative tenses, which can be united to the principal. Future time is expressed by putting the hand forward. The pronouns are taught by indicating with the finger the speakers, the actors, and the spectators of the action. The verb to be demands a special demonstration in which the master, his pupils, and the persons present take their parts, by indicating their presence." (Ch. xiv.-xix.) He taught numbers by objects grouped to represent them, and then by associating with them the names and the figures.

The last three chapters of his book are very interesting and some of the philosophic opinions worthy of attention, for they contain views which are too much neglected by some masters at the present day. He shows how the pupil should be exercised by a set of methodical comparisons to remark the differences and analogies of objects, in such a manner as to make them stand out by contrast, to classify them regularly, and to form just and exact conceptions of the terms expressing them. He recommends the interrogation of the learner every evening on what he has seen and done during the day, and thus to elicit from his own present and recent experience the ideas we are desirous he should remember; also to question him on what he intends to do; to accustom him to give an account of what he thinks and of what he feels, in fine, to make him apprehend, by well devised comparisons, the often delicate shades which serve to distinguish among them the value of analogous expressions or of reputed synonyms. He recommends reading, and indicates how the choice of books should be graduated according to capacity and progress; how the master should assist him in the difficult passages, and finally he explains how the learner should be taught to write a good current

hand that he may be able to repeat the exercises, the questions and their answers, by writing. (Chs. xxi.-xxiii., Deg. Tom I., pp. 313—319.)

This is only an outline of his methods, but enough to prove that he was neither a pretender nor an appropriator of another's work, but a man of original genius, who perceived its real difficulties and grappled with them so effectually as to clear the way for all his successors. There is a copy of his book in the British Museum and another in the library of the National Institution, Rue St. Jacques, Paris. Pereira was probably in possession of one, and the Abbé de l'Épée tells us he studied Spanish that he might acquaint himself with its contents.

At first he paid little attention to lip-reading, because he thought speech could not be revealed by the whole of the muscular movements of the organs executed within the mouth and larynx of the speaker, the perception of which is indispensable to the reader. On this Degerando remarks, "that he did not know how to formulate a positive rule, but left the learner to his own sagacity, which on some occasions would enable him to divine the speech from the movements of the lips, by active attention, long habit and the aid of external accessory circumstances which usually serve to explain our utterances."

In a later edition of the work than that referred to by Digby, he appears to have given lip-reading fuller attention and found its utility much greater than he had at first thought it capable. As we have three copies of the work at the British Museum some Spanish scholar would confer a great boon by making a translation of it for our library.

SIR KENELME DIGBY'S ACCOUNT.

WHAT Bonet had so admirably accomplished in Spain did not long remain unknown to other nations. As the currents and storms of the ocean deposit the seeds of a new vegetable life on the coral islands of the Pacific, so the wars and political alliances of the nations spread the knowledge of the sciences and the arts of life. Our James I. sought to ally himself more closely to the House of Braganza

by the union of Charles, Prince of Wales, with the Infanta. Weary of delays, he at last sent him to Madrid with Buckingham and a well appointed suite, to push his own pretensions. Of this suite Sir Kenelme Digby was one. He was already famous in the court, the camp, and literary circles; certainly possessed of no ordinary talents, and of great versatility of character. By travel and residence he had made himself well acquainted with France, Spain and Italy, and spoke their languages with fluency. After his return he related what he had witnessed of Bonet's achievements. This account was of vital importance in the education of deaf mutes, for it was the occasion of our being connected with Spain as the immediate successors of Bonet. Bulwer, Wallis, and Holder had taught and written many years before Amman in Holland, 1692, and Pereira in France, 1744. We are, therefore, next in the order of time, if we cannot claim St. John of Beverley as the first inventor of a rational method of instructing deaf mutes.

In Sir Kenelme Digby's "Treatise of the Nature of Bodies," published in Paris and London, 1644 and 1645, c. xxviii., paragraph 8, pp. 307—309, he says :

"But this is not the relation I intended when I mentioned one that could hear by his eyes (if that expression may be permitted me); I then reflected upon a noble man of great quality that I knew in Spaine, the younger brother of the Constable of Castile. But the reflection of his seeing of words called unto my remembrance the other that felt light, in whom I have often remarked so many strange passages with amazement and delight, that I have ventured on the reader's patience to record some of them, conceiving they may be of some use in our course of doctrine. But the Spanish lord was born deafe, that if a gun were shot off close by his eare he could not heare it, and consequently he was dumbe, for, not being able to heare the sound of words, he could neither imitate nor understand them. The loveliness of his face, and especially the exceeding life and spiritfulness of his eyes, and the comelinesse of his person and the whole composure of his body throughout were pregnant signes of a well-tempered mind within. And, therefore, all that knew him lamented much the want of means to cultivate it and to imbue it with the notions which it seemed to be capable of in regard of itselfe, had it not been so crossed by the unhappy accident, which to remedy, physicians and chirurgians had long employed their skill, but all in vain. At last there was a Priest who undertooke the teaching him to understand others when they spoke, and to speak himself that others might understand him, for which attempt at first he was laughed at, yet after some years he was

looked upon as if he had wrought a miracle. In a word, after strange patience, constancie and paines he brought the young lord to speake as distinctly as any man whatsoever, and to understand so perfectly what others said that he would not lose a word in a whole dayes conversation.

“They who have a curiosity to see by what steps the master proceeds in teaching him may satisfy it by a booke which he himself hath writ in Spanish upon that subject to instruct others how to teach deafe and dumbe persons to speak, which, when he shall have looked heedfully over, and shall have considered what a great distance there is between the simplicitie and nakedness of his first principles and the strange readinesse and vast extent of speech resulting in process of time out of them; he will forbear pronouncing an impossibility in their pedigree whilst he wondereth at the numerous effects resulting in bodies out of rarity and density, ingeniously mingled together by an All Knowing Architect for the production of various qualities among meats, of strange motions in particular bodies, and of admirable operations of life and sense, vegetables and animals. All which are so many severall words of the mystical language which the great Master hath taught his otherwise dumbe scholars (the creatures) to proclaim his infinite art, wisdome perfections and excellency in.

“The priest who, by his booke and art, occasioned this discourse, I am told is still alive, and in the service of the Prince of Carrignan, where he continueth (with some that have want of his paines) the same employment as he did with the Constable's brother; with whom I have often discoursed while I waited upon the Prince of Wales (now our gracious Sovereign) in Spain, and I doubt not but his Majesty remembereth all I have said of him, and much more; for his Majesty was very curious to observe, and inquire into the utmost of it. It is true, one great misbecomingness he was apt to fall into whilst he spoke, which was an uncertainty in the tone of his voice, for, not hearing the sound he made when he spoke, he could not steadily govern the pitch of his voice, but it would be sometimes higher, and sometimes lower, though for the most part what he delivered together he ended in the same key as he began it. But when he had once suffered the passage of his voice to close, at the opening it again, chance or the measure of his earnestness to speak or reply, gave him his tone, which he was not capable of moderating by such an artifice as is recorded Caius Gracchus used, when passion, in his orations to the people, drove out his voice with too great a vehemency or shrillness. He could discern in another whether he spoke shrill or low, and he would repeat after anybody any hard word whatsoever, which the prince tried often, not only in English, but by making some Welshmen that served his highness speak words of their language, which he so perfectly echoed that I confess I wondered more at that than at all the rest, and his master himself would acknowledge that the rules of his art reached not to produce that effect with any certainty. And therefore concluded, this in him must spring from other rules he had framed unto himself out of his own attentive observation; which the advantages which nature had justly given him in the sharpness of his senses to supply the want of this,

endowed him with an ability and sagacity to do beyond any other man that had his hearing. He expressed it, surely, in a high measure by his so exact imitation of the Welsh pronunciation; for that tongue (like the Hebrew) employeth much the guttural letters, and the motions of that part which frameth them cannot be seen or judged by the eye otherwise than by the effect they may happily make by consent in the other parts of the mouth exposed to view. For the knowledge he had of what they said sprung from his observing the motions they made, so that he could converse currently in the light, though they he talked with whispered never so softly. And I have seen him, at the distance of a large chamber's breadth, say words after one, that I, standing close by the speaker, could not hear a syllable of. But if he were in the dark, or if one turned his face out of his sight, he was capable of nothing one said."

BONIFACCIO.

A REMARKABLE work on Signs was published in 1616, twenty-eight years before Bulwer's "Chirologia and Chironomia," by D. Giovanni Bonifaccio, a Jurist and Assessor at Vicenza, called "L'Arte de Cenni," or "The Art of Signs." This is a rare book, but there is a copy in the British Museum. To a sign-teacher it would be very suggestive. The author, instead of limiting himself to the hands and to rhetorical action, treats on every part of the person which can be employed in making signs; for beginning at the head, he descends in order to the feet, and illustrates the expression of each part by apt quotations chiefly drawn from classic and Italian authors. Bulwer's works are on a similar plan.

He divides his "Art of Signs" into two parts, the first on Signs specially, and the second on their use in the Arts and Professions. A specimen of the first, in reply to the inquiry, "How can Man without speaking make himself understood by signs?" is here given. The 41st Section is on the feet. First the action and then the meaning is given:—

(2.) Stand on a foot, vacillation. (3.) To lift a foot, sign of going to start. Shakespeare has "Jocund day stands tiptoe, on the misty mountain top." (4.) Leap, sign of joy. (5.) To place the feet firmly on ground, a sign of stability. (6.) To have any thing under the feet, subjugation. (7.) To tread upon with the feet, an act of conquest. (8.) To strike or stamp the earth with the feet, oratorical sign to excite the hearer's contempt. (9.) To wash the feet of another, an act of abject submission or great humility. (10.) To anoint the feet of others, an act of humility and great

honour. (11.) Not to wash the feet, to treat with contempt. (12.) To stand or cast himself at the feet of another, an act of great reverence. (13.) To be barefooted, sign of great sorrow. (14.) To have one foot in the slipper, and the other in the bath, said of one who is accustomed to entertain another while he is doing something convenient. (15.) To drag one foot after the other, a sign of changing one's mind. (16.) The right foot first, a pagan sign of success. (17.) To stumble on going out, a bad omen. (18.) The left foot first, a bad omen. (19.) One foot above the other, a sign of repose. (20.) To limp, not in a right state of mind, to be unjust and unfair. (21.) To display the foot finely shod, an act which conveys an uncertain hint. (22.) To show the sole of the foot, give a sign of flight. (23.) To drag by the foot, an act of great cruelty. (24.) To prick with a spur, an offensive act of revenge. (25.) To kick, an act of a base mind. (26.) To carry the shoes of any one behind him, or to untie the shoes, an act of great reverence and profound humility. (27.) To take off his own shoes, an act of reverence (Ex. iii. 5). (28.) To shake off the dust of the feet, an act of entire renunciation. (29.) Chains on the feet, a sign of slavery. (30.) To have wings to the feet, showing a great desire to depart, like Mercury. (31.) Tracing, to seem to track the footsteps of a man or animal of which there are remains.

JOHN BULWER.

To Bulwer by right belongs the honour of priority in England. His "Philocophus, or the Deafe and Dumble Man's Friend," was published in 1648, by Humphrey Moseley, London. Wallis' "Loquela," as he tells us in his letter to Amman, prefixed to the work of the latter, was published in 1653, five years after Bulwer's. That he knew something about Bonet's work is evident from his making Sir K. Digby's account a text for his own treatise, but there is no evidence that he had seen the *Reduccion*. The form in which he writes is not that of an imitator or copyist, but of an original investigator. By profession a physician, he had been led to study the language of expression as employed in oratory, and afterwards published "*Chirolugia: or, The Natural Language of the Hand*," and "*Chironomia: or, The Art of Manuall Rhetoricke*," published by Harper, London, 1644. In these he names himself *Philochirosophus*, or, "A lover of the Wisdom of the Hand." These works embrace all that manual expression adds to conversation, acting, and oratory. The subjects are treated with learning, the proofs drawn

from the best authors, and rich in illustrations and reflections. They prepared him for a kindred subject, the education of the deaf and dumb, for their natural use of signs is an attempt to make a language of expression and mimic gestures, instead of its ornaments. The occasion, as he relates, of the work, was the unhappy dumbness of Sir Edward Gostwicke and his brother, of Willington, Bedfordshire, for whom it was written: "That learning first to write the images of words, and to understand the conveyances of a visible and permanent speech; from that hand A, B, C (manual alphabet), you may proceed unto a lip-grammar, which may enable you to hear with your eye, and thence learn to speak with your tongue." He also calls his book a "Tractate whose argument is new and strange, that there never was so much matter concerning you presented under one object of the eye, containing a narrative of your original state, with the supplemental advantages thereof, the novelty and inventive straine of this booke may at once delight and profit you, which is the hopeful wish of Your officious Friend and Historiographer, Philocophus."

Philocophus consists of two parts. The first is on the possibility of giving Speech and Language to Deaf-mutes; and the second a running commentary on Sir Kenelme Digby's account of Bonet's work in Spain, and which he quotes in extenso. The first part is the more important, for it contains his reasons for the opinions he holds on the possibility of educating the deaf and dumb. The principal of these are selected to reveal his method.

(Ch. I.) "The mouth is an adequate organ of Speech." This is self evident. The parts of the organ are adapted to the purpose. (Ch. IV.) "Speech is a voluntary action and therefore performed by motion." (Ch. V.) "Words are nothing else but motion." Digby had said this before, and Esdras calls the angel's words "the image of a voice." (Ch. VIII.) "Speech is an articulate voice formed by the conjugation of certain letters." (Ch. IX.) "These are natural." (Ch. X.) "The motions of instruments of speech which go to the making the alphabet of natural letters are worthy enquiry." In support of this he quotes the following from Bacon. "The Motions of the tongue, lips, throat, palate, etc., which go to the making up of the several alphabetical letters, are worthy enquiry. The Hebrews have been diligent in it and have assigned which letters are Labial, which Dental, which Guttural, etc. As for the Latins and

Grecians, they have distinguished between semi-vowels and mutes, and in mutes between mutæ, tenues, mediæ, and aspiratæ not amiss, but not yet diligently enough: for, the special strokes and motions that create these sounds, they have little enquired, as that the letters B, P, F, M. are not expressed but with the contracting or shutting of the mouth. That the letters N and B cannot be pronounced, but that the letter N will turn into M, as Hecatonba will be Hecatomba, etc."

(Ch. XI.) "The forms of letters, and so consequently of words, may be punctually observed and took notice of." Bacon says, "Although it be neither possible or to purpose to seek in grosse the formes of those sounds which make words, which by composition and transposition of letters are infinite;" "yet," says Bulwer, "to enquire the formes of those sounds or voyces which make simple letters is easily comprehensible, and being known induceth and manifesteth the formes of words (lip reading) which consist and are compounded of them, this being no more a vain pursuit than the enquiry after the Formes of Sense and Voluntary Motion."

(Ch. XIV.) "Articulate Speech doth not necessarily require the audible sound of the voice, but may consist without it, and so consequently be seen as well as heard." In this manner he formulates the two great principles which govern Speech and Lip-Reading, Motion and Form, as apprehended by Bacon also, and whose full meaning and application are still imperfectly understood. The laws of motion are the laws of speech, and the forms taken by the organs under their action the elements of articulate sound as felt or seen. On these points he surpasses Cardan in the philosophy of speech. In his commentary on Digby's story of the deaf Spanish Prince, and in reference to the distinctness of his utterance of sounds, and his skill in lip-reading, he remarks "that motion and articulate sounds to be one and the same thing." Referring to little children learning to speak, he again avails himself of Bacon's remarks, "That it is a thing strange in nature when it is attentively considered, how children learn to imitate speech, they take no marke at all," as he thinks, "of the motion of the mouth of him that speaketh"—not quite correct—"for they learn in the dark as well as in the light, the sounds of speech, which are very curious and exquisite." "It would," saith he, "make a man thinke (though this which we shall say will seem exceeding strange) that there is some transmission of spirits and that the spirits of the teacher put in motion should worke with the spirits of the learner a predisposition to offer to imitate, and so to perfect the imitation by degrees, which operation, by the transmission of spirits is one of the highest secrets in nature."

Now, we call these hoarded tendencies and sympathies, but are no nearer the *modus operandi* than Bacon. That minds do touch and move each other into action is certain, but that this is wholly through the agency of the senses has yet to be discovered and demonstrated.

Bulwer did not, like others, treat on the phonetic elements of speech or on teaching language, but contented himself with this statement of principles.

DR. WALLIS.

DR. JOHN WALLIS. Degerando says that Wallis claims for himself the priority in England "of having achieved a work which had not as yet been attempted by any other person, at least, to his knowledge"—Preface to his English Grammar. Was he ignorant of what Bulwer had written, or did he refer only to his work as a teacher? It is difficult to say, but time has done him the justice ignored by his contemporary. Degerando, too, does him scant justice, for he says, in comparing him with Wallis, "he employed no other means than mimic signs, the manual alphabet, and attention to the motions of the lips." This he had seen in Morhoff, and treated as true; but had he read Bulwer's own book carefully through, he would have found that he says very little about signs or the manual alphabet, but much about the motion and imitation of the voice as expressed on the lips. Wallis had the advantage of being a teacher, for he had succeeded in 1661 in teaching two deaf-mutes to speak, and in 1653 he published his "*Grammatica Linguæ Anglicanæ*," of which the "*De Loquela*" is the first chapter. He was a distinguished mathematician and theologian, as well as a king's chaplain. Professor G. S. Boulger, in a paper on Ray, the naturalist, says that, "The leading spirits in promoting the Royal Society were Wilkins and John Wallis, then Rector of St. Gabriel, Fenchurch Street, Secretary of the Westminster Assembly, and afterwards Savilian Professor of Geometry at Oxford. Fifty years later the latter wrote of those early days."

As a member of the Society he could at once submit his success as a teacher to the learned of the day; but Holder, about whom he was silent, was in no respect inferior to him in his clear perception of the principles and their practical application, by which speech is given to deaf-mutes.

But did he owe nothing to his contemporaries, Van Helmont

and Amman, as has been often asserted? Fortunately, his vindication is supplied by Amman himself in the preface to his *Surdus Loquens*—the Deaf Speaking,—in which he inserts a letter he had received from Dr. Wallis, that tells him: “It was only yesterday I met with your treatise entitled ‘*Surdus Loquens*’ which, it appears, was printed in 1692; I immediately read it, and more particularly, because I had already employed myself upon the same subject; I commend your efforts, and wish you joy of your success. I do not know whether you have seen my ‘*Tractatus de Loquela*,’ prefixed to my Grammar of the English language, first published in 1653, and since then frequently reprinted. There you may see many things treated by you common between us, and I believe you will not be displeased if I have written anything contrary to your practice, or described sounds omitted by you. In the third volume of my mathematical works, among the miscellaneous articles; in my letters also (Letter 29) you will find an account of my methods of teaching deaf-mutes, with particular reference to the English language. About 1660-1 I succeeded in teaching two men, who were quite deaf, by the means there described; they were able to speak distinctly and to utter any sounds whatever; one of them is still living, or was a short time ago.” Amman replied at length, and criticised his treatment of some of the sounds, but agrees with him on the principles of his method, saying, “I should venture to add nothing to what you have written with so much ingenuity and aptness on speech in general.” That neither was indebted to Bonet, beyond reports of his work, would appear from what Amman declares, “Like yourself, I have no idea whether the method we employ in teaching deaf-mutes to speak, and to correct the defects of articulation, are the same as those of the Spanish monk, but you will agree with me that such enquiries into the nature of letters are ingenious and of practical application; it is, therefore, natural to conclude that since we agree in theory, our practice could not be very different.” These quotations are enough to prove that both were original in their inventions, and honourable in their mutual recognition of each other as authors and teachers.

His own account is to be found in "A letter of Dr. John Wallis (Geom. Prof. Oxon. and F.R.S.) to Mr. Thomas Beverly, concerning his "Method for instructing Persons Deafe and Dumbe," and in his letter entitled, "A letter of Dr. John Wallis to Robt. Boyle, Esq., concerning the said Doctor's Essay of Teaching a Person Dumb and Deaf to speak and to understand a Language, together with the success thereof made apparent to his Majesty, the Royal Society and the University of Oxford." There is a translation in Latin of the former of these letters in the copy at the British Museum, entitled, "Epistola D. Wallisii ad Thomam Beverly Oxonii, September 30th, 1698, Johannis Wallis." The part of his English Grammar, called "De Loquela," afterwards published separately, was the first chapter on the letters and their organic production. The letter to Boyle is of great value. It was published at Oxford March 14th, 1661/2.

After referring briefly to his method of teaching speech, he says: "As to teaching him the language, I must (as mathematicians do from a few principles first granted), from that little stock (that we have to begin upon) of such actions and gestures as have a kind of natural significancy, or some few signs, which himself had before taken up to express his thought, as well as he could, proceed to teach him what I mean by somewhat else, and so by steps to more and more." In two months he had taught him to speak, not accurately, "time only could bring that about." In reply to Mr. Beverly's enquiries how to set about teaching five of a family of eight, who were deaf and dumb, he says: "You desire my direction, how best to supply that defect; having had some acquaintance (I understand) with Mr. Alexander Popham (who I think is yet living), whom (being deaf and dumb) I taught about four or five and thirty years ago to speak distinctly (though I doubt he may have forgotten much of it) and to understand a language so as to express his mind (tolerably well) by writing, and to understand what is written to him by others, as I had before taught Mr. Daniel Whaley, who was deaf also, but is lately dead." Now about this youth he wrote to Boyle, "I shall add this also, that once he could have spoken, though so long ago that (I think) he doth scarce remember it. But having by accident (when

about five years of age) lost his hearing, he consequently lost his speech also, not all at once, but by degrees in about half-a-year's time." He does not promise accuracy in speaking. "And though it may be thought possible that he may in time discern by the motion of the lips (visible to the eye) what is said to him (of which I am loth to deliver positive judgment, since much may be said conjecturally both ways) yet this cannot be expected till at least he be so perfectly master of the language, as that by a few letters known, he may be able to supply the rest of the word, and by a few words the rest of the sentence, or at least the sense of it, by a probable conjecture (as when we decipher letters written by cipher), for that the eye can actually discern all the varieties of motion in the organs of speech, and see what sounds are made by these motions, of which many are inward, and are not exposed to the eye at all, is not possible."

Dr. Wallis did not pretend to have done what his admirers claimed for him. Popham was expert at the use of his pencil when he came to him, and in two months he had taught him the elements of speech, and enough of language to express common things. He was not a magician but a worker who honestly tells what he has done and how he did it. His observations on lip-reading deserve careful attention. Though he has doubts he does not dogmatize, and from his own limited experience in teaching and the little attention given at that time to the mechanism of speech, we may be allowed to suppose that had he been possessed of all we now know of both, he would not have hesitated so much in giving his opinion. It is evident, from his own account, that lip-reading had not taken its right place in the education of his scholars. It was by writing rather than speech that he taught them "to understand what was written to them by others."

"Others," he says, "who were not deaf, but had great impediments in their speech (who stuttered extremely or who have not been able to pronounce some letters) I have taught to speak very distinctly, and to pronounce those letters which before they could not; so as perfectly to conquer that difficulty at least so as that it was very little (if at all) discernible."

“Some other deaf persons I have not attempted teaching them to speak, but only so as (in good measure) to understand a language and to express their mind (tolerably well) in writing, who have thereby attained a much greater measure of knowledge in many things than was thought attainable to persons in their circumstances, and become capable (upon further improvement) of such further knowledge as is attainable by reading.”

In his “*De Loquela sive Sonorum Formatione tractatus Grammatico-Physicus*,” he introduces his subject in the preface by saying, that after careful attention he has been enabled by its means, not only to correct defects of speech in many of his friends, but also to teach two deaf and dumb persons to utter every sound distinctly, and thereby to express their ideas both by spoken and written words.

After a brief introduction, in which he treats of the nature of the elements of speech and of the organs by which they are produced, he devotes the remainder of the work to the analysis of the different sounds used in our language.

In the second section he treats of the vowels, which, as well as the consonants, he divides into three main classes, Gutturals, Palatals, and Labials. Under each of these he places three sounds determined by the width of the opening through which the voice has to pass. These three positions he calls the major, media and minor apertures.

THE VOWELS.

GUTTURALS.—The gutturals are formed in the throat itself, or in the back of the tongue and palate, the breath being moderately compressed.

Ā, Ō, open. If the breath be driven out with the “greatest” opening, that is, with the mouth gaping, the sound formed is the German *Ā*, or our open *Ō*. This sound is common to the French and many other nations as the *A* sound. The English pronounce it short, as *Ō*; long as *AU* or *AW*; less frequently as *Ā* in *fall, folly, hall, bawl, holly*, etc.

Ê feminine. In the same place, but with the “middle” opening of the jaws, is formed the French “feminine *Ê*,” an obscure sound. The formation is the same as the preceding, except that the jaws are less widely opened, though less so than in the formation of the following vowel. Hardly recognized in English, except when short *E* precedes *R*—and here rather from exigencies of ease than because it ought to be pronounced so—as in *vertue, liberal*, etc.

Ō and *Ū*, obscure. The same formation with the “least” opening,

produces "obscure" O or \hat{U} ; differing from the "feminine E" of the French merely in the mouth being less widely open and the lips closer together, French EU in *serviteur*. English, frequently pronounced by short U, in turn, burn, cut. Sometimes O and OU, pronounced carelessly, give the same sound, as in *come, done*; which, however, ought to be pronounced differently. Welsh Y.

PALATALS.—The Palatal Vowels are formed in the palate, the breath being moderately compressed between the middle region of the tongue and palate; while the cavity of the palate is rendered smaller than in the production of the gutturals by the middle of the tongue being raised.

Diversity is obtained in two ways here, either the jaws being brought together, the tongue retaining the same position, or the middle of the tongue being raised higher and brought towards the more forward part of the palate.

\hat{A} , *exile*. With the "greatest" opening is formed the English A, that is, the "thin A"; such as is heard in *bat, pale, same*. (The pronunciation of these words must have changed, for A in *bat*, and A in *pale* are different vowels.) This sound differs from German \hat{A} the full sound, in that the English raise the middle of the tongue, and so compress the air in the palate; the Germans depress the middle of the tongue, and so compress the air in the throat. The French have almost the same sound when E precedes M or N, as in *entendement, etc.*, Welsh A.

(There is a general organic action peculiar to every language, probably arising from so great a diversity of structure, the use of aspirated gutturals by some and not by others, or the culture of the language in its earlier stages.)

The influence of Norman-French on our own pronunciation is evident when we compare the Anglo-Saxon with the Norman-English.

One language brings certain muscles into more active use than do others, and this affects many of the vowel sounds.)

\hat{E} *masculine*. With "middle" opening is formed French "masculine \hat{E} ," as the English, Italians, Spanish, and others pronounce this letter with clear and sharp utterance. It is intermediate between the last-named and the succeeding letter. In English, represented not only by E, but also—when lengthened—by EA, sometimes by EI, as in *the, there, these* (the last two are different, for the first is guttural, and the second palatal), *seal, receive*.

EE, I, *exile*. With "least" opening is formed thin I; common to French, Spanish, Italians, and many others. In English, when quickly uttered, it is represented by I short; when lengthened, often by EE, frequently by IE, or even EA, e.g., *sit, see't* (I see it), *fit, feet, friend, fiend, near*, Welsh I (in ultimate syllables), Y and U. (These vowel sounds differ essentially.)

LABIALS.—Labial vowels are produced on the lips, brought together into a rounded form, the breath being moderately compressed at that point.

\hat{O} *rotundum*. With "greatest" opening of the lips is formed the full \hat{O} like the ω of the Greeks.

The French pronounce their AU in this way, often. English O or OA (the A sound having almost vanished at this time), as one, none, coal, chose, etc. Short O is pronounced as described above, rarely by this \hat{O} rotundum.

OO, full \hat{U} . With "middle" opening, the full \hat{U} of the Germans is formed; also by Italians, Spanish, etc. French OU; Welsh W; English often OO (more rarely U or OU); foot, shoot, full, etc; but doe (= do), goe (= go); and similar sounds are more rightly pronounced \hat{O} full than \hat{U} .

\hat{U} exile. With "least" opening is formed thin U, well-known in English and French. Long U in English, sometimes EU, EW—which should, however, retain the first sound of E "masculine"—as muse, tune, lute, mute, brew, etc. This sound may be pronounced by foreigners in the attempt to pronounce as a diphthong, IU; as in Spanish ciudad; this is not, however, the exact sound, since it is a compound sound; while the English and French sound is a simple one. Welsh IW, YW, UW, as Duw (God). These nine vowel sounds I know; nor do I know any others. For I do not consider the English I long to be a simple sound.

How the number of vowels may be increased. I do not deny that in every vowel position, where I have described three modifications of the opening, there may be, or may have been, or in future may be others formed; and there may be also intermediate sounds formed, as the neutral E of the French, between palatal \hat{A} and \hat{E} ; for the width of the opening is capable of an infinite variety of measurement. For as, in enunciating the names of the winds, we may call them four, or twelve, or even thirty-two, so, as the Arabs, and perhaps the old Hebrews hold that there were but three vowels, (i.e., one in each position of the organs), while in our time we can clearly distinguish three in each position; what is there to hinder our descendants from interposing intermediate sounds even to these?

Origin of the length and shortness of syllables. But all these vowels are capable of lengthening and contraction—whence the distinction between long and short syllables;—certain—as in U obscurum and E femininum—being more rarely lengthened; others—as \hat{O} rotundum and \hat{U} exile, at least with us—more rarely shortened. But the consonants also are capable of lengthening—especially such as approach in their nature to vowels—except P, T, K, which are absolutely mutes, and give no sound (by this he means voice), but simply modify preceding or following sounds.

Exactitude seems to have been sacrificed to symmetry; for instance, he puts as being the same sounds our long A in father, AU in pause, and O in not; while some sounds, such as A in pay, seem to find no place in his system. Amman and he were at variance on some of the vowel sounds.

Some of the examples given of the various sounds show

either a want of clearness in the writer, or else tend to prove that the pronunciation of the time must have differed considerably from that of the present day. For instance, he gives *the, there, sell and seal* as examples of the same vowel sound, and similarly *foot, mood, mourn, source*.

While limiting his analysis of the vowels to these nine sounds, he recognises, however, that there may be modifications of some of them.

Next he treats of the consonants :—

The consonants also we divide into three classes, similar to those of the vowels, Labials, Palatals and Gutturals; for it is in the three places corresponding to these classes, viz., the lips, palate, and throat, that the breath, when driven out of the lungs, is either intercepted or at least strongly compressed.

A triple direction of the breath must also be noticed, according as it passes through the mouth and lips entirely, or altogether through the nose, or equally through mouth and nose. This difference in the direction of exit, I believe, depends entirely upon the variation in the position of the uvula.

We have, therefore, three different ways of emitting the breath, and at each of the three places the breath may be intercepted, hence giving rise to nine consonants, which may be called the primitive or closed consonants; but if the breath be not altogether intercepted, but only tightly compressed, so that it finds an exit with difficulty, we have others which we will call the open consonants.

CLOSED CONSONANTS.

MUTES.—P is formed by driving the breath through the mouth to the lips and stopping it there by closing the lips.

If, however, it is stopped at the palate before it reaches the lips—the tip of the tongue being placed on the front of the palate, or, what amounts to the same thing, on the gums—T is pronounced.

But if it is intercepted even before this, right in the throat,—the back of the tongue being moved to the hinder part of the palate—K is formed.

These three are called Mutes, because no sound is emitted, since the breath finds no exit by either nostrils or mouth.

SEMI-MUTES.—Here the breath is divided equally between the nose and the mouth; then B, D and G are formed according as the breath is intercepted at either of the three corresponding points, the lips, palate or throat.

These I call semi-mutes because they produce a slight sound in the nose, which can be heard independently of any accompanying sound.

SEMI-VOWELS.—Now, if the whole breath (or the greater part of it) is sent through the nose (only causing the air remaining in the hollow of the mouth to vibrate as it passes by), then we have the letter M if the lips form the closure, N if it is effected at the palate, and if at the throat, the

[nasal] sound which the Greeks represent by γ before κ , γ , χ , ξ . This sound was written in classical Latin and in modern languages as *n* before *k*, *ch*, *g*, &c. ; as in *sing*, *sink*, *lynx*, &c.

I call these three sounds semi-vowels, because they give rise to more sound than the semi-mutes.

OPEN CONSONANTS.

These are "aspirations" of the first class (with the exception of the semi-vowels); and are either Thin when emitted through a narrowed aperture, or Thick when the breath passes through a rounded opening.

The semi-vowels are excepted not because it is impossible to aspirate them, but because such utterance gives rise not to articulate sounds, but to noises of the nature of a murmur or a groan.

LABIALS.—If, in pronouncing *P*, the breath is allowed to escape, we have the sound of *F*, or *Ph*. In this case the narrowness or otherwise of the opening makes very little difference.

If this is done with the formation of the letter *B*, with a narrow aperture, we have the English *V*. If the aperture be rounded the sound of *W* is pronounced. This sound differs very little from the sound of *oo*, French *ou*, pronounced rapidly.

PALATALS.—From the position for *T*, if the breath is driven out by a full opening, we have *Th*; if by a narrow opening, *S*, the tip of the tongue being raised so that the breath is compressed into the form of a thin, leaf-shaped layer.

Similarly from *D* we obtain the two sounds of *Dh* (i.e. *th* in *thy*, *though*, &c.) and *Z*.

Under the heading of *D* and *N* must be taken also the sounds *L* and *R*; rather than under *T*, because in this sound there is not the vibration of the larynx and the emission of the breath through the nose, which are the characteristics of these sounds.

L is formed if instead of pronouncing *D* or *N* the breath is driven out gently by the side of the cheeks (either of one or both) and so to the opening of the lips, with the addition of a vibration of the tongue.

R is formed by the curving inwards of the tip of the tongue, which vibrates rapidly and forcibly, thus striking the breath in its passage. By which conflict is produced that "burring" sound [*ille horridus sonus*].

GUTTURALS.—If instead of saying *K*, the breath is allowed to pass out by a narrow opening, being thus closely compressed, we have the sound *ch*, Greek χ , a sound hardly in use with us, though familiar in the German language.

If the opening be less narrow we have the sound *H*.

Similarly from *G* we have the two corresponding sounds *Gh* and *Y*. The former produced by a narrow aperture, was formerly pronounced in such words as *light*, *daughter*, &c., and still exists among the Scotch and Irish. The latter, made by enlarging the aperture, is very similar to *I* rapidly uttered.

[The fourth and last section treats briefly on compound sounds, both vowels and consonants. Here he clearly shows that it is an error to

consider the semi-vowels *y* and *w* as simply the vowels *i* (*ee*) and *u* rapidly pronounced, as some hold, by calling attention to the radical difference introduced by pronouncing the *y* and *w* before the corresponding vowels *ee* and *u*—i.e. by saying *yee* and *wu*. His analysis of the compound consonants is not quite satisfactory, as when, for example, he separates *j* into *d* and *y*; and *sh* into *s* and *y*. In his *De Loquela* he did not furnish any account of his method of teaching language. In his letter to Mr. Beverly this is supplied: "The other part of the work to teach a language is what you now enquire about."]

ON TEACHING LANGUAGE.

"In order to do this, it is necessary in the first place, that the deaf persons be taught to write. That this may be something to express to the eye, what the sound (of letters) represents to the ear. It will next be very convenient because pen and ink are not always at hand, that he be taught how to design each letter by some certain place, position or motion of a finger, hand, or other part of the body (which may seem instead of writing). As, for instance, the five vowels *a, e, i, o, u*, by pointing to the top of the five fingers. And the other letters, *b, c, d, &c.*, by such other place or posture of a finger, or otherwise as it shall be agreed upon.

"After this a language is to be taught to this deaf person, by like method in which children are at first taught by a language (though the thing perhaps be not heeded) only with this difference, children learn sounds by the ear, but the deaf and dumb person is to learn marks (of those sounds) by the eye. But both the one and the other do equally signify the same things or Notions; and are equally (*significantia ad Placitum*) of mere arbitrary signification.

"'Tis, then, most natural (as children learn the names of things) to furnish him (by degrees), with a nomenclator, containing a competent number of names of things common and obvious to the eye (that you may show the thing answering by such a name), and those digested under convenient titles and placed (under them) in such convenient order (in several columns, or other orderly situation, or on the paper) as (by their position) best to express to the eye their relation in respect to one another as contraries or correlatives, or appurtenances under their principals, which may be seen in a kind of local memory (no irksome or tedious labour)."

Then he ought to proceed to teach the parts or individuals included under general names.

I. He teaches the individual under the general, as under mankind, including sexes and ages; under body (1.) The principal parts. (2.) Then the several parts of these, as head, hair, ears, etc. Then in another paper (3.) Inward parts, beginning with the head. (4.) Beasts. A collection of the names of domestic animals. (5.) Bird or fowl. (6.) Fish. (7.) Plants or vegetables and subdivisions, as tree, flower, fruit, etc. (8.) Herbs (weeds), grain. (9.) The inanimate, as Heaven, etc. (10.) Elements into metals and earths. (11.) Water, sea, etc. (12.) Air, light, etc. (13.) Cloud, rain,

etc. (14.) Fire. (15.) Clothes. (16.) House and furniture. With other classes under their heads. (The suggestion is worth remembering of classifying things under their general names as assisting abstraction.)

The singular and plural, and their formation.

Possessives from these and the corresponding possessive pronouns.

Show the particular and then the general title.

The particles are the, this, that, these, and those.

Pronouns I, thou, he, etc.

Then, under the title adjective-substantive let them be connected, as my home.

To increase the names of adjectives, teach the colours. Then the tastes and smells, hearing, touch, feeling, as hot, cold, etc.

From whence you may furnish more examples of adjectives with substantives, as white bread.

It should be observed, that up to this point no sentence or affirmation was taught. It was all collecting the materials like brick for the building.

II.—Then by inverting the order, substantive and adjective with the verb copulative between, as “silver is white,” which will begin to give him some notion of syntax.

In like manner when substantive and substantive are so connected, as gold is a metal. The abstract verb to be is thus first in the order of sentences.

To increase the knowledge of more words give him some other kinds as of quality and quantity, as long, short; of figure and position, gesture, motion (as move, etc.), time, place, number, weight, measure, money, divisions of time, names of places and countries, then arithmetic at leisure.

III.—1. The Intransitive Verb and its Nominative are now to be taught together, as I go, and above them their names.

2. Next the Transitive Verb with object, as I see you, or with a double Accusative, as You teach me writing—or to write.

3. Two Tenses of the Verb, present and past, should now be conjugated, and two participles.

4. The auxiliaries do, be, have, &c., should follow. If taught by examples, then all the inflexions are learned.

5. Write out a full paradigm of the verb.

6. The verb has only four variations, as see, saw, seen, seeing.

7. Am is somewhat irregular, as was, were, Be, beest, be, Were, wert, were, which, with other auxiliaries, make up the passive.

8. All verbs in the active voice have the present participle ending in ing. The past and praeter-past in ed. But boil, roast, bake, teach, bring, buy, see, give, take, forsake, write should be learned.

9. Prepositions occupy the place of cases, as a piece of bread, and so of the others.

10. Last, conjunctions, which are to connect words and sentences, as, Because I am cold, therefore I go to the fire. The book.

formed by these exercises will be Dictionary and Grammar. The scholar ought to have pen, ink and paper at hand, to write as well as signify by signs. We must endeavour to learn his language in order to teach him ours. It would be convenient to teach such sentences as, The head is the highest part of the body; The forehead is over the eyes.

This is a full account of what Dr. Wallis' letter to Mr. Beverly contains on his method of teaching language.

When compared with Bonet's, there is a general resemblance observable in the method, but with such differences as to show that Wallis was not a copyist, but an original teacher. Had Bonet's book been in his hands, he would not have been contented with what he had done. Bonet's method was more mature, richer in the fruits of experience, and more in harmony with the mental aptitudes of the Scholar. His large use of action, facts and objects at hand to illustrate his lesson—afterwards imitated by Pereira, and now more consistently and efficiently applied—is an evidence of his ability to apprehend the relation of the scholar to nature, and to utilize it in teaching. But it is evident that both authors were greatly influenced by the rules of grammar, and forgot that as yet the scholars knew nothing of the language to which grammar could apply. It was about the same as if when he was asked by a scholar for a piece of bread, corn, water and a fire were given to him to prepare it for himself. And yet this method prevailed for a long time in Germany, France and England. Thirty years ago it was closely adhered to by a distinguished master in England, and possibly still lingers among us in remote places. The revolt of the Germans against it drove it from their schools, and the mother's method took its place. An infant does not begin to speak in this manner. He wants to know, as well as speak, and therefore without reserve he gets the words which best express the objects and actions that excite his curiosity. However this method may be modified or shaped to meet the special conditions arising from deaf-mutism, it is the only one which can be called rational. The logical development of the sentence adopted by Tarra and others, is on the same lines, but seeks to supply a more complete knowledge of the structure of the language than would be acquired by object lessons, pictures and reading-books.

HOLDER.

DR. WILLIAM HOLDER, of whom little is known, had evidently enjoyed all the advantages of birth and station to smooth his way to the University, where he distinguished himself sufficiently to be made a Doctor of Divinity. He was also a member of the Royal Society, and had the honour to read his Essay at one of its meetings in 1668-9. It was approved, and ordered to be printed by J. Martyn, their printer, in 1669. Its title is "Elements of Speech, an Essay of Enquiry into the Natural Production of Letters; with an Appendix, concerning persons Deaf and Dumb." He was therefore not a pretender nor a rival of Dr. Wallis, but a free worker, actuated by the highest motives in his endeavours to promote the education of deaf-mutes.

An Analysis of the Elements of Speech. This is the first part of his essay. In this he treats on the senses, but chiefly on seeing and hearing. These he calls "senses of learning," and shows the superiority of the eye by the manner in which it "takes in at a greater distance, and more variety, at once, comprehending also quiescent objects, which hearing does not." "Signs for communication may be contrived at pleasure from any variety of objects." Speech surpasses all, and is "suitable to the excellency of the soul, being easy, speedy and certain." "The chief, I say, of all signs—which the Almighty's providence, in the creation of man, indued him withall, and distinct to that use—is the human voice and the several modifications thereof by the organs of speech, viz., the letters of the alphabet, formed by the several motions of the mouth, and the great variety of syllables, and formed with almost equal velocity."

"These are reduced to letters which, seen, suggest the sounds. This is language in counterfeit." After treating on our alphabet and its imperfections, he turns to the natural alphabet, and says "it prepares a more easy and expeditious way to instruct such as are deaf and dumb, and dumb only, by consequence of their want of hearing, (by showing them the proper figures of the motions of the organs whereby letters are formed) to be able to pronounce all letters, and syllables and words, and, in a good measure, to discern them by the eye when pronounced by another."

Language, as to its form, he defines to be "an apt connexion of letters, forming and producing words and sentences," and speaking "a sensible expression and communication of the notions of the mind by several discriminations of utterance of voice used as signes, i.e., having by consent several determinate significancies."

THE MATERIAL PARTS ARE BREATH AND VOICE.—He describes the

organs, and then the articulation of the letters. What constitutes them vowels and consonants. Voice is vocalised breath. He is often happy in his descriptions of the positions of the organs. Analogy in the production of the consonants as p, b, t, d, etc., influences him. The nasals are associated with these, and the distinction between the passage of the breath and voice clearly described. L and R are peculiar. "L is made by the same appulse of the tongue to the gums as in t, d, but then the sides or edges of the tongue are drawn in, and leave smooth and free lateral passage for the voice." "For R show the pupil the gingival—gum—posture of the tongue, and putting your mouth close to his hand or cheek while you pronounce it, make him sensible of the jarre; which with often trial he will be brought to imitate, though for a while it will be troublesome to him, by reason of its roughness."

ON TEACHING SPEECH.

He would first teach the consonants and arrange them in the following order as the simplest:—

p, b, t, d, k, g, m, n, f, v, th, s, z, sh, j, l, r, and the vowels a, ā, æ, e, i, o, oo, u, ou. These are placed last because more difficult, but he does not unite them till they have been all learned apart.

The learner is to begin with writing the letters of the alphabet, till his eye is acquainted with their figures and he is able to write them pretty well.

Beginning with p, as first written, he is to learn to pronounce it by being shown the motion of your own lips. When pronounced shew him the letter he hits upon and make him repeat it till he is perfect in its pronunciation and its association with the written letter. Thus on to b, t, d, etc. Afterwards associate them with the manual alphabet on the joints of the fingers. An artificial tongue of stuffed leather would be useful to give a better idea of the positions.

When names are pronounced, associate them with the objects, writing out phrases and sentences. Adjectives and adverbs can be added from visible bodies and colours. He intended to write a grammar, etc., but "the occasion of exciting and exercising my thoughts being unhappily removed, I went no further; but hope to see them perfected by those, who shall meet with such like occasions." He refers to a young gentleman born deaf and continued dumb till he was ten or eleven years old. It was occasioned by a sudden fright before birth, so that one side of his face "were a little distorted." "One ear was quite shut up, and the other distended and too open." But he discovered he was not quite deaf of the latter ear. He imagined the deafness was owing to the relaxed state of the tympanum. He describes the ear, and to increase the tension of the tympanum beat a drum fast and loud by him, and while it went on he could hear those behind him calling him gently by his name, which he understood from having learned to pronounce it previously. But when the drum ceased he did not hear the same persons, when they again very loudly called him by his name. He confirms this by other similar instances, supporting the assumption that not the tympanum only, but the whole organ is stimulated by loud noises.

In the "Appendix Concerning Persons Deaf and Dumb" Holder remarks that there are very few, who are such through defect in the organs of speech; but most commonly that imperfection is the effect, or rather consequence of want of hearing. Imperfections in some of the organs of speech do not utterly deprive of the use of speech. The laxness of the tympanum is one great cause of deafness.

"The natural part of speech, viz., words made of letters, by such exquisite, various, articulations, is learnt by much practice and imitation." "It is from the want of discipline, or control of the ear that they are dumb." Only by having recourse to "seeing . . . and showing him the visible motions and figures of the mouth," can they be taught to speak.

There are great difficulties and objections that lie in the way of any one who would attempt to instruct the deaf. These are discouraging and "portend such a design unfeasible." But they may be overcome. *Venit miseris solertia rebus.*

The first is that it is painful and irksome to the learner to exercise his voice, which is rough and harsh, and the muscles of the larynx soon become weary. It is a great objection and "except a great regard be had to it, whoever goes about this design will attempt it in vain, especially in the first progress of it. Therefore the deaf person must be gently and discreetly treated, and by all kinds of pleasant usage wrought upon, to take some pains at it, watching your seasons, and taking great care, that he may not hate his task, but do it cheerfully. He must be allured by much sweetness, and encouraged by applause and admiration, and must exercise often, and a little at a time; and, in some time, habit and custom, and the pleasure he will take in it will make it easier for him."

The objection that "if all the nine articulations of the nineteen consonants were understood and imitated by him; yet how can he discern the material differences, which make up the number of consonants, and consist only in sound, and cannot be represented to the eye," he meets by admitting that it is "impossible to know infallibly by the eye what another speaks." "But any equivocal word spoken alone cannot be known by him who hears it; yet the same word in connection of speech, as part of a sentence, is understood as easily as any other, as *But*." "In whispering we understand one another, but there is no voice, nor breath." [Rather not whispering where breath is used, but only the positions of the organs in the production of the motions without voice or breath.] "So in the common use of speech, as a dubious word is easily known by the whole sentence, so may a deaf person, having attained a competent knowledge of language, assisted by an acute sagacity, by some more evident word discerned by his eye, know the sense, and by the sense other words, and by the words the obscurer letters . . . and know what others say to him." The larger use of his eye makes him "quicker to perceive the motions of articulation, and conjunctions of letters in words, than we can easily imagine."

They are encouraged to learn in order to find out what is said by others. He errs about the Eustachian tubes being open. The sound is carried by the bones of the head. Some of the consonants "are most easie to be

showed to the eye." Beginning with these, the more difficult become less so from practice. Writing the words and shewing them to the eye is a great help, for he associates the sounds with them.

The following, on teaching the articulation of P, will serve to illustrate his method :

"Write down on a paper P and B, and make signes to him to endeavour to pronounce, and guide him by shewing him the motion of your own lips, to offer at one of those letters ; which, being the easiest of all, he will, with a little endeavour, stumble upon one of them. Shew him upon the paper the letter which he hits upon, and, much applauding and encouraging him, make him repeat it often, till he be very perfect, both in the pronunciation and in the written character of the letter." Had Holder clearly apprehended the difference between an air and voice stop he would not have left the articulation of P to chance.

His controversy with Wallis was very painful for both. If Wallis had candidly stated that Popham had been Holder's pupil, but forgot much that he had learned in the years that elapsed before his studies were resumed under himself, Holder would not have felt so aggrieved. But, as Wallis claimed the exclusive honour of educating him to speak, etc., Holder felt deeply, and resented the injustice done him by Dr. Wallis. Whoever wishes to acquaint himself with Dr. Wallis' defence will find it in his "Vindication of the Royal Society," in the works of Dr. Wallis, Brit. Mus. It would have been better for both if feelings more akin to their benevolent enterprise had prevailed over small grievances.

PETER MONTANS, a Dutch pastor at Delft, in 1635 published a work, "De Spreeckonst: or, the Art of Speech." It has been very commonly supposed that Montans was the first of his nation who referred to the instruction of deaf-mutes in this work, or even taught them, but Mr. Bickers, Principal of the Institution at Rotterdam, in an account of Montans' book, and of which there is a translation in the American "Annals of the Deaf," 1887, has shown that such an impression has no ground in fact ; and is due to an imperfect acquaintance with the nature and objects of the book. "The statements, says he "with regard to the merits of Montans as an instructor of the deaf are evidently imaginary. The place that has been assigned to him in the history of that instruction in the Netherlands belongs rather to Van Helmont, but still more justly to Amman."

VAN HELMONT.

JOHAN BAPTIST VAN HELMONT was born at Brussels in 1618. His father was a chemist, celebrated as a metaphysician, physiologist and physician. His attention was in part turned to all the arts and sciences, from the study of which he expected great things, but in his disappointment he came to the conclusion that there was no real knowledge under the sun. In his researches he made many discoveries, and as Hœfer remarks, "had the immortal glory of revealing scientifically the existence of bodies invisible, impalpable, though material, which previously had only been guessed at." The son inherited all his father's devotion to research. He visited Germany, Holland and England, but spent most of his life at the house of the Pfalzgraphin von Sulzbach, in Bavaria. He died in 1693. His work on the Hebrew alphabet as the literal pictorial description of the action of the organs in the production of the sounds was published first in Latin in 1667, under the title "*Brevissima delineatio alphabeti vere naturalis hebraici, quae simul methodum suppeditat juxta quam qui surdi nati sunt sic informari possunt, ut non alios solum loquentes intelligant, sed et ipsi ad sermonis usum perveniant, 1667.*" It was published in Dutch, with Amman's "*Surdus Loquens,*" in 1697. The work is more speculative than practical. It is in the form of conversations. In the first he treats among other things, on the different uses of the human mouth, and its formation, and how persons born deaf can understand others, and catch the meaning of their speech.

They are dumb because deaf, and "learn to speak by observing the appearances of the tongue and mouth of others in speaking." He refers to a deaf and dumb person near Leyden, who had learned to catch the speaker's meaning in everything. But he exaggerates the place of sight in hearing children learning to speak.

The Second Conversation is on the Hebrew alphabet, and its place in respect to speech and knowledge. He says, "There is a wonderful likeness of the Hebrew characters to the movements of the human tongue." "The letters

themselves are nothing else than pictures representing the different movements of our tongues." But the original forms are no longer used by the Jews. Contractions and the influence of other alphabets have robbed them of their real resemblance to the positions of the organs in the production of the sounds.

His theory is that these letters were given when man was taught speech by his Creator, as a pictorial description of the organs, and at the same time as an alphabet to be used in writing. In a series of well executed engravings, in which the face is seen laterally with the flesh of the cheeks and throat removed to permit a view of the teeth and tongue, he ingeniously strives to prove that the very form of the corresponding Hebrew letter is apparent. There is enough to give some semblance of reality to his theory; but, unfortunately, the history of the Hebrew alphabet points rather to a hieroglyphic than a phonetic origin, in which objects were selected because the first sounds of their names corresponded with the phonetics, as B, from Beth, a house; G, from Gimel, a camel. This part of the work is more curious than instructive.

In the Third Conversation he treats on the nature and qualities of the human tongue, with remarks on the speech of children. Of the latter, he asserts that it comes from the idea (thought image) of the mother's voice, with the order in which it takes place. We do not notice the motions of our own tongues, and this is the reason why the tone and voice are altered from the different openings of the mouth and teeth. He describes the manner in which the tongue, from its muscular activity, can adapt itself with ease to every position required by phonation.

In the Fourth Conversation he treats on the breath and its importance in the formation of the human voice and speech.

In the Fifth, on the living power of the voice, its origin and effects.

In the Sixth the letters of the Hebrew alphabet are described and explained.

In the Seventh the Holy Language, its use and its perfections, are set forth.

That Van Helmont's own opinion of this work in the education of the deaf and dumb was not very high is evident from what he said to Amman. The latter says, "When I was instructing the sixth deaf-mute, circumstances made me acquainted with that celebrated philosopher, J. B. Van Helmont (now among the saints), who informed me of a certain natural alphabet, discovered by him some years before, by which he had instructed those who had been deaf and dumb from birth. But when he saw and heard me teaching, he acknowledged with the greatest candour that I had not only not borrowed anything from him, but that I had greatly surpassed him in practical results."

GEORGE SIBSCOTA.

"THE Deaf and Dumb Man's Discourse," by George Sibscota. Published London, 1670. He proposes three things: First, "The reason itself, by which Aristotle maintained that the sense of hearing may be easily injured from the very birth, above all the rest of the senses, because the principle of speaking or of articulate speech may be easily prejudiced, the principle of hearing being the same." Second, "We take into our consideration that which follows by consequence from that very reason, to wit, that the hearing is never damaged from the birth, unless speaking or the articulate enunciation of the voice be so likewise." Third, "We subjoin and inquire into their understanding, that are born deaf, as also the way and manner of their knowledge."

Section I. Why is hearing, of all senses, soonest prejudiced? Aristotle's principle does not explain. The voice is the material principle of speech, and by this is the hearing stirred up to the act. But this does not answer the question, Why there is a voice in deaf men, yet there is no hearing. And when those that are mute can frame a voice, infants cannot speak. The defect is to be sought in the organs. The reason why new-born babes can hear, but not presently speak, or pronounce articulate words, is, because there is more required to the framing of speech or speaking than to the reception of a sound or hearing. Brutes have

lungs, etc., yet cannot speak. They make a noise, but do not utter words."

[Children require exercise and habit. The weakness of their organs of speech, like their limbs, prevents them from using them. They are bestowed on man for language. The defect lies in the structure of the ear.]

Section II. controverts Aristotle's and Galen's opinion, pp. 2, 41, 94, that they are dumb because born deaf. May they not be capable of speech? Vallesius and others cite instances. Dumb because never instructed. Bartolinus, in his "Anatomy," bk. iii., ch. 9, says, "that those who from their birth are thus affected, are also for the most part dumb, because they neither can conceive in their mind nor utter with their tongue those words which they never heard." This controverts the opinion that they ought to use some natural language as speech, from some nerve connection at the roots of the senses. "If the ear cannot hear, words cannot be learned."

Section III. In reply to the inquiry, With what knowledge are they imbued? he says, "They can see and gain a knowledge of visible things, as if they heard, and can proceed to the knowledge of God." Even though blind as well as deaf they can attain to knowledge. Those who see can begin with writing, as P. Ponce taught, and understand things. Then they can use pantomime, like the deaf and dumb servants of the Grand Turk. They can arrive at the use of signs by study and exercise, can also imitate the voice, and know what is meant by the lips. "Platerus," Obs. p. 118, 52-53. A brother and sister at Gröningen can read speech. "Ph. Camerarius Horæ Subcisivæ," I. Cnt., p. 37. The remainder of Sibscola's work is on the reason, speech, and language of beasts.

Sibscola did good service in this work by controverting, with equal learning and clear discernment, the erroneous opinions of the learned and the vulgar on the causes of dumbness, and the possibility of instructing deaf-mutes by writing, pantomime, and speech.

Of Sibscola himself, nothing has been learned; he lives only in his work. Stirred by Digby's report, and perhaps

a witness to the sad state of the deaf and dumb, he wrote to promote their education. His book was published in 1670, seventeen years after that of Wallis. There is a copy in the Library of the British Museum.

RAMIREZ DE CARRION.—Nicolas Antonio, in his "Bibliotheca Hispania Nov.," while honouring Pedro de Ponce as the inventor of the art, awards the same honour to another Spaniard, posterior to both Ponce and Bonet, Ramirez de Carrion, a deaf-mute from birth. He was the author of a work called "Maravillas de la Naturaleza," 1629, in the Brit. Mus. Antonio says "Here Ramirez discovered, or at least exercised alone in his time, the art of teaching the deaf and dumb to speak and write. The Marquis de Priego, to whom he was secretary, Don Luis de Valasco, brother of the Connétable de Castile, and others, also owed their education to him." Morhoff also informs us that this master had Emmanuel Philebert, Prince de Carignan, as a pupil, who was a deaf-mute, that he was still living in his time, and could write and speak four languages. Deg. I. 323. As nothing very satisfactory can be learned of this teacher or his work, and writers are divided in their opinions about him, in the absence of his book, we are not in a position to say anything more definite.

About 1670 lived P. LANA TERZI, a Jesuit, at Brescia. He was a professor of rhetoric at Terni, and an ardent investigator of the secrets of nature. He also wrote some compendious but just views on the art of teaching deaf-mutes, which might have proved fruitful, had they been practically applied. In his "Arte Maestra," or Master Art, he treats "on teaching deaf-mutes by examining the positions and movements of the different parts of the organ in the formation of each tone or of each articulation, then to imitate them, and to recognise them in others by the positions and movements of the lips. At first he exercised the deaf-mute to utter each letter separately, to read it on the lips of another, afterwards to unite these letters into words, and lastly to teach their meaning by indicating the objects they referred to, and gradually to travel over the meanings of the words which relate to the functions of the senses, to the acts

of the understanding, and to the will." Such—according to Lana—is the substance of the art. "Whatever may be the difficulties which the exercises on which it depends seem to present, they will be surmounted by deaf-mutes in an astonishing manner, for the loss of one sense gives the others a novel and singular sagacity."

PIERRE DE CASTRO head physician to the Duke of Mantua, it is said, instructed the son of Prince Thomas of Savoy, but of his method there is no account.

GEORGE DALGARNO.

THIS distinguished man was born at Aberdeen. His name has an Italian ring about it, but of his family little is known. They were respectable, possibly wealthy, citizens of Aberdeen, for he was educated at the University, and the king—Charles II.—refers to the loss of his property in the letter he wrote to commend his work on a "Universal Language." But before its publication he had removed to Oxford, established a school there, and become intimate with some of the leading scholars and thinkers of the day. His principal work, "*Ars Signorum, Vulgo Character Universalis et Lingua Philosophica*," was an ingenious attempt to construct a "Universal Language." It has much to commend it, and might prove all that the author had fondly hoped in its laborious construction, if men could be persuaded to adopt it. There is, however, little doubt that it was used by Bishop Wilkins in his more celebrated work on a "Universal Language," but which he never acknowledged. Anthony Wood, in referring to it, says of the latter, "who from thence taking a hint of a greater matter, carried it on and brought it up to that which you see extant." Dr. Max Müller, in one of his essays, has given us an analysis of this work, but says nothing of Dalgarno. He was not without friends and admirers in his day. Dr. Seth Ward, Bishop of Sarum, Dr. J. Wilkins, Bishop of Chester, and Dr. J. Wallis of Oxford, were among them. Even royalty itself honoured him with special favour, for Charles wrote a letter—printed in the preface to Dalgarno's work—in which he commends him to the sympathy of the learned and benevolent to enable him to

bear "the charge and expense for the effectual prosecuting of this work as the nature of it requires;" "for through the various vicissitudes of providence he hath suffered the loss of a considerable estate." The king was more lavish of his words than of his wealth, for it does not seem that much from the privy purse found its way to Dalgarno's. This work was not unknown abroad, for it is quoted several times by Leibnitz, and Fontenelle refers to it in his *Éloge on Leibnitz*.

But the work which is much more interesting to us is his '*Didascalocophus*,' "Deaf-Mutes' Preceptor," published at Oxford in 1680, and since then reprinted privately by Lord Cockburn and Mr. Thomas Maitland, and presented to the Maitland Club, Glasgow, 1834. Though intimately connected with a universal language, there are evidences in the book itself that he thoroughly sympathised with the blind and the deaf and dumb in their great privations. Possibly he had been brought into close contact with both had his heart touched and was led to study their condition more closely. It is difficult to account otherwise for his deep insight into their state and practical suggestions about their treatment. Dugald Stewart, who had brought his works to light, says, "His ideas with respect to the education of the dumb do not seem to have attracted any notice whatever. In fact, they were too refined and enlightened to be duly appreciated at the period in which he wrote." This is strong but not undeserved. But the fact is they were speculative rather than practical, confined too much to principles and lacking in illustration. This is why he was eclipsed by the works of Wallis and others who began with the elements and reserved the principles. "For thirty years he taught his grammar school with good success in the parishes of St. Michael and St. Mary Magdalen, and dying of a fever on the 28th of August, 1687 [probably being above sixty], was buried in the north body of the church of St. Mary Magdalen."

In the introduction to his work, "The Deaf Man's Teacher," he lays down the principle that "all signs, both vocal and written, are equally arbitrary. Neither is there any reason in nature why the mind should more easily apprehend the images impressed upon sounds than upon characters

when there is nothing either natural or symbolical in the one or the other." Nothing except its greater fitness.

He then enters on a lengthened discussion of the question, Whether has the dumb or the blind the greater advantage in learning? And after weighing a number of reasons adduced on both sides, he concludes in favour of the deaf and dumb. Here he asserts that a deaf man "is as capable of early instruction in language as a blind one," and goes on to add that "a mother might communicate with a deaf child by presenting familiar names to his eye, pointing from the words to the things and vice versâ, as the blind child hears them spoken, and they would be remembered as soon by the one as the other." For this purpose he prefers dactylogy to writing. Had Dalgarno made the attempt he would have found that the difference was greater than he imagined. There is no well attested instance of success by this method. Sounds arrest the attention of children more than objects without life and destitute of the forms and motions in which children delight. But the ears of the blind receive the living words and his hands soon make him familiar with the forms of things and their qualities, save colour. With this exception he has everything that brings him into the same relations to language as a hearing child. As a matter of fact a blind child is well advanced in a knowledge of language before a deaf child of the same age has learned his first sentence. It is well "to place before the eyes of the deaf written forms with questions, to copy them by writing and use the manual alphabet to spell them," but till the mind of the child is able to associate them with the objects, as their names, no knowledge is acquired.

CH. III.—"On a deaf man's capacity to speak," he says "That a deaf boy can be taught to speak, is no more of doubt to me than that a blind man may be taught to write, both which I think not only possible, but also not very difficult." (1.) Both have the organs equally active, and in a capacity to act. (2.) Both are equally destitute of their proper guides, the eye and the ear, to direct them in acting; and, therefore (3.) both must be equally obliged to the sense of feeling for direction. Though they act out of place, "the soul can exert her powers by the ministry of any of the senses, and therefore, when she is deprived of her principal secretaries, the eye and the ear, she must be contented with the service of the other senses, which are not less true and faithful to their

mistress than the eye and the ear, but not so quick for despatch." This is well perceived and expressed. (4.) It will be as hard to teach the deaf man tone, accent and emphasis in speaking, as to teach the blind to write a good hand; yet both may speak and write so as to be understood. (5.) Simpler characters may be written, and sounds of easier pronunciation invented. (6.) They are equally incapable, the one of singing, the other of painting. (7.) The blind man has the advantage in speaking, being more used in common commerce and business; but the deaf man has the advantage of him on the other hand, of his greater facility in the use of writing, which the blind man can never use to as great a degree of perfection; but he cannot come to speak without much time and pains, and then not perfectly.' (8.) He has an ingenious device of an instrument with keys, which would enable the deaf and the blind to converse by touching the keys, so constructed as to have the letters equally distinguishable upon the keys and strings to the eyes of the deaf, and, in the sounds, to the ears of the blind. "So that Homer could converse with *Æsop*."

Two things are learned by this: "That the hearing and seeing be the principal, yet are they not the only means of knowledge. That the hand is, or at least, is as capable of being made a more serviceable organ of interpretation to the soul than the tongue, for it has access to its mistress's presence by the door of three senses. Of hearing or Autology; of seeing by both species of Schematology, to wit Typology and Dactylogy; of feeling by Haptology—touch; whereas the tongue can enter only by the door of one sense, and do its message by only one kind of interpretation, Glossology—or speech."

CH. IV.—He admits the possibility of a deaf man's capacity to understand the speech of others "if all the distinctions of letters were no less manifest and apparent to the eye, than to the ear, from the speaker's face, as read by us from permanent characters upon paper." But this he does not admit, because "the distinctions of letters are not manifest to the deaf man from the speaker's mouth."

"There is nothing in sounds (to the deaf), more than in motion and figures to the eye. If distinct enough, they can be read like the letters on the manual alphabet. All is motion, whether in the object, or the eye; yet a blind man learns a language by hearing people speak, better than a deaf man by seeing others speak, from the advantages the ear has above the eye." The differences lie in the opportunities, rather than in the things themselves. His reference to Sir Kenelme Digby's report, shows that he was familiar with it, and, possibly like others, had been led to the study of the subject by its statements of what Bonet had accomplished. But his theories stood in his way and made him sceptical of either the accuracy of the report, or the honesty of Bonet, whose ambition, set forms

previously taught, promptings by secret signs, and his pupils having previously learned the sounds of the Welsh words, which he imitated from lip-reading, account for all.

The best means to be used in teaching are, diligence to increase their opportunities ; reading and writing ; associating the pen and the fingers much ; use of tablets at hand for expedition ; common forms ; colloquial phrases ; interrogatives ; to use no signs, but letters only, in all his intercourse with others.* His method may therefore be called the Silent rather than Oral.

CH. VI.—OF A DEAF MAN'S DICTIONARY.—“Teach him the language of his country. It is upon the whole the simplest.”

Let him learn to write grammatically, then use “the more rude discipline of the nursery,” the mother's method. Learn his letters well, so that he can at once write any, make them on the fingers, etc. “Associate the words with the things, teach the names of things best known, absolute and relative.” Alphabetically, following the order of double consonants ; reduce them to heads or classes ; proceed to adjectives with some metaphysical notions. The adjectives should be joined to the nouns ; of verbs of action he remarks “In a word occasion will be the best mistress of method,” the full value of which has yet to be appreciated.

CH. VII.—GRAMMAR.—Confining himself to Etymology and Syntax, he proceeds on the usual lines. Almost every concrete substantive in English is also used verbally, pen . foot, hand.

SYNTAX.—“As I would advise the dumb scholar to be often put to practice upon verbs of bodily action, varying the circumstances by the particulars, so will I single out the verb cut to be the principal verb in the following examples for explaining the particles. 1st. Begin with pronouns I, thou, etc. Write down I cut, and let the master place his scholar by him and place a third person over against him, all of them prepared with a knife, an apple or stick. Then let them follow in order. The master says I cut. 2. Let the scholar cut, the master pointing to the words, or saying thou cut. 3. Let the third person cut, the master pointing to the words he cuts. And for the plural number, let the master

and his scholar first stand together, placing two more near them and two over against them. Then let the master and scholar cut, pointing to we cut; let the two by them cut pointing to ye cut. Let the two over against them cut pointing to they cut." Now let us suppose that speech has been taught, how much shorter and clearer would the exposition be. Possessives can be taught in the same manner, and then conjoined. He advises much practice on such verbs, and says that "the verbal terminations will be learned by the persons. Then the tenses should follow, and nice distinctions ought to be avoided. Let them practise much upon the pronouns and signs of tenses with verbs of action, adding other circumstances of time and place, manner, etc., and that with all the variety possible of familiar, plain, easy, most common and most frequently recurring circumstances."

The copula is easily understood because of its frequent use. "Or" and "and" should be diligently inculcated. "The particles signifying motion, as to, from, etc., and such like words signifying circumstances, perceivable by sense, are as easily apprehended as words signifying bodily substance or sensible quality." "Of abstract particles relating to cause and effect and comparisons, use such examples as these, This pen was made by the master, of a goose quill, for to write after my copy. Explain why, wherefore, what is the cause of expostulation by interrogations with your scholar himself, or others; because is an answer to them." In relation to equivocal particles, he says, "Do not put his understanding to the rack, by an indiscreet pressing upon his apprehensive faculty notions either simple or complex, which you find he receives not readily; but make a collection of such words and watch opportunities of explaining them." "When the principal verb of a sentence is clearly apprehended, it brings great light to other circumstantiating words." This is excellent. Particles such as than, much, more, as, so, etc., may be demonstrated to the senses. This water is as hot as that, etc. Model sentences ought to be collected, to which reference can be made. "For exercise you may find variety for him, such as to vary the circumstances proposed, to describe things from their causes, from their contraries, by

comparing them with other things ; to form a narration of things seen, to write an epistle." He concludes with this suggestive reference to the learner, "In the application of all I have said, respect is due to the quality of the person to be taught, whether young or old, dull or docile ; how to comply with their circumstances must depend on the prudence of the teacher."

Dalgarno invented a manual alphabet, which is very simple in its construction. The left hand is the tablet, and its joints furnish the natural divisions, so that each letter has its own place. The tips, beginning with the thumb, are the vowels A E I O U, and Y can be added outside the little finger. The first joints are B C D F G ; the second joints, H K L M N ; the third joints, P Q R S ; and T V W X Z are on the large joint of the thumb and the palm. The index finger of the right hand is used to point to them. But the thumb of the left can be also used to point all the other letters, except those on itself, which can be supplied by the index finger. Thus it may be made one-handed. Perhaps for distinctiveness it is hardly equal to the Spanish alphabet ; but when we would converse with a blind and deaf man in the dark, it is superior in simplicity and expedition. In teaching it, a white glove might be used, having the letters written in their places.

Dalgarno has anticipated many of our improvements, but his great merit lies in his discovery of the fundamental relation of words to acts, and the application of the law of simple association in writing them. He found no place for signs in his system.

AMMAN.

JOHN CONRAD AMMAN was born in 1669, at Schaffhausen, and was educated for the medical profession at Basle, where he took a high degree in 1687. He afterwards went to Holland about 1690, and took up his residence at Haarlem, where he commenced the education of his first deaf-mute pupil, Esther Kolard, and continued to live in his adopted country till his death, in 1724.

Amman's views on the education of deaf-mutes were first

given in a work, "Surdus Loquens," published in Latin at Amsterdam in 1692, and of which an English translation was published by Dr. Daniel Foot in 1694. This work Amman afterwards greatly extended and published in 1700 under the title of *Dissertatio de Loquela*. Successive editions of it appeared up to 1740. While the first edition was in the press Amman received the communication from Dr. Wallis already referred to. Mr. Baker, of Doncaster, published a translation of the work in 1873.

The *Dissertatio* consists of three chapters. In Chap I. Amman gives some curious and mystical opinions on the origin of speech and language; holding that man was put in possession of them at his creation, exercising speech from an innate knowledge of things; that this language was purely intellectual, by which man had the power of effecting whatever he wished through his intimate union with the Creator; that with man's fall this natural language was all but lost, the letters only remaining, with a few vestiges besides; and that all the varied languages of the nations were the shadow of this primitive gift, destitute of its original force—in fact, "a mere artifice without which we should be mute." He also held that, if language was not learned traditionally, men were endued with the power to utter the sounds which would form a new language and be understood by all. Hence he held that deaf-mutes could not invent a language among themselves. Under the influence of this idea he could not see how deaf-mutes could be educated. But, instead of searching for the means in the mechanical action of the voice, he entertained the theory of an artificial restoration of the use of the voice.

"Van Helmont and he were the veritable chiefs of the school of writers who, in treating on the education of deaf-mutes, have made its essence consist in the artificial restoration of the habit of the voice." "How different are his ideas and method from those of the judicious Wallis, with whom, however, he has been compared, being put almost on the same line!" The larger part of this chapter is, however, devoted to the more practical consideration of the nature of breath and voice, how they are originated, and the causes of their variations in pitch and tone; and to a description of

the organs of speech, which he divides into "those employed in forming breath and voice and those employed in articulating and modifying them in various forms." "There is," he says, "a certain difference between voice and non-sounding air, which is of such importance that, if it be ignored, most of the deaf would never learn to speak with a clear voice; for they would not know what the various positions of the mouth meant unless the vibration of the larynx, palpable to touch, were shown to them."

Chapter II. is on the organic classification of sounds, their nature and the mode of forming them.

Amman classes all sounds as vowels, semi-vowels, and consonants, each of which is guttural or dental or labial, according to the region of the mouth in which it originates.

I. Vowels, which are the voice modified by a different opening of the mouth, and are pronounced with a clear voice and hardly any impediment, are—

1. Simple, as guttural A, dentals E, I, J (=Ü), Y, labials O, U, W.
2. Mixed, guttural and dental, as German Ä, English AA (in aal) French AI; dental and labial, as German Ö, Ü, French EU, U.

II. Semi-vowels, formed from a sonorous breathing or voice, but much broken in its emission, are—

1. Nasal, as labial M, dental N, guttural N (before K and G).
2. Oral, as R, L.

III. Consonants, which are formed from air or non-sonorous breath, and whose force consists not so much in some kind of sound as in the varying modification of non-sonorous breath, are—

1. Simple, comprising
 - (a.) Mute sibilants, as gutturals H, German CH, Spanish G; dentals S, German SCH, French CH, G before E and I; labial-dentals F, PH.
Vocal sibilants, as guttural Belgian G, dentals, French Z and J; labial-dental V.
 - (b.) Mute explosives, as gutturals K, Q and C before A, O, U; dental T, labial P.
Vocal explosives, as guttural G before A, O, U; dentals, D, English TH; labial B.
2. Double, comprising (1) mutes, as German X and Z, and C before E and I, English CH, and (2) vocals, as English and Italian J and G before E and I.

Amman then proceeds to describe all these sounds in detail. Of the guttural A, as he calls it, he says, "it is the simplest of all, the key of the alphabet, and hence the initial letter among all nations." The diphthongs he dismisses in a

few words, remarking that "generally they are formed from the successive, but quicker pronunciation of two, rarely three, vowels."

In Chapter III. Amman explains his method of teaching deaf-mutes speech, and of correcting defects. After satisfying himself that the scholar "was of a quick and docile disposition, neither too young nor too old, but verging on youth, between eight and fifteen years of age, and that his organs of speech were perfect," he would proceed :

1. To get him to produce a clear emission of the voice and have the power of controlling it. Amman at the outset lays great stress on the value of touch as enabling the deaf to have an intuitive perception of sounds. He calls it "the great mystery of the art, and if it is right so to speak, the hearing of the deaf, or at all events what is analogous to it."

2. To teach him to pronounce first the vowels, then the semi-vowels, and next the consonants, at the same time making him repeat and write them from dictation, or recite from the written forms, until, by constant repetition, the association between speech and writing was firmly established. To assist the scholar a mirror was used. The pronunciation of the vowels Amman regarded as a "delicate matter," owing to the tendency to produce a sound different from the one required. The deaf, he says, never make nasal sounds unless taught to do so, but of all sounds R is the most difficult. The consonants are comparatively easy.

3. Then, combining the sounds learned, he next proceeds in the same way with syllables and words, beginning with the easiest. Later, he made his pupils read in a book, which he closed at the end of each line; then, securing their attention, pronounced the words, which they repeated after him. Thus he closely associated reading with artificial articulation. His success seemed incredible, unless we assume that it was confined to speech only. In lip-reading he taught his scholars to read not only his own speech, but that of all about them.

4. Of his method of teaching language, if he ever had any, Amman tells us scarcely anything. Though, as we have seen, he gave great attention to teaching articulation and lip-reading, he does not seem to have attached that degree of importance to language which would have made the former of real use to his scholars. He did not search out a philosophic method of teaching language, but proceeded as if it were a very simple affair, "when my scholar, a born deaf-mute, can read and imitate me a little in speaking, I treat him as a sheet of white paper—*tabula rasa*—and as a young child. First, I teach the names of the most striking objects,

substantives as well as adjectives, as also the more necessary verbs and adverbs, with a few conjunctions; then the declensions and conjugations; and lastly the idioms of language that he ought to learn, which I illustrate by the most amusing and useful examples, in which necessary wants, reverence to God and his parents, equity towards relatives, good manners, etc., are expressed."

Amman, if we may judge from his *Dissertatio de Loquela*, was a greater teacher than writer. His vivacity, earnestness, aptness and sympathy for his pupils endowed him with the facility and readiness which can arrest attention and find the most fitting illustrations in the simplest things at hand. His success as a teacher was, therefore, greater than his ability to describe the means he employed. When minds are in active sympathy things are said and done of which no record can be made. The light often enters by windows of which we take no account. But his little book lived till it sowed the seeds from which Germany and France are now reaping their greatest harvest. Switzerland has given in him her greatest contribution to the education of deaf-mutes.

J. R. CAMERARIUS.—The rich inheritance left to Holland by Amman was for a long time neither valued nor cultivated, but Germany discovered its excellence, and entered upon its possession. A celebrated doctor, Jean Rudolph Camerarius in his "*Sylloges memorabilium medicinae*," etc., published in 1624, had anticipated Amman in his deep interest in the state of the deaf and dumb. In his historic survey of the centuries he touched on the facts and witnesses which declared the possibility of restoring them to society. The following are a few of his references, taken from the edition of his work, published at Tübingen, 1683:—

Page 100, Sight is prior to hearing; (102) The deaf hear by the mouth; (616) Why are those who are deaf at the same time dumb? (876) About speaking infants. This refers to reported instances of infants born with teeth, and speaking soon afterwards; (877) On Athys, son of Croesus, who was a deaf-mute, and spoke; (912) Hearing is more excellent than sight; (1093) Why do so many become deaf? (1482) Are

there more dumb than deaf? (1584) He tells of Nicasius de Werda, born at Mechlin, and blind from his third year—who became a close student, passed the University examinations with great success, was made a doctor of laws, and lectured on law at Cologne with great renown—quoting from memory alone many works that he had neither seen nor read.

P. GASPARD SCHOTT.—A German jurist, and intimate friend of Kirker's, states in his "*Physica Curiosa*," published 1642, that he had either seen or heard of many deaf-mutes, who had learned to read on the lips of others what they said. He also knew a learned Jesuit, in Sicily, with whom he had conversed on all subjects, by this means, and artificial pronunciation. The first works on the education of the deaf, published in various other countries were soon known in Germany, and some—Holder's being one—were translated into German.

But KERGER, about the beginning of the eighteenth century commenced the work at Liegnitz, in Silesia, and gave some account of it in a letter to Ethmüller, in 1704. He associated his sister, who excelled in signs, in the enterprise. The works of his predecessors were studied by him, and he never claimed the honour of being an inventor. The difficulties he met with he overcame by invincible patience. One of the chief was in the loose and often superfluous forms of expression in the language. His leading principles were:—

1. To furnish the memory of the pupil at first with many names of sensible objects; to give him the names of rational things not prehensible by the senses, when he can understand intellectual notions; and to explain them by relations, contrasts, negations, comparisons, and other circumstances appropriate to his enlightenment.
2. To teach the names of the most common substances either by drawings, the *Orbis Pictus*, or by prints and engravings.
3. To teach the value of participles - used adjectively—with the aid of the objects to which they specially belong.
4. To teach the signification of the most familiar verbs and adjectives, and also the auxiliary verbs, by the help of gestures, which are the most effective for this kind of demonstration.
5. To have recourse to synonymous or equivalent expressions, as far as examples will assist; to make known the meanings and use of pronouns, adverbs, prepositions, conjunctions, and interjections.
6. In composition Kerger prefers examples and oft repeated exercises to all the rules of grammar.

He used writing, reading, artificial pronunciation, the labial alphabet, drawing and pantomime, but chiefly writing. He does not mention the manual alphabet. He anticipated de l'Épée in the value he set upon signs, and the possibility of forming them into a language. His benevolence led him to design the preparation of a work detailing his methods for the benefit of the poor, but he never found time. The work of Raphael contains his letter.

Amman's method entered Livonia and was applied by J. WILD and PASTOR NIEDERHOF. Wild engaged a celebrated mechanician of Frankfort to construct him a machine to imitate the motions of the vocal organs, by which he was able, better than by a mirror, to instruct his pupils. A learned philologist of Danzig, GEORG PASCH, successfully educated a deaf mute, and about the same time, 1711, PROFESSOR ELIAS SCHULZE announced in the "Dresden Gazette" his success in one year in educating a congenital deaf-mute. A merchant of Hamburg had done the like for his son.

GEORG RAPHEL, the fellow-countryman of Kerger, was first moved to undertake the work through paternal affection and sympathy. He was born at Lüben, in Silesia, in 1673, and became Professor at Rostock, afterwards Pastor and Superintendent of the Church of St. Nicolas, at Lüneburg. Three daughters in his family of six children were deaf-mutes. He longed to be their teacher, and nothing is more touching than his account of his anxious solicitude about their sad condition. His work, "Kunst Taube und Stumme reden zu lehren," published in 1718, is an outline of the methods employed by him in the education of the eldest, who died at twenty. Her articulation was so perfect, that in speaking she could hardly be distinguished from others. Printed works and writing traced on the hand she freely read. Her composition was good, her acquaintance with the doctrines of religion extensive, and her inferiority in society could hardly be perceived. His success induced him to publish his method. Amman was his guide, but he modified the processes, to render them more effective.

Beginning with the vowels, then the consonants, uniting

them with the vowels, he proceeded to teach his pupils to read the corresponding letters ; thus forming syllables, by which he quickly taught them to read. But teaching language he looked upon as the most difficult part of his work. He began with exercises on pronunciation and reading. Making his model the manner in which the hearing learn language, he simplified it in adaptation to the special requirements of his scholars. He first named the objects within view, and tried to make them seize the value of the terms expressive of the ideas which could not be so presented, by their relation and association with the old and known terms. He proposed a series of questions, composing — like the little problems in which they figured, as so many given quantities — the circumstances of the thing of which he wished to give a clear conception for clothing his expression. The regular conjugations of the verb were not taught, and grammar was only resorted to when usage did not suffice. He used mimic gestures.

Others followed, as LISCHWITZ, 1719, who was guided by Wallis and Amman. BUCHNER, 1757, BAUMER, 1749, and GORISSON, 1759, the last treating the subject from a medical point of view. DAVID SOLRIG, 1727, a pastor, and ANDRÉ WEBER, a preacher (1747). But the two men who did the most for deaf mutes prior to Heinicke were Lasius and Arnoldi.

OTTO B. LASIUS, 1775, Chief Pastor of Burgdorff, in Zell, undertook the education of Miss Meding, a congenital deaf-mute. He simplified his method, and was content to teach his pupil to read, write, and comprehend the sense of the words and phrases by a direct association of the ideas with the figures composed by the union of the characters as written. He thus followed Wallis in his method. He designed a manual alphabet, which he never used. In two years her education was well advanced. An account of his work may be seen in Arnoldi.

PASTOR J. L. F. ARNOLDI, born near Giessen, was attracted to the work by an Hessian nobleman, who had a very interesting and promising deaf-mute son. In two years he so far succeeded in his education, that he undertook the education

of other deaf-mutes. Excelling as a teacher, the progress of his pupils was astonishing.

In his "Praktische Unterweisung, Taub-Stumme Personen reden und schreiben zu lehren," Giessen, 1777, his method is found. One of its principal features was the use he made of drawing and pictures to supply the place of absent objects (p. 15). In this respect he anticipated Hill, but he remarks that it is not easy to give in a picture a complete representation of the sense of a proposition (p. 21). He founded his religious instruction on 150 diagrams, expressly designed to embody the principal facts of Bible history (p. 40); but he has no picture of God (p. 22). "His works," he says, "suffice to reveal Him," and by them he communicated and developed the idea of their Author. The chief series of lessons was taken from the Bible. Mimic gestures, reading, writing, and artificial articulation were united in his course.

Though much addicted to the use of pantomime, he always confined it to what was natural to the deaf and dumb, or growing out of their increase of knowledge. In this respect he was the disciple of his pupils. But he confesses their insufficiency for the usual relations of life (p. 16). He taught the names of verbs by actual movements produced at the moment, but he confesses that all these means are insufficient for a complete education. Hence he tries as early as possible to make them read, that they may become familiar with all the forms of composition.

The success of Lasius did not convince him of the possibility of giving a complete education to deaf-mutes by reading and writing alone (p. 49), and he advises that it should not be confined to these means except when from some organic defect the scholar could not learn artificial articulation. He tells of a scholar who displayed greater aptitude in learning to read and write than in artificial speech. But he had permitted her the use of the instrument which she preferred, and had reason to congratulate himself on his success (p. 54). And in fine, he states it as a principle, that the essential object to be attained in the education of the deaf is to put them, as much as possible, in possession of the means of reading books, so that when alone they might

be able to carry on their own education and give it a suitable completeness (p. 40). It seems he was not acquainted with the works of Wallis and Amman. His lessons in articulation are his own (p. 11). He composed a little grammar adapted to his method. The following are its chief features, as added in foot-notes:—

1st. While he would not trust too much to memory.

2nd. He had recourse to habit and to repeated examples to teach the tenses of the verb.

3rd. Above all things he sought to secure the attention of his pupils, to fix it and free it from distractions.

4th. He took his scholars to walk in public places, into company, wherever there was something fresh to observe, to elicit their remarks, and to teach them to express themselves; he showed them paintings, engravings, and even recreation itself was made as instructive as the hours spent in the class. The age of five he considers as the most favourable for teaching articulation, and from ten to fourteen for the successful study of the other branches (p. 66). Deaf-mutes he says are naturally passionate, because we do not understand them and find it still more difficult to make them understand us, and therefore it is very difficult to convince them of the justice of our motives when we oppose their wishes and seek to restrain them. Their harsh treatment has also increased their irritability, and therefore we ought, in order to secure their confidence and affection, and to obtain access to their minds, to treat them with indulgence, gentleness and indomitable patience.

LUCAS and VANIN.—France, contrary to what we should expect from the place held by her in science, art, and enterprise, was among the last to give the education of deaf-mutes the attention it deserves. The works published in other lands on the subject seem to have been unknown. At the beginning of the seventeenth century P. Dumoulin had denied the possibility of instructing them. Casaubon, on the other hand, thought it possible but gave no reasons. By a decision of the Parliament of Toulouse, 1679, the will of a deaf-mute named Guibal was confirmed, because it was proved that though deaf from birth, he could read and write, had composed different pieces on painting and other subjects, and could transact business. He had evidently learned by reading and writing, but who was his instructor is unknown. In 1746, a builder named Lucas began the education of Saboureaux de Fontenay. Of P. Vanin, who taught some deaf-mutes, among whom was the celebrated

Saboureaux de Fontenay, and his methods we know very little. He seems to have used engravings in teaching, but they would be of little use without writing and reading. There were others who made the attempt, aided by the manual alphabet, but of how far they succeeded we can form no estimate for lack of evidence.

ETIENNE DE FAY.—It will be seen afterwards that Pereira had as his second pupil a young gentleman called D'Azy d'Étavigny. When only six years old, about 1736, he was sent to be educated by an old man, deaf and dumb from birth, a brother of the Abbey of St. John, at Amiens. Here he spent six years before he was placed in charge of Pereira. This aged deaf-mute seems to have been the first teacher in France of deaf-mutes, but nothing was known till recently, either of his name or history. However, the researches conducted under the direction of M. Denis have resulted in some very interesting discoveries about this aged teacher.

It has been found that his name was Etienne de Fay, and that he belonged to one of the most noble families of Picardy. Froissart tells of one of his great ancestors, Godmart de Fay, as one of the most valiant defenders of the city of Tournay, in 1340, and that he heroically disputed the famous passage of the Somme, on the eve of the battle of Crecy, with the troops of King Edward.

In his Abbey, Etienne de Fay was distinguished as a sculptor; some of the pieces of his work on the stalls still remaining to attest his ability—and also as an architect, in the beautiful buildings of the convent, which were his designs. He was also an author, for the Public Library at Amiens contains a MS. catalogue of the Museum and Cabinet of Medals, at St. John's, in two volumes, illustrated by his own drawings. He was evidently a man of such genius that deafness could not debar him the possession of science. That something had been done in educating deaf-mutes in France, either by him or some other, is evident from the fact already cited, that the Parliament of Toulouse confirmed the legality of the testament of a deaf-mute in his own handwriting.—“Revue Française,” 1887.

PEREIRA.

THE work in France really began with Pereira. Jacob Rodrigues Periere or Pereira, was born at Berlanga, in Spanish Estramadura, in 1715. He belonged to a family of Spanish Jews, who were employed in commerce. Persecution drove them to Portugal, and then to Bordeaux, where they settled in 1741. Pereira had a sister deaf and dumb, and this circumstance no doubt excited his interest in this class; as, besides being her first teacher, it appears from a letter written by a friend as early as 1734, indicating, in answer to Pereira's request, what books there were on the subject, that he was already studying it; and he tells us himself that he spent several years of reflection on it. He had for his next pupil one of his own people, in 1744, and his success with him having been publicly noticed, led to his having, in 1746, the charge of another, one D'Azy d'Étigny, born deaf, from La Rochelle, who was then sixteen years old, and who, as we have seen, had already had some slight education at Amiens. Under his care, he made good progress for nine months, and obtained the favourable notice of the Caen Academy. After his father, for some unknown reason, had removed him, only to return him to Pereira nine months afterwards, he made such good progress, that Pereira, who had already come to live in Paris, thought the time opportune to bring his work to the notice of the French Academy of Sciences. This he was able to do through influential friends, and in 1749 he appeared before the Academy with his two pupils and read a memoir. In it, he says that his aim had been "to teach deaf-mutes not only to pronounce all the words of the French, or any other language, but also, what was essential, to comprehend the meaning of these words, and to express, both verbally and by writing, all their thoughts, like other men, which consequently renders them capable of learning and practising any science or art, except those for which hearing is indispensable." The Academy appointed a commission, of which Buffon was a member, to report on the value and results of Pereira's method. Their report states that "M. Pereira has introduced two congenital deaf-mutes to the Academy, whom he had instructed to

understand what was made known to them either by writing or by speech or by signs, and to reply either by speech or writing. They read and pronounced distinctly all kinds of French expressions; they gave very sensible replies to all the questions put to them; they did promptly what they were required to do; they gave nouns their proper genders and cases, conjugated verbs, made a correct use of pronouns, and adverbs, prepositions and conjunctions; they knew the rules of arithmetic and on the map the four quarters of the world, the kingdoms, the capitals, etc. In fine, it appears that M. Pereira had given them with speech the faculty of acquiring abstract ideas of which till then they had been deprived. He employed, as we have said, in order to communicate his thoughts to them, writing or signs which he made to them with the hand, and of which he had composed an alphabet much readier to use than writing. He hoped also to be able to instruct his scholars to understand, by the movements of the lips and visage alone, what one might say to them, provided at the same time that they are persons who have daily intercourse with them; others would always have to avail themselves of writing or of the signs of which we have spoken."

All this made Pereira famous, and brought him to the notice of the Duc de Chaulnes, an officer of high rank at Court, by whom he and his pupil were presented to the King. The duke was the godfather of a deaf-mute from birth, named Saboureaux de Fontenay, whom he sent to Pereira in 1750. Saboureaux, who was then thirteen years of age, and had previously received some education, remained with him five years, and was his most distinguished pupil. Pereira appeared a second time at the Academy accompanied by Saboureaux, who had then been with him some three months.

How far he had progressed, will be seen by the following interesting extracts from the proceedings of the Academy :—

"M. de Fontenay already pronounces all the letters, diphthongs, and syllables distinctly, not excepting the more complex ones such as blanc, franc, grand. He recited the Pater Noster to the Academy, and pronounced the names of several things which were indicated to him by signs, such as, a hat, a coat, etc. Despite the irregular pronunciation of

French syllables, he does not ordinarily make mistakes in them ; he pronounces CA, CE, CI, CO, CU, and not SA, QUE, QUI, QUO ; GA, GE, GI, GO, GU, and not JA, GUE, GUI, etc., he knows the difference between É open, E masculine, and E mute. He already knows the meaning of several familiar phrases ; so that when he is told in writing sit down, blow your nose, embrace me, etc. ; he does each of these actions exactly. He has, besides, a knowledge of his master's manual alphabet, by means of which he learns to pronounce. All this proves that M. Pereira has a singular talent for teaching deaf-mutes from birth to speak and read, and that the method used must be an excellent and ingenious one, as children with all their senses do not generally make so much progress in so short a time."

Saboureaux de Fontenay's name is of historical interest as one of the earliest instances on record of the successful education of a deaf-mute. From all accounts he was an intelligent and apt scholar who did Pereira credit ; and long after he left him, his own love of knowledge induced him to continue its pursuit. De l'Épée bears testimony to his high attainments, and speaks of a work written by him against the use of methodical signs, which he intended to publish. He also says "M. de Fontenay was indebted to M. Pereira for his knowledge of the French language ; another person was charged with teaching him religion ; afterwards he acquired several languages by the use of his methods and of dictionaries." Saboureaux himself became a teacher and succeeded surprisingly.

Pereira seems to have been as successful as he could desire, his reputation was secure, and he had more pupils from time to time. He enjoyed high patronage, had a royal pension, and at various times was presented to several European monarchs. His work was noticed by Rousseau and Diderot, the latter in his "Lettre sur les sourds et muets à l'usage de ceux qui entendent et qui parlent." Our own country honoured him by his election as a F.R.S., in 1760. His efforts and sympathies were, however, confined to a privileged few, and from this circumstance, as well as his keeping his methods a secret, his work, unlike de l'Épée's, had no lasting effect on the deaf as a class.

Pereira is thus described by Coste, 1803. "He was a Spaniard. His face was marked with the small-pox. His large eyes were full of fire and expression. Probity, sweetness, frankness and benevolence were painted on his

countenance. We could not approach him without loving him. He was one of those men who did honour to human nature. His scholars were so much attached to him that when he had arranged for them to return home it was necessary for the parents to prepare for the separation by sending for them every fifteen days, for a limited period, to spend a week at home. They returned to their teacher with transports of joy, most touching to witness, but when he must himself separate from them, no idea can be formed of the sorrow of the children, who, weeping, embraced him a thousand times, determined not to part from him till he gave them his word to come and see them frequently. He was faithful to his word, and he had days consecrated to make the round of his old pupils, who always received him with fresh signs of tenderness."

Pereira's method practically perished with him, as unlike most others, he kept it a secret, and never published any detailed account of it. He himself in a letter tells us that he believed his method "to be a secret which ought to be perpetuated in my family only." However, we are able to form some idea of what it is from various sources, chiefly from miscellaneous writings of Pereira's, the public records of the time, and the accounts of his pupils, of which that of Saboureaux de Fontenay, in a remarkable letter written in 1764, is the best.

(1.) The most distinctive feature of Pereira's method was his manual alphabet. He had adopted the Spanish manual alphabet, but considering it to be inadequate to his purpose, he greatly simplified and augmented it. It served both as a means of communication and of indicating the pronunciation. Saboureaux tells us that it "is contained in the fingers of one hand, and is composed of twenty-five signs of written letters, and of the signs which M. Pereira invented for conforming this manual alphabet exactly to the laws of pronunciation and of French orthography. Thus there are as many sounds and written combinations (*liaisons*), each making one sound in pronunciation, as there are signs in the manual alphabet; which for this reason, I named *Dactylology*, a name Pereira adopted. Moreover, the different sounds which the same letters and combinations had in different

words were distinguished, so that the dactylogy comprised in all more than eighty signs;" and Pereira says, "each particular position of the fingers indicates not only the form of one or several characters, but the arrangement and action of the organs of speech necessary to produce the value of the vowel or consonant which these characters indicate. My dactylogy is also expeditious in indicating at once several letters by one sign By habit it becomes closely associated in the scholar's mind with the organic movements of speech It prevents ambiguities in pronunciation and writing in reading it saves my pupils the disheartening trouble of spelling."

(2.) This manual alphabet closely associated with speech formed the fundamental basis of Pereira's method of teaching. In addition, he made use of signs, reading and writing. Of pantomimic gestures, however, he never seems to have had any great opinion, as one of his pupils, Mdlle. Marois, tells us that when his pupils had made some progress in speech, he interdicted their use, and only resorted to them as a means of explanation to be dispensed with whenever he could do without them.

(3.) Pereira does not appear to have given lip-reading so prominent a place in his method as Amman did.

(4.) He divided his course of instruction into two periods; the first, of twelve or fifteen months, devoted to mechanical exercises in pronunciation, and the second to intellectual exercises in the knowledge of language and its meaning, and to the acquisition of some elementary knowledge; this latter course necessarily taking a much longer time.

(5.) As to his method of teaching language, Saboureaux de Fontenay describes his primary lessons in language as founded on action. "In the same manner," says he, "in which an infant learns French, so Mr. Pereira applied himself at first to give me a knowledge of words in daily use and of the commonest phrases, such as 'open the window,' 'close the window,' 'open the door,' 'close the door.' Finding me sufficiently acquainted with the dialogues of everyday life, he abandoned the use of gestures in my presence, but at the same time he employed the Spanish manual alphabet — one-handed — which he had

enlarged and perfected." "And in order to exercise me still more in the meaning of familiar phrases, he made me take part in doing everything according to the import which the language would suggest to my mind which anyone would employ who wished to command me; to reply to all questions, easy or difficult; and to reproduce my own thoughts. He also obliged me to give a daily report of everything that had occurred, to repeat whatever had been said, to talk, to converse, to dispute with himself or others about everything of ordinary use which we might think of; to write letters in my own way to my acquaintances, and to reply to letters I had received.

Pereira followed the same course that Nature does with hearing children; beginning by giving his pupils a practical knowledge of everyday language, constantly exercising them by question and answer, accustoming them to converse and express their own thoughts, and carefully impressing on their mind by usage and examples the meaning and value of the different classes of words. And not till he had trained them in the practice of common language did he begin its theoretical instruction according to grammatical rules. It is quite clear, from various indications, that actions and objects were also made use of to teach language. Saboureaux himself indicates the spirit of Pereira's method when he says "I can say, without much doubt, that it was by usage I learned French, and that my education was not mechanical. . . . This usage was nothing else than a constant repetition of the same words, phrases and modes of speech, applied in all sorts of ways and on all occasions."

(6.) Popular opinion at the time regarded deaf-mutes as quite incapable of abstract and general ideas. How Pereira succeeded in surmounting this difficulty let Saboureaux again explain: "The exact and clear explanation of intellectual terms, abstract and general, is one of the most difficult parts of the work of teaching, and capable of disgusting both master and scholar. The former is obliged to find in daily events the means of making his scholar attain to the knowledge of abstract ideas; by this you will understand that there are in visible objects and in history primary signs which serve in some way as a ladder by which to reach

intellectual and abstract ideas." So also Mdle. Marois, having been asked how Pereira made her understand such words as courage and hope, says, "He managed it in various ways. Thus, for example, it is raining. Well then, he would explain to us that perhaps to-morrow it may be fine, that he expected, that he hoped it would be so; whence the word hope."

ABBÉ DE L'ÉPÉE.

DE L'ÉPÉE will ever fill the highest place in the annals of the education of deaf-mutes, not because he had more genius, inventiveness, or practical ability as a teacher, for others had excelled him in all these, but none had ever equalled him in sympathy, compassion and intense devotion to the emancipation of the whole class. He was the apostle of deaf-mutes. For them nothing he could give was spared. He was, in fact, the first who attempted to educate the poorest. Prior to his time the children of the rich only received any education, the expense was so great. But all were alike to him, because they were suffering from the same calamity. He was the first to establish a public school where all were welcome and received the same education, love, and attention. He did for deaf-mutes what St. Vincent de Paul did for the deserted children of Paris. He was born at Versailles in 1712, of a noble family, and educated for the Church, entered the priesthood, and became a Curé. It was in the discharge of the duties of his office in Paris that he was first brought into actual contact with deaf-mutes. They were two young sisters, twins, and dumb from birth. Finding they did not reply to his enquiries, and that he could not communicate with them, his interest was excited, and he learned that they had no instructor. "The Père Vanin had commenced their instruction, but this worthy minister was dead, and these two poor girls found themselves without any help, no one desiring, for a long time, either to continue or to recommence their education. Believing that these two children would live and die in ignorance of their religion if I did not try to instruct them, I was touched with compassion for them, and said, if they were brought to me, I

would do all I could for them." This was the beginning. He took a house in the city, and his school soon increased, till he had sixty scholars. How did he provide for them? Well, he had a small fortune, about 14,000 livres, or £600 a year; one-seventh of this he allowed for personal expenses, and the remainder was spent on his children. "So strictly had he adhered to this appropriation that, in the rigorous winter of 1788, when in his seventy-sixth year, and suffering under the infirmities of age, he denied himself fuel rather than trench upon the fund he had destined for them." The tears and entreaties of his pupils could alone move him to spend a little more in his own relief. He sought no aid, and he received none. The work was all his own.

Speaking of his own preparations for teaching deaf-mutes, he says, "Till then I was solely occupied with theology and ethics, and entered on a career which was absolutely unknown to me. The method by prints was not to my taste. But the French Manual Alphabet, which I had known from my childhood, would be more useful to me for the purpose of teaching my scholars to read, but it would also serve to lead them to a knowledge of words. The simplest signs, which served but to show with the hand the things whose names we wrote, sufficed to commence the work, but they did not go far, because the objects are not always within view, and there are many which cannot be perceived by the senses. It now appeared to me that a method of combined signs would be the most convenient and the surest way, which would equally apply to things present or absent, dependent or independent of the senses."

At first he used writing, and associated the words with the objects. His progress was cheering, till one day a stranger brought him a book, which, he assured him, would help him much in his work. But it was in Spanish, a language of which he knew nothing. On opening the book, "what should I see but the manual alphabet of the Spaniards, neatly executed in copper-plate? I wanted no further inducement; I paid the messenger his demand, and kept the book;" afterwards, to his great joy, he read on the title-page *Arte para enseñar a ablar los Mudos*, 'The Art of Teaching the Deaf and Dumb to Speak,' and "immediately," he says, "I

resolved to make myself master of Spanish, that I might be able to render my pupils so great a service." Having procured a grammar and a dictionary, he speedily applied himself to the study of Spanish. Next he was told of Amman's *Dissertatio de Loquela*. It was in Latin, and he could read it with ease. Their study soon led him to discover the merits of these works, and he published his obligations to their authors. "They are two torches," he says, "which have lighted my footsteps." But he did not feel satisfied, and, in order to find out whatever others had written, he studied English, German, and Italian.

He now taught speech, and his success astonished him. Writing on this afterwards he says, "To teach deaf and dumb persons to speak is an enterprise which does not require great talents, but much patience." However, he did not begin by teaching speech, but by signs and writing, and when he had taught his scholars to speak he did not abandon signs, but associated speech with them, not as their mental substitute, but complement, so that the thinking was in signs, and speech their translated form.

Of his "True Manner of Educating the Deaf and Dumb," published 1784, the second part was taken up with his method of teaching speech. This was afterwards re-edited and revised. But Bebian reprinted it with the explanations of his "*Manuel d'Enseignement Pratique des Sourds-Muets*." Tom. II. It is very evident that in this he was largely indebted to Bonet, Wallis, and Amman for his classification of the sounds. Yet, as a close observer and practical teacher, he scatters valuable hints and observations by the way.

"When I am about to teach a deaf and dumb person to pronounce, I begin with making him wash his hands thoroughly clean. This done, I trace an A upon the table, and taking his hand, I introduce his fourth or little finger, as far as the second joint, into my mouth, after which I pronounce strongly an A, making him observe that my tongue lies still." And so he proceeds with the other vowels using the finger as in A. But of U (French) he says: "Doing next with my mouth as if I were blowing a candle or a fire, I pronounce a U. The deaf and dumb are apt to pronounce OU." He advises a teacher to "study what naturally takes place in pronouncing letters and syllables; because he has articulated them from infancy without adverting to the mechanism of their utterance." He also advises the application of his hand to the throat,

"that he may feel the palpable difference there when I only dispose my organs to pronounce a letter and when I actually pronounce it. This difference is also very sensible on the sides, at least on the utterance of peculiar letters, as P and Q when pronounced strongly. I also make him feel on the back of the hand, by the concussion of air, the difference when I pronounce and when I do not pronounce. Lastly, placing his finger in my mouth so as to touch neither my tongue nor my palate, I make him perceive this difference very sensibly." He begins with the labial consonants, as—

PA, PE, PI, PO, PU, BA, BE, BI, BO, BU. He suggests "squeezing the hand or shoulder of the scholar to make him understand the difference between B and P, as B is only the softening of P."

Then D and F associated with the same vowels. The V like B, as the softening of F. Thus he proceeds with CH=K and J, the softening of SH. The guttural K is one "to exercise the patience." He tells how it may be taught. "Gently applying the hand of my pupil to my neck, I put it in the situation of a man's hand taking hold of my throat to strangle me. I make him feel that in strongly pronouncing this syllable my throat is very palpably inflated; and then show him that my tongue draws itself back after pressing strongly to my palate so as to leave no vent to the interior air until forced downward to give the pronunciation to this syllable. I make him observe the sort of effort which takes place at the same time on the sides. After this, I apply my hand to his throat in the same manner as I had applied his hand to my throat, and engage him to attempt to do what he has seen me do."

These extracts will suffice to give the teacher a tolerably clear idea of the Abbé's method of teaching speech; but before leaving the subject let us see how he deals with double consonants, as in PRA, which his pupils at first pronounced peura.

"I tell them by signs that these two syllables which we have separated, as peura, must be united and coalesce so as to make but a single syllable. Their fingers being still upon my mouth and wind-pipe, I pronounce with precipitation PRA; and, in like manner, PRE, etc.; showing them at each that I make but one emission of voice; they become sensible of this; they try to do the same, and generally in a little time succeed."

The constant and enlightened use which he made of both touch and sight, is admirable, to enable the learner to perceive intuitively the vibrations of the sound when sight by itself can lend but slender help. It is much to be regretted that he was not permitted to persevere in teaching speech. He would have excelled, but with a school of sixty children and no assistants it was practically impossible for him; and then he freely confesses his preference for signs

for he says, "charmed with the facility which I discovered of instructing the deaf and dumb by writing and the intervention of methodical signs, I bestowed no thought upon the means of untying their tongues."

He, therefore, deliberately abandoned teaching speech, and henceforth made signs the language of deaf-mutes. In fact, he accepted mimic gestures as their natural language, and, therefore, he made it the basis of their linguistic education. They were, at first, only few in number, for he learned them from his scholars, but like all inexperienced teachers he imagined them capable of indefinite development, equal to, if not superior to any artificial language—the universal language much desired by the learned—but ere long he found out that they failed when most required, and had recourse to artificial, not mimic, but formal signs which resembled nothing.

Degerando in describing his method says it is founded on these two principles: "1st. The words of our languages are not associated with the ideas they represent, unless by an arbitrary and conventional bond; from which it is concluded that this bond can be as well established between the ideas and the written words as between the ideas and the spoken words, so that the instruction can be made to enter by the eyes which cannot enter by the ears.

"2nd. A deaf-mute possesses a language in signs and gestures which is peculiarly his own, and which is for him a veritable mother-tongue. Therefore to teach him an artificial language involves no more than to make a veritable translation, such as we do when we would teach a language to a foreigner who knows only the vernacular of his own country. A dictionary of signs can therefore be written.

"This idea being absolute, he wished the whole education of the deaf-mute to be only a constant translation. At present the materials were wanting for so prolonged a translation. The vocabulary of the pantomime of deaf-mutes is so extremely poor compared with that of our conventional languages, that there is no proportion between them. The former provides signs only for the most familiar images. Still more, this mimic language of the deaf-mute has no syntax corresponding to that of our languages."

How was the deficiency to be supplied? For the translation of thought from one language to another is impossible if one of them is so poor compared with the other. If signs are retained then it could only be by developing pantomimic resources till they conformed in every respect to the conventional language, or till they provided for the expression of thought in similar forms. Were the deaf-mute in posses-

sion of this then he could translate every form of thought into the conventional language, and in like manner the conventional into the sign language.

But de l'Épée found that mimic gestures were utterly deficient for the purpose, and had recourse to motions and gestures to complete his vocabulary and form his syntax. And he held that this new language, so composed, formed one with the old, and that it filled the same place in the mind of the deaf-mute. But this was a mistake, for the old in its mimic form represented objects of sensation; but on the contrary, this great addition had no corresponding objects but was arbitrary and fanciful. In fact, they were all translations from the conventional language into motions which stood in the same relation to it that stenography does to writing, and could not be explained by mimic gestures but only by the conventional language itself.

He never completed his dictionary of signs, and his successor, Sicard, who accepted his principles and was pre-eminent as a teacher, has left us only a fragment of the great work. An example from his "Théorie des Signes," vol. ii. p. 297, will best illustrate what has been said.

"Origin.—1st. To represent an object, a being, anything whatever. 2nd. In figure, the beginning, the birth, the principle, the source; we give examples of them. 3rd. We figure a well known family, ascending from the infants to the children, from these to the father, to the grandfather, &c. 4th. We figure the origin of the world ascending to the creation, which we figure. We remind of a fête, a ceremony, a custom. We explain the commencement, the source, the occasion, the cause of it. 5th. The abstract sign."

This is, first, an elaborate exposition by a series of illustrations, each of which carries forward the term till it gives the idea of the connection existing between the living and their first parent, or the thing and its creation. And next, the abstract sign which in future is to be a term in the new language, has no mimic relation to it and is no more than a mnemonic figure.

At first the apathy of the public troubled him. Like all great philanthropists, he could not comprehend why others felt so little for a class whose destitution was consuming his heart. He was angry, too, at the prejudices, not of the ignorant alone, but of the theologians and philosophers.

With what warmth he reproves them and tells them, "deaf-mutes are only such because the precious treasure they possess of a soul within them, created in the image of God, is shut up in an obscure prison, of which no one opens either the doors or the windows to let it come forth and leave the material! This is what fills me with the greatest sorrow." Then he was assailed by Pereira, who condemned his method as a failure, "for mimic gestures cannot be found to express abstractions and mental operations." He replied by inviting him to an examination of his scholars, for it would prove that his was a genuine work. Pereira never replied. Then Heinicke assailed him through the Abbé Stork, whom the Emperor Joseph of Austria had sent to de l'Epée with a letter of introduction, to be instructed in his method which he had seen at Paris and much admired. Heinicke heard of this and wrote to Stork, assuring him "that the Parisian method of tuition was not simply of no use, but absolutely detrimental to the advancement of his pupils, and urged him to abandon it." De l'Epée replied on behalf of Stork. This was the beginning of the war of the Systems. Heinicke's close concealment of his method, and avowed claim to it as a monopoly, gave de l'Epée, who concealed nothing and wished the world to know his method, a great advantage, for the former could not show the superiority of his own by an appeal to principles and modes of teaching, but indulged in loose assertions of its superiority and what he had been able to accomplish by it in a short time. All candid minds accorded to de l'Epée the victor's honours. He became famous, royalty smiled upon him. His school was visited by the most distinguished. He received them politely, gave them full explanations of his method, but when they had departed was again happy among his scholars. They were his home and his glory. He had no unreasoning antipathy to articulation, on the contrary, he says, "That the only way of restoring them fully to society is to teach them to understand with the eyes and to express themselves *vivâ voce*." On one occasion, when at a public examination, some one was delighted to hear one of the Abbé Sicard's—de l'Epée's successor—pupils speak.

“Messieurs,” exclaimed this celebrated teacher, “If I could pay the needful expenses, a single child should not leave my doors who could not speak.”

The real difference between him and Heinicke in principle was that de l'Épée made signs, as mimic gestures, the language of thought; Heinicke, speech only, to the exclusion of signs. They cannot be united or combined, one must prevail and exclude the other.

Professor Fornari, in his *Sordo-muto che Parla*, has given the following summary of de l'Épée's system:—

1. “The education of the deaf and dumb should be transferred to the eye, as that which cannot enter by the door (the ear) can be introduced by the window (the eye).”
2. “The visible form of our language is alone suitable to the deaf and dumb; then writing; and to this form ought their acquisition of language to be restricted.”
3. “Ideas have no more affinity to their symbols in sound than to those in writing.”
4. “All then lies in translating into writing that arbitrary and conventional link which unites speech with thought.”
5. “The deaf and dumb can indeed learn to speak, but the results do not by any means correspond with the time and labour it requires, and therefore it has no practical value and would not be an equivalent for the loss which the mental education would suffer from the absence of the voluntary extension of mechanical (mimic) exercises.”
6. “The use of the manual alphabet by the deaf and dumb supplies the place of their aptitude to speak.”
7. “Every deaf-mute, who is not imbecile, is in possession of the language of gestures, which is his natural mode of expressing himself, and his mother tongue.”
8. “To instruct a deaf-mute in our language which is to him a foreign language, and generally to instruct him, he has continually to employ his mother tongue (signs) as a medium, as any one would have to do in learning a foreign language.”
9. “Whatever may be the intelligence of the deaf and dumb, their language of gestures remains limited and inadequate to their requirements; most true, the teacher ought, therefore, as a primary thing, to aim at developing and perfecting, materially and formally, this essential medium of acquiring knowledge so that it may suffice as an exclusive medium of instruction.”
10. “Such a completion is best pursued in the manner most conformable to the object after the rules and forms which the deaf and dumb should learn, in the manner that such modes of expressing himself shall differ only from writing, by being manual signs.”
11. “There is no impediment to the said culture of signs, except one that has never been removed.”

12. "The language of gestures is the one form in which the deaf and dumb can think."

We cannot withhold our admiration from such a man. His greatness is in his humility, devotion, and benevolence. He is at home and happy only in the midst of his children, who so love him that the thought of losing him by death gathers them about him weeping, embracing his knees and entreating him not to forsake them. All that they know has been taught by him. He has opened a new world to them, and given them a new mental life. On them he has spent his fortune, to them devoted his time, and dedicated his genius. He is their father, mother, brother, sister, friend, for he is nearer to them than all the relations that unite the family and society. He is a very plain man—almost in this respect another Socrates—but when he teaches, his countenance grows luminous, almost beautiful, from the intensity of his love and the fire of his soul in communicating knowledge. They are attracted, fascinated, and quickened, for its fullest reception. But his heart teaches more than his head.

The good Abbé died in 1789, and the deaf and dumb lost their best friend, but he had done enough to rouse the sympathy and benevolence which are gradually emancipating the whole class.

SAMUEL HEINICKE.

IT is hardly just to call Heinicke the founder of the German method. He only gave a more logical application to the principles taught by Bonet, Wallis and Amman, but he clearly perceived that there could be no compromise between speech and signs as fundamental in teaching language. This is his greatest service in the education of deaf-mutes, for it proves that he thoroughly comprehended the effect of signs as the basis of language by unfitting the mind for making speech the sole instrument of thought. His father was a small landholder or yeoman, and he designed to make his son, who was born at Nautzschütz, in 1723, a successful farmer. But young Heinicke was wayward, and instead of complying with his father's wishes, went his own course and was in turn soldier, schoolmaster, singing-master,

and, finally, a teacher of deaf-mutes. But his education had not been neglected. In addition to the ordinary schooling, he had studied Latin, French, and music. Nature made him a teacher, quick, versatile, fruitful in expedients, and facile in adapting his methods to the capacity of his scholars, for he achieved in a few months—if his assertions are to be credited—more than others had done in as many years. Amman was his principal guide, but he afterwards studied de l'Epée.

He first began his work as a teacher of deaf-mutes at Dresden, in 1754, a century after the publication of Wallis' *Loquela*. His success soon became known. Then he removed to Eppendorf, near Hamburg, where he collected some pupils and began to write and publish on the subject of their education. But Frederick Augustus, Prince of Saxony, heard of him and invited him to come and found a School for deaf-mutes at Leipsic. There, in 1778, he began with nine scholars. This was the first public school in Germany, and to Heinicke belongs the honour of being its founder, under the munificent patronage of the Prince.

Of his methods little is known, for he sedulously concealed them, and when reproached for his selfishness, in his correspondence with de l'Epée, in contrast with the latter's unrestrained publication of his own methods, he defended himself in this manner. "The method which I now pursue in the tuition of deaf-mutes was never known to anyone besides myself and my son. Its invention and arrangement cost me incredible labour and pains, and I am not inclined to let others have the benefit of it for nothing." "I defy all the casuistry in the world to argue me out of money that I lawfully and laboriously gain." (Letter in de l'Epée's *Method of Educating the Deaf and Dumb*.)

Of his noted "Arkanum" Walther says: "So must we hold the hidden art as an inexcusable humbug which would disappear when he actively applied a critical light to his method." He was Kantian in his philosophy. Condemning the use of signs, yet he retained them while they were helpful.

On the manual alphabet, he writes to de l'Epée—"if you suppose that I make no use of dactylogy in my tuition you very much mistake; I use it, however, only for the

combination of ideas; but the signs which serve for communicating thoughts among my pupils consist in language articulated and expressed in writing."

✓ He taught the vowel sounds in a peculiar manner. The sense of taste was enlisted in his aid, not so much because there was a close connexion or analogy between them, but for the distinctive character that it gave to each sound.

✓ As the mnemonic for \bar{I} he selected sharp vinegar, for \acute{E} the essence of wormwood, for A pure water, for O sweet water, and for U sweet oil. To secure correctness of articulation he put a little vinegar with his finger or a feather on the tongue and in the mouth, associating it with the I in its pronunciation and so on for the others. Thus these appliances became perpetual signs of the sounds. But there is nothing in them. His success was through touch and not taste. But on teaching sounds he drops a useful hint: "Of a real and complete knowledge of sounds they acquire only an obscure and imperfect idea from the undulations of water and other like motions," implying that he had perceived the close relationship between vibrations of sound in the organs of speech and undulations in liquids.

He wrote a work, "Beobachtungen über Stumme und über die Menschliche Sprache," or Observations on Mutes and on Speech, Hamburg, 1778; and several articles on the education of the deaf, but in none gives a satisfactory account of his method. However, the following observations from the former deserve a place:—

"The sounds which the deaf-mute has learned to utter are of a kind which are at once united to the chain of ideas. In a short time the play of his thinking is exercised on these new signs. Now his vocal organ is put in continual interior movement, even though he keeps silent, because he conceives that his own ideas are united to words and phrases, which for him compose the different combinations of this movement, as if he thought in masticating. After a time we should let the learner acquire the habit of executing this movement, which, to a spectator, would seem as if the deaf-mute really masticated, [This is nothing more than the action of the organs of speech, and similar to our whispering] until he has acquired both a sufficient number

of ideas and great facility ; but of this he will free himself in due time. So soon as, according to my method, the deaf-mute begins to extend the circle of his vocabulary, he also begins to speak in his sleep, and from this time we are assured that with him the faculty of thinking in words has taken root."

Walther, whose knowledge, as a writer, of Heinicke's work is more intimate than that of any other at present available, says, "In Heinicke's work there are two phases of development distinguishable ; in the first (the period of attempt) he makes more of written language. What he does in this case is grounded, probably, on the following principles :

1. In order to furnish the deaf-mute with ideas, we proceed from things which he looks at, and out of the concrete, by analogy, form the abstract idea.

2. Written language serves to fix the idea.

3. Deaf-mutes are in a position, with the help of writing, to express themselves even about abstract matters, especially of a religious nature, and to read and understand what is written or printed.

4. They can also thoroughly learn language expressed by sounds, since there is inborn in every man (and consequently in the deaf-mute) a natural connection between those sounds and corresponding faculties of the mind, and it only requires that the organs of speech be brought into the right pitch.

5. Not until deaf-mutes are able to express themselves in writing rationally, in question and answer upon all sorts of subjects, can they begin to learn oral speech."

This is fundamentally opposed to what he afterwards came to teach. Here written language is the instrument of instruction and thought, and speech is delayed till reason has been developed and rendered capable of dealing with phonetic elements. Compared with Amman and Wallis, but specially with Dalgarno, there is no actual advance. When he left this standpoint and came to adopt the principle, that not writing nor signs should be prior in the order of instruction, we know not, but he did affirm that speech was to hold the first place and become the sole instrument of language and mental development. It would be interesting

to know his reasons for so great a change in principle ; but his studied concealment leaves us to fancy, when we ought to have facts and reasons.

But even when he did come to formulate the principles of his method he did not free them, by the retention of signs, from the one element which made it practically no better than the methods of his predecessors. If the fact is unquestionable that thought is ever bound up with the form in which it is expressed, whether by signs, or letters, or speech as its *couche*, then his admission of natural gestures, which is found in Walther's first principle, deprives the language of speech of its one opportunity of becoming the language of thought. He, therefore, did not consistently apply his one great principle, but left it to his successors.

The more mature principles of his method may be found in Professor Fornari's "*Il Sordo-muto che Parla*," Milan, 1872, and in "*Walther's Geschichte der Taubstummen-Bildungswesens*." As they differ in some important points they are combined.

1. "Human thought is impossible either by gestures or by writing, but most assuredly by the spoken word only." (F.) This cannot be sustained.
2. "Hence the deaf and dumb desire to learn to speak and read aloud." (F.)
3. "It is impossible for them to remember the infinite variety in the composition of written words, which serve the purposes of thought." (F.)
4. "The knowledge of a thing precedes its (naming). The education of the deaf and dumb must, therefore, advance from intuition. Natural signs and pictures are suitable auxiliaries to intuitive perception." (W.)
5. "Clear thinking is possible only in speech, and therefore deaf-mutes ought to be taught to speak." (W.)
6. "Learning speech, which depends on hearing, is possible to deaf mutes only by substituting another sense—taste—(touch) ought to be that sense. The last serves in a peculiar way to fix the vowel sounds." (W.) (This specially refers to his theory of the relation of tastes to sounds.)
7. "It is also true that deaf-mutes can think in signs and

pictures ; yet this is confused and indefinite, so that the ideas thus acquired are not enduring."

8. "They are also capable of receiving conceptions by means of writing, but they can be retained only by the frequent repetition of the words ; and by the help of conceptions, acquired by writing, they are capable of a certain degree of thought, but the progress is slow, and the conceptions acquired by writing not very lasting." (W.)

9. "The manual alphabet is useful, but, contrary to the usual custom, it only serves to combine ideas." (W.)

10. "The deaf and dumb are in the condition to understand what is spoken by another from the motions of his lips." (W.)


11. "The deaf and dumb cannot grow to acquire abstract ideas by gestures and by writing, but solely by the use of spoken language." (F.)

12. "As soon as they have learned to speak they must employ correct language, whether by themselves or with others, and not be permitted to express themselves by signs." (W.)

[It is much to be regretted that teachers should indulge in unqualified assertions of the impossibility of deaf-mutes attaining to clear conceptions and abstract thinking by signs or mimic gestures. Facts are against them. There is nothing in the nature of a sign to prevent it from becoming, from long use, a mere symbol, and thus serve the same end as a spoken or written word. There is no magic in speech, it is only the simplest and least cumbrous form of expressing thought.]

13. "The method of de l'Epée, which is to teach language by means of gestures, and by writing, should be rejected by every one, because nothing more is done by it than by a writing machine." (W.) [This assertion is invalidated by facts. Nothing is gained by ignoring natural laws and possibilities.]

The controversy between Heinicke and de l'Epée, on his method, arising out of the appointment by the Emperor Joseph of the Abbé Stork—a disciple of de l'Epée—to the charge of a school at Vienna, brought Heinicke little honour. The sedulous concealment of his method and

expedients put him at a great disadvantage before the benevolent Frenchman. His defence was therefore not only poor, but still more weakened by his selfish assertions, in contrast with the noble self-denial and unreserved publication of all his methods by his opponent. But the assertion of the great principle, "That the deaf-mute can learn, and should be taught to speak; and that language, as spoken, should be the instrument of instruction, and that by such means will the unhappy one be restored to society," has lived and redeemed his credit for all ages. He was the first who proclaimed the possibility of educating deaf-mutes as nature teaches the hearing. He died in 1790. 

HENRY BAKER.

EVERY one interested in the education of deaf-mutes greatly regrets that the spring, so rich in promise for Great Britain, which burst forth after the publication of Sir Kenelme Digby's account, was not followed up by an abundant harvest. Such works as Wallis and Bulwer's ought to have made many students, and led to the establishment of public schools. But instead of this, vanity and selfishness made a secret and a monopoly of the inheritance of the poorest deaf and dumb child in the land, and they had still to wait for the benevolent impulse, which came from France, in the great and good work of de l'Epée and Sicard. But it was not wholly extinct. Two men studied and applied the principles taught by Holder and Wallis: Henry Baker and Thomas Braidwood.

Henry Baker was a son of William Baker, a clerk in Chancery, and born in London, in May 1698. He was apprenticed in 1713 to a bookseller, whom he left in 1720 to reside with Mr. John Forster, an attorney. He had studied the method of teaching deaf-mutes, and became tutor to Mr. Forster's deaf and dumb daughter. She was his first pupil, and in her education his success was so great that it attracted public notice, and led to the establishment of a private school in which children of some of the first families were placed for education. But it does not seem that his success enlarged his sympathies for all the deaf and dumb, but rather, "he was not solicitous that mankind in general should profit by

his power of communicating ideas to these unfortunate objects, for he is said to have required a bond of £100 from each pupil not to mention his method of teaching."

He married in 1729 the daughter of Daniel De Foe, the celebrated author of "Robinson Crusoe." In 1725 he published some erotic rhymes in which he had indulged; but did better when he published his two popular works, "The Microscope Made Easy" and "Employment of the Microscope." These and other contributions to science brought him the Copley Medal of the Royal Society, of which he was elected a Fellow. He died in 1775.

Nothing was, therefore, known of his methods till lately, when we got possession of his Lessons, in four manuscript volumes. These came from the collection of Dawson Turner. This is very probably the work he promised to publish, to which Dr. Johnson refers, in saying "he had flattered him with hopes to see his work published." Many of the MSS. seem to have been copied by another for publication. Of their genuineness there can be little doubt. Their form is their best evidence. They are lessons for deaf-mutes by one who knows how to teach. They are in a small, neat hand, except the original exercises of the scholars, which have many mutisms. However, their arrangement is bad, for they do not follow in any order, either grammatical or logical, unless we suppose they are hand to mouth supplies by one who felt himself able to carry forward impromptu the education of his pupils till language was learned. But we have the author's own letter when he sent the papers to the compiler, who seems to have been his son, from the address, "The Rev. H. D. Baker," on the other side.

To D——,

I send two lots of Papers for Instruction of Deaf and Dumb, that you may judge how far you have appetite for arranging them, and enabling others to use them, as they have been used.

It seems to me that no one who has not made the dumb speak can give Life to these dry bones. Is it not a case for "ÆS triplex?"

signed,

HY. DE FOE BAKER,

D.T.

This was his legacy to deaf-mutes, but in a form which

buried it, so it was of no use except to tell us in later days how he taught, and prove that it is difficult to hide the truth where it cannot be found.

He employed writing, drawing, speech and lip reading. His success in teaching speech and language must have been considerable, for there is the evident thoroughness in all he attempts which ensures achievement. One of his lessons on language will best enable us to understand his method.

FRÖSTY.

A fröst. frēeze, froze, freezing, frozen. A fröst.

It is frösty weather. It is a hard fröst. It froze very härd läst night. The ground is frozen very härd. I believe it freezes now. The wäter is frozen. There is ice upon the wäter. The boys will slide upon the ice. I säw boys and girls both slide upon the ice last winter. Ice is very slippery. If people walk upon the ice they will fall down.

Slide	Slid	Sliding	
Slip	Slipped	Slipping	Slippery

It is a white frost. The frost is upon the windows. The ground is covered with a white frost. It is very cold weather. It is a sharp, pinching frost. It is a biting frost. I love to sit by the fire in cold, frosty weather. The sün shines and the ground is hard and dry, so that it is very good walking, but the sün will melt the ice, and then it will be dirty. A fire is very comfortable in cold, frosty weather. There is always a great deal of frost in the winter time, but there is never any frost in the summer time. Frosty weather is very wholesome.

Snow is white. It snows. It snowed. Snowy weather.

A snow bäll ☉.

This lesson indicates a few points which reveal his method of teaching language.

First, there are diacritic marks which distinguish the long and short sounds of the vowels.

2. Then the verb to freeze and the noun frost are used and distinguished in the various forms of sentences.

(A.) The verb freeze is used in the present, the imperfect, and perfect tenses, as well as in the passive present.

(B.) The noun is used as both subject and object. Then it is qualified by an adjective.

(C.) Again, it is used as an adjective in the phrase, frosty weather.

(D.) The principal tenses are also written for repetition. Thus, this lesson puts the learner in possession of some of the principal forms of language, while his thoughts are

exercised on a very few objects and actions, all of which can be seen and felt in frosty weather.

Evidently Mr. Baker had learned to associate words with their objects in a realistic manner.

Another and more advanced specimen will suffice to show the increasing command of words and construction.

"Mr. Baker showed me a letter which he received from Miss Forster, sealed with her coat of arms. Miss Jane Forster was dumb, and is deaf like me. But Mr. Baker taught her, and she can talk and understand everything, and she can write letters very well. She has got a room full of books and she understands them all. Mr. Baker taught her six years, and she left off learning ten years ago. Miss Jane Forster is a woman, but she has got a brother and a sister that are deaf, and Mr. Baker teaches them both."

In reading over the lessons we are greatly interested in the manner in which he turns every event and circumstance of London life to account in teaching language. His pupils go everywhere, either with himself or some responsible person who can talk with them about what they see. Royalty contributes to these lessons, and nobles play their parts. This is the mother's method and cannot be surpassed because it uses the interest that has been excited by objects and events to fix the forms of speech which best express them. Baker knew how to teach. Possibly, in the eyes of some, he kept too close to grammatical forms, but if so, it was with the freedom which supplies the substance with the shadow.

Independently of these evidences of his success, found in his MSS., we have the witness of the Rev. Mr. Dutan, *Christian Observer*, who says, "I applied to a professional man named Baker, who, by a method of his own, had taught Lady Inchiquin and her sister and some other pupils. I saw some of his scholars and was astonished at the facility with which they understood what I said by observing the motions of the lips. He taught her to write, then, the meaning of the words by the objects."

Daniel De Foe, as Mr. Baker's father-in-law, no doubt felt a great interest in the education of deaf-mutes. Probably this led to his writing "*The Supernatural Philosopher; or the Mysteries of Magic in all its branches clearly unfolded,*" under the pseudonym of W. Bond, Esq., "*Bury St. Edmunds, 2nd Ed., 1728.*" (*Brit. Mus.*) This work was

written to expose the impostures of Duncan, Campbell and others. But he added, "The method of teaching Deaf and Dumb Persons to Write, Read and understand a Language," p. 38. In this he gives a fair account of the elements of speech, and the English two-handed alphabet. In teaching language he associates the written characters with the objects. He also refers to Dr. Wallis' letter to Mr. Beverly, making it very probable that it was also seen by Mr. Baker. "The celebrated Popham," he says, "was brother-in-law to the present Earl of Oxford." Mr. Baker's MSS. are well worth a careful perusal.

BRAIDWOOD.

WHILE Henry Baker was still teaching deaf-mutes, Thomas Braidwood founded a school, in 1760, in Edinburgh, and taught with such success as to attract public notice and increase the number of his pupils. His method was professedly oral, but, like Baker, he concealed it as much as possible from the public. Mr. Pennant, in his tour in Scotland in 1772, visited the school, and remarks of the scholars, "They see our words, and our uttered thoughts become to them visible; our ideas, expressed in speech, strike their ears in vain; their eyes receive them, as they part from our lips; they conceive by intuition, and speak by imitation. Mr. Braidwood first teaches them the letters and their powers and the ideas of words written, beginning with the most simple. The art of speaking is taken from the motion of his lips; his words were uttered slowly and distinctly. Their answers are slow and somewhat harsh."

Dr. Johnson, also, in his celebrated journey to the Western Highlands of Scotland, visited the school. He relates: "How far any former teachers—he had referred to Wallis and Holder—have succeeded it is not easy to know; the improvement of Mr. Braidwood's pupils is wonderful. They not only speak, write, and understand what is written, but, if he that speaks looks towards them, and modifies his organs by distinct and full utterance, they know so well what is spoken, that it is an expression scarcely figurative to say, they hear with the eye. That any have attained to the power mentioned by Burnet, of feeling sounds by laying a

hand on the speaker's mouth, I know not ; but I have seen so much that I can believe more ; a single word, or a short sentence, I think, may possibly be so distinguished."

But the most satisfactory account we have of his work is that contained in a letter from Mr. Green, who had a son at Mr. Braidwood's school, and read by Mr. Mitchell, the first principal of the institution for deaf-mutes in Kentucky, in "a discourse pronounced by request of the Society for Instructing the Deaf and Dumb, in New York, on the 24th of March, 1818."

It appears that Mr. Green visited the school in 1781, and spent six weeks in the city of Edinburgh.

"The extraordinary importance of my discovery of what is precious for all humanity disposes me to give you a complete account of my experience in connection with the establishment of Mr. Braidwood. If I was not even consulting my personal interest I believe that in making known this institution I should have done something worthy to attract the attention of the whole world. At my first interview with my son, who had impatiently anticipated me, he said to me intelligibly, and with a loud voice, 'How do you do, my dear father?' He had then been a year at the institution. This first salutation was on both sides followed by many other questions and answers.

"I then gave him a letter from his sister which he read in a loud voice. Some words of this letter, such as write, letter, papa, were accompanied by gestures, which convinced me that he understood them all as well as pronounced them intelligibly and correctly.

"I remained in Edinburgh six weeks, and every day I was a witness of the real progress of my son and the other scholars; every day I was rejoiced to find in them marked signs of their being endowed with intelligence and the power of speech, of which they had been previously deprived through some defect in their hearing. By this method of instruction deaf-mutes should no longer live without being useful to the state, or condemned to ignorance and public neglect, but have the ability to acquire much useful knowledge and of profiting by the advantages and pleasures of their social position.

"I have also seen and become acquainted with the adult scholars educated in the institution. One of them, a very intelligent young man and an agreeable companion, is head clerk at the Leith Custom House. Another is pursuing his studies at the University, and I am certain that my son will be an adept in the art of speaking.

"The energy and the faculties of deaf-mutes vary in the same manner as in the hearing. I have remarked also in all the boarders a special liking for study, and it is not improbable that some extraordinary talents may be developed by study, attaining to such a degree of perfection as to become envied by persons in possession of all their senses.

"Permit me to add a few words on Mr. Braidwood's methods. He at

first teaches his pupils to utter sounds and to articulate letters; he then gives the tongue and the lips the positions necessary to the formation of syllables. Lastly, by numerous graduated exercises he leads them to pronounce words and understand their meaning, either as printed or written. If the scholars attentively follow the movements of the mouth, they can understand what is said without hearing. *Vox oculis subjecta*, such is his device. The eyes of the scholars are fixed on the mouth, as a bird fascinated by a serpent remains nailed to its place.

"My son has made extraordinary progress in a very short time, not only in articulation, but also in reading, arithmetic, and drawing, so that despite his deafness, he will be enabled to fill an honourable place in society."—Translated from Snyckers' "*Le Sourd-Parlant*."

"*Vox oculis subjecta*" is also the title of a work on the instruction of the deaf, published in 1783 by "A parent," who in all probability was Mr. Green.

Mr. Braidwood removed to Hackney, then a village near London, in 1783, where, says Dr. Watson, "he was the first who kept a regular academy in this island" (Baker and his work are ignored). In 1784, Mr. Joseph Watson, a nephew, joined him.

A public institution for the education of deaf-mutes had as early as about 1780 been proposed, to which the King subscribed £100 or guineas as a royal donation. The matter, however, lacked vitality and made no progress till 1792, when a society was formed and a public school opened, to which six were admitted.

The Rev. John Townsend was its earliest and warmest friend, and by his energetic advocacy placed it on a sound basis, and with the Rev. Henry Cox Mason, increased the funds so much that in 1809 there were seventy pupils in the Institution. This was the origin of the Old Kent Road Institution, London. At the death of Mr. Braidwood in 1806, Mr. Watson, afterwards Dr. Watson, was appointed the principal of the school. In 1809 he published a work on the "*Instruction of the Deaf and Dumb*. London, Printed and sold by Darton and Harvey," in which he gives an account of his method of educating his scholars in speech and language. It also contains some valuable references to Mr. Braidwood and his methods, which assist us in arriving at some clearer ideas about what he had himself carefully concealed. Dr. Watson had learned and then taught by Mr. Braidwood's methods. He was the

heir to the family monopoly, and therefore his book may be accepted as a tolerable index to what his uncle had taught. He says, *Introd.*, p. xxiv., "When I say that these, my venerable predecessors in the arduous work, but yet pleasing undertaking, of teaching the deaf and dumb, taught upon the same principles which I have attempted to explain, I do not, by any means, intend to convey, that in their practice, they were guided by the light of these principles embodied into a regular theory; my meaning is, that their practice accorded with, was explicable by, and referable to these principles." This seems to imply that Dr. Watson claims to have systematised what Mr. Braidwood and others had left in a crude state. But on a previous page he said that "Dr. John Wallis, near a hundred and fifty years ago, 'taught a person dumb and deaf to speak and to understand a language' (I use his own words in a letter to Robert Boyle, Esq.), upon principles such as I have endeavoured to unfold." Yes, and he might have added that he wrote a work called *De Loquela*, in which he gives a much more elaborate account of his method than himself. Perhaps he did not see it, but this does not seem very likely after his reference to the letter to Mr. Boyle.

We can, therefore, form a pretty safe opinion of Mr. Braidwood's method. He used Wallis', but by great facility in teaching, and a much larger experience as a teacher, he developed his system as the Germans did that of Amman. He used speaking, writing, reading, drawing, and natural signs, as we learn from what Messrs. Pennant and Green have written, but it does not appear that he added any important principles to the system, but left it very much as he found it. More generous than Baker, he prepared the way for founding the first public school in England in 1792, about thirty years after that of *de l'Épée* in Paris, and fourteen years after that of Heinicke at Leipsic, and lived to see it prosper.

PESTALOZZI.

No modern teachers have done more for the better education of little children than Pestalozzi and Froebel. Their methods, though intended only for hearing children, have

greatly influenced the education of the deaf, because they were founded on benevolence and a closer study and appreciation of child nature.

Pestalozzi's family, as the name implies, was of Italian origin. They dwelt at Chiavenna in the Grisons, where the Splügen and Maloya passes unite on the way to Como. It is a place of considerable importance from its industries and its direct connection with Switzerland and the Tyrol. In the second half of the seventeenth century, Antonio Pestalozzi, with his family, emigrated to Zurich, where he might freely profess the reformed faith which he had embraced. His son, Baptiste Pestalozzi, born in 1718, exercised at Zurich the profession of a surgeon. He married a lady of good family, by whom he had three children, two sons and a daughter. Henry, the second son, was born in 1746. He is our Pestalozzi. His home education was excellent, for of his mother, he said in after years, "My mother devoted herself to the education of her three children with the most entire self-abnegation, and the most complete surrender of everything that had any attractions at her age and with her surroundings. In this she was much assisted by a faithful servant who never abandoned them after the death of their father." He was a dreamer in his boyhood and gave very little promise of what he became in after years. At eighteen he entered the university, where he excited the regret of the professors, and the amusement of the students, by the neglect of his appearance, distracted air and the habitual reverie in which he indulged. He was an original, but behind all this there was a soul of the highest order which only required the right circumstances to reveal its greatness. His attention was chiefly engrossed with the sad state of the education of the young. It was not only defective, but cold, hard, and inhuman in its method and conduct. Fear and the whip were head masters. Not to evolve but to drive in was its ruling principle. His gentle tender soul revolted against it and he devoted his life and talents to its reform.

At first Pestalozzi turned his attention to the domestic education of children. He was convinced that the home ought to be the primary school and the mother the head teacher. In his work called "Leonard and Gertrude," he

refers thus to the subject, "Every one is occupied with the heart of children, the lieutenant—a model father—is occupied with their head also. His desire is that everything which enters there should be as clear and bright as the full moon in the heavens. Above all things he teaches his children to see and hear well, and he exercises them in the good sense which is common to every man. When we wish to turn men from error we should not attempt it with the arguments addressed to madmen, but seek rather to quiet their foolish temper. But to do this it will be of no use to paint or describe the blackness of the night. By letting the light in you can alone show what the night is, and by removing the cataract you can alone teach the blind what blindness is. To see well and hear well are the first steps to wisdom in life. Reflection is the guiding clue which will preserve us from error in searching after truth. It is also the corner stone of the peace and well being which a life of toil, reflective and foreseeing, can alone assure to the children of men." Stapfer, the minister of the Swiss Republic, says of his methods, "Founding his system on the nature of infant minds, he calls to his aid memory, imagination and understanding in the proportions adapted to the successive developments of their intelligence, and he has the merit of being infinitely saving of the time of the scholar and the labour of the teacher."

But the most satisfactory account of the principles of his method is found in "How Gertrude Instructed her Infants."

"One day, after many attempts to attain my end, or rather in the middle of my vagrant dreams on the subject, I came to ask myself simply, What is, and what should be, the manner of proceeding in each particular instance by a man of culture, who wishes to analyze and gradually to elucidate any obscure and complicated subject?

"In such a case he ought always to direct his attention to the three following points:—

- 1st. How many objects, and of how many kinds, has he under his eyes?
- 2nd. What are their appearance, their form, and their outline?
- 3rd. How are they named, and how can each be represented by a sound or by a word?

"But it is evident that the success of this research presupposes the development of the following faculties:

1st. The faculty of perceiving by sight the form of each object, and how it presents itself.

2nd. The faculty of distinguishing these objects from one another in respect to number, and of representing them clearly either as unity or plurality.

3rd. The faculty of repeating this representation of an object in respect to number and form by means of language, to prevent them being forgotten."

"I conclude that form, number, and language, are the three elementary means of education, because the sum of all the external characteristics of an object is found within the limits of its outline, and in its numeric relations, which my consciousness appropriates by means of language. The art of teaching should take for its invariable guide and basis, this threefold rule to arrive at this threefold result:—

1st. To teach the infant to apprehend each of the objects given him to know as a unity, that is, as separate from those with which it appears united.

2nd. To teach him to distinguish the form of each, that is, its dimensions and proportions.

3rd. To familiarize him, as soon as possible, with the whole of the words, and the names of all the objects known by him."

"And because the instruction of children should start from these three elementary points, it is evident that the primary efforts of the art should tend to give these three elements the greatest simplicity, the greatest compass, and the greatest possible harmony."

"I advance still further and I recognise that all our knowledge proceeds from three elementary faculties:—

1st. The faculty to emit sounds, whence comes the aptitude for language.

2nd. The faculty of unlimited and purely sensible representation, whence comes our knowledge of forms.

3rd. The faculty of determinate representation, no longer purely sensible, whence comes the knowledge of unity and with it the aptitude to reckon and calculate.

"So the problem is found solved and nothing afterwards hinders the application of the mechanical laws—which I recognise as the basis of education—to the forms of instruction, which the experience of the ages has furnished to the human race, as writing, reading, counting, etc. to serve in its development."

In teaching the infant to apprehend clearly each of the objects, he relied much on frequent repetitions of all that had been learned, but he failed in the best use of free interrogation, and analytic distribution of the different parts of a composition from his impatience to obtain results and to wait on the answers of his scholars.

"In the room of the old chateau where he kept his school, there were

some pieces of torn and faded tapestry, but he soon turned them to account in teaching language. Hours were spent in examining the figures and holes, their form, number, position, and colour, and in expressing thoughts about them in more or less appropriate phraseology. He proceeded thus: What do you see? I see a hole in the tapestry. Well, repeat after me, I see a hole in the tapestry. I see a long hole in the tapestry. I see the wall behind the hole. I see the wall behind a long narrow hole. Repeat again after me, I see figures on the tapestry. I see some black figures on the tapestry. I see black and round figures on the tapestry. I see a yellow and square figure on the tapestry. By the yellow and square figure I see a black and round figure. The square figure is joined to the round figure by a long black strip, etc."

"The exercises on language borrowed from natural history were not so well conceived. He spoke the lesson first and we repeated it after him, forming it all as I have said. For example, he made us say:—

"Amphibians: amphibians with feet, amphibians without feet. Monkeys: monkeys with a tail, monkeys without a tail. We understood nothing of these expressions for they were not explained, and in other respects he spoke in such a singing, rapid and indistinct tone that what he said was unintelligible; and, moreover, he shouted so loud that he could not hear what we repeated and still less, for he never waited after he had pronounced a phrase, but continued without a pause. What he said was written on sheets of pasteboard, and in general we were content to repeat the last word or the last syllable of the phrase. There were neither interrogations or repetitions."—Ramsauer's *Autobiography*.

"I seek," Pestalozzi said, "to psychologize education; that is, to submit the forms of all instruction to the eternal laws according to which the human soul is elevated from the intuitions of sense to clear ideas. I have sought to simplify conformably to these laws all the elements of human knowledge and to arrange them in a series psychologically arranged."

"The psychologic laws of the acquisition of knowledge are revealed to us by the physical laws which are seen to operate in nature."

"The mechanism of the nature of man on the side of the senses is in its essence subject to the same laws which physical nature obeys in the development of her forces. According to these laws all instruction should at first impress profoundly on the human mind the ineffaceable traits, the essential parts, of each kind of knowledge; then gradually connect the things less essential on this primary ground and associate them there without breaks and in an orderly manner; and maintain among all the parts, even to the most distant, an organic bond of such a kind as to constitute a living and well proportioned whole." "The problem to be solved is this:—how to adapt the elements of each art and each science to the inmost constitution of my mind, following the psychologic-mechanical laws agreeably to which the mind is elevated from sensible intuitions to clear ideas."

These are the fundamental principles of Pestalozzi's

method and they embody nearly all that are essential in education. This dreamer became the Bunyan of his glorious visions.

FROEBEL.

AUGUSTUS WILLIAM FREDERICK FROEBEL, the originator of the Kindergarten, was born at Oberweissbach, Principality of Schwarzburg, Thuringia, in 1782, and died at Marienthal, Saxe Weimar, in 1852. His father was the pastor of the parish, and he received the domestic training and all the other advantages enjoyed in such a household. In due course he entered the University of Jena, but left at the end of three sessions. But some time afterwards he resumed his collegiate studies. Of a thoughtful and enquiring mind he early attempted the solution of the most difficult questions in theology and morals. But his love of nature was greater, and in its study he imagined he had found the solution of his greatest difficulties.

He says: "I have learned to see in nature and especially in the vegetable kingdom a mirror—I would venture even to say—a symbol of the life of man in his highest aspirations." But nature was not all to him, or the chief as his teacher. In the life and character of Jesus he saw the model for his imitation and he made Him his ideal, and this is enough to reveal his tendencies and the kind of soil in which his educational principles germinated and matured. He was a great lover of children from their close alliance to nature and their dependency on their teachers for their full mental and moral development. He saw that their fresh hearts were open to all the wealth of life in nature and responsive in awe and terror, admiration and delight to all her moods and aspects. He therefore desired to draw them still closer to this great mother that he might stir their emotions to use them in play and song for their education. That the mind must be approached through the senses was his guiding law.

One day the sight of a boy playing with a ball taught him the intensity of the interest felt, and the pleasure enjoyed by children in such games. How, also, they excite rivalry and emulation while they exercise skill, agility, and constructive-

ness! For him then play was educational. A mathematician and an enthusiastic teacher, he imagined he had discovered in the simplest solids the principles of primary education. His explanations of these first appeared in a weekly journal published in 1837, and called, "Come, let us live for our children." He had formulated them on the subject of the playthings or gifts, as he called them (*Spielgaben*), contrived for infants.

There the first plaything or gift, the BALL, has a lofty philosophic signification. Who can doubt it, because the word ball, according to him, is a symbolic name formed of letters borrowed from *Bild*, an image, and *alle*, all. (*Bild vom ALL*), i.e., Image of all! [This etymology will hardly hold.]

The second plaything or gift, which is for the second half of the first year, is composed of the sphere and the cube. The sphere is distinguished from the ball by the elasticity of the latter. But the sphere and cube are in opposition to each other; the one represents motion and the other rest; the one is diversity in unity, the other unity in diversity; the one is to the other what sentiment is to spirit; and as these two mental faculties manifest themselves very early together in a child, he ought also to receive the cube and the sphere, not separately, but together.

After the sphere and the cube came the doll as his third plaything or gift, but Froebel soon modified this, and made the cube, divided into eight equal parts or cubes, the third gift. It is designed for infants from one to three years of age, and serves to show them a whole which is divided into parts, of which each reproduces the characteristics of the whole. To this third gift he attached all sorts of considerations, too long to reproduce here; but, to emphasize its importance, he devised a new play of words, intended to prove that the number eight merits special attention.

The fourth gift is the cube, divided into eight rectangular parallelepipeds, formed suitably for building bricks. The infant here finds himself in the presence of solids, whose three dimensions are no longer equal, and there he has the materials which he can utilise for little buildings.

And, finally, the fifth gift is the cube divided twice in each of its dimensions, or parted into twenty-seven equal cubes, of which three are divided into two prisms each, and three others into four prisms each by means of an oblique section, single or double.

[These gifts are fond speculations, into which mathematical students have often been seduced, from Pythagoras till now. The perfect forms and proportional relations of solids have suggested the theory that in them lay the fundamental laws of creation itself, as well as of the Infinite Mind who produced them, and of him who can comprehend their relations. Thought itself, with all knowledge, it is said, can be accounted for from these lines and figures. Plato, in his *Timaeus*, has given us something of it; but,

however this may be, it can do little in the education of an infant beyond directing his attention to their perfect forms, whose beauty he can hardly perceive or feel till he has learned to imitate them with pen, pencil, and compass, and can measure them with lines and numbers. They are not everything in knowledge, but only one class out of many which supply the young mind, under the attributes of form, size, colour and weight, with the materials of thought. To trouble a child with them before reason has learned its ABC would be only a loss of time and a weariness.

Fortunately Froebel's views on preparatory education were not so much affected by these speculations. He had clearly apprehended the true relations in which the infant mind stood to all its surroundings, and the pleasures engaged in them by the ministry of the senses. He felt the power of poetry and music over himself, and how they suggested thought, as well as excited emotion; and he concluded that all children were equally susceptible of the charms of rhythmic thought wedded to sweet sounds, and could remember best what they learned in this form. He could sing, play, and write fitting verses to the music composed by his friends for the use of his scholars when they marched or exercised themselves in rhythmic gestures. Body and mind were swayed and directed under the influence of these pleasurable emotions. Play was made the handmaid of education, and served freely in doing the work once done by the rod.

But to reduce play to a mechanical set of exercises would soon have robbed it of all its freedom, and made it as dull as sitting on a form for hours, trying to look at a book, regarded as the enemy of all pleasure. To be efficient it ought to be natural, spontaneous excitement, and yet wisely directed by the teacher, who sees the end, completely concealed from the children, in the means.]

"The kindergarten gives the place of highest honour to play, but the gardener—the teacher—is never detached from it. In the free play she is apparently uninterested, but in reality more than ever occupied with the little folks. There she sees them as they are, there she can distinguish their characteristics; there the good or bad dispositions reveal themselves without restraint; there she learns that which enables her to judge, to decide, to correct and to direct. In the common plays and marches she takes an active part. The plays performed there are from the events of everyday life, which are first observed and then imitated. Such as the work of the farmer in sowing, reaping, and thrashing the grain; the train passing with its many waggons; the birds going and returning to their nests; the mill-wheel revolving—turned either by the water or the wind. Each play is associated with a song which reproduces it. This song is led and tuned by the teacher, who insists on an exact imitation of the movements, and, at the same time, elicits remarks and comparisons. Her care is not confined to their physical development, but extends to their moral, also."

It ought to be carefully noted that the action of these plays is not a mimic reproduction of their subjects, but rather a

recitation of them by singing. They are ideal, not actual; the reproduction of remembered impressions in appropriate words, and not an attempt by pantomime to place them on the scena. Froebel was led on to other methods of interesting his scholars, such as the use of tablets on which to write and draw, and of wands to form geometric figures; in plaiting bands of coloured paper, or in folding and cutting out; in design and modelling. He also taught them to execute roundelays and various games, accompanied with suitable songs.

At Yverdun he spent two years with Pestalozzi and adopted his principles and method. In a letter to the Duchess of Schwarzburg-Rudolstadt he said that "he then considered the doctrine of Pestalozzi as the definitive formula of the new education." His work afterwards was therefore supplementary to that of his master, by giving it a more human form and adapting it to infants. Pestalozzi had hardly patience to wait for nature, and often failed by pushing too fast to reach his ends. Froebel, with a truer instinct and fuller appreciation, courted nature and charmed her to light his way. He lived in his children as well as with them. "For he insisted more than any of his predecessors on the importance of play as a manifestation of infant activity; and he perceived that a child should not only hear and see, but act also for his self-development; that he has in him a creator and a worker who longs to produce, and he proposes that to this need of creating, working, and producing free scope shall be given in the Kindergarten during the age preceding that for school discipline."

If this method is carried out as Froebel describes, it will awaken the mind, train the senses, and teach the elements of knowledge; but if it becomes a drill and a recitation, then the mechanical will become habitual while the mind sinks into a deeper slumber. Nearly all depends on the teacher. If she infuses life and freshness into her every exercise, then she will be like one that prepares the soil for the best seed and the largest harvest. Our deaf pupils cannot sing but they can play almost every game, and through them we ought to try and do what the successful teacher of the Kindergarten does by uniting instruction with enjoyment.

A RETROSPECTIVE GLANCE.

From this time the education of deaf-mutes enters on a new phase. Hitherto there has been no war of systems. Methods were eclectic more than systematic. Everything was welcome which promised assistance, but when de l'Epée and Heinicke disputed on the superior claims of signs or speech the two rival schools were formed which have ever since divided the work. It is therefore, a favourable time for a brief survey of the methods that had been previously used, and their practical results.

I. Methods.—1. Teachers generally availed themselves of the mimic gestures used by their scholars, on coming to school, as the medium of intercourse and an introduction to the study of language. Ponce, Bonet, Wallis, Amman, and even Heinicke, alike availed themselves of the assistance of signs. But, though having a general resemblance, they differed so much in form and use as to make the free intercourse of the schools very difficult. There was no language of signs, nor any attempt made by the masters to reduce them to a language by adding the accidents of the vernacular and arbitrary abstract motions. Their variations were as great as the provincial dialects of a modern language. Nor was there any attempt to develope and systematize them by artificial expedients into a language so corresponding in every respect with the vernacular that exact translations from the one into the other were possible. But, on the contrary, it has been seen that the most distinguished masters discountenanced their use as soon as the vernacular could be made to take their place. They were simply tolerated for a time.

2. Speech was taught, with few exceptions. The success of Ponce, Bonet, Wallis and others in this respect had set the example, and there was no controversy either on its possibility or fitness. It was accepted and attended to by all till de l'Epée substituted systematic signs, not because they were better, but because they could be taught with greater ease and in a shorter time to a large number of scholars. With him it was not a matter of principle, but of means. On the utility of lip-reading opinions differed, but results, as in Bonet's pupils, surpassed the theories of their teachers, and

pointed to the fact that natural resources, in this respect, were greater than supposed. Bonet's own views were modified by greater experience.

3. Writing was generally taught, and in closest association with speech, the manual alphabet, and signs. It was an alternative form to each of these as a principal means of connecting and fixing the language of speech in the memory. Dalgarno seems to think that writing, the manual alphabet, and action were equal to all the requirements of deaf-mute education, but he had no practical experience.

4. The manual alphabet was used by most teachers and closely associated with speech and signs. Roman in its origin, but improved and adapted by Ponce and others, whether as one or two-handed, its inventors evidently sought to imitate the forms of the letters in the positions of the fingers. It was thought to be superior to writing, not only in convenience and expedition, but somehow in connecting the words of sentences so that they could be better mentally grasped in their various relations. But apart from its action and animation it is very difficult to discover any intrinsic superiority it has over writing, in which the eye can still better connect the words of a sentence and verify the correctness of the meaning attached to them by another glance. After all it is only like writing or printing with vanishing letters, and furnishes nothing to thought beyond the signs of the sounds represented by them. No one on principle objected to the employment of the manual alphabet.

5. Drawing was also used to convey ideas of objects not at hand, or which could not well be described by signs. In fact there is an intimate relation between them, for mimic gestures are pictures formed by airy outlines and prominent features of things, and drawings are similar representations of them, only the latter is permanent and the former vanishing. Neither provide the objects, but only pictorial substitutes, and they must therefore be inferior to the intuitional perception of the objects themselves.

These are the principal means employed by the early teachers, and they were to a great extent tentative and experimental. Every successful teacher was at the same

time an inventor, for he had no opportunities of comparing his methods with those of others, there was no available literature of the subject, and much reserve on the part of some as to how they achieved their wonderful work. As the children of the rich and noble were alone instructed on account of the expense, selfishness made the methods monopolies, and they were carefully concealed so that there might be few competitors. De l'Épée was the first who broke through these restraints by educating the poor, publishing his methods, and inviting the world to come and learn their meaning and application.

II. Results.—Now in regard to actual results it is very difficult to get at the facts in order to form a correct estimate. The reports that have reached us, some by the masters, and some by visitors and competent judges, tell of results far exceeding anything we could expect from what we know of the methods. Ponce and Bonet's pupils attained to great learning and knowledge, and their articulation was so good that they could take part in public worship and serve in the army. Their minds, too, were highly cultivated, so that they were hardly inferior to the best educated gentlemen of the time. This is what we learn of them, but unfortunately we have very little of their own compositions which would enable us to test its accuracy. But Pereira fortunately had a pupil, Saboureaux de Fontenay, who gave an account to a lady of his master's methods, and to this added many of his own reflections. This is a remarkable production, and though its style is not up to the level of the age of Buffon, it is respectable. But he can relate, describe and express his opinions so well that we must conclude that he was as well educated as most Frenchmen. In Germany Raphael had great success in the education of his daughters. The eldest pronounced well, read the speech of others with facility, and her composition was good. Kerger and Arnoldi taught with equal success. The former had a young lady pupil, Mademoiselle de Meding, whose written replies to important religious questions were highly thought of in Germany at the time. In England, till the time of Braidwood and Baker, little had been achieved. Neither Wallis nor Holder got beyond the simplest rudiments of an education. The time spent on the

work was too short for anything more. Wallis evidently thought that he was the first to devise a complete method, but had he read Bonet's work attentively he would have found he was more than anticipated. Upon the whole the progress of the work from the time of Bonet was very limited, and not much fresh light was thrown on the different methods. Our chief regret in thus looking back is in the sporadic character of the work, for this was a great loss to them and us. Many spent their time in inventing what had been much better done by others in different countries, instead of climbing on their shoulders to something higher. They were ever beginning what they would have been able to take up at an advanced stage, had the literature of the subject been available, and the free intercourse of teachers permitted them to compare their methods. In this respect the Milan Congress did much more than affirm the principle of oral instruction by bringing the representatives of the National Institutions together to compare notes, to discuss systems, to hear expositions and exchange their literature. That congress made the education of deaf-mutes an International question, and we cannot now retreat from its platform. But we shall not have done all our duty till we have a college with professors, classes, and a normal school, in which the last words and the best improvements of the most eminent teachers and schools in the world will be made familiar to our teachers, so that they may go to their classes with the assurance that they know where they stand and what are their best appliances. We are as far apart at present as our island from continental teachers, but the time has come when all must yield to the imperative demand to supply deaf-mutes with the best education which can be discovered. We claim it for them in justice, as a department of our national education, in benevolence from their great privations, in patriotism, for they should contribute, like other citizens, to the good of the State, and in the spirit of sympathy and compassion essential to our holy religion, and manifested by the Son of God when He looked up to heaven and sighed, because of the great evil of their dumbness.

I.

PREPARATORY EDUCATION
OF
DEAF-MUTES.



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OF

DEAF-MUTES.

INTRODUCTORY.

1. WERE it not for the functions of the senses, the union of the mental and the material in human nature could never be perfectly consummated. The senses have been called "the windows through which the soul beholds all things." But close these windows, or let nature fail to open them, there would be no perceptions, and knowledge in consequence quite shut out. The senses are therefore essential to mental life and progress. Animals possess them even more perfectly than we, but they do not minister to the same exalted uses. Where theirs end ours only begin to discharge their higher functions, by providing mind with the materials out of which it forms a language and all that it can express. Education really begins with the primary exercise of the senses, for on their existence and efficiency the future mental life and development have very much to depend. In infancy they are occupied with their inferior functions in ministering to physical growth. Mind is dormant, and when it really awakes is difficult to say, but no doubt nerve impressions are transmitted and hoarded till thought enters on their full possession and appropriates them to its special purposes. In growth there is movement, conflict, mastery, and servitude, but activity everywhere, in the reception and assimilation of food, as well as in the play of nerve, muscle, and limb. Life is struggling and striving to reach the maturity of a nobler type of being.

2. Our place, as educators, is to observe and record the development of the senses, the dawn of reason, and the

forms in which ideas are at first fashioned. Every mother is or ought to be best fitted to nurse her own child. Her maternal instincts and intense affection make her quick to discover and apply whatever is wanted for the protection and nourishment of her little one. She marks every look, gesture, and movement, but unfortunately she keeps no diary, nor seeks to discover the occasions and the manner in which the senses and the mind begin to act. Enough for her if she discovers that every sense is perfect, that the soul looks out and smiles, and gestures tell her that her love is returned.

She has no well devised method of dealing with the temper and tendencies of her infant. She serves more than rules, and waits to see what nature will do before she attempts to teach or control. Even in teaching speech she hardly knows how to begin or what first to supply.

Her best prompters are his growing achievements and increasing facility in imitating and using what he hears. The Mother's Method is, therefore, a very elastic name. Could she supply us with the occasions, the facts, and the means she employed, with her reasons, the information would be invaluable; but she keeps no journal, and therefore we are left in ignorance of the elements of primary education, so far as the senses, instincts, and dispositions are concerned, for it is generally assumed that, till an infant begins to speak and know the meaning and use of words, his mental and moral states are of little importance.

3. Of late, however, this subject has attracted the attention of such thinkers as Darwin, Spencer, and Perez, whose careful observations and trustworthy records of facts have furnished psychologists with some data on which to reason. All these assert that the after life of an infant is largely influenced, for good or evil, by the kind of moral education he has in his infancy. Indeed they do not doubt that the tempers and dispositions take shape and determination in the first eighteen months of an infant's life. Hoarded tendencies, race types, and personal idiosyncrasies manifest themselves very early, and call for the attention and control, which, will not eradicate, but direct them aright, and make them subservient to the best interests of their possessor. Those

who have most to do with the nurture of infants confirm these conclusions, and there is a growing sense of moral responsibility on the part of well trained nurses, who feel that much more is required of them than health and vigorous growth in a child. When nursing is directed by knowledge and affection, much will be done for the higher education of the race, but there are limits to these hopes, unless the Great Father Himself is the prime mover and disposer.

4. Development of the Senses in Infancy.—Let an infant, then, who has recently arrived on our shores have our attention. It is at first utterly helpless and incapable. It would speedily perish were it not sedulously watched and cared for. Yet even now two of its senses are active. Touch and taste have discovered and certified its proper food. Its reception seems to satisfy. Warmth is grateful, but cold or heat disturbing and exciting, till cries express dissatisfaction. For the first few weeks it seems only to eat and sleep, but growth and muscular development are making rapid progress. Now the eye, which at first saw nothing, begins to look out as if in search of attractive objects. Light is the first. The light of a candle, sunlight, or the sparks leaping from the fire, are gazed at or followed in their movements. Bright colours, too, attract, so that sight is evidently beginning to distinguish the brightest shades. Another sense is active. Nurses also say that about this time hearing begins to distinguish their voices in the dark, and that there is an evident enjoyment of sweet sounds. Now all this time, through these growing senses innumerable sensations have been carried to the brain. What is their value? Do they fade away without leaving any effects? Not very likely; there are cerebral functions that have to be quickened and prepared for their higher exercise. These sensations may serve such uses if they are not hoarded. "A child of two months," Perez says, "who can distinguish several objects about himself, and is beginning to have a vague idea of distances, not being able to stretch out his hands and seize distant objects, as he does those that are near to him, bends his whole body towards them." "Before the end of the third month he begins to lift up his hands to his face oftener than before, and a little later the first pains of teething cause his fingers to be incessantly in his mouth."

santly carried to his mouth." The sense of muscular energy is awake, and touch is finding out from pain or pleasure the parts of his body, and the qualities of some foreign substances. What is soft and warm evidently pleases, for he strokes it or carries it to his face, if he can. "In a word he has gained greater consciousness and mastery of his activity," for at this age "he will also attempt movements of his legs and thorax, to balance himself when held up by his arms, and will struggle with arms and knees to climb up to his nurse's face, when she helps him forward on his feet."

At six months or later, his control of himself, and his mental activity are greatly enlarged. "His triumph is to sit on the floor surrounded by his playthings, of which he shows himself a jealous master. His hands, arms and fingers accomplish many delicate and varied movements, of which a cat or a dog of a year old would not be capable. His activity doubled now by curiosity, and stimulated to the highest pitch by emotional sentiments of all sorts, makes him happier and happier, and seems to him so great a necessity, that a quarter of an hour of relative inactivity weighs on him as much as a whole day of ennui on a grown up person."

At eight or nine months "a child gets an immense amount of pleasurable sensations of all kinds, muscular, intellectual, and moral, from its first attempts at walking and talking, and imitating all the different gestures of the people around."—Perez.

5. Mental as well as physical life is now active in the multitude of sensations eagerly sought after and enjoyed; and in untiring effort to do like others and tell them how he feels and what he desires. Imitation has already enabled him to do much of both. He knows the difference between a kind and an angry look, attention and neglect. He has also learned that his smiles and kisses, cries and tears, touch the heart and procure him many things he desires, he therefore resorts to them to obtain his ends. As yet he cannot utter a word, yet he knows receptively much of language in expression and speech, for he is now familiar with the names of persons and objects about him, and can distinguish them by sounds alone, or by their looks and their figures. In this manner he has stored many words by observing whence they

come and how they differ in volume and pitch. Thus the impulses of nature and the school of domestic life are preparing the young scholar for his first essays as a speaker.

6. How is speech learned by hearing children?—Speech is learned by imitation. But this implies a prior perception that things have names and are known by them. Now these names are formed of sounds, issuing from the mouth and heard by the ear, but having no resemblance to the objects. Their value lies in their association. Any other vocal sounds would be quite as good for this purpose. The relation is artificial. The child knows nothing of this, but only that the sounds mean the things, and as an imitator he tries and succeeds in uttering similar sounds for the same things with his own organs. He says PA for father, and MA for mother, because he has heard and seen others name them so, and they at once respond by look and gesture, so that he now knows that they apply to them, and he calls them by them. He is delighted at the discovery that he, too, can speak. So the language of speech is initiated, and consists of four elements:—

1st. The objects, persons and acts perceived by the child.

2nd. Their names in sounds, uttered by the voices of others.

3rd. Their constant association with these objects in his mind.

4th. And his successful imitation of them for his own use.

7. This imitative power opens a large field for inquiry. There is no doubt that the child sees the motions of their lips in the speech of others, but that cannot suggest to him how to place his organs to form the sounds, except in a very few labials. It must be his own spontaneous act. But how is he led to place the organs in their right positions? Evidently not by seeing. Well, he has two servants to assist him, hearing and touch. Now hearing will certify the right sound when it is uttered, but nothing more. It can exert no motor nerve influences on the organs of speech. By touch then the work has to be done, for there is no other sense to intervene. Now touch in tongue or lip can tentatively feel about till the right position is found, and then the ear will approve; but

some have questioned this tentative action, and think that there are strong tendencies called into action by the promptings of the ear, and under their power the organs at once adjust themselves to the required positions. But, on the other hand, it is asserted by some who have carefully observed how children learn to speak, that they do not arrive at the right articulations till they have made many attempts. The subject deserves attention.

However it may be, as such it is a striking illustration of how things so diverse that they have not a single point of resemblance in common, can yet become so closely associated, and seem so much one, that some suppose that the sounds were originally imitated because they were an "echo of the sense."

8. As the mother has hitherto replied to her child by looks and gestures, so now she replies by speech. Master of a new and wonderful instrument of thought, he would try it on everything; but she selects the names of the most familiar persons, objects and actions, to suit his tender age and small capacity. Some of the sounds are too hard for his feeble organs. These are avoided for the present or his imperfect substitutes accepted. Love and sympathy dictate her lessons, which are selected as much to please as to instruct. Names, phrases, short sentences are repeated till they become familiar. Habit begins to contribute its aid, and make that easy which at first was difficult. The nerves and muscles are increasing in energy and responsiveness to thought, which is itself growing. Domestic amusements, objects and employments, but chiefly the preparation of food and its enjoyment, are her class book, for everything is seen and touched, handled and named in closest mental relations, realized and verified by many repetitions. Grammatical definitions do not trouble him. He is collecting the materials out of which, one day, grammar will be framed and illustrated. By binding word to word and sentence to sentence in close association he is learning to think the thoughts in their logical connection, which will enable him one day to analyse and synthesize whatever of practical truths he may have to examine. She knows the meaning of the saying, "Nothing too much," and will not weary him with long, dry lessons, but tell

him little tales in simplest phrase, sing him sweet ditties, astonish him with the wonderful, or delight him with the good and the beautiful. He dwells upon the scenes, and repeats the beautiful words till they are his own and laid up for similar uses. This is the mother's method of teaching language.

X 9. LANGUAGE.—In order to prevent obscurity in the use of this term, some explanations and illustrations are necessary. Generally, language and speech are used as synonymous, but this is both incorrect and misleading. Language is much more.

A. It may be defined as whatever expresses and makes known our thoughts to others. Evidently, its knowledge must be common to both parties, else it has no meaning for one of them. Our ideas are mental pictures, and have no real existence of their own apart from the recipient mind. They are derived from sensations; these form perceptions which are again moulded into concepts by mental action. We may or may not have names for them, but we are in the habit of treating them as real representations of the objects which excited the sensations.

B. But the moment we wish to make others acquainted with our ideas, we require a language or some form of giving outward or sensible expression to them, as they are purely mental and invisible. Whatever this form may be, if it answers our purpose so that the same ideas are reproduced in their minds as in ours, this is language. Language, therefore, embraces whatever expresses our thoughts intelligibly to others, or theirs to us. Or in other words, a system of commonly accepted signs by which all we think can be communicated to others.

C. Now as ideas have no real existence of their own, but are purely representative, so their expression has no real existence as ideas, but consists only of names, signs and symbols, whose respective claims to recognition and use depend absolutely on their fitness for the purpose. They are all artificial expedients, for none of them can show reason why it should be exclusively employed for the purpose on account of some innate relation and connection it has

with the ideas themselves. Were this so, the deaf and dumb would speak without a teacher.

D. But these forms of expression differ so much from one another that they require classification, as if they constituted different languages instead of being different forms of the one language. They are:—

1st. Expression, because it is natural, direct, and generally understood.

2nd. Mimic gestures or signs, and pantomime.

3rd. Speech or articulated words.

4th. Ideographs, phonetic signs, or alphabets and pictures.

10. **EXPRESSION.**—Those who know nothing of our methods have often inquired, But how do you begin? For they cannot imagine how we can get a deaf, speechless, child to make the first attempts to speak. Our reply might be, by **EXPRESSION**, and a few natural gestures. But these need explanation.

1st. Whatever our educational means and methods may be, we cannot do without Expression. As already seen, it is the simplest, most direct and best understood of all our modes of communicating a class of our thoughts. It is the language of the emotions and affections. But these might be called vibrations of the material arising out of mental states. Much of what is good or evil, lovable or disagreeable, stirs the emotions, which, by their nervous connections, take outward form in expression. Apart from all teaching, most children, but specially deaf-mutes, soon discover the value of expression as the way to our hearts, and always avail themselves of it when they know how we are disposed towards them. As their affections and dispositions are like our own, the state of our feelings is quickly interpreted. This is the secret power about which Bacon speaks, and by which we may attract, control, and animate these afflicted children. Their ears are closed but their hearts are open to the eye which brings good tidings. It was said of the late Dr. Gallaudet that "he could discourse with his pupils by looks alone." But I do not mean the looks of an actor, which are often used to conceal or simulate, rather than reveal, but of a benevolent and sympathetic soul.

Expression, by Darwin, is defined to be—

"1st. The principle of serviceable associated habits.

"2nd. The principle of antitheses.

"3rd. The principle of actions due to the constitution of the nervous system, independently, at first, of the will and independently, to a certain extent, of habit." Or, we are pleased with what suits us, displeased with what we think unsuitable or threatens our hurt, and in these and the like there is a corresponding nervous action which is involuntary in infants.

Professor Bain says, "I look upon the expression so called as part and parcel of the feeling. I believe it to be a general law of the mind that along with the fact of inward feeling or consciousness there is a diffusive action or excitement over the bodily members." And Sully says, "These movements of expression are partly instinctive, partly acquired. Crying, smiling, frowning, etc., are instinctive, appearing uniformly in all cases very early in life. Other movements, as clenching the fists, are largely, if not altogether instinctive. In certain cases imitation—(conscious or unconscious)—plays a part. In this way we acquire, to some extent at least, the actions expressive of moral displeasure—(scolding, etc.)—ennui, and so forth. In some cases the will distinctly cooperates in the acquisition of so-called expressive movements, as in adopting the customary look, tone of voice and gesture of polite life." But we are chiefly interested in natural rather than artificial expression for educational uses. Dr. F. Müller says "The completely different expression of the features in different passions shows that, according to the kind of feeling excited, entirely different groups of the fibres of the facial nerve are acted on. Of the cause of this we are quite ignorant."—"Elements of Physiology," Vol. ii., p. 934. These seem to be its principal elements.

1st. There is a class of mental phenomena which are followed by feelings or emotions, more or less intense.

2nd. These emotions have an associated nervous connection, by which they find external manifestation.

3rd. But as these emotions spring from very divergent and often conflicting interests, there is also a corresponding difference in the nerves specially used to make them known.

The motive power is primarily mental, but of that order which deeply affects our moral and material constitution, and therefore stirs it into an activity, which finds its outcome in expression. Animals also give strong expression to their feelings, but in man it is at once mental, moral, spiritual, and material, so as to reflect his nobler, fuller nature. Deaf-mutes, most of all, consult the eye, to learn how we feel towards them, simply because it most fully expresses our emotions, and if they learn that we love them, pity them, and want to help them, they will yield to our wishes, and bestir themselves to do their best. But if our work is a hard and disagreeable task, and we regard them with something akin to dislike, then they will find it out to the loss of our most potent moral power to act upon them mentally. Soul is the highest in us, and it must unite with the highest in them, else the lowest will not be at our disposal. Let expression, then, lead the way.

11. MIMIC GESTURES, SIGNS, and PANTOMIME are all akin, for they are attempts to represent our pictorial ideas by motions and postures, intended to figure or reproduce them in a pictorial form, so as to suggest them to other minds. When well executed they are very expressive and pleasing. All nations resort to their use, but chiefly the Indians of America; and they are the natural resource of the deaf and dumb, in the absence of hearing and speech.

A. A mimic gesture is a simple effort, by means of descriptive motions, to express our conception of some object or action. It is also called a sign, but

B. Signs, as a term, has been so much employed to represent the language of gestures that it has lost its specific meaning, and become ambiguous. When a mimic gesture is oft repeated, and is an accepted form of expression, like a word, then it is a sign, as used and understood by all the teachers of deaf-mutes till de l'Épée strove to develop signs into an artificial language, corresponding in every respect to the vernacular. But, in order to accomplish this, he was compelled to resort to a class of motions which were suggestives or mnemonics rather than natural signs, and these were called systematic or artificial signs; but, strictly speaking, they are not mimic gestures or signs, but

motions designed to remind the learner of all the natural signs which unite in the concepts or names with which they are associated.

12. (C.) Pantomime is a representation of all sorts of actions and characters, independently of speech. It is an attempt to reproduce life in action and events, as an artist strives to do by his drawings or sculptures, or an actor by speech and action. It is pre-eminently pictorial, and therefore so far language, and includes expression and mimic gestures; but it is never used in ordinary intercourse, nor has it ever been of much value in education.

The Greeks and Romans cultivated it successfully, and it filled a place second only to that of the drama, but it does not appear that they ever practically employed it in the education of deaf-mutes or as a substitute for spoken language, except to barbarians who were ignorant of Latin. The painter, actor, and orator, all resort, in their manner, to a similar mode of expressing the emotions, the scenes and the events of life, for each resorts to a pictorial representation, either fixed, movable, or mimic in gesture. His end is to make his conceptions more vivid, real and impressive, than mere words could do. Painting surpasses gestures in form and colour, but it ever remains the same. Gestures surpass painting in animation and movement, but they are indefinite and limited. Pantomime surpasses both, because it unites them in a succession of tableaux, but it never can be developed into a language which will express all our thoughts, serve the highest mental uses, or have the facility necessary to the free intercourse of rational beings. This remains for—

13. (D.) SPEECH alone. Of all expedients to express thought speech fills the highest place. Homer calls it "the language of gods and men," and spoken words are "winged" because they enter so speedily into the mind. Some would object to their being called artificial and arbitrary, because they claim for them the same origin as mimic gestures, or attempts to reproduce by the voice the sounds associated with objects as heard in nature. Well, it may be so, but now they are no longer suggestive, save in a few instances, of such an origin. They are not pictorial. They do not crowd the mind with

second thoughts, but directly suggest the objects or relations of which they are only the names. Like the electric current which though unseen writes the words, so they carry to the mind the suggestives only of the things spoken of. Their simplicity and capability of infinite combinations permit sounds to be associated with every form of thought; and then we remember them, think in them, and express our every fancy in them, without perceiving the essential part they play in all. Writing, too, owes nearly all its value, not to being pictorial, but as signs of sounds, so that when we see the characters the sounds are revived, and when we read them, as in a letter, the words seem spoken to us by the friend who wrote them.

14. (E.) ALPHABET.—But out of these alphabetic characters a language may be formed, not as signs of sounds nor pictures of objects, but as silently representing to the eye the names of the objects with which they are associated. Their arrangement and their phonetic place as signs of all the sounds of the language enable us to teach all the names of things by them to deaf-mutes, who, knowing nothing of their sounds, learn to write or spell them till they suggest the objects which again suggest the letters. If blocked out and movable, under the touch of the deaf, dumb, and blind, they may be the only means by which the mind can be reached with words of light and life, as in Laura Bridgman, and any other suitable forms would answer the same purpose, but as deaf-mutes generally can see, it is much better for them to use the writing and printing known to all.

The manual alphabet, strictly speaking, is only another form of presenting the letters of the alphabet to the eye, and is therefore only a substitute for the written or printed one. But it has the advantage of being strikingly apparent, rapid in execution, and disappearing to the eye, as sound does to the ear, as soon as its function is discharged.

15. (F.) IDEOGRAPHS, such as are used by the Chinese, were many of them at first outline pictures, but in process of time, and from much use, became signs, not of sounds, but of the whole conception expressed by the picture. Hence their number and diversity of form. Very probably, like our letters, they have ceased to suggest their pictorial origin, and

bring the sentences only to remembrance. Disconnected from sound, in their separate parts, whether as phonetic letters or ideographs, their use is artificial, and sight being the only sense by which they are perceived, they might be made the elements of a silent system in the education of deaf-mutes.

16. (G.) LIP-READING.—In a similar manner the movements of the organs in speaking may be made a means of expressing thought to those who do not hear. They might be called an alphabet formed of the different visible motions of the lips, cheeks, and jaws, arising from the action of the organs in speaking. This might be done to some extent without learning articulate speech, but much more completely when associated with the articulation of the sounds. They are evidently only signs of sounds known by touch, and are as destitute as letters of any resemblance to them. This is called Lip-Reading. The eye interprets them, and they are silent, but association recalls the muscular movements of the organs which produced them.

All these are forms of language, each more or less expressive, and most valuable in its proper place, but none of them comparable to speech. It has survived, because the fittest, but not to their total exclusion. Expression, mimic gestures, pantomime, paintings, letters and motions are all employed. But speech is the chief, and the others are added to give grace, vividness, force, pathos, or impressiveness to its utterances, or to repeat it when it cannot be heard. A great artist talks to us in his works by interpreting nature and life, as imagined by himself. The language of humanity is living, active, spiritual, subjecting the material to its uses, not flowing like water from lips of marble, but replete with mental and moral vivacity.

But suppose any one of these is alone used to express thought, then, by the action of the same law which makes sound the *couche* or sense form of all our words, as mentally employed, so it operates to make signs, or writing, or the manual alphabet, or ideographs the sense form of thought expressed exclusively in them. We think in signs, or in speech, or in writing, or in ideographs, as we happen to have learned the language in any one of them. This is funda-

mental, and will materially aid him who apprehends it clearly to form a correct opinion on the radical difference between signs and speech in teaching language.

17. But now let us suppose that one of the senses, as hearing, is either wanting or very imperfect, the conditions are greatly changed, for the exclusion of all that sound conveys to a hearing ear throws the burden of finding out what others mean by looks and gestures on sight and touch. There is no naming of things, no sound-signs of them, but only objects and their motions. But this is not the whole loss. Speech is prompted and lives by hearing, and in its absence, as the organs are never called into action for this special use, they become inert, and if allowed to remain so for years, can with great difficulty be invigorated. And still more so the brain suffers from the inaction of the sense nerves of hearing, and their associated influences. There may be a hoarded tendency to speak, but it depends on hearing for its prompting and exercise. It is a twin which perishes with its brother. The state of such a deaf-mute is deplorable, but hardly conceivable by us who hear. A prison with solitary confinement is a dreadful place, but even there we could hear our own voices and remember the familiar words of joy and love we had so often heard; but to be a deaf-mute is still worse, for it is a mental imprisonment in perpetual silence, from which the knowledge and sympathy which might make it tolerable are almost excluded. Born in the midst of the best that thought and toil have done to increase knowledge, enrich and beautify life, his state is worse than that of the children of a savage. But the loss cannot be estimated. 4

18. ORIGIN OF SIGNS.—Now what are his resources? The deaf-mute sees about him the members of the family. Their lips move in vain to him. But they act and there is meaning in the action. He begins to perceive this, and chiefly when it ministers to his own wants. He can cry and struggle and finds that it brings mother or nurse quickly to his side. Looks, too, begin to have a meaning for him, and he soon learns to distinguish between them as they express joy or sadness, sympathy or neglect. There is action in all that affects his own interests or promotes his happiness. He

knows the hand is lifted to the mouth and the jaws move in eating ; that the feet are moved in walking, that the head is laid on the pillow when going to rest, that he is lifted in the arms of mother or nurse when she takes him out of doors, and instinctively he resorts to a mimic reproduction of these movements when he wishes any of them for himself ; and if he succeeds he is as glad as a child who has spoken his first word. Others no doubt assist him in learning these mimic gestures, but he is the chief inventor. Now these are the primary elements of the language of signs, which many maintain is the only language for the education of deaf-mutes, because it is natural to them. The precise difference between a hearing and a deaf child in respect to language then is this, that the former hears it spoken by others and learns it by imitating them, but the latter does not hear it and as a substitute copies the forms and motions he sees about him and invents his own language of gestures.

19. The intellectual capabilities of deaf-mutes, may be as great, or even greater, than those of a hearing child ; but as they are chiefly dependent on the senses of sight and touch to stimulate them into activity, these provide very little mental food for years, compared with what hearing would have done. Their progress is slow and halting, instead of rapid and continuous. Mimic gestures are a miserable substitute for the variety and expressiveness of speech. In the two years, of which it is said, "that in them we learn more of language than in all our after years," he learns nothing. The instincts, tendencies, and impulses roused and cherished by our first mental contact with life and nature, which teach us so much of language, without effort, study or task, knowledge of others and of ourselves, are almost lost to him, and he becomes familiar with, perhaps tired of objects, before he learns their names or their uses. The few gestures he employs are known only to some. He wants others to understand him as he sees hearing children are understood when they speak, but he fails. Again he strives to invent new signs, but they are either not apprehended, or attention is lacking, so that he feels vexed, and disappointed, or resorts to passion to obtain what a word would have secured. His temper suffers, he resigns

himself to apathy, and begins to look stupid. Thus, instead of development there is deterioration, instead of growth atrophy. These are the years in which deaf-mutes suffer most, from the arrest which is put upon the mental, moral and physical forces, whose activity ought to be at their greatest, and for which a large allowance ought to be made in the time allotted to their education.

20. But now in addition to all this, let us suppose that some theorist or slave to system warned the friends of the infant deaf-mute not to permit him the use of gestures or to resort to them in communicating with him, so that this door also is closed against him, and cries, sighs, tears and struggles are all that remain by which to tell what he feels or wishes. What would inevitably be the effects? Stagnation and atrophy, for nearly all cerebral activity would cease, all the senses would be benumbed for want of intelligent exercise, and the poor prisoner would look out on the universe of light and truth, with eyes that indeed reflected it, but saw no more than those of an animal. He is treated like a beast, and he becomes little better. Had nature been permitted to have her way, his mimic gestures would have saved him from much of this and left him a few of the minor enjoyments of thought and feeling. Surely not to permit this would be a great injustice and a lasting evil. It is not science, it is ignorance of the primary laws of life which leads anyone to issue such a veto.

21. Can anything better be done for deaf-mutes at this early age? Some reply that they ought to be taught to speak; others that they might learn enough of lip-reading to know many of the common things of life; others, again, like Dalgarno, that they might be taught, by words printed in large letters, to associate them with their objects, and, by oft repeating, fix them in the memory. "I doubt not," he says, "but the words hand, foot, dog, cat, hat, written fair, and as often presented to the child's eye, pointing from the words to the things, and vice versa, as the blind child hears them spoken, would be known and remembered as soon by the one as the other." This is ingenious, but it assumes a degree of attention and power of association possessed by few children at such an early age as one or two.

Then he forgets the difference between sounds falling distinctively and successively on the ear and mere letters grouped together, and difficult to distinguish or write. Children who can hear spend a long time over their letters at a riper age, though sound is assisting. The use of the manual alphabet is open to the same objections. If the child could associate it with written or printed letters so as to write the one when the other is formed by the fingers, or, when the letter is pointed to, make its correspondent on the fingers, he might learn a number of names, but till then he will make little progress.

22. Can deaf children between one and three be taught to speak, write, read the lips and learn the use of words? No instance is recorded or reported of which we have ever read or heard. But if any one has succeeded then it ought not to be concealed, for to know it might lead other teachers to make the attempt. But if after careful and patient trial it has failed in every instance, then theories are of little value in the face of such evidence. However there is no need to leave deaf-mutes to themselves all these pregnant years. They have senses and they can be educated by play and exercise. The Kinder-Garten supplies much which might be borrowed.

On this point Mr. Schöntheil, an experienced and distinguished teacher, says: "The best way, therefore, to make the deaf use speech as their vernacular is to my mind, not to 'teach them to speak,' but 'to give them our vernacular.' And when I am asked how this is to be effected, I answer, Cultivate lip-reading! This ever was, is, and always will be, my watchword and my war-cry. Get the keen eyes of the deaf by unintermittent practice to distinguish the rapid and minute movements in those outward organs by which human speech is moulded into being; get them habitually to hang upon your lips, and you have broken the spell which keeps the deaf tongue tied; you have paved the way which will assuredly lead you to the desired goal of making speech the vernacular of the deaf." The remainder of this excellent paper is taken up with the practical application of this method.—("Quarterly Review," January, 1888.) This affects lip-reading, and is deserving of all the attention the

author claims for it. No doubt familiarity with the motions of the lips may lead, as signs do, to a knowledge of some of the simpler words, while it fixes attention on the organs to learn what is said, but it lacks two important elements: there is no intuitive perception of the sounds which create these motions, so that they are never associated with speech; and then there is little to aid in distinguishing the labial or palatal articulations from one another and which in teaching lip-reading is our greatest difficulty.

23. BY WHAT METHOD SHOULD THEY BE TAUGHT?—The problem for solution, in respect to deaf-mutes is—How can they be best instructed in the language of their country and prepared for the social pleasures, employments and duties of life? In their case everything depends on the answer, for their condition is exceptional. In a hearing child, domestic and social life supply a partial education, but in a deaf child little or none. His teachers and their methods must supply the loss and complete the work. They are therefore bound to prove that their method is the best, for if not the loss must be infinitely greater than that of a hearing child, who never enters a school. A variety of solutions has been given :

1st. By systematic signs associated with writing, the Manual Alphabet and drawing. This is called the Sign System, and till the last few years was almost exclusively taught in France, Italy, Spain, England, America, and other countries. It dates from the time of the Abbé de l'Épée.

2nd. By writing only, or writing and the Manual Alphabet. These are directly associated with the objects, and take the place of sound in the hearing.

3rd. By speech taught artificially, which can be directly associated with objects, and fill the same place in mental use as sound does from hearing. This is called the Oral System.

4th. By combining the best parts of the Oral and Sign Systems. This is the Combined System. All others are only modifications of these methods.

THE SYSTEMS DESCRIBED.—Of the Sign System a full exposition will be given on the part of the work exclusively devoted to it. At present, to avoid obscurity and indicate

the chief points of difference between it and the Oral System, a few things must be premised.

24. SIGNS, as already explained, are mimic gestures or movements copied by deaf-mutes, from what they observe in those about them. They are, therefore, like airy pictures intended to suggest the objects to others, and fill the place which their names would have done could they have spoken. As such they are substitutes for speech and rudiments of a language. These are Natural signs, and they were used by nearly all the old teachers, as Bonet, Wallis, Pereira, and others, in association with speech and writing. But when De l'Épée used them independently of speech, he found them so defective in teaching that he set about their development by economising gesture, laying hold of faint resemblances between the mental and material, and then by the invention of purely arbitrary motions associated with Natural signs as their abstracts, intended to suggest but not to describe. It was a splendid attempt on his part to create a language of motion to correspond with the refined and artificial vernacular of France. Sicard and Babian followed on the same lines, and toiled in vain to construct a Dictionary of signs as complete as that of the Academy. But this introduction of systematic signs was a departure from their principle and a confession of their insufficiency. Signs are mimic and nothing more. Whatever is added is only a mnemonic. On this point Degerando says :—

“But it is evident that the language of action in proportion as it advances (on the line of arbitrary invention) will inevitably and gradually lose this character of analogy which belonged to its primitive condition. The more it would borrow the properties of an artificial language, the more it would be constrained like them to have recourse to arbitrary conventions. If anything remained to it of the analogy, which once made it a kind of painting and self-interpreting, it would shed only a feeble ray, much more likely to lead astray than to guide the intelligence to the sense of the signs ; and this would be to propose an insoluble and contradictory problem by pretending to preserve to the language of action the character which is founded on imitation, and to secure for it, at the same time, the prerogatives for which conventional languages are indebted to the art which governed their formation.”—(Vol. I., p. 233.)

The opinion of the late Mr. Charles Baker, head master of the Yorkshire Institution for Deaf-mutes, himself a distinguished sign teacher, may be

added to this of Degerando. Speaking of signs, he says, "This is the language which is natural to the deaf, and which they always use in their communications with each other. But it is not desirable that they should use this language to the exclusion of that of their country; its poverty is obvious, and it is particularly undesirable to cultivate it, as the pupils, on leaving school, are to mix with persons who possess a copious phraseology. It is impossible to impart riches, purity, and clearness to a language which is calculated for the expression only of the ordinary emotions and tangible things; which has no inflections, and which is wanting in the thousand modifications which give shade and colour to the expression of thought. The high intellectual cultivation requisite to soften the asperities of the sign-language, to impart to it the system and perfection of an artificial tongue, and thus to elevate it to the rank of our modern languages, will probably never be attained by a sufficient number of associated and highly endowed deaf persons; and, if done, it would be a labour of no benefit, even to the deaf and dumb, for it would be as difficult of attainment as any modern language, and much of its beauty would have to be transmitted to future generations by memory and tradition.

"The Abbé de l'Épée and Sicard fell into a great error when they endeavoured to reduce the language of signs to a system. They aimed at the production of a vocabulary of signs equal in extent to a spoken language, forgetting that such signs would be as meaningless to their pupils, without the ideas they represented, as the words they were intended to supplant, and that they were imposing on their pupils the task of acquiring two languages instead of one. Their notion evidently was that, by supplying the deaf and dumb with such a vehicle for the expression of thought, the process of imparting instruction would be reduced to nothing more than a translation of the language of signs into that of speech; they did not sufficiently keep in mind how limited was the stock of their pupils' ideas, and that their intellectual powers were to be strengthened and informed before the refined language they were preparing for them could be understood and applied to useful purposes. Teachers of the deaf and dumb of the present day are aware that sentences correctly constructed may be conveyed, by the means of arbitrary signs, to their pupils, and written by them, not a word of which shall be more understood by them than the transcripts of a foreign tongue, mechanically copied by one to whom that tongue is unknown."—"The first publication of the Central Society of Education."

And further, as arbitrary signs do not stand in the same logical relation to one another, but generally in an inverted order, writing and the manual alphabet were resorted to as necessary to restore the construction, and converse with those who used the vernacular. This perpetual mental transposition of the order increased the labour of learning and the liability to mistakes in composition. The manual alphabet is also founded on resemblance, and was a fine invention to re-

produce the letters of the alphabet on the fingers. But it has no more relation to signs than the written alphabet.

On principle there is no valid objection to the manual alphabet. It is only a substitute for writing. Its chief value lies in its greater convenience and facility. Oral teachers object to it because it occupies the time and diverts the attention which ought to be given to speaking and lip-reading. But, on the other hand it ought to be said that natural signs have a strong claim to recognition in the education of deaf-mutes. They are already to some extent acquainted with them when they enter school. Nature was their teacher in the absence of hearing, and they are, therefore, much more germane to their habits and proclivities. They introduce no difficult and distasteful method of teaching language, for they advance on the same lines. There is also action, animation and interest in signs which are all congenial to the hearts of children. They do not impose such self-denial and painful effort on the teacher but give him a fine opportunity, if he is anything of an actor, "to play many parts" before delighted spectators. They may not, it is true, be found equal to spoken language for the higher culture of the deaf, yet they provide them with enough elementary knowledge to fit them for life's duties and services. Such are the reasons assigned by many for their support of sign rather than oral teaching.

25. **THE SILENT, OR LITERAL SYSTEM**, is confined almost exclusively to writing. Some admit the manual alphabet. Signs are excluded and there is nothing between the names as written and the objects to which they belong. Their association is, therefore, direct, and writing fills the same place as sound in relation to thought. We think in sound, in signs or in letters as we have learned language. Dalgarno was in favour of this method, but he added a manual alphabet. Compared with signs it has the advantage in using only the vernacular from the first, and no translation or conversion is required, but thought follows in the usual order of the words. It is somewhat difficult to imagine a form of mental reproduction in which letters only are the signs of our conceptions, as if we were ever reading in a book. Once in a morbid state this phenomenon occurred to the author, but it passed away with returning

health. No instance of any one constantly engaged in writing having fallen into such a habit has been reported. Even in writing sound dictates the letters, and would, therefore, prevent the same close association as in the silent system. As a psychological question it is worth the attention of our metaphysicians as to whether letters, signs, or sounds are most facile and best adapted to the requirements of thought. Letters from their forms, number, and grouping, would seem most difficult to reproduce as the vehicle of thought, for they are isolated as written, the syllable having no place, nor the rhythmic relation of action, so that they seem cumbrous and artificial, a burden more than a help. Signs seem more inviting, for we can imagine mimic motions with some facility, but to form them into sentences must be a habit acquired with difficulty. But sound somehow does not resemble either signs or letters, for it introduces neither shape nor motion, but takes the thought into itself, so that they seem connate. In the use of signs there are two languages, as Tarra says, "one behind another." Sound cannot be portrayed or reduced to any imaginary shape. It is felt but not seen, like the objects of vision, and this gives a unity to the language of speech which makes it pre-eminently adapted to the expression of thought and the mental use of words.

26. THE ORAL SYSTEM, as its name implies, when strictly applied makes speech artificially taught the exclusive means of deaf-mute education in language. Under it they are treated as possessing the organs of speech, capable of using them with proper instruction as if they heard, and of being brought into an intuitive relation to speech as the instrument of thought, so that mentally and socially, they can think, speak and act like those in possession of all their senses.

And further, oral teaching furnishes the learner with language, not in an imperfect and unsettled form, but in its most highly cultured, so that he can think, speak and write, in logical order, and possess himself, without the mental labour and confusion which translating into signs involves, of the knowledge floating in his social grade and in the literature of his country.

All languages by culture grow artificial, from the necessities of reason applied to arts and sciences as well as to literature.

At first they were largely pictorial, and sound was of more importance than sense. Of these some remains are still to be found in our oldest literature. But in process of time, as reason grew stronger and life more prosaic, new names, forms and relations of ideas were introduced, and as they were proved to be more accurate, the pictorial and pantomimic faded away, except some far off echoes which none but the poet cares to reproduce. This is an immense advantage to clear logical thinking, however the rhythm of motion and sound may have suffered by the change.

But to return to signs would be to withhold from the learner all that culture has done for our artificial language, and make him think like a savage.

In a similar manner has writing, the sister of speech, been developed. At first it consisted solely of rude outline drawings of battles and other memorable events, such as the Mexicans and Indians used. Very probably the hieroglyphs of the Egyptians came from such, but afterwards, yielding to the exigencies of thought and language, some were made phonetic, not by characters, but by names beginning with the sounds. But these again were compelled to yield to life and literature. A selection was made of the objects, or their first signs used for the phonetic purpose, and these became the letters of an alphabet which was the parent of our own.

"It seems in effect that it was in the country of San, with its mixed population, that the writing called Phœnician or Semitic was invented. The necessity for transcribing the Semitic names into Egyptian impelled them to phonetism; that is to say, to make a choice among the hieroglyphic characters, which they robbed of their meaning, to leave them only their value as signs of sounds. It is exactly what the Chinese Buddhists did to translate the Sanscrit words, and also what the Japanese, the Coreans and Anamites did by selecting from the infinite variety of the Chinese characters very reduced alphabets. So the Hyksos pushed the law of alphabetic writing, and their choice of twenty-two letters, made with the greatest appreciation of Semitic phonation, has remained a definite fact."

Professor Maspero says that "phonetism was long in existence among the Egyptians. The work of the Semites consisted: 1st. In suppressing the ideographic part, and the syllabic consonants of the words. 2nd. In choosing for each sound one sign only in place of the Egyptian homophones (like sounds in the names of objects). It is rather a systematisation of the principle of phonetism than a discovery of the principle." Or, instead of having many objects to represent it, with the same sound in

their names, one of them was selected and made its permanent phonetic sign. If the consonant never stood alone, but only as a part of a syllable, then in copying them, the associated vowel was understood with them.

"Dominated by the use of Egyptian hieroglyphics, which took account specially of articulation, they wrote but the consonants, an insignificant deficiency from a Semitic point of view, but a capital one, for the alphabet of twenty-two letters was adopted by other races. The Greeks a thousand years later supplied this deficiency by making vowels of the Semitic aspirates, and thus it has constituted the writing adopted by all nations. Without doubt Hebron knew the invention of the Hittites of San, adopted it, and had writing from a very remote age. It is probable that the Moabites and Israelites there learned it, unless we prefer to suppose they borrowed it directly from San. An hypothesis which we cannot object to as impossible." (R.) Yes, and quite as reasonable to suppose that it originated with the Hebrews in Goshen, as with the Hyksos.

27. Unfortunately, the Chinese never advanced beyond the primary stage. Their alphabet is not phonetic, but pictorial. In fact, they have no alphabet, but eight hundred pictures, like Mr. Hill's ideographs, by which a whole sentence or phrase is expressed. These, however, have lost their pictorial character, unless to the eyes of the learned. The Japanese, however, have burst the net, and are now using the Roman alphabet.

Now, to make signs a language would be like going back to these primitive pictures, and foregoing all the advantages of a phonetic alphabet. Language and the alphabet are, therefore, of a similar origin, and the characters in the one are the visible signs of the invisible sounds in the other. Signs have no alphabet. Oral teaching restores the true relation of speech to writing, and therefore ought, if possible, to be practised.

The order of the signs is arbitrary and changeful; any attempt to assimilate them to spoken language would destroy their life, and therefore experienced masters declare that signs never can be made to conform to the syntax of an artificial language. And then, from the strong tendency to seize first on whatever will produce pictorial effect, the connecting particles, the secondary tenses of the verb, and all complex relations expressed by conjunctions and prepositions, are either dropped altogether or very imperfectly used. This leads to an unceasing conflict between the two forms of construction, very much to the disadvantage of speech, for the

deaf-mute imagines he enjoys much greater liberty of thought in his language of signs than in ours of speech. An artificial language binds thought to some definite end by its very structure. But a natural leaves it to wander at will in the realms of fancy. Degerando on this point writes forcibly.

“Artificial languages,” he says, “have rendered immense services to human intelligence, for it is enough to say that they have introduced order in the objects of our knowledge, and in our proper ideas. Do we not perceive every day for ourselves, that when from confusion and chaos—a mass of objects united by chance—we would deduce order, we are constrained to imagine certain signs to distinguish them, to separate them, and to make them accessible to study by a definite distribution? For order is the light of intelligence; it is by order that intelligence knows, creates, converses, and executes; it is by order that it reigns.”—Vol. I, p. 178.

Signs refuse to submit to this order, but the language of speech is its production, and therefore it must be superior to signs.

And then there is no literature of signs for the special use of deaf-mutes. The attempt has never been made to construct it, for there is no fixed vocabulary of signs, and, as they consist of mimic gestures, no satisfactory form of representing them can be devised. Should an educated deaf-mute desire to enjoy the literature of his country, he must study the artificial language in which it is written, and abandon his signs altogether. Oral teaching begins and ends with the language of literature and society, and therefore is the best introduction to its study. Such are the principal arguments in support of the oral system, as the best instrument of deaf-mute education.

28. THE COMBINED SYSTEM is eclectic in principle, for it proposes to select and unite the best parts of the Sign and Oral Systems into something like consistency. In fact it is a sort of compromise between opposing claims, but virtually a declaration of failure on both sides, and therefore the attempt is made to succeed by uniting them. Each system, it is said, contains some excellent elements,¹ and their union may accomplish what independently is impossible. But as yet no attempt has been ²made to reduce this system to logical consistency, or completeness, or even to specify the precise parts of the systems from which the selection is

made. Surely this is due to those who are asked to abandon what they are persuaded is well founded and consistent! And they seek for information on such points as these: Are signs to be retained? If so, what signs? natural or systematic? for a limited part, or for the whole course? As the mother tongue, or mental matrix, into which all thought is to be cast, or dropped when speech has been sufficiently mastered for direct association with the objects of thought? Are writing and the manual alphabet to fill primary places, as in the silent system, and are lip-reading and speech to be the final form of intercourse between master and scholar; or, are signs, the manual alphabet, speaking and lip-reading to supplement one another? All these press for answers before the combined method can take its place or be proposed for adoption. On one point oral teachers insist tenaciously, that signs, either natural or systematic, shall not be made the basis and form which an artificial language shall be compelled to submit to, for this would be the surrender of their fundamental principle, and the one instrument, by whose use they can alone hope to give deaf-mutes the mental and moral education of their age and nation. Signs, or spoken words are not indifferent expedients to be employed or abandoned at pleasure. They are each master principles, which shape and determine the form in which thought will ever be mentally expressed; and the one which has the priority, till the elements of language are learned, will keep the field and finally exclude the other. Compromise is hardly possible between them, for they are fundamentally opposed in principle and structure. Better to let the one or the other have ample time and place to do its best, and not attempt to amalgamate them. Oral teachers do not rest the claims of their system alone on speaking and lip-reading perfectly, but on the superiority of speech as an educational agent. It is nevertheless very desirable that their scholars should speak and read well for social and business convenience, and they hope, by a profounder study of the organs of speech and the laws of sound, one day to attain to such a result; but the personal claims of deaf-mutes are paramount to such utilitarian ends because of the magnitude of their privations. Their social relations are secondary. But a youth well trained under the

oral system can avail himself of either writing or the manual alphabet, if he cannot make himself understood by speech, so that in this respect he is no worse off than if he had been taught by signs only.

THE ORAL SYSTEM.

29. PREPARATORY TRAINING OF THE SENSES.—In deaf-mutes the organs of speech are usually perfect. They are silent because the sense which would have prompted their exercise is absent. Some other mode of stimulating them must be found. But as there is no access to the mind unless by the senses, the place of hearing must be supplied by making those which remain as far as possible its substitutes. Strictly speaking, there can be no substitute for hearing, in the matter of sound, but sight and touch can discharge its functions so far as to suggest and regulate speech till it seems as if they heard. But this cannot be done unless by careful culture, for there is no recorded instance of one born deaf who ever came to speak, unless orally instructed. It was for this reason that the ancients thought that there was such an intimate and natural connection between the sense of hearing and the organs of speech, that the one could not suffer, and the others escape. This is now exploded as a popular error, but the fact remains which led to it, that speech never comes naturally without hearing.

Now to do what nature has failed to do must be a difficult task, for what is not with nature seems to be against her, and the demands on the capacity, temper and docility of the scholar, as well as the skill and patience of the teacher are greatly increased by having to lead nature herself into a new path. Learning to speak, when we hear, develops attention, observation, and imitation, from the pleasure and satisfaction it affords. We are ready to give ear, but the deaf-mute is deficient in all these, and they must be supplied by appropriate artificial training, else the teacher will meet with difficulties and disappointments on the very threshold of the work, for which he is wholly unprepared.

Lord Bacon—in his *Nov. Org.*—calls the aids of the senses the *Lamp* giving immediate information, and adds, “They are such as assist the

senses, for since every interpretation sets out from the senses, and leads by a regular fixed and well-established road from the perceptions of the senses to those of the understanding (which are true notions and axioms) it necessarily follows, that in proportion as the representatives or ministerings of the senses are more abundant and accurate, everything else must be more easy and successful." He is here referring to such artificial aids as the microscope, telescope, sextant, etc., by which the range and accuracy of vision is vastly extended, both in respect of the great and the small; and therefore is still more applicable to the culture of the senses themselves, that observation, whether direct or instrumental, may be more accurate.

30. The senses are, therefore, our instruments, and mental culture our end. In deaf-mutes they are absolute masters now and the mind is their slave, but we will use them to liberate and restore the rightful ruler. But what are these senses? They are special organs so fitted and adapted that the sensations borne by them report to the mind the qualities of the objects which affect them directly or mediately. These are called sensations, and their mental reception perceptions. They are, therefore, so many approaches used by appointed messengers who report on what they have found. Each has its own special office which cannot be filled by another. The ear cannot see, nor the eye hear, nor touch do either. Only five in number, yet they seem capable of putting us in possession of all that is most important of the qualities of matter. The lamps, as Bacon calls them, that we have invented increase the range of the senses, so that the infinitely great and small are revealed to us by them. But they have added no new sense, and only strengthened the old. But the senses are only special parts of a complete system of nerves and muscles which invest the whole frame, so that every part is placed in intimate communication with the brain, which is at once their terminus and their aggregation, or, as it is called, the sensorium.

The muscles are the strong bands which bind the many members into one, and through their forces, which the nerves bring into action, give free expression to life in its manifold relations and activities.

31. The NERVES are usually classified as motor and

sensor; the former bear the motive power from the brain to the extremities, and the latter the impressions made upon the senses by the qualities of matter, to which they are adapted, to the brain. Both of these classes are to a great extent subject to the will, and are therefore named Voluntary, to distinguish them from another class which belongs to the organic functions of physical life and the emotions. These are named Involuntary, because they act independently of the will. The motor and sensor nerves have their centres in the brain, which is the seat of all our sensations and the organ of the mind. It is with these and the senses which are their higher development that we have most to do in the work of Preparatory Oral Education. Their functions ought to be carefully studied and their action well understood, for the mind cannot be reached or its full mastery over them established till they are thoroughly cultured. As "the senses supply the material for thoughts" (Sully), the mind is dependent on them not only for this, but also for the increase of its own power to make higher uses of its materials.

However, the nerves and senses are far from being independent of one another. There is a close and interwoven connection among them—action and reaction—to their mutual gain. "We are familiar," says Bain, "with a large class of instances where a sense stimulus seems also to be a motor stimulus." And Lotze says, "There are stimuli of various kinds which, along with their own effects, frequently produce adequate stimuli as side results." This is a very serviceable condition in the training of the senses, for it assures us that, by bringing one into active and efficient use, others are more or less indirectly benefited by its gain.

32. Again, the senses in their special exercises are auxiliary to one another. This follows from the different qualities of the external objects of which each furnishes the signs or indications. The eye perceives different colours, but fails in determining the form or distance of an object without the aid of touch. Smell detects a strong odour, but not its taste. Then, when the tongue has perceived this, the eye must search out its source. The ear hears a loud report, but the eye searches for the smoke which follows the explo-

sion to find out its place. In this manner the senses are auxiliary to one another from their special relations to the attributes of matter, and thereby provide the mind with more complete representations for the formation of its concepts.

Now if we suppose that one of these senses, as seeing, or hearing, is lost, the cerebral effects must be very considerable, for

1st. Atrophy in the nerve centres of this sense follows from inaction.

2nd. This atrophy must interfere with the cerebral functions.

3rd. And the other sense nerves must suffer from the absence of the stimuli they would have received from the indirect healthy action of the lost one. And therefore the co-ordination and balance of the whole cerebral system is disturbed, so that the mind cannot act with the ease and completeness which perfect sensation would have ensured. Something like limping from a sprain must follow. Is there no remedy? None for the lost sense, and no other sense can take its place or discharge its functions. But happily there is some help in the auxiliary services which feeling and seeing can render, and in the place their higher development will enable them to take. The eye cannot perceive sounds, but it can to some extent perceive the muscular movements which accompany them. Touch cannot feel sounds, but it can feel the vibrations which produce sounds and the positions of the organs in their utterance, and it has been proved that by proper culture, these two senses will enable deaf-mutes to speak and read speech as if they heard.

But there is another point from which the subject can be viewed, and that is the mental. The education of the senses cannot be secured without a corresponding mental education. And still more so, for however they may stimulate mental activity, they are of little practical use apart from the determinations of the will. It is by thought, reflection, and willingness, that the senses are turned to higher uses. Animals are as keen, if not keener in their vision, but we see a thousand things which they never see. It is a true

saying that "the eye sees no more than the heart desires." Sensations have to become subjects of thought and careful examination to find out their meaning and relations, and this can alone be done by attention, observation, imitation and facility in the use of the senses. These are mental efforts directed and controlled by thought and will. Now if we can succeed, by a preparatory training of the senses and the vocal muscles, to get the learner into this mental and physical condition, we have done much more in his education than prepare him to learn speech. Our task is a difficult one, for we have to deal with a being almost destitute of the mental forces we require for our purpose, and who has been accustomed to obey the promptings of his emotions without reflection or self-control—a creature of passion rather than a child of reason.

Nature would have used his senses for higher ends could he have heard, so also must we, as her ministers, and therefore, we resort to the training of the senses, by Muscular, Sense, Breath and Voice Gymnastics.

GYMNASTICS OF THE MUSCLES.—The gymnastics usually taught in schools and gymnasiums are designed for the full development of the physical forces. This was the end sought by the Greeks and Romans. Beauty of form, fleetness of foot, strength of arm, and capacity of endurance were among them largely due to such training. For mental training they had recourse to the sophists and the schools, but for physical to the gymnasiums. Modern gymnastics are for the same ends. We hear little of any other. And yet, indirectly, the culture of the senses is promoted at the same time, for the eye, ear, and hand are brought into frequent prolonged use, and profit by the exercises. Still, as these are not the ends, they are neither designed nor conducted for the special development of the senses. They are not sense gymnastics. They must therefore be subordinated to higher uses, and while they do all that is needful in muscular, do more for sense and mental development.

1. Deaf-mutes should be indulged in free, hearty play; in running; in jumping hand-in-hand; in hide and seek; blind man's buff, or any other play in which children delight in the company of their mates.

2. They should learn to stand and walk erect, at first singly, then in pairs, and then in rank and file, keeping step, and swinging the arms in unison, under the eye and leadership of a teacher whom they can see and imitate.

3. Their steps in marching, with their rate, ought to be graduated in the same manner.

4. SENSE GYMNASTICS.—Placed in line opposite the leader, they ought to be exercised in every position of their arms and hands—above, below, behind, in front, singly, and together, so that attention must be given to him, and imitation quick to follow his movements.

5. Their hands and fingers might be called into active exercise; first the hands, by shutting, opening, turning, lifting up, dropping down; then the fingers, first each singly, beginning with the thumb as if in counting one, two, etc., or beginning with the little finger inversely. These movements ought to bring the nerves and muscles of the hands into free action, and at the same time cultivate sight and touch.

6. In addition to such exercises the head and neck should be well exercised in every possible movement, from left to right, right to left, up and down, in looking after some object on a long rod which is moved in all these directions. It would be well also if the leader were at times to pause suddenly in his movements, and thereby keep the attention in suspense, for a number of seconds. By following up these and similar exercises, in which the ends they are designed to serve are never lost sight of, a good beginning will be made in the education and discipline of the senses. At a more advanced stage, when a sufficient power of speech has been acquired, the steps, strokes, or other repeated movements might be accompanied by pronouncing them in numerical order, as one, two, etc., so that speech and action might be more closely associated. The special exercises for respiration will be treated in connection with the description of the muscles which are employed in sense gymnastics.

If muscular gymnastics are conducted after the above suggestions they would do much for the education of the senses, but still far from enough as a preparation for oral instruction, for the work is special, and therefore requires special preparations. The absence of hearing so much

increases the demands made on sight and touch for greater efficiency that they ought to have a corresponding higher training. The importance of this subject justifies a fuller treatment.

33. SIGHT.—Upon the whole, no other sense fills so large a place in our mental furniture as sight. A close analysis of our highest conceptions would not fail to prove that light and its effects enter largely into their material. Its functions are not only of wider range, but more perfect in combining the parts of a view than any other sense. Dr. Newan on this account calls it

“That princely sense

Which binds ideas in one and makes them live.”

The gladsome light bears an image of every object on which it falls to the retina, which is faithfully transmitted by the optic nerve and converted into a perception. The whole of a prospect and all its parts, with their shapes, relations and colours are at once seen and remembered. And then any one object of the many can be made a subject of special attention without the loss of the others. The tallest tree in the forest, the brightest star in the sky, the commander of an army is as prominent in thought with its surroundings as it is in perception. “This princely sense” is fortunately possessed by nearly all deaf-mutes, and if wisely cultured will largely compensate for the loss of hearing. The range of sight, from the position, form and mobility of the eyes, connected with the mobility of the head, is so great as to embrace three-fourths of the panorama. All things above, below, and on either side are so open to sight that it can receive, when well trained, at least three-fourths of the materials of thought. But the power of vision lies chiefly in the capacity to distinguish objects and seize on their attributes so as to get a mental picture of each as fine as a photograph. But this can alone be obtained by directing the attention closely to them. A selection of striking objects ought, therefore, to be made and each of them submitted to closest inspection. And after thus exercising the eye on the things that are near, it ought to be taught to range on every side, above and below, to find out the most interesting objects to engage attention. We want to educate the sense of sight, but we also want

vivid perceptions which will live in memory till we provide their names.

2. Then animals in all their varieties of size, form, colour and action, ought to have much attention, for nothing is more attractive to deaf-mutes. They are not satisfied with merely looking at them, they would handle them, and play with them, think about them, imitate them and make rude drawings of them. They are rarely forgotten.

3. But games of chance or skill are of much greater service in mental culture, for they cannot be either learned or played without a considerable amount of attention and imitation. Many of the old games played by children, as marbles, peg-top, etc., are replete with demands on thought. So also are the playthings with which children are abundantly supplied. How curious they are to find out their hidden mechanical movements! How pleased they are to build with brick after some model or plan, and to construct something that requires ingenuity! A selection from them might be made which would best call forth the mental faculties we seek to cultivate. Then the more expert and intelligent should be exercised in making something in wood with a knife, saw, plane and chisel, as little boxes, toys, etc., for this does more than all besides in stimulating thought, memory, imitation, muscular energy and facility. And for those who will most probably have to live by some handicraft there is no better training. When the eye and the hand act together the culture is mental and physical. By no means let the pencil be neglected. To imitate the forms and colours of things with pencil and paint brush calls sight into active and discriminating use. The rudest outline cannot be drawn without directed attention and imitation with some reflection. The pleasure of success is a fresh stimulus. How eager children are to show their drawing books! By these and kindred means, much may be done in the culture of those finer perceptions on which successful speech depends. We are not dealing with a nature formed of a bundle of faculties, but with a mind which is a unity whose faculties are its instruments, and its correct conclusions some fact or truth. It is mind we cultivate when we educate the senses.

34. HEARING.—It is generally, but erroneously believed,

that dumbness and deafness are inseparable. Statistics show, on the contrary, that there is a small percentage of dumb persons whose hearing is perfect. Their dumbness has arisen either from paralysis of the muscles used in speech, or some defect of will-power over the nerves which would have called them into action. Till this is restored they cannot be taught to speak. But this is no excuse for allowing them to grow up in ignorance. They can hear, learn language, and understand much that is said to them. But they can also learn to write and express their own thoughts through this medium, or by the manual alphabet. Cardan says "it would be a crime to neglect them." They might therefore learn to read, know the sounds of words, use them for writing, and thereby increase their mental resources, add much to their enjoyments, and be more useful to their relatives. Teach them to write, pronouncing the sounds, for you also teach them to read, and possibly greater mental energy may stimulate the muscles into activity.

And further, the instances of total deafness are comparatively few. Hearing is of every grade, from the faintest perception of sound up to its perfect appreciation.

35. But, even when the hearing is very limited, its culture would be very helpful to the voice by increasing its intuitive effects. To be able to detect the difference in pitch between two or three vowels would suggest the nature of sound, and direct the glottis to muscular efforts in the same direction when the other sounds were no longer perceptible. When the voice itself, in relation to the ear, is the topic, this subject will have larger notice.

Deafness is a great privation, for it deprives the mind of musical conceptions and language. It is difficult to define the place of music in our emotions and mental culture. Like the air itself, its subtle influence passes into all our thoughts and feelings, and gives them a tone and character. Poetic thought is musical; the profoundest emotions are uttered in rhythmic forms. Devotion seizes the harp, and a sacred song is sung. Our thoughts run in imaginary sounds, which have been selected and arranged to please the ear. Even the most abstruse sciences do not escape its power. Add to this what it is in the voice or instrument of a great artist,

with all the feelings that it excites, from gayest to saddest, and its loss is an immeasurable calamity.

Wordsworth well describes this in some of its effects when he sings of one

“ From whom, in early childhood, was withdrawn,
 The precious gift of hearing. He grew up
 From year to year in loneliness of soul ;
 And this deep mountain-valley was to him
 Soundless, with all its streams. The bird of dawn
 Did never rouse this Cottager from sleep
 With startling summons ; not for his delight
 The vernal cuckoo shouted ; not for him
 Murmured the labouring bee. When stormy winds
 Were working the broad bosom of the lake
 Into a thousand thousand sparkling waves,
 Rocking the trees, or driving cloud on cloud
 Along the sharp edge of yon lofty crags,
 The agitated scene before his eye
 Was silent as a picture ; evermore
 Were all things silent, whereso'er he moved.”

(See his poem on the “Power of Sound.”)

These were great privations, but there are greater. Not to hear speech which is at once the first prompter and guardian of sounds, and then of their places in words, and the thoughts conveyed by them till they are built up into a language, is worse than blindness, for the loss is two-fold ; first, of the hearing of sound, and then of the opportunity to imitate the speech of parent or friend, till art steps in and tries to take the place of the ear. The mind of man can never invent anything equal to the voice as the agent of thought. It is through it that the materials of higher conceptions find access, and by its hardly perceived associations that we seem to think the things themselves, rather than the sounds which have named them.

36. TOUCH as a sense is second only to sight in its mental services. In its absence, speech would be hardly possible, for sight alone could not originate the habits on which it depends. By it the tongue and other organs are so directed and controlled in all their movements and positions, that the repetition of any sound, which is uttered, becomes increasingly easy and soon grows into a habit. Our eyes see nothing of these movements, and yet through the power of

touch we feel as if they were all seen. What is seen in another speaker are only certain external associated muscular movements, which bear very little resemblance to the movements within. The mechanism of speech is almost as much hidden as the works of a clock ; but touch is present at every point, and reports every movement through its own special nerves. All parts of the body are possessed of this sense, but it is most fully developed in the lips, hands and tongue.

“One of the distinguishing characteristics of this sense is its universal diffusion over the exterior of the body, by which its sphere of action as a recipient of impressions, and as a criterion of locality, is rendered more extensive than that of any other. The contact of foreign bodies is perceived as occurring at the point at which they actually strike the organ of touch, whether that point be within the sphere of operation of any other sense or not. The precision with which this is effected depends very much on the degree of development of the papillary tissue in the several regions of the body.”—Todd and Bowman.

These papillæ are the termini of the nerves in the cuticle. “They are the nerve points of touch. In general, touch is most acute in regions best suited, by their structure, for easy and diversified contact with external substances ; for the power of nicely determining the position, direction, and amount of pressure upon the organ of touch, is essential to the perfection of the sense. The will can not only excite and check the contractions of the muscles, but is able to regulate their force and duration with wonderful precision ; for by the muscular sense, the mind is able to appreciate the state of contraction of a muscle by impressions originating in the nerves supplied to its fibres. The perfection to which habit, in numerous instances, brings the sense of touch, is chiefly due to an improved capacity it confers of appreciating the impressions made on the organ, in connection with niceties of muscular movement.”—Todd and Bowman.

Professor Bain says, “Touch is an intellectual sense of a higher order than taste or smell. It is not merely a knowledge-giving sense, as they all are, but a source of ideas and conceptions of the kind that remain in the intellect and em-

brace the outer world. Another mark of its superiority over taste and smell, qualifying it to furnish intellectual forms and imagery, is the distinctness or separateness of the sensations felt over the different parts of the skin. The sensations of the different parts of the surface of smell would seem to fuse all into one stream of sensibility." Some men of science, reasoning from primitive forms of life, regard this sense as the parent of all the others, that are only its higher developments induced by the different qualities of matter. These are speculations which do not concern our object, for the fact remains that Touch and Sight are the great sources of knowledge, for "To begin with, what we mean by perception in its simplest form is externalising or referring a sensation to a point in space. Now it is only touch and sight which give us any direct knowledge of space, of the situation of objects with reference to one another and to ourselves. Again, touch and sight directly make known to us the space, qualities of bodies, figure and size, and this they do by help of local discrimination supplemented by movement."—Sully.

From these quotations given to sustain the conclusions arrived at by observation and experience the following points are evident:—

1. That touch is specially present in the lips and tongue to meet the requirements of speech.
2. That touch is a localizing sense by which the mind can refer any sensation to the tactile point.
3. That it is an intellectual sense of a high order and a source of ideas and conceptions which remain in the intellect and embrace the outer world.
4. And that it is closely associated with sight in giving us a knowledge of space, and of the sizes and relations of objects in respect to one another and ourselves.

These two princely senses remain to deaf-mutes, and if well developed would not only provide them with speech, but also with the conceptions and ideas which are the principal elements of all our thinking. The progress of their higher education is in this direction. Nature has prescribed the lines, and the more closely they are kept, the greater will be our success.

37. As sound is vibration appreciable by the ear and at the same time appreciable by touch, the education of this sense ought specially to provide for its development in this latter respect that the place of hearing in relation to speech may be, as far as possible, supplied. Both senses find their unity in the vibrations which have sound as one of their effects, and therefore the exercise of touch is the nearest intuitive approach to hearing which exists in sensation. When the finger is placed on the glottis it ought by touch to be prepared to convey sensations which the mind can distinguish. This could be done by familiarizing the learners with all sorts of vibrations in tight cords of different lengths, musical instruments, wood or any other materials which are conductors of sound. Attention is secured without the help of sight by a stamp on the floor or a tap on the table, from the vibrations which follow, and this means of communication is capable of being turned into an exercise of touch in other parts of the body as well as the hands and feet. A piano provides an admirable series of exercises for the fingers and the lips. 1st. For ascertaining how many of the notes can be perceived. There is little reason to fear about those of the lowest octave. The slowness of their vibrations, coupled with their greater intensity, make them usually appreciable. Starting from these, the fingers might move upwards as far as touch could detect the vibrations and enable the teacher to discover how far they were perceived as sound, and then as vibrations only, and 2nd, These would also form a standard by which the progress of the learner might be ascertained in both touch and hearing.

Of these and the exercises of sight in which touch also had a part, a set of exercises might be framed for touch alone to enable the mind to become familiar with its intuitive nature. Blindfolding ought to be resorted to for this purpose.

1. Let a number of cups, toys, balls or other objects, varying in form and size, be placed on a table. One of these should be put into the hands of the scholar and felt all over, permitting him to form as clear perceptions about it as possible, then take it and place it with the others and let him find it out through touch alone. By selecting first those

that differed most; afterwards, as the sense became more discriminating, the less different, till all were distinguished; this exercise would be found very instructive.

By the same means the relations of touch to sight might be exhibited and strengthened by making the one confirm the decisions of the other.

2. Weight, as the muscular resistance to whatever presses more on the nerves than mere touch, can assist in training this sense. If a number of objects of the same materials, and afterwards of different materials, are dealt with as in the preceding exercise, each of which is placed on the palm of the open hand, and distinguished from the others by its weight only, this phase of the sense would be better developed. Then a number of the smaller weights used in trade, of coins of the same metal, differing in size and weight, and afterwards of copper, silver, and gold coins of the same and different sizes and value would best test the perceptive power, and at the same time assist in laying the foundations of the rational discrimination of differences which is the parent of science. By substituting leaves, cloth, books, and other objects differing in form, size, weight, and material, such exercises might not only assist in the culture of touch, but familiarize the learner with them so that their names when taught would be more associated with them in memory, for the principle holds good here also "that what is best known is best remembered."

This nerve culture in special parts will also increase their power in other parts, for it is accompanied with an increased mental power over the whole system; but it would be well to devise a set of exercises for the lips and tongue. And, first, these might consist in touching the musical instruments, cords, pieces of wood and metal made to vibrate in the production of musical notes, or regulated strokes. If a pipe is used and the lips closed on the mouth-piece, while the notes are sounded in succession, the vibrations are perceived and the sensitiveness of the parts increased. In addition to these, the lips and tongue might be exercised on substances, soft and hard, rough and smooth, pressing, more or less, so as to excite and develop the muscle and nerve power which speech requires.

When it is recollected how musicians and mechanics become experts in detecting the smallest deviations from some typical forms or positions in the use of their instruments, through the exercise of their organs, the value of such preparatory training is still more evident.

38. SMELL and TASTE are of minor importance, compared with touch and sight, as mental agents. Their functions are chiefly confined to the gratification of the physical side of our nature. Ideas about tastes and smells widely differ. They seem at times capricious, but depend much on primary use and habit in their formation, so that one person delights in odours and flavours which are most disagreeable to another. Touch, smell and taste are so closely connected that they must affect one another considerably, and they are frequently auxiliary in deciding on some doubtful substance. But our low estimate of their mental services ought not to make us undervalue their general action as essential parts of the nervous system which furnish our knowledge of some of the qualities of matter, and the indirect influence they exert on other senses. It will be seen afterwards that they can be utilized for learning speech.

The objects which gratify the majority of our senses are most likely to be remembered. Sight, touch and smell are all captivated by a rose. Its name can never be forgotten, because associated with so much sense gratification. On the other hand objects which create disgust or nausea from their smell, taste and appearance are never forgotten, and their very mention seems to revive the sensations. (a.) It is therefore safe to infer that the objects which excite the most vivid impressions on several senses at the same time will be best remembered by their names; and also (b.), that the increase of perceptive power in any of the senses, in any one service, prepares it for more facile action in another from the central unity of the sense nerves and the increased mental control. And then (c.) it is found that attention, observation, and imitation, as well as greater efficiency in the use of the senses, follow from their education as described above, and these are pre-requisites to the successful teaching of speech and language.

39. SOUND.—VOICE is sound produced by the vocal organs. But, as sound, it is not only propagated in waves, but the organs which produce it participate in its vibrations. Nor is it confined to these. Aided by the cartilages and the adjoining bones, it spreads to the gums, skull, and chest. In fact, the whole head and body participate more or less in the movement. A speaker feels all this, as well as hears the sound. But a deaf-mute feels only the vibrations. This, however, suffices to bring him into sense-touch with sound. He does not perceive its vibrations by the ear as voice, but he perceives it by touch, as he evinces, when invited to place his finger on the larynx of another who is speaking, by his surprise and pleasure. And, though he has never uttered an articulate sound before, he will at once imitate what he feels, and utter a vowel sound. This is the revelation of a significant fact. Hearing had nothing to do with it, but touch only, and therefore it proves the presence and possession of a capacity to utter vocal sounds, else they could not be so easily evoked. For this no education is required. It is an instinct or a tendency. But he not only knows that he feels the vibrations of sound in the larynx of another, but he feels and knows them in his own, and can reproduce them. They are, therefore, intuitive to him, and stand in the same mental relation as any other kind of sensation. Surely this is enough to prove that in him speech is not a lifeless, mechanical motion, but a vital, conscious activity, fraught with possibilities of priceless value to himself and others. Oral instruction is, therefore, based on simple natural laws, and has only to be conducted in harmony with them to put deaf scholars in possession of the same speech and language as their countrymen. And to this we presume to add that the possession of the organs and the ability to use them constitute a moral claim on the community to provide for their oral instruction.

40. Voice is, therefore, a motion felt, measurable, and illustrated like any other kind of motion, and this is the point of view from which it ought to be specially regarded in the education of deaf-mutes, for if absolutely deaf they know nothing about musical sound, defined by Stone as "Vibrations perceptible by the ear," or by Helmholtz as "Musical sound caused by the rapid and periodic movements of a sonorous

body," but only as vibrations or motions perceptible by touch, for the organ of hearing, which would have made them perceptible as sound, is absent, and nature has provided no other substitute which can make sound perceptible as such. The finger cannot see, nor the eye hear, but touch is cognisant of the vibrations, which are the fundamental element common to all sensation, and of which sound itself is only a special phase. These vibrations can be made as perceptible to touch, in the organs of speech, as if they were heard, and are, therefore, efficient agents for teaching articulation. Or, otherwise expressed, deaf-mutes can be brought into such close sense contact with the vibrations produced by sound, as not only to perceive its presence, but its quantity and some of its variations of pitch. This is intuitive, and therefore a subject of consciousness and memory.

SOUND.

41. SOUND IN CONNECTION WITH SPEECH.—But as sound is propagated in waves, time is consumed in its progress, and becomes an element for calculating the rate of its advance. Careful experiments have proved that it moves at the rate of 1,120 feet in one second of time when the air is 60° Fahrenheit, eliminating errors from influence of wind, etc. If the distance were known to the point where a gun was fired, the difference in time between the first appearance of the smoke and hearing the report would be the time the sound took to travel over the intervening space. This, if more than one second, when the temperature is 60°, multiplied by 1,120, would be found to correspond exactly in feet with the measured distance.

42. Sounds are distinguished by their pitch, timbre, and intensity. The number of vibrations per second of any note determines its pitch. The greater the number the higher the pitch, and the fewer the lower.

Sound is motion in one of its forms, and is either quicker or slower. The structure of the ear enables us to perceive the differences of sounds as higher or lower, intenser or feebler, and we call them bass, treble, tenor and alto, in the

ascending scale. But these terms represent groups of notes rather than their natural succession. When we arrange them in the latter form, they are divided into octaves or groups of eight notes, because the number of vibrations in the eighth is exactly double that of the first, and they so fully harmonise as to seem one, though the interval is so great between. When they are arranged in this ascending order, a gamut or scale is formed, and each note has a name. These names are also applied to the second octave and all others. The letters of the alphabet from A to G are used in musical notation as the names of the signs by which they are read. For singing purposes, syllables are employed.

A, B, C, D, E, F, G, A
La Si Do Re Mi Fa Sol La

But as C is made the fundamental note in the diatonic scale, the order is, Do, Re, Mi, Fa, Sol, La, Si, Do.

Now the number of the vibrations in the fundamental note C is about 540, and its octave the double of this, or 1,080; and the fractional expression of each note in the scale, as determined by the number of the vibrations, assuming C as 1, and its octave as 2, is—

C	D	E	F	G	A	B	C
1	9/8	5/4	4/3	3/2	5/3	15/8	2
Or in vibrations,							
540	607.5	675	720	810	900	1012.5	1,080

The variations in the number of vibrations among these notes arises from the intervals between them being different, as between E and F, and B and C, which are called semi-tones.

43. All this can be illustrated on a chord attached to two points like that of a violin, whose fundamental note is C in the diatonic scale. Now if a bridge is interposed dividing it into unequal parts, it is found that it must be placed at $\frac{8}{9}$ of the total length for D; at $\frac{4}{5}$ for E; at $\frac{3}{4}$ for F; at $\frac{2}{3}$ for G; at $\frac{3}{5}$ for A; and $\frac{8}{15}$ for B; the whole being unity. The corresponding fractions which express the number of vibrations is the reverse of these as above. Hence the rule follows:

1. That the pitch of a sound, that is to say, the number of corresponding vibrations, is in inverse ratio to the length of the chord, the diameter, density and tension remaining the same.

Again, if a number of chords, placed side by side and fastened at the ends, are of proportional lengths, corresponding with the fractional expression of the notes as above, on striking each it would be found that the note yielded would be that represented by the fraction. The longest chord would yield the lowest note, and the one half its length its octave above.

Now if a chord is stretched over an open box, with one of its ends attached, and a weight of five pounds suspended to the other, its tension is five pounds, and the note yielded, on striking, may be called its fundamental note. But if five pounds more are added to the first five, then the tension is doubled, and on striking it, the pitch is found to be raised, and therefore the second rule:

2. That the pitch of a sound increases with the weight or force of the tension of the chord. This increase is found to be in the proportion of the square root of the tension.

3. The pitch of sounds in chords of equal length decreases with the increase of density in the inverse ratio of the square root of the densities. The chords of a violin are arranged according to their density and length. Each also is tuned up to a required pitch by increasing the tension. The scale on a flute is produced by shortening the tube, or what is tantamount, uncovering the holes and decreasing the aperture formed by the lips through which the air is blown.

4. The musical appliances of the organs of speech closely resemble these, for when the pitch is raised the vocal chords are drawn closer, the larynx raised, the tongue placed nearer to the palate, and the pharynx contracted; thus the tube is shortened and narrowed, and the orifice at the mouth-piece contracted and shortened in the utterance of the higher sounds.

In singing without words the action differs, for as the object is to utter musical sounds only, the larynx acts independently and rises or falls as required by the tension of the musical chords. But when words are associated with the music, then all the organs take part, but in subjection to the demands of the music, which may ascend a couple of octaves at a single glide. Learning to sing the notes may be helpful to our scholars in improving the voice, but it is not the form which nature has provided in speech, for the end is different.

Here the chief function of sound is to express thought, and for this purpose the scale of the vowel sounds is more limited; and the consonants with which they are associated being of a less variable character as sounds, there is less room for vocal variations. Some speakers confine themselves to a scale of a very few notes, while others use a more extended, but beyond a certain point any indulgence in lower or higher is called singing.

“The vowel sounds of the human voice are marked by comparatively low partials; those of E and I alone somewhat exceeding the limits of the forks used. U and O, the modified German Ö, and even A can be more or less imitated. By further additions to the series of forks E, and indeed all but I were produced. (H.)

“The vowels are arranged by Helmholtz, after Du Bois Reymond in this series,—

(1). The broad A in father is the common origin of all, the cavity of the mouth being funnel-shaped, with uniform enlargements outwards. A lower series consists of O, as in more, and U in poor, in which the lips are contracted and the tongue depressed so as to form a bottle-shaped cavity.

(2). In the vowels A, E, I, and the modified German A, the lips are drawn far apart, and a contraction is made between the middle of the tongue and the hard palate. These have a higher and deeper resonance tone.

(3). In the third series from A, through O and U, in addition to the contraction of the tongue and palate, we have also a contraction of the lips into a sort of tube like that of a bottle with a very long neck.

“The resonance of the cavity of the mouth for vowels may be thus expressed in musical notes :—



45. When a chord vibrates in all its length the sound is called fundamental. But in addition to this, other sounds are evoked, whose tone is less intense, but distinct enough to be heard by an attentive ear. These are called harmonics to the fundamental note. The poker, as already referred to, has not only two harmonic octaves, but several intermediate fifths, which a trained ear can readily distinguish. When a note on the flute is blown with greater intensity, the harmonic octave is perceptible; and musical glasses respond to one another, the note struck on one according with the harmonic pitch of the others. This law is thus formulated by Stone :—

“When any note is sounded on a musical instrument, in addition to the primary tone, there are a number of other tones in a progressive series, each note of the series being less intense than the preceding. If M denotes the number of vibrations of the primary tone in a given time, the vibration numbers of the whole series will be in the order—

$M, 2M, 3M, 4M, 5M, 6M,$ etc.

If the first note is $C1, C2, G2, C3, E3, G3,$ etc.

Vibrations $64, 128, 192, 256, 320, 384, 448,$ etc.

In comparing these it is found that they are multiples of the first or 64, having 1 as its sign—1, 2, 3, 4, 5, 6, 7. Discords follow when these proportions are not observed.

46. The causes which influence the intensity of sounds are,—(a.) Where it is produced in the open air and becomes more and more diffused as the distance increases like circular receding waves. The decrease is in the direct ratio of the square of the distance.—(b.) But its intensity suffers less

diminution by being confined to tubes, narrow passes, or any other conditions which prevent the diffusion of the waves. The speaking trumpet and hearing tubes are constructed on this principle. But it is evident that, if projections or angles exist in the walls and dust on the surface, the sound will be reverberated and not pass forward as it left the mouth. A smooth tube of iron, brass, or wood, of the same diameter throughout, is best adapted to the purpose. When two persons station themselves at the extremities of such a tube, of many feet in length, the faintest whispers will be heard by them.—(c.) The intensity of a sound is also increased by sympathetic vibrations from a wall, a cave, or an arched roof; in fact by any surface to which it is near, or in contact.—(d.) But on the contrary, when it impinges on a body incapable of vibrating or echoing the sounds, as furniture drapery, etc., the intensity is diminished.

- “1. Intensity is therefore inversely as square of distance;
- “2. Directly as square of amplitude of vibrations;
- “3. Increases with density of medium;
- “4. Modified by motion of atmosphere, and
- “5. Strengthened by proximity of sonorous bodies.”—

(Stone.)

In some instruments of music, as the trumpet and cornet-à-piston, the lips of the performer are the *anche*, or generator of sound, and the mouth-piece the channel through which the air passes. In acoustics there are two kinds of sonorous tubes; (a.) such as are open at both ends, and (b.) that have the end closed opposite to the mouth-piece.

47. The relations of the pitch of the sounds to the length and diameter of the tubes in which they are produced.

OPEN TUBES. If two tubes have the same diameter, but differ in length, the longer tube has the graver sound, so that if the one is double that of the other the shorter yields a sound an octave higher; and if two tubes are the same length, but of different diameters, the narrower yields the sharper sound. Hence the pitch of sounds produced by two tubes is in the inverse ratio of their length and diameter.

The notes of human voices are produced in tubes of different lengths and diameters. Little children have the smallest, females larger, and males the largest. The male voice is, therefore, the deepest, and the child's the sharpest, but the vocal chords in children and females are also shorter than in males. The resonant properties of the walls are not alike, or the construction may differ in regard to harmonics, and hence there is room for all the differences we hear in voices, though the fundamental tone of each is the same, and therefore, if the harmonics are added to the sensation of the fundamental sound, the resultant sensation is called the **TIMBRE** of the fundamental note of the voice or an instrument.

45. **CLOSED TUBES.**—Though one end is closed, there is an opening at the mouth-piece, through which the air escapes. Compared with an open tube, the sound produced is an octave lower. Some children construct a kind of flute or whistle by separating the bark of a green branch from the wood, and they vary the notes by slipping up and down the stripped wood in the bark, as a tube. Pan's-pipes are made of pieces of cane or reed of different lengths and diameters, closed at one end and left open at the other, which becomes a mouth-piece by blowing across its diameter. Organs are usually constructed of both closed and open pipes. The use of the former economises space and intensifies the sound by additional harmonics. The consonants B, D and G are formed in closed tubes.

A knowledge of these laws of sound will assist the teacher, for it will lead him to treat the organs of speech as a musical instrument from which he is to evoke the clearest and sweetest sounds by seeing that the action of the air on the glottis produces the true fundamental note, and that the positions of the other organs are the best for articulating the different sounds. But to do this intelligently he ought to have such a knowledge of the muscles whose action best develops respiration and the learner's command of his breath; of the structure and action of the muscles of the glottis; and of all the other organs of speech; with the facial indications arising from muscular action, by which the sounds that produce them can be read, as will enable

him to enter upon his work with clear conceptions of all the conditions required by accurate articulation, and to escape from attempting what nature cannot perform, or wearying the learner by superfluous efforts. We have the best of all instruments for our performances, and ought, therefore, to have the most accurate knowledge of its structure and capabilities.

RESPIRATION.

✓ 46. STRUCTURE AND GYMNASTICS.—Speech as a form of action is produced by air received from without into the lungs and propelled thence or expired by muscular force excited spontaneously. The lungs are, therefore, the bellows which supply the air, and two things are required of them for the efficient performance of their function—capacity to contain a sufficient supply, and force equal to its regulated expulsion and inspiration. Or expressed as a rule, The capacity and power of the lungs ought to be equal to all the demands of respiration. Now it is found that the absence of speech leads to an imperfect development of the lungs, both in capacity and power, because the muscular action that speech would have occasioned is never brought into this special use, and like any other active member of the body when unemployed they become smaller and weaker and finally rigid. This is the condition in which the lungs of deaf-mutes are found. Artificial means must therefore be applied to develop the muscles more intimately connected with respiration and speech. Their close connection with the lungs leads at the same time to their development and the consequent promotion of health, and physical vigour.

47. MUSCLES, LIGAMENTS AND TENDONS.—“ Voluntary muscle is composed of long cylindrical fibres, measuring on an average about $\frac{1}{300}$ of an inch in diameter in mamma-

Fig. 1.—OUTLINE OF THE LARYNX, TRACHEA, AND BRONCHIAL TUBES, SEEN FROM BEFORE. (One-third natural size.) *h*, hyoid bone; *e*, epiglottis; *s*, superior, and *i*, inferior cornua or horns of the thyroid cartilage; *c*, the cricoid cartilage; *tr*, trachea, the unshaded parts being the cartilaginous rings; *b*, *b'*, the right and left bronchi respectively.

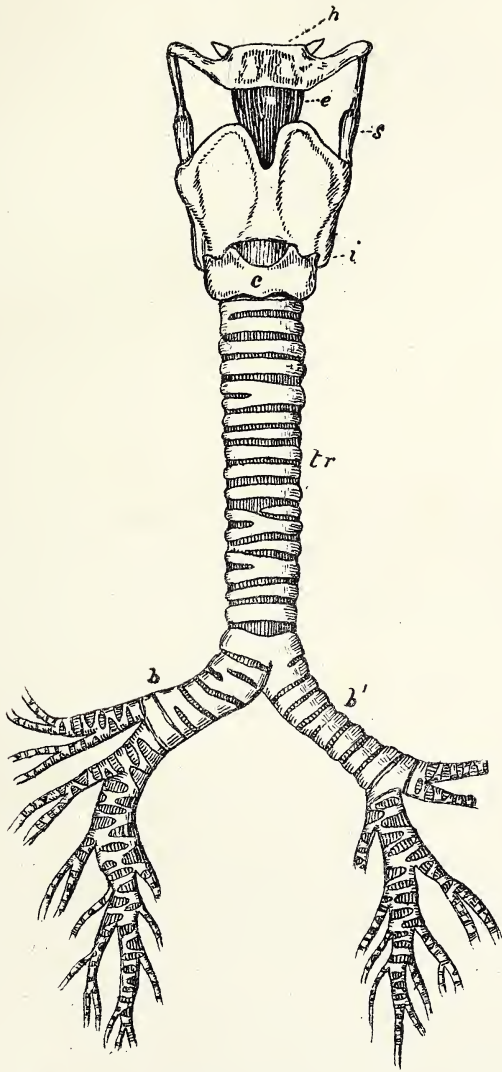


Fig. 1.



lian muscles, but having the length of an inch or more. Each fibre has an elastic sheath, the sarcolemma, which encloses the contractile substance." (S.)

"They compose the substance known by the name of red flesh, and a good idea may be formed of them by examining the red flesh of quadrupeds. Their characteristic property is contractility, and there is neither action nor repose in the position of any of our limbs without muscular contraction. For every moveable point in the animal frame is constantly situated between two muscular powers opposed to each other; between those of flexion and extension, of elevation and depression, of adduction and abduction, etc.; this opposition is a condition essential to motion, for in whatever direction the limb is moved the moveable point must necessarily be in the opposed direction, the act of flexion requires it should be first extended, and vice versa." (P.)

"The nerves which are connected with the brain and used by its determining power, call the muscles into action; and for this they pierce the sarcolemma and terminate in a ramified expansion as an end plate." (S.)

These muscles are, therefore, under the power of the will, and can be freely exercised for their own development and the functions they have to discharge.

Involuntary or plain muscular tissue is composed of long, somewhat flattened cells, which vary much in length but are usually not more than $\frac{1}{600}$ of an inch long. Each cell has an oval or rod-shaped nucleus, which shows the usual intra-nuclear network, and commonly one or two nucleoli." (S.)

Though these involuntary muscles are not directly dependent on volition in their action, they are indirectly affected, and become strong or weak with the healthy or diseased state of the voluntary muscles. "If one member suffers all the members suffer with it."

48. "Cartilage or gristle is a translucent, bluish-white tissue, firm, but at the same time elastic, and for the most part found in connection with bones of the skeleton, most of which, in the embryo state are at first represented entirely by cartilage." It consists of two kinds. In one, the hyaline, "the matrix, or ground-substance, is

clear and free from obvious fibres; in the other, called fibro-cartilage, the matrix is everywhere pervaded by connective tissue-fibres." When these are of the white variety, the tissue is white fibro-cartilage; when they are elastic fibres, it is yellow or elastic fibro-cartilage. Hyaline cartilage is found in two situations, (1) covering the ends of the bones in the joints, where it is known as articular cartilage; and (2) forming the rib-cartilages, where it is known as costal cartilage. "It forms also the cartilages of the nose, the external auditory meatus, the larynx, and the wind-pipe; in these places it serves to maintain the potency of the orifices and tubes." (S.)

"Ligaments may be described as an assemblage of strong fibres, firmly joined to the articular surfaces of bones, and giving that security which will prevent displacement, and yet such a latitude of motion as will admit of the easy movement of one bone on the other." (P.)

Tendons, as distinguished from ligaments, unite muscles with bones.

49. The Trachea or wind-pipe is a fibrous and muscular tube, the wall of which is rendered somewhat rigid by C-shaped hoops of cartilage (Fig. 1, *tr*), which are imbedded in the fibrous tissue. The muscular tissue, which is of the plain variety, forms a flat band, the fibres of which run transversely at the back of the tube. The trachea is lined by a mucous membrane, which has a ciliated epithelium upon its inner surface.

The two divisions of the trachea, the bronchi (Fig. 1, *b*, *b'*), are precisely similar in structure. And the larynx is also very like the trachea, so far as the structure of the mucous membrane is concerned, but over the true vocal chords and upon the epiglottis (Fig. 1, *e*), as well as here

Fig. 2.—SEMI-DIAGRAMMATIC VIEW OF THE THORAX, TO SHOW THE POSITION OF THE LUNGS WITH RESPECT TO THE RIBS, ETC. (One-fourth natural size). The lungs have shrunk from the front of the chest; *a*, right clavicle; *m*, placed on the lower part of the manubrium of the sternum; *g*, the right lung; *t*, the heart; *f*, *f*, the diaphragm, separating the cavity of the thorax from that of the abdomen; *h*, right, *h'*, left lobe of the liver; 1-10, placed on the 1st, 2nd, etc., ribs, just beyond the end of the costal cartilages.

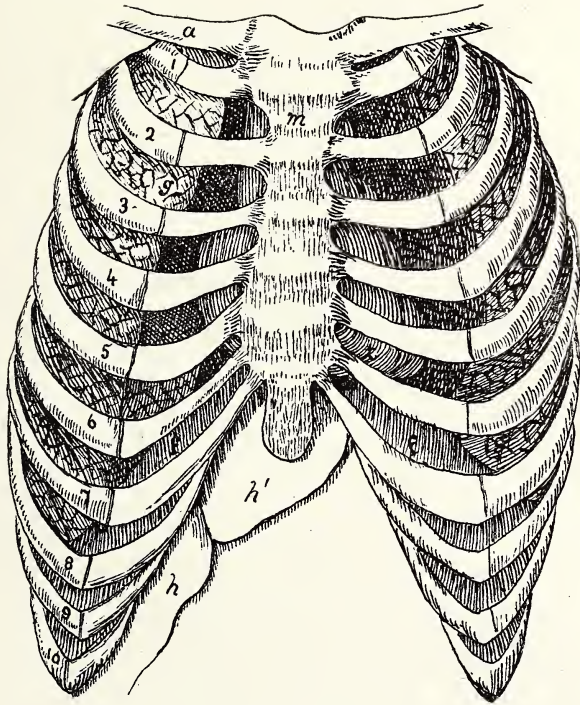


Fig. 2.



and there in the part above the glottis, stratified epithelium and taste-buds may occur, except over the vocal chords. (S.)

The bronchial tubes at first consist of two main branches (Fig. 1, *b*, *b'*), afterwards they ramify still more and terminate in air cells.

50. The Lungs (Fig. 2) are formed of an infinite number of these cells, separated from one another by a thin tissue filled with bloodvessels. They are charged and emptied of air by an alternative movement of expansion and contraction. In their expansion, or inspirative action, the external air is drawn in through the windpipe and bronchial tubes; and by their contraction or expirative action this air is driven out by the same route. In a healthy state this double movement is made with great regularity, at the rate of eighteen double respirations per minute in adults, which are $3\frac{1}{3}$ seconds for both. The second movement is a little longer than the first, for it is followed by a short pause. But in special circumstances, as in great fatigue, a long rapid race, or strong emotion, this movement is accelerated, and becomes irregular, in some cases to such an extent as to prevent the flow of the air into the lungs, and, if not relieved, would lead to asphyxia. The voice is affected by these movements, and therefore to secure a full, clear voice, the respirations should be made when the lungs are free from all excitement or undue exercise. The quantity of air contained by the lungs varies much in different persons, owing to the variation of the capacity of the lungs.

51. The Lungs (Figs. 2 and 3) are contained and protected by a strong cage formed of bones, for rods—the ribs—which are articulated behind with the corresponding vertebræ, and are twelve in number, with moveable joints; and before into a broad flat bone, called the sternum (Fig. 3, *a*, *e*). But while five of the twelve have independent articulations, four are united and have only one articulation before, while three more are shorter and have none. This cage is much smaller at the top than at the bottom. It is evident that the posterior articulations of the ribs are higher than the anterior (Fig. 3), and as they are mobile they permit a double movement, of elevation and depression, which increases or lessens the capacity of the chest. Below,

the diaphragm like a veil separates the chest from the abdomen (Fig. 2), and participates in the muscular action of respiration. The surface of the lungs being in close apposition to the chest wall, and there being no opening for the external air to enter between them, the air readily enters, or is expelled from the air passages and cells when movement of the chest wall takes place.

The result is that the lungs closely follow the ribs and the sternum in all their movements of elevation and depression—or expansion and contraction—which render the entrance and exit of the air, the double function of respiration, possible and facile.

52. THE MOTOR ORGANS. As the sternum and ribs are by themselves inert, the motor organs come to their aid. These are the inspirator and expirator muscles, which play the part of the hand, when placed on the upper part of a pair of bellows, in alternately raising and depressing it, by the introduction and expulsion of air. A brief description of the muscles which take part in this action is here given, in order to deduce from their functions the attitudes and exercises most favourable to respiration.

Their attachments and functions with the attitudes which favour or retard these functions will be stated.

The principal inspirator muscles (Figs. 4, 5):—

1. The great pectoral.
2. The small pectoral.
3. The sterno-mastoid.
4. Serratus magnus.
5. The broad dorsal.
6. The scalene.

53. Pectoralis Major, Great Pectoral (Fig. 4, 7).—It

Fig. 3.—FRONT VIEW OF THE THORAX, SHOWING THE STERNUM, COSTAL CARTILAGES, RIBS, AND DORSAL VERTEBRÆ. (About one-fourth natural size.) *a*, body of sternum; *b*, first dorsal vertebra; *c*, placed on the costal cartilage of the 4th rib; *d*, twelfth dorsal vertebra; *e*, ensiform process of the sternum; *f*, *f*, 11th ribs; *g*, *g*, 12th ribs.

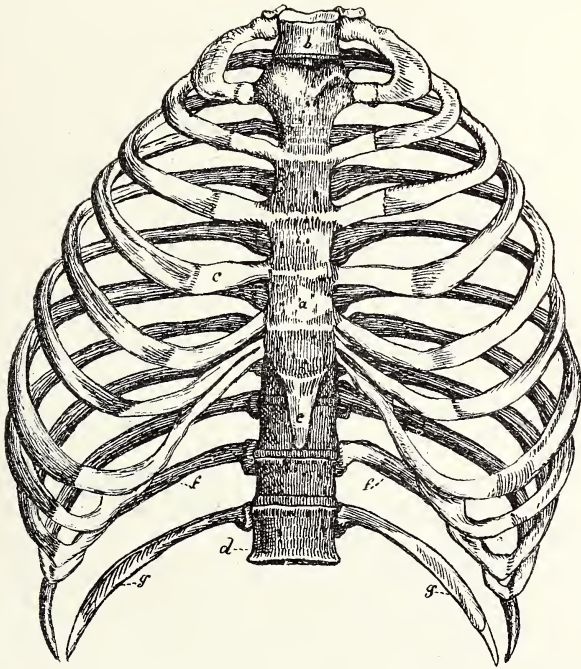


Fig. 3.



is attached (a) to the inner half of the clavicle; (b) to the middle part and whole length of the sternum; (c) to the cartilages of the true ribs, except the first, and a little to the bony portion of the fifth rib; (d) and lastly from an aponeurosis or tendinous expansion of the external oblique muscle of the abdomen.

Functions.—This is a powerful muscle in moving the arm upwards, forwards and downwards, as in striking a blow. When the arms are hanging down, the humeral insertion being a little elevated, the lower fibres can alone act together in elevating the ribs; but when the arms are raised, as in climbing, the muscle becomes an inspirator by all its fibres.

The exercises favourable to inspiration are elevating the arms, the gymnastic exercises on the trapeze, on smooth and knotted ropes, oscillating poles, the orthopædic and horizontal ladders, the suspension bar and rings.

54. *Pectoralis Minor*, Small Pectoral.—This is behind the preceding (Fig. 4, *l*). Above, it is attached by a strong flat tendon to the coracoid process of the scapula (Fig. 4, *x*) (shoulder-blade); below, to the third, fourth, and fifth ribs. In action it draws the shoulder bone forwards and downwards, but when this is fixed it elevates the ribs.

Functions.—From its direct action on the ribs in elevating them it is a more efficient inspirator than the great pectoral. Every attitude that favours the elevation of the shoulders also favours this inspiring action.

55. The *Sterno-mastoid* is attached above to the mastoid process or great tubercle of the skull behind the ear, and below to the superior part of the sternum, and inner end of the clavicle (collar bone).

Functions.—If the lower extremity is fixed, it lowers the head, but if fixed at the mastoid it elevates the sternum and the inner end of the collar bone, and hence, but only in very deep respiration, becomes an inspirator. Its greatest effect, in this respect, is when the head is erect, and its least when the head is bowed or leaning on the shoulder.

56. The *Serratus Magnus* is situated on the side of the chest and anteriorly attached to eight or nine of the first

ribs (Fig. 4, *g*, and *6*) and posteriorly, to the whole length of the base of the scapula (Fig. 5, *10*).

Its office is to bring the scapula forward; but when that bone is fixed it probably becomes a muscle of inspiration, for it raises the ribs.

Scalene Muscles. A group of strong muscular columns, usually three in number. 1. *Scalenus anticus*, is attached superiorly to the anterior tubercles of the transverse processes of the third to the sixth cervical vertebræ, inferiorly to the surface of the first. 2. *S. medius*, is attached above to the transverse processes of all the cervical vertebræ, below to the first rib. 3. *S. posticus* (Fig. 5, *2*) attached above to several of the lower cervical vertebræ, and below to the second rib.

Functions.—They expand the chest by raising the upper ribs.

57. **DIAPHRAGM** (Fig. 6).—This muscle separates the chest from the abdomen. Its form is nearly circular, with a convex side turned towards the chest, and a concave towards the abdomen. It is fleshy at its circumference, and tendinous in the middle (Fig. 6, *a*, *b*, *c*). Above, it is attached to the ensiform cartilage (Fig. 3, *e*), laterally to the inner surface of the last six ribs, below to the transverse processes of the upper lumbar vertebræ (Fig. 6, *l*), by its left pillar (Fig. 6, *o*) to the bodies of the first three, and by its right pillar (Fig. 6, *n*) to four of the first lumbar vertebræ. Its upper surface is connected with the pericardium, the mediastinum (the space between the lungs), and the pleura;

Fig. 4.—RESPIRATORY MUSCLES OF THE CHEST AND ABDOMEN. (On the right of the body the more superficial, on the left the deeper muscles are seen.) *i*, atlas or first cervical vertebra; *a*, levator anguli scapulæ muscle; *b*, sternum; *c*, left clavicle; *d*, tendon of the pectoralis major; *e*, tendon of the latissimus dorsi; *p*, coracoid, and *f*, glenoid head of the biceps cut short; *g*, serratus magnus; *h*, external intercostal; *j*, rectus abdominis; *k*, internal oblique; *l*, pectoralis minor; *m*, subscapularis; *o*, subclavius; *n*, coraco-brachialis cut short; +, coracoid process.

1, trapezius; 2, deltoid; 3, acromion process; 4, biceps; 5, triceps; 6, origin of the serratus magnus; 6', external oblique; 7, pectoralis major.

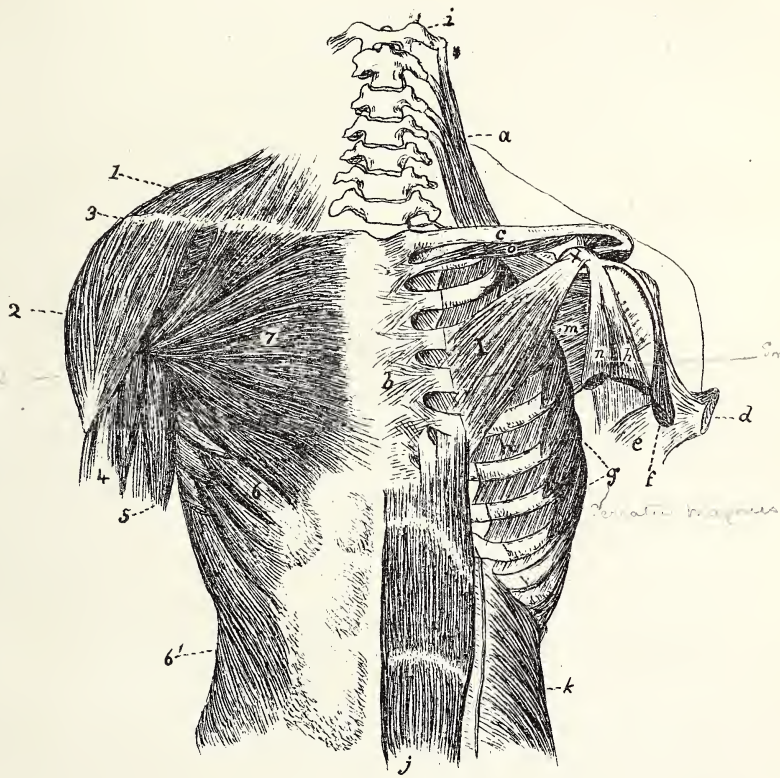


Fig. 4.



it supports the heart and the base of the lungs (Fig. 2, *f*). In its whole extent it is covered below by the peritoneum.

Its functions in respiration are most important. Every time we draw our breath it contracts, and reduces its vaulted form into a plane. This enlarges the capacity of the chest so as to admit of the greater expansion of the lungs. In forced expiration the abdominal muscles press the viscera upwards, and the diaphragm ascends into the thorax, compressing the lungs at the same time, and so becomes a strong expirator. It also assists in many other functions, as coughing, laughing, hiccough, and the action of the intestines.

The attitude which is most favourable to the inspirator action of the diaphragm is the vertical posture, because it separates most fully the attached points of the muscle and permits the greatest compression of the abdominal viscera. On the contrary, a sitting posture is less favourable.

Large inspirations give more life to the body and also seem to stimulate mental life. He who speaks standing has greater facility and influence than one who speaks seated. To bend the body forwards hinders the action by bringing the points of insertion of the diaphragm closer.

Filling the stomach impedes respiration, for it prevents the depression of the diaphragm; and the same effect is produced by bending the thighs in a sitting posture. When the arms are crossed on the chest or the hands joined behind the back, inspiration is impeded by arresting the upward movement of the ribs.

It is very evident that all the attitudes which are favourable or adverse to respiration produce similar effects on the voice in speaking or singing, and that the healthy use and development of the lungs in capacity and power must increase the resources for sustained and vigorous vocalization.

58. Broad Dorsal—*Latissimus dorsi*.—This is a large, thin, flat muscle, situated on the back and side of the lower part of the trunk. Above, it is attached (Fig. 5, *d*) to the inner edge of the groove in the shoulder blade which receives the long tendon of the biceps; below to the posterior half of the external border of the crest of the ilium,

and to the back and upper part of the sacrum ; on the inner side it is fixed to the spinous processes of all the lumbar vertebræ and to those of the six or seven lower dorsal ; on the outer side to the last four ribs by as many digitations.

Its functions are to carry the arms backwards and downwards, or when the hand is fixed it brings forward the body. When the arms are elevated the great dorsal is able to draw up the four last ribs and becomes an inspirator. In climbing it is an inspirator, while it elevates the body. The gymnastic exercises which set it in motion are climbing the ladder, the oscillating bar, smooth and knotted cords, the trapeze and rings, and swimming or dumb bell exercises by the backward action of the arms.

59. Deltoids or elevators of the arms (Fig. 4, 2, and Fig. 5, *b*); which raise still higher the humeral insertions of the great pectoral and the broad dorsal. It forms the fleshy part of the shoulder. Above, it is attached to the external third of the clavicle (Fig. 4, 3); to the acromion process (Fig. 5, *c*) and to the lower part of the spine of the scapula ; below, the fibres unite to a tendon inserted into the deltoid impression in the middle part of the external surface of the humerus.

Fig. 5.—RESPIRATORY MUSCLES OF THE BACK. (On the right the more superficial, on the left the deeper muscles are shown.) *a*, trapezius extending downwards to the middle of the back ; *b*, deltoid ; *c*, acromion process ; *d*, latissimus dorsi ; in the angle between this and the trapezius is seen a part of the spinalis dorsi ; *e*, external oblique abdominal muscle ; *f*, infra-spinatus ; *g*, teres major ; *h*, teres minor (the part of the muscle on the left of *h* belongs to the infra-spinatus).

x, levator anguli scapulæ ; *s*, placed on the oval tendon between the two trapezius muscles, points to the upper part of the serratus posticus superior (the darker strip) ; 1, splenius capitis ; 1', lower end of splenius colli ; 2, a small part of the scalenus posticus ; 3, rhomboideus major ; 4, rhomboideus minor ; 5, infra-spinatus ; 6, supra-spinatus ; 7, teres major ; 8, long head of the triceps ; 9, teres minor ; 10, serratus magnus ; 11, 11, upper and lower portions of the serratus posticus inferior ; 12, internal oblique muscle of the abdomen ; 13, part of the spinalis dorsi ; 14, part of the longissimus dorsi ; 15, tendons of the ilio-costalis ; *i*, crest of the ilium.

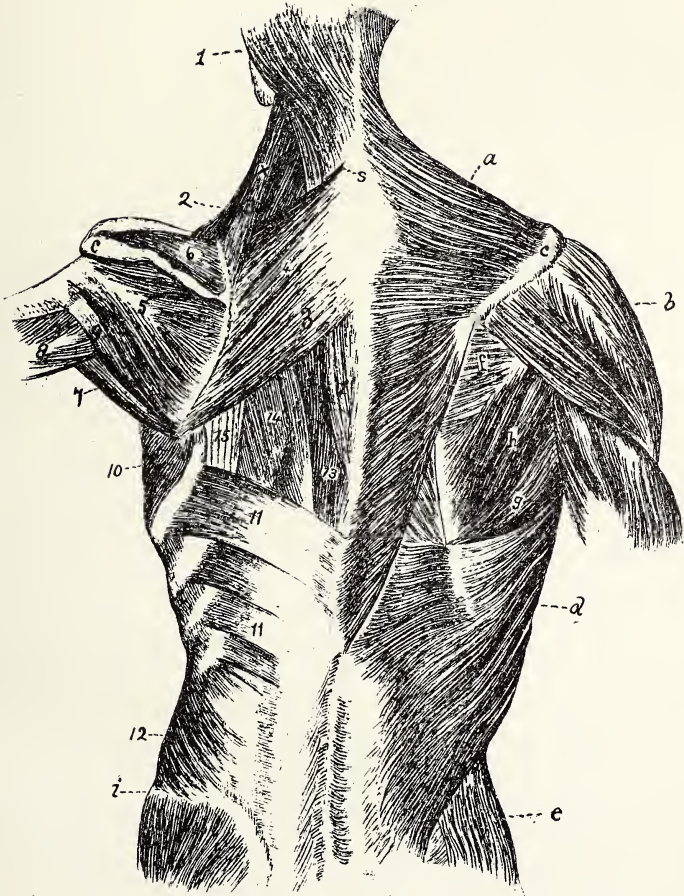


Fig. 5.



Its principal office is to raise the arms, but it can also move them backwards and forwards, and therefore favours inspiration. The gymnastic exercises already described are adapted to its development.

Serratus posticus superior (Fig. 5), a thin flat muscle. Its upper attachment is chiefly to the spines of the last cervical, and two or three upper dorsal vertebræ. The lower attachment is to the second, third, fourth, and fifth ribs, a little beyond their angles.

Its function is to elevate the upper ribs, and it is therefore a muscle of inspiration.

Serratus posticus inferior (Fig. 5, 11). The lower attachment is to the spines of the lower two dorsal and upper two or three lumbar vertebræ, passing outwards, upwards and forwards. It is attached by four fleshy digitations to the lower borders of the last four ribs.

Its function is to draw the lower ribs downwards and more backwards, and therefore it is a muscle of expiration, but it is also a muscle of inspiration, enlarging the bottom of the chest and giving additional purchase for the action of the diaphragm.

60. The *Trapezius* is a broad flat muscle (Fig. 4, 1; 5, *a*), situated at the posterior part of the shoulder, and upper part of the back. Above, it is attached at the superior transverse line of the occipital bone to the cervical vertebræ; below, to the spinous processes of all the dorsal vertebræ; on the outer side to the spine of the scapula, and the edge slides over a triangular space at the extremity of that bone; to the acromion (Fig. 5, *c*); and to the external third of the clavicle (Fig. 4).

Functions.—When all the fibres of this muscle act simultaneously, they draw back the scapula and clavicle; the upper fibres will elevate the shoulder, the lower move it backwards and forwards obliquely and downwards. It also impresses on the head a triple movement of lateral inclination, of neck extension, and of rotation to the opposite side. The two trapezius muscles favour the action of the sterno-mastoids and the scalenes, and consequently are indirectly inspirators.

61. **EXPIRATOR MUSCLES.**—The principal muscles discharging this function are the *obliquus abdominis*

externus and internus, the rectus and transversalis abdominis. The first or external oblique abdominal muscle is situated on the anterior and lateral parts of the abdomen. It is attached above by fleshy triangular slips, called digitations, to the external surface and inferior margin of the last seven or eight ribs; below, to the two anterior thirds of the crest of the ilium or hip bone. (Fig. 4, *e*, and Fig. 5, *e*.)

The second or internal oblique abdominal muscle (Fig. 4, *k*, and Fig. 5, *i*) is placed behind the preceding. Above it is attached to the border of the cartilages of the tenth, eleventh and twelfth ribs; below to the spine of the ilium (Fig. 5, *i*), to the crural arch and the pubes; behind by means of a broad tendon, to the spinous processes of the lumbar vertebræ and to the sacrum, before to the linea alba.

The third or upright abdominal muscle (rectus abdominis) (Fig. 4, *j*) is situated immediately in front of the abdomen on each side of the linea alba—white line—under the anterior laminae of the tendons of the oblique muscles. Long and flat, it is attached above to the cartilages of the fifth, sixth, and seventh ribs, and to the ensiform cartilage; below to the pubes.

The fourth, or transversalis abdominis—transverse abdominal muscle, is situated behind the oblique muscles; its form is similar, and it is attached above to the cartilages of the lower ribs; below, to the crest of the ilium, and to the two internal thirds of the crural arch; behind to the transverse and spinous processes of the lumbar vertebræ by their common tendon.

Fig. 6.—LOWER SURFACE OF THE DIAPHRAGM, AS SEEN FROM THE FRONT.—(After Paxton.) Above and on the sides are seen the lower ribs. *a*, *b*, *c*, are placed on the three divisions of the trefoil tendon; *d*, by the œsophagus; *e*, by the aperture for the inferior vena cava; *f*, *f*, eleventh ribs; *h*, *h*, twelfth ribs; *g*, fourth lumbar vertebra; *i*, aorta; *j*, on the left side of the figure, attachment of the arched ligament to the transverse process of the first lumbar vertebra; *j*, on the right side of the figure, external arched ligament, attached to the twelfth rib; *h*; *k*, part of the psoas magnus muscle; *l*, transverse processes of the lumbar vertebræ; *n*, tendinous part of the right crus or pillar; *o*, of the left pillar. (The opening for the œsophagus is shown too much to the left, and that of the vena cava considerably too much to the right.)

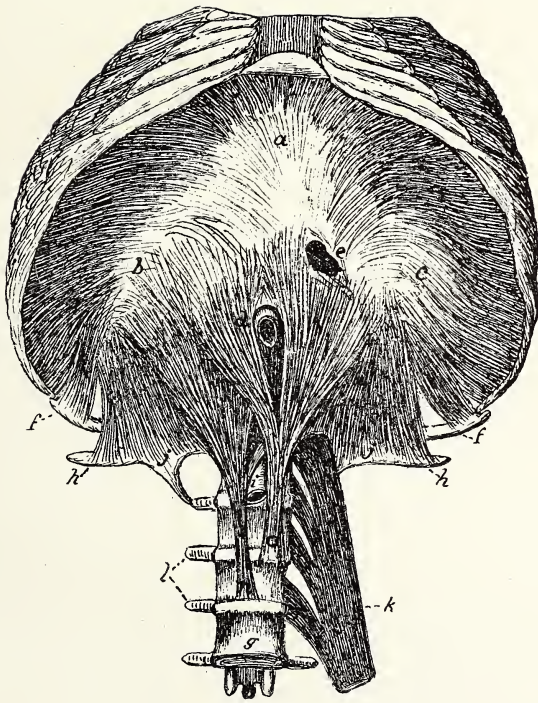


Fig. 6.



The chief function of the four pairs of last mentioned muscles is to draw down the thorax and raise the abdominal viscera towards the diaphragm, whose convex or upper side rises towards the chest and diminishes its capacity by expelling the air contained in the lungs. The upright position, by lengthening their attachments as much as possible, favours their functions; but, on the other hand, a sitting posture or the bending forwards of the trunk, hinders them. Respiration is also favoured by the extension of the trunk behind.

These different postures have similar effects on phonation, for they give greater tension to the expelled air, and consequently greater force on the organs of speech.

62. These are the principal organs of respiration. Their action in inspiration and expiration in the human organ is like that of bellows, by elevating and lowering the walls of the thorax as the air is alternately inhaled or expelled in the double function of respiration and phonation. Ordinarily these movements follow with rhythmic alternation. But at times the action is impeded, to the great detriment of the respiratory and vocal functions. This happens frequently with stammerers. Deaf-mutes are not deficient in respect to this rhythmic alternation, but the functions are performed with diminished energy, from the absence of the voice. In fact, the production of the voice demands muscular action to provide the tension necessary to the action of the vocal chords, and it must be artificially provided.

The primary care ought to be to station the learner in the most favourable attitude, which is the erect, directly opposite to the teacher, and to make him execute the inspirations and expirations rhythmically by giving him examples of these movements. We begin with that in which the diaphragm plays the principal part, to make profound abdominal inspirations, and then gradually restore the diaphragm by the inverse action of the abdominal muscles. Then to excite and regulate this function, we place pieces of paper graduated in weight, from the lightest to the heaviest, and lead the scholar to blow them off in succession. Then, when sufficiently exercised in this manner, he is led to execute the most energetic movements of the whole of the muscles, in order to

make them flexible and to introduce normal habits by good discipline.

1. By the action of the deltoids we raise the arms aloft, at the same time raising the humeral insertions of the pectoral and of the broad dorsal.

2. Care should be taken that the contraction of the diaphragm is executed at the same time as that of the deltoids ; the chest should also be well expanded.

3. Then, by the contraction of the broad dorsal, we should quickly throw the arms below and also behind, making the contraction of the abdominal muscles coincide with that of the broad dorsal. The gymnastic exercises of the rigging and the elementary movements called the soldiers' drill will also aid in these special exercises of respiration.

The great quantity of air introduced to the lungs by these exercises favours hematosis, and in addition to the immediate object sought by them exerts a happy influence on the health.

63. In the foregoing description of the muscles which have been chiefly to do with respiration, their different functions have been sufficiently noted to enable the teacher to select the most appropriate exercises for their development. But, this is not enough, the breath itself ought to accompany each of them in vigorous or prolonged inspirations and expirations ; so that these muscles and the lungs may interact and thus increase their power and confirm the habits most helpful to free and ample respiration. Those who hear and speak have been unconsciously using their forces since they pronounced their first word, so that their muscles and lungs are highly developed. Deaf-mutes use them only for

Fig. 7.—VIEW OF THE CARTILAGES OF THE LARYNX FROM BEHIND. (Figs. 7 to 12 are the natural size.) *a, a*, arytenoid cartilages ; at their tips, above, the cornicula or cartilages of Santorini ; *i*, muscular process of the left arytenoid ; *e*, cricoid cartilage ; *th*, thyroid cartilage ; *b*, its upper, *d*, its lower horn ; *e*, epiglottis ; *h*, ligament connecting the lower horn of the thyroid with the cricoid.

Fig. 8.—EXTERNAL VIEW OF THE RIGHT SIDE OF THE LARYNX. *a*, hyoid bone ; *b*, its small, *c*, its great horn or cornu ; *d*, thyro-hyoid ligament ; *e*, upper horn of thyroid ; *f*, posterior crico-arytenoid muscle, partly hidden by the thyroid ; *g*, crico-thyroid muscle, attached below to *h*, the anterior part of the cricoid ; *i*, right wing or ala of the thyroid ; above *g*, between it and the thyroid, is seen the crico-thyroid membrane.

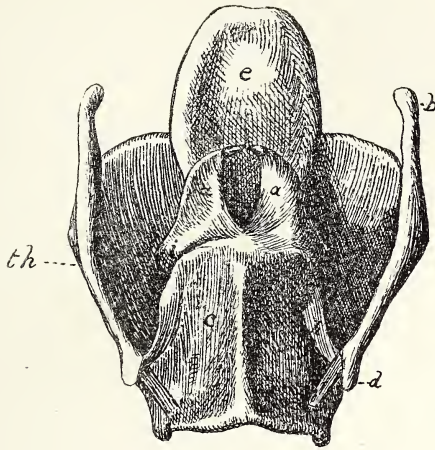


Fig. 7.

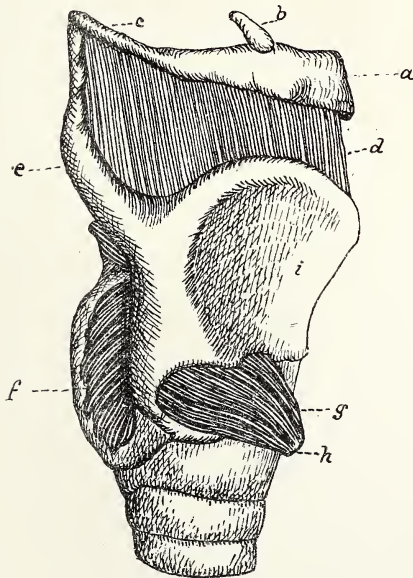
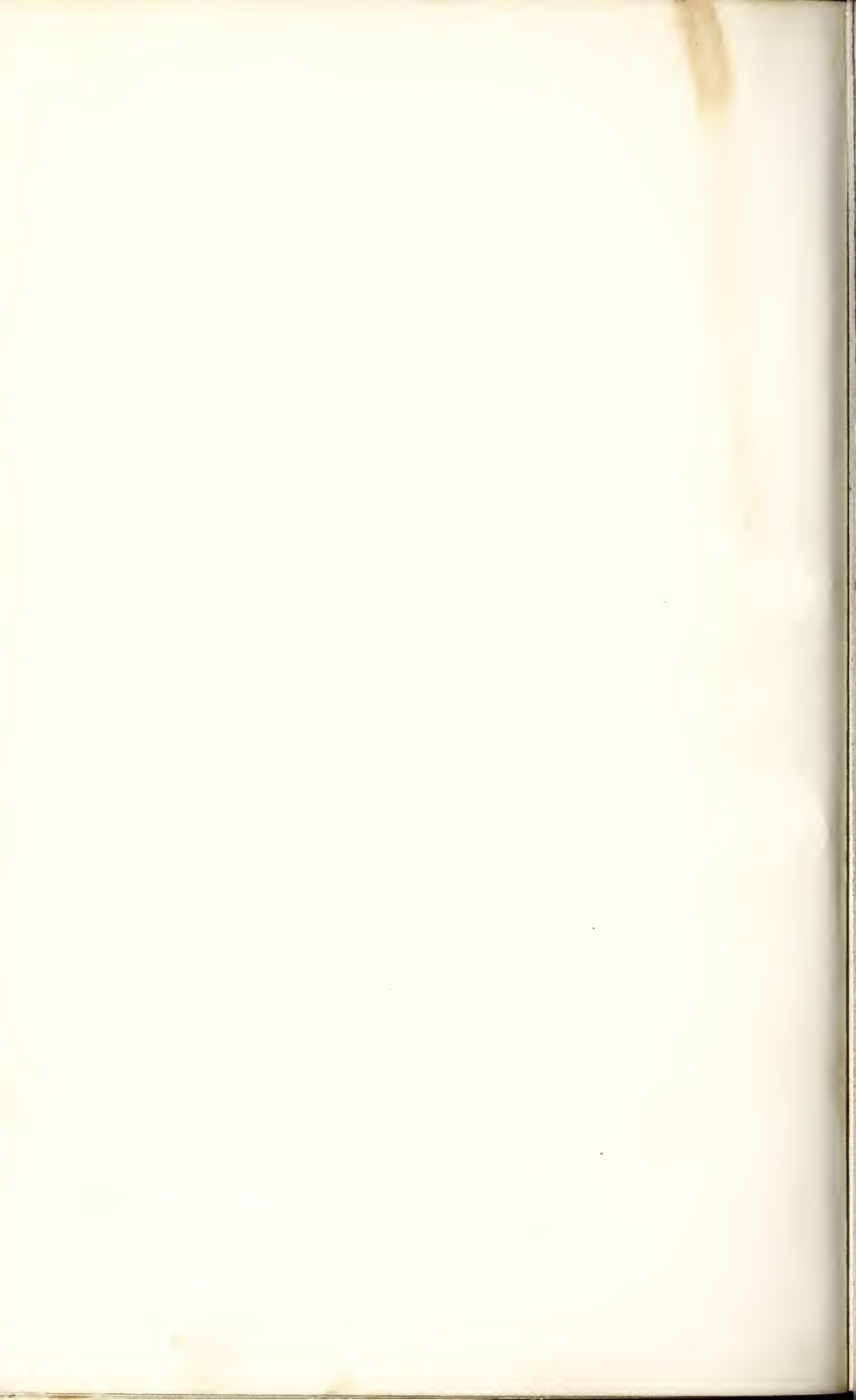


Fig. 8.



vital respiration, and their action is therefore limited to its necessities; but speech requires much more in volume, muscular force and facility for its free production. This must at first be produced artificially. Let then respiration be increased by muscular action till every utterance shares in the effect.

ORGANS OF SPEECH.

64. The LARYNX is a continuation of the tube formed by the trachea, but differing in structure, on account of the two-fold uses it has to serve. Like a chest it has a framework open above and below, and the shell is of cartilage and bones, to which the muscles employed in phonation are attached (Fig. 12). These cartilages are, the cricoid, thyroid, and arytenoids, with the hyoid bone.

The Cricoid Cartilage is situated immediately above the uppermost ring of the trachea (Fig. 12, *k*), itself a larger and deeper ring, narrow in front but gradually widening towards the rear till it terminates in a form resembling a signet ring. This is the basis of the structure.

The Thyroid Cartilage is the largest of all, and has been likened to a shield, or rather a breast-plate, from its shape. Below it ends in two short cornua—horns (Fig. 7, *d*), which overlap the cricoid (Fig. 12, *u*), and above by two longer horns, which form parts of two pillars by which the thyroid is united to the hyoid bone (Fig. 12, *e*). The wings—*alæ*—are closely knit together. In front it bulges outward into the protuberance called *Pomum Adami*—Adam's Apple (Fig. 12, *c*, *f*, *g*). Behind are the vocal chords whose vibrations are most perceptible to touch at this point. Above the apple it parts and curves away on both sides, like the wings of a bow (Fig. 9). This leaves an irregular space which is filled by the lower section of the epiglottis. From the decrease in the width of the cricoid cartilage another narrower space is left between it and the thyroid, resembling a young moon (Fig. 1, above *c*); and both these spaces are very serviceable for touch to perceive the action of the cricothyroid muscles.

Arytenoid Cartilages. As the functions of these

cartilages are essential to the production of vocal sounds, they deserve the closest attention. They are comparatively small and pyramidal in form (Fig. 7, *a, a*). By one of its angles and part of its outer base it is attached to the cricoid cartilage (Fig. 12, *i*), which forms a kind of pivot for its action. Another angle points to the plane of the vocal chords (Fig. 11, *c, d*), and the third, perpendicular to these, extends outwards (Fig. 7, *i*). The apices terminate in two small curved horns, which bear the name of Santorini (Fig. 7, above *a*). The base of each arytenoid is slightly hollowed, having towards its outer part a smooth surface for articulation with the cricoid. Two of its angles are remarkably prominent, one external (Fig. 11, *a, b*), short and rounded, which projects backwards and outwards, and into which the posterior and the lateral crico-arytenoid muscles are inserted (muscular process), the other anterior, which is more acute, and forms a horizontal projection forwards (Fig. 11, *c, d*), to which the corresponding true vocal chord is attached (vocal process).

The Hyoid Bone gives attachment to the base of the tongue. It resembles a horse shoe, and consists of five pieces united by ligaments. That in the centre is a plate about an inch in length and two-fifths of an inch in diameter (Fig. 1, *h*); above, it terminates in two blunt cornua (Fig. 8, *b, c*). The two side bones at their tips rest on two little pillars, which, united by ligaments with the long horns of the thyroid (Fig. 12, *e*), complete the structure

Fig. 9.—POSTERIOR MUSCLES OF THE LARYNX. *b*, placed on the interior of the left ala of the thyroid; *c*, the middle of the back of the cricoid; the two larger muscles running obliquely upwards and outwards from *c* are the posterior crico-arytenoid muscles; they are attached to the lower part of the arytenoids below *i, i*, but the attachment is not clearly shown in the figure; *i, i*, arytenoid cartilages; between them lies the transverse arytenoid muscle; the oblique fibres crossing one another pass round the arytenoids to join the thyro-arytenoid and to form the aryteno-epiglottidean muscles.

Fig. 10.—SIDE VIEW OF THE INTERIOR OF THE LARYNX. (The right ala of the thyroid is cut away, to show the muscles next to the rima or slit of the glottis.) *a*, upper horn of the thyroid; *b*, inner surface of its left ala; *c*, cricoid; *d*, right posterior crico-arytenoid muscle; *e*, right arytenoid cartilage; *f*, part of the arytenoid muscle; *g*, thyro-arytenoid; *h*, lateral crico-arytenoid.

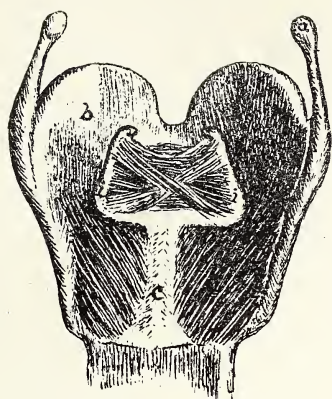


Fig. 9.

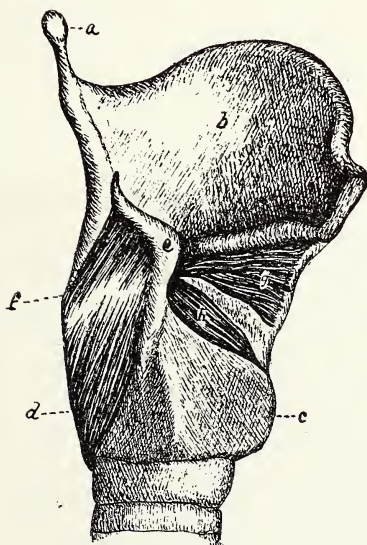
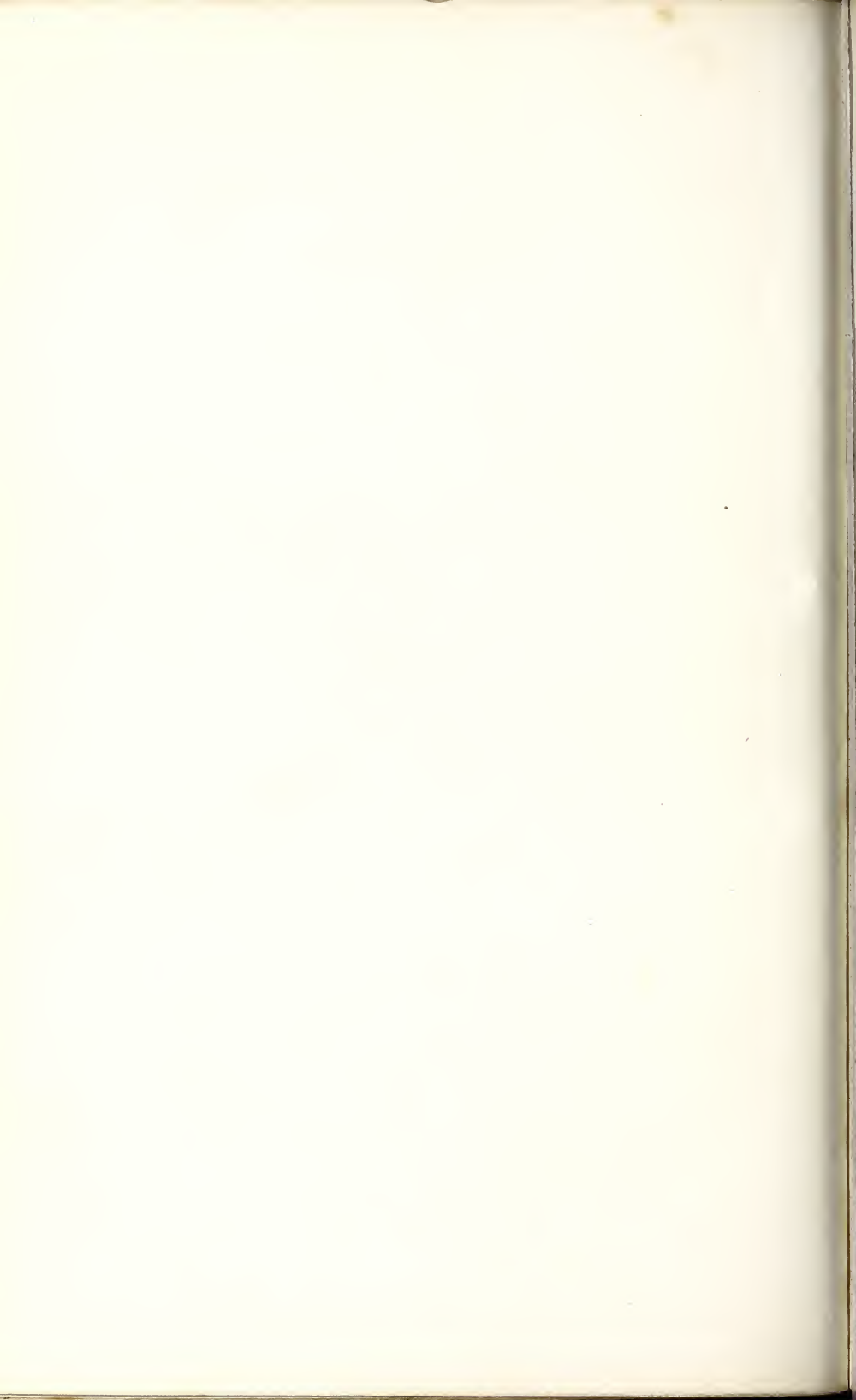


Fig. 10.



externally. Its strength, compactness, and elasticity are eminently adapted to its special uses.

65. MUSCLES OF THE GLOTTIS.—Voice is produced, as in a musical instrument, by air on approximated lips or chords, and provision is made for the action by muscles so situated as to close, open, lengthen, or contract them, as the pitch and intensity of the sound may require. This is done by muscles having different attachments and functions.

Beginning with the Crico-thyroid muscle (Fig. 8, *g*), it is seen to be a short triangular muscle in the front of the larynx. Below, it is attached to the cricoid cartilage and extends from the median line a considerable way backwards; and its fibres, passing upwards and outwards, diverging slightly, are fixed above to the inferior border of the thyroid cartilage, and to the anterior border of the lower horn. By anterior contraction it draws closer the cricoid and thyroid cartilages, the thyroid being fixed and the cricoid moving on the crico-thyroid joint (Fig. 12, *u*), and the part of the cricoid behind these joints is depressed, and with it the arytenoid cartilages, so that the vocal chords are thus put on the stretch, and higher tones are produced.

Lateral crico-arytenoid. These are attached at their lower extremities on either side to the front of the cricoid cartilage at its upper border (Fig. 10, *h*; Fig. 11, *l*, *l*). They pass upwards and backwards, and are attached to the muscular processes of the arytenoids; their action is to rotate these cartilages so that the vocal processes are approximated and the vocal chords themselves brought nearer together.

66. The Posterior Crico-arytenoid muscles are attached below to the cricoid cartilage on the back of the seal side of the ring, and passing upwards are attached to the outer angle of the base of the arytenoids (Fig. 8, and Fig. 9, *i*, *i*). As already seen, they act upon the vocal chords, by drawing the outer angles of the arytenoids (Fig. 11, *a*, *b*) backwards and inwards, and thus rotate the vocal processes outwards and widen the glottis; in this way acting antagonistically to the lateral crico-arytenoids.

The Thyro-arytenoid muscle is attached at one extremity to the thyroid, from which it extends horizontally to

the arytenoids, in whose movements it assists (Fig. 10, *g*; Fig. 11, *o, o*).

If both the posterior and lateral crico-arytenoids are thrown simultaneously into action, the arytenoids will not rotate, but will be drawn downwards and outwards, so the glottis will then be widened.

Two other muscles, the thyro-epiglottic and aryteno-epiglottic, are attached to the epiglottis outside near its margin and pass downwards obliquely, the former to the thyroid cartilage, which it joins near the attachment of the thyro-arytenoid.

The aryteno-epiglottidean muscles, arising near the inferior and outer angles of the arytenoid cartilages, cross one another (Fig. 9), and their fibres are partly attached to the upper and outer part of the opposite arytenoid, partly pass forwards in the aryteno-epiglottidean fold, and partly join the fibres of the thyro-arytenoid muscle. The oblique arytenoids are now considered part of this muscle. These muscles both draw together the arytenoid cartilages, which they unfold, and draw down the epiglottis so as to contract the whole superior aperture of the larynx.

The arytenoid muscle passes straight across between the arytenoid cartilages (Fig. 9), and its fibres are attached to the whole extent of the concave surface on the back of each.

Fig. 11.—VIEW FROM ABOVE OF A SECTION OF THE GLOTTIS THROUGH THE BASE OF THE ARYTENOID CARTILAGES, THE VOCAL CHORDS, ETC. *a, b*, muscular processes of the arytenoids; *c, d*, their vocal processes; *e, f*, posterior crico-arytenoid muscles; *g, g*, ligaments uniting the arytenoids with the cricoid; *h, h*, thyroid; *i, i*, placed on the rim of the cricoid in front; *o, o*, thyro-arytenoid muscles; *2, 2*, lateral crico-arytenoid muscles. The shaded part between *c* and *d* is the slit or rima of the glottis.

Fig. 12.—OUTLINE OF THE LARYNX AND ADJOINING PARTS. (The dotted lines indicate the parts hidden from view by the thyroid, etc.) *a*, body of the hyoid; *b-f*, upper and lower extremities of the epiglottis; *c, c*, upper and lower extremities of the thyro-hyoid ligament or membrane; *x*; *d*, the lateral thyro-hyoid ligament; *e*, cartilage joining the horns of the hyoid bone and the thyroid; *g, g*, thyroid; *h*, right arytenoid; *i*, its junction with the cricoid; *k*; *l*, crico-thyroid membrane and space; *m*, horn of left arytenoid; *n*, left, *q, r*, right vocal chord; *p*, pouch, or ventricle of Morgagni; *t*, first ring of the trachea; *u*, crico-thyroid joint; *w*, hyo-epiglottic ligament.

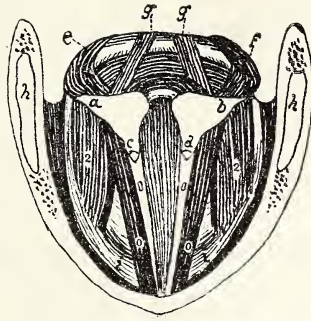


Fig. 11.

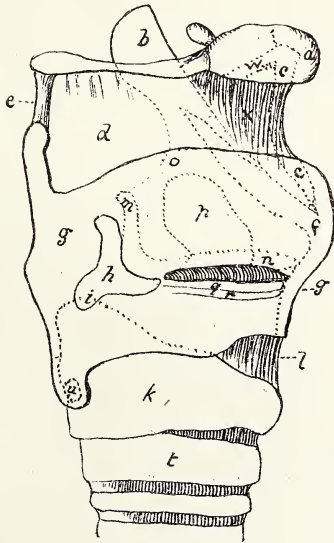


Fig. 12.



They draw the arytenoid cartilages together. These then rotate in such a manner that the vocal processes are drawn apart and the glottis is widened, and at the same time the glottis is depressed.

These are the muscles which act upon the vocal chords and render them efficient in all the variations of tone and expression required by speech and song. X

But to obtain a clearer idea of their action let us make a horizontal section of the glottis, just above the vocal chords.

67. The Glottis proper, and parts adjoining, looked at from above, present the form of a semi-ellipse or horse shoe, the tip of the horse shoe being the front of the thyroid cartilage, or the "Adam's apple." Within this horse shoe lies the cricoid, or ring cartilage (Fig. 11, *i, i*), in the form of an ellipse, the longer diameter being from front to back. Upon the posterior rim of the cricoid stand the two arytenoid or pyramid cartilages (Fig. 11, *a, b*), side by side, but a little apart, and approaching one another at their horns or tips (Fig. 7, *a, a*), which also curve in a backward direction.

Each of these cartilages has two prominent angles at its base; one pointing outwards (Fig. 11, *a, b*), called the muscular process; the other, called the vocal process, projecting towards the front of the glottis (Fig. 11, *c, d*); it is to this pair of vocal processes that the vocal chords are attached, whence they pass to the inner surface of the front of the thyroid, i. e. to the tip of the horse shoe. Stretched tightly across from back to front, these have the appearance of two thin yellowish-white threads running side by side (Figs. 11 and 13), and between them lies the opening into the trachea, the slit or rima of the glottis. The slit, however, takes the form of a triangle, having its apex to the front, for the vocal chords do not run parallel, but are wider apart at the back, where they join the arytenoid cartilages (Fig. 11). The posterior end of the slit is closed by the transverse arytenoid muscle, which runs from one pyramid cartilage to the other across their backs, in the form of an arch.

The pyramid cartilages, from the nature of their position and their power of adjustment, are the principal agents in adapting the form of the slit to the production of the various tones of the voice, by means of the relative position and

tension of the vocal chords. These adjustments are brought about by the muscles of the interior of the larynx, which in our bird's-eye view are seen running in pairs between their different points of attachment.

Parallel with the vocal chords, and just on the outside of them, lie the narrow strips of the thyro-arytenoid muscle (Fig. 11, *o, o*), firmly attached in front to the thyroid just beside the point of attachment of the chords themselves, and at the back to the front surface of the arytenoids. Outside these, and also running from back to front, are the shorter and broader bands of the lateral crico-arytenoid muscles (Fig. 11, *2, 2*), passing from in front obliquely upwards and backwards along the rim of the cricoid cartilage, and attached behind to the outer (muscular) processes of the arytenoids. These muscles, with the cricoid cartilage itself, fill up the greater part of the front half of the section; the back part behind the arytenoids is taken up by the "signet" part of the cricoid, hidden, however from view for the most part by its covering of muscles, viz., the transverse arytenoid above mentioned, connecting the pyramids at the back, and thus closing the tube of the glottis behind, and the pair of posterior crico-arytenoids (Fig. 9, and Fig. 11, *e, f*) running downwards and inwards from their attachment to the outer part of the bases of the arytenoids over the posterior surface of the cricoid.

The two ligaments (Fig. 11, *g, g*) connecting the arytenoids with the cricoid cartilage, complete the general view of the section as seen from above.

The actions of the interior muscles of the larynx may be briefly summed up thus:

The general action of the thyro-arytenoids is to draw the arytenoid cartilages more forward, and so relax the vocal chords.

Fig. 13.—TRANSVERSE VERTICAL SECTION OF THE LARYNX NEAR ITS MIDDLE, VIEWED FROM BEHIND. *e*, epiglottis; *e'*, its cushion; *h*, great horn of the hyoid bone, left side; *f*, thyro-hyoid membrane; *a*, thyro-arytenoid muscle; *d*, thyroid; *c*, cricoid; *g, g*, the false vocal chords; *x, x*, the ventricles; the one on the right shows the pouch, *o*, more opened by carrying the section further forward; *b*, the right inferior thyro-arytenoid ligament in the membrane of the true vocal chord at the rima of the glottis.

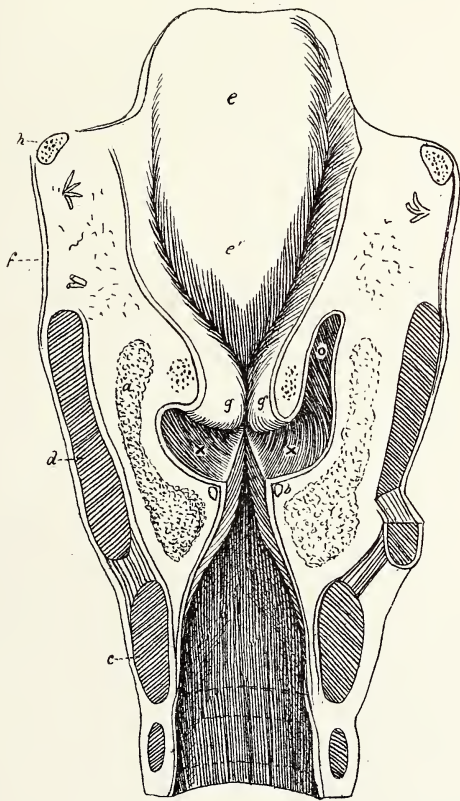


Fig. 13.



The lateral crico-arytenoids rotate these cartilages in such a manner as to cause the vocal processes to approach one another and so to narrow the slit.

The posterior crico-arytenoids rotate them in the opposite direction, and so widen the slit.

The transverse arytenoid draws the back of the arytenoids together, with the effect of widening, to a certain extent, the front half of the slit, and at the same time depressing the glottis.

68. The practical object sought by this detailed description of the glottis, is to give the student not only clear conceptions of its action on speech, but also to enable him to apply his knowledge to this special work. Muscular action is a form of motion, and this in the glottis is perceptible by touch. We can not only feel the vibrations of the glottis in vowel sounds, but the action of the muscles in raising or depressing the whole larynx. The action of the crico-thyroid muscle is also itself perceptible if we place the fourth finger on the vacant space between these cartilages. By pressure, too, on both sides of the thyroid cartilage with finger and thumb we can change the pitch of the voice. We are, therefore, in possession of very valuable appliances to enable the learner to become acquainted with the organ—in action of his own voice in its vibrations and muscular shifts.

For him this knowledge means an increase of intuitive perception of the vibratory nature of voice and with it of power, for to know them intuitively is to be able to imitate them. But in addition to this, to be able to perceive the muscular action of the larynx in its different movements in obedience to the pitch of the tone is to be able to escape the monotony complained of in the speech of deaf-mutes, and vary the tones also according to their pitch. If the hand of the learner is placed on the larynx of his teacher all this can be made evident to him by the rise and fall of the larynx. But the vowels ought to have associated consonants so that the fullest action may be felt, as in DA, KA, TA, PA. What the learner most needs is something to suggest what the ear would have done, and touch serves this purpose in its perception. It is true we cannot find any substitute for the lost

music of speech, but we can endow him with the ability, by tone, accent and emphasis to feel and know that he has power over his organs to express all his thoughts so that he can be heard and understood by others. Half the distance is thus covered which separates him from the hearing.

69. But the voice as it thus issues from the glottis is never heard by us in its primitive form, but is largely modified by the shape and resonant properties of the walls of the tube through which it has to pass before it escapes to the open air. Beginning with the larynx these will be noticed in detail.

THE LARYNX.—In speaking of the glottis it was remarked that the tubular passage to it resembled a sack drawn closer at one point by a cord (Fig. 13). In looking at the glottis under the laryngoscope, the foreshortening prevents our forming a correct conception of its extent and conformation. It is bounded below by the thyroid cartilage and the vocal chords, but its sides are not uniform. Immediately above the glottis there is a deep, narrow depression (Fig. 13, *x, x*) all around, which curves upwards like a bent groove into pockets (Fig. 13, *o*). These are called the ventricles of Morgagni, and their presence produces a lip or fold in the surface of the larynx (Fig. 13, *g, g*). This leaves the edge of the vocal plate perfectly free to vibrate, receives and increases the vibrations, and by the motion of the fold formed between the groove and the upper surface of the larynx further increases the resonating surface. This margin is called the superior or false vocal chord, but experiment has not as yet demonstrated how far it affects the production of voice. The walls of the higher part of the larynx are covered with mucous membrane (Fig. 13, *e*, and *e'*), along which the sound travels to its upper extremity, the epiglottis; but as this is acted upon

Fig. 14.—VERTICAL SECTION OF THE MOUTH AND PHARYNX FROM BACK TO FRONT.

n, placed on the wall of the left nasal fossa; *e*, close by the opening of the left Eustachian tube; *a*, arch of the palate; *v*, velum palati or velum pendulum, the soft palate; *s*, tonsil; *t*, tongue; *ph*, pharynx; *g*, epiglottis; *th*, thyroid; *æ*, œsophagus. The dark muscle running from the chin below the tongue is the genio-hyoid.

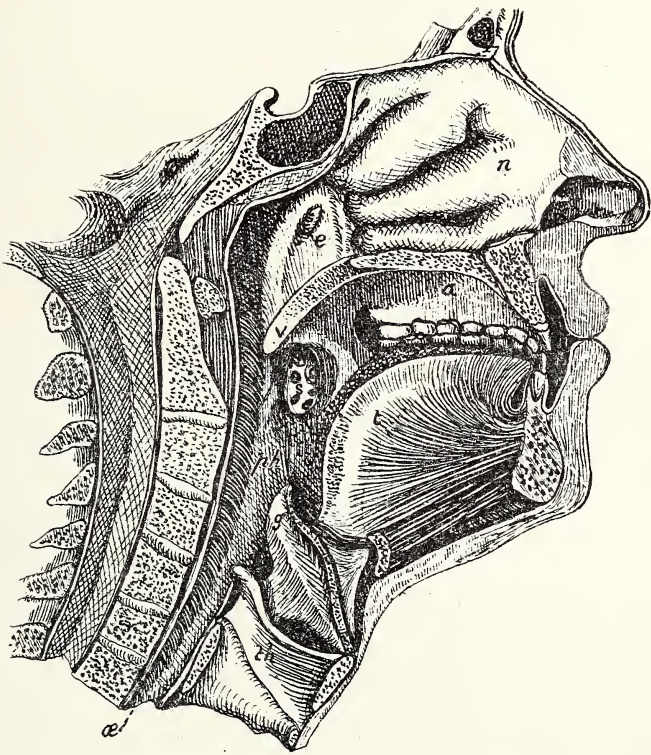


Fig. 14.



by the hyoid or tongue-bone, some account of the uses of the latter is in place.

70. **HYOID BONE.**—Its construction has been already described, from which it was seen that its two long horns are joined by strong bands to the corresponding horns of the thyroid cartilage (Fig. 12, *e*). Its relation to the tongue is as follows: “The floor of its cavity passes obliquely backwards and downwards over the upper border of the hyoid bone till, immediately in front of the cervical vertebræ, it comes in contact with the posterior or back wall of the pharynx with which it is connected.”

71. Following up the larynx, it is seen to take another form and direction, for instead of terminating beneath the tongue in a horizontal tubular top, it bends on the posterior side towards the wall of the pharynx, and in a graceful curve unites with the greater horns of the hyoid bone (Fig. 8, *c*), but in front ends like a leaf or spoon, still retaining its form as a section of the larynx (Fig. 7, *e*; Fig. 14, *g*). This is the epiglottis or glottis lid, which, when any food is about to be swallowed, by its own action, aided by the tongue, is drawn down and effectually closes the orifice of the larynx (Fig. 14, *g*), so that the food passes over by a backward movement of the base of the tongue to the orifice of the œsophagus (Fig. 14, *e*) through which it passes down by special muscular action. But if from undue haste, or speaking while eating, some crumbs should find their way into the larynx, their presence is at once detected and a strong cough speedily ejects the intruder. The epiglottis projects into the pharynx and can be seen when the base of the tongue is pressed close to its couch. Thus the hyoid bone serves as a strong frame for the epiglottis and larynx, which it embraces between its long horns, at the same time giving support and purchase to some of the muscles of the tongue and pharynx. It really forms the crown and completion of the box which contains the glottis.

Taking the line of the upper surface of the tongue which bends downwards to the upper edge of the hyoid bone, it is found that the latter forms a barrier to its further retreat; for its two long horns stretch towards the opposite

wall of the pharynx, where two short feet unite with the long horns of the thyroid cartilage. The muscular action required by speaking and swallowing is felt at the time, and if the finger is placed on the top of the thyroid cartilage the different movements can be perceived and may suggest their imitation by the scholar in learning to speak.

The muscular action of the tongue in swallowing is involuntary, but it can be utilized by leading the learner to feel that he is already in possession of the power to withdraw it for the articulation of guttural sounds. Let him attempt the first and feel with his finger the direction of the action, and the perception of its nature will lessen the difficulty sometimes found in getting him to comprehend what is required of him. *f*

72. THE PHARYNX is the open space above the larynx, and extends upwards to the entrance of the nostrils. It is partly closed in front, by the velum palati (Fig. 14, *v*), ending in the uvula and by the base of the tongue, but altogether behind by the wall of the cervical or neck vertebræ (Fig. 14). Its form is therefore irregular, and, in addition, it is subject to many changes from the action of the velum palati in uttering nasal sounds, and the movements of the tongue in many others. As a part of the tube through which the voice passes after leaving the larynx, its changes of form must largely influence its pitch and timbre, at one time lending it greater fulness and clearness from its

Fig. 15.—MUSCLES OF THE TONGUE, PHARYNX, ETC., OF THE RIGHT SIDE.

a, the upper jaw-bone; *b*, the branch of the lower jaw drawn up, cut through at the chin, *b'*; *c*, its external lateral ligament; *e*, the mastoid process; *f*, the styloid process; *d*, the tongue; below it, *y*, the fan-shaped genio-hyo-glossus muscle; *w*, the genio-hyoid. From *f*, the styloid process, extend three muscles, *n*, the stylo-glossus; *o*, the stylo-hyoid; *p*, the stylo-pharyngeus; and two ligaments, the upper, the stylo-maxillary ligament, running to the angle of the lower jaw-bone, *b*; and *m*, the stylo-hyoid ligament, running to the small process of the hyoid bone; *q*, the superior constrictor muscle of the pharynx; *r*, part of the inferior constrictor; *g*, the hyoid or tongue bone; *t*, the hyo-glossus; *s*, the thyro-hyoideus; *x*, the thyro-hyoid membrane; *h*, the body of the thyroid cartilage; *i*, its upper horn; *j*, cricoid cartilage; *k*, œsophagus.

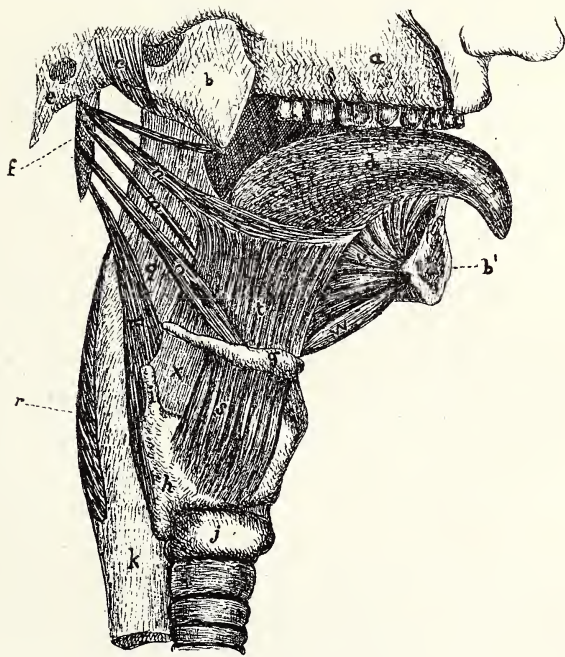


Fig. 15.



resonant properties, at another reducing it to roughness and sharpness.

The bent form of the epiglottic part of the larynx deflects the voice (Fig. 14, *ph*) so that it impinges against the cervical wall of the pharynx, and thence deflected at the same angles passes over the base of the tongue (Fig. 14, *t*), and again impinging on the soft and hard palates (Fig. 14, *v, a*), from which it is a second time deflected, escapes between the teeth and lips to the external air. But when the veil is dropped, in pronouncing *m*, then it impinges on its posterior side, and, after a variety of deflections, escapes through the nostrils. If the mouth is opened to its full extent and the tongue depressed on its couch so as to free the glottis as much as possible, the sounds uttered in these conditions are found to vary considerably in resonance from what they do when permitted to receive the full influences of the pharynx in its normal action.

73. The muscles peculiar to the pharynx (Fig. 16) and external to the larynx employed in various functions :

1. The inferior constrictor, or laryngo-pharyngeus (Fig. 16, *l*), is attached posteriorly to the cervical wall of the pharynx, and anteriorly partly to the upper surface of the thyroid cartilage, and partly also to the cricoid (Fig. 16, *e, f*). This muscle contracts that part of the pharynx to which it is attached, and aids in passing down the food and in elevating the larynx.

2. The middle constrictor, or hyo-pharyngeus (Fig. 16, *k*), is attached posteriorly to the wall of the pharynx, about the middle, on which it spreads out, and, dividing anteriorly, one of its parts is attached to the long horns of the hyoid bone, and the other to the short horns. This muscle acts specially on the hyoid bone, to which it has a fourfold attachment, and has much to do with the action of swallowing as well as the movements of the glottis, and "compresses that part of the pharynx which it covers."

3. The superior constrictor, or gnatho-pharyngeus (Fig. 16, *j*). "This muscle, like the others, is broad, thin, nearly four-square, and partly covered by the middle constrictor. It is attached to the occipital bone before the large foramen—behind the ear, to the pterygoid process

of the sphenoid bone, to the upper and under jaw near the last molar teeth, and approaches the buccinator muscle without uniting. Some fibres also are fixed to the root of the tongue and palate." "It compresses the pharynx at the upper part; for the constrictors act in succession and contract that portion of the alimentary canal when it is filled with food and force it downwards into the œsophagus." Its action can be partly felt when we swallow some food. The functions discharged by these three muscles of the pharynx are very important, both in speaking and the reception of food. Extending from the skull above to the rings of the trachea below, they participate in all the movements arising from vocal utterances, and the removal of every article of food into the stomach. ✓

74. THE SOFT PALATE.—This is a crescent-shaped curtain with a projecting middle, the uvula, which hangs down (Fig. 23, *c*). The horns of the crescent rest on the base of the tongue on either side. It is attached to the hard palate at a more advanced point, whose curve it continues and completes. It is called the *velum palati*, or veil of the palate; and, by the aid of the tongue, its chief function is, like a veil, to rise in order to let the voice pass through the mouth, or fall to deflect it through the nose. When at rest it reposes on the rounded portion of the back of the tongue on either side. It is visible over the base of the tongue, where it forms two small arches, divided by the uvula (Fig. 23, *c, f*). Its movements in speech are secured by two loop muscles, which act in opposite directions.

The first, palato-pharyngeus, elevator of the pharynx (Fig. 23, *e*), is situated in the soft palate and wall of the pharynx. Above, it lies in the soft palate, taking origin partly from its fellow of the opposite side, partly from the fibrous tissues of the soft palate, and partly from the edge of the hard palate. Passing down from this position its fibres

Fig. 16.—DEEP MUSCLES OF THE CHEEK, PHARYNX, ETC. (Nearly one-half natural size.) *a*, external pterygoid plate; *b*, styloid process; *c*, body of the lower jaw; *d*, hyoid bone; *e*, thyroid; *f*, cricoid; *g*, trachea; *m*, œsophagus; *j*, superior constrictor of the pharynx; *h*, middle constrictor; *l*, inferior constrictor; *n*, lower part of the stylo-glossus; *o*, stylo-pharyngeus; *p*, mylo-hyoid; *q*, hyo-glossus; *r*, thyro-hyoid membrane; *i*, buccinator; *h*, orbicularis oris.

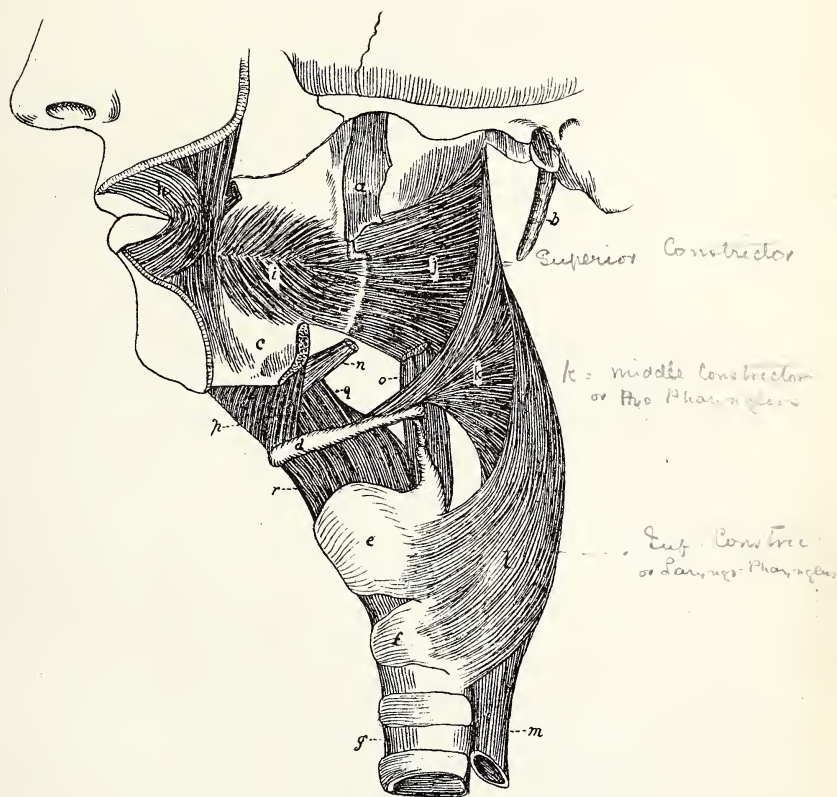


Fig. 16.



run in the posterior pillars of the fauces on each side; these are the hindmost of the two folds of membrane, enclosing the tonsils. The muscle passes down in the pharyngeal wall to be attached to the posterior edge of the thyroid cartilage. By the combined action of the two muscles the soft palate is depressed, and the pharynx and larynx raised, while the mouth is cut off from the nose and throat by the approximation of the pillars of the fauces. The second, levator palati or veli (Fig. 23, *a*), elevator of the palate, is attached to the apex of the petrous (bony) portion of the temporal bone, and to the adjoining margin of the Eustachian tubes (Fig. 14, *e*), whence it descends into the soft palate, covered by the superior constrictor (Fig. 16, *j*). Here it expands into a loop which lies behind the loop of the palato-pharyngeus. Its action raises the velum forwards (Fig. 14, *v*, and Fig. 23) when nasal vowels are wanted. This action is further strengthened by the Azygos uvulæ elevator of the uvula (Fig. 23, *c*) acting like a cross band, which is attached to the hard palate above, and extends to the uvula at its lower extremity.

Another muscle, the tensor palati, is attached at one end to the scaphoid fossa of the sphenoid bone, and the margin of the Eustachian tube (Fig. 14, *e*). It crosses over the superior constrictor, and entering the soft palate, spreads out and forms a layer attached to the fibrous layer of the soft palate, and by its means to the edge of the hard palate in front. This layer is made tense when the muscle acts, giving a horizontal direction to the soft palate.

By these muscles the action of the velum palati is controlled, and, in those who hear, their action is perfect without any special training; but in deaf-mutes it looks very difficult, almost impossible to institute by the aid of the will what nature does independently. Were the muscles so situated that their action could be seen and felt, there would be little difficulty; but, hidden away as they are from both senses, the suggestives are absent which would enable us to assist. But there is really no difficulty, for nature has already supplied the training. The reception of food never takes place without the very action demanded by speech, for the veil

falls to prevent its return into the mouth when it has passed over into the pharynx and rises again to permit its entrance, and the same, in fact, with every respiration in which the mouth or nose is the sole passage for the air.

And from this it is also evident that in order to prevent every vowel becoming nasal—a tendency found in some of our scholars—the free passage of the air in respiration should precede the vowel sound and the head be erect at the same time, and the latter will naturally follow its leader. Touch assists so efficiently in the nasal vowels themselves that the attempt to imitate the vibrations felt on the nostrils is usually successful. √

75. THE TONGUE (Fig. 15, *d*).—Its place and form need no description. Its uses, too, are well known in masticating and swallowing, in taste, touch, and speech. But the last is the most important, and for this its construction is eminently adapted. Guided by the ear it moves freely into every position required by articulation, and afterwards returns to their repetition as if by instinct. This great mobility arises from its structure. It looks as if formed of a confused mass of muscular fibres, but really their arrangement is most perfect; for if we follow them carefully they are found to be distinct ramifications of three principal muscles on each

Fig. 17.—SUPERFICIAL AND DEEPER MUSCLES OF THE LEFT SIDE OF THE HEAD.

a, frontalis muscle; *b*, occipitalis; *c*, elevator of the external ear; *d*, anterior, *e*, posterior muscles of the ear; *f*, points to the orbicular muscle of the eyelids; *g*, pyramidalis nasi; *h*, left compressor naris (compressor of the nostril); *i*, elevator of the upper lip and nose (levator labii superioris alæque nasi); *k*, elevator of the upper lip (levator labii superioris); *l*, a deeper muscle, elevator of the corner of the mouth (levator anguli oris); *m*, great zygomatic (zygomaticus major); *n*, lesser zygomatic (zygomaticus minor); *o*, depressor of the corner of the mouth (depressor anguli oris); *p*, depressor of the lower lip (depressor labii inferioris); *r*, elevator of the chin and lower lip (levator menti or l. labii inferioris); *s*, buccinator; *t*, orbicularis orbis; *v*, masseter; *w*, external lateral ligament of the lower jawbone.

(Below *c* and *d* and covered by them lies the temporal muscle; a large fan-shaped muscle arising from the branch of the lower jawbone, above the upper insertion of the great zygomatic, *m*, and spreading out over the whole of the temple.)



Fig. 17.



side, or three pairs in all, from three directions, intimately bound together and attached at their extremities. Three other and smaller muscles are also found, which are special to the tongue, and their attachments within itself. As it lies in its bed it looks a long body, flat at the top or dorsum, round at the edge, and finely fretted with corpuscles which we know to be those of touch and taste. But beneath it is different in form (Fig. 15), for while the greater part of it is attached to the floor by a set of ligaments which permit the dorsum, tip and sides the freest action in every direction, its base or root approaches the epiglottis, with which a mucous membrane connects it, called the glosso-epiglottic ligament; and another mucous membrane, seen when the tongue is raised, the frenum linguæ, or rein of the tongue, passes from the under surface of the apex downwards to the floor. When this is too short to let the tongue have free action, it is said to be tied.

76. (a.) The first of the three pairs of muscles is the genio-hyo-glossus (Fig. 15, *y*). They lie together on the lower side, and form the basis as well as a considerable part of the mass of the tongue. At one end they are attached to the upper genial tubercle on the inner surface of the joint of the chin. Thence passing backwards and upwards they spread out through the whole tongue till their uppermost fibres terminate in the apex of the tongue, and their lowest at the hyoid bone, where the dorsum terminates. The function of this muscle is to obtrude, retract and depress the tongue. But its obtrusive action is not employed in speech, for it never passes beyond the teeth in the articulation of any sound. Its depressing power is of greater importance, for by it the tongue can be kept close to its floor out of the way for the full utterance of certain vowels.

(b.) The hyo-glossus (Fig. 15, *t*) is the second pair of muscles. At one end they are attached to the greater horns of the hyoid bone, then they pass close by the lateral wall of the pharynx, above the hyoid bone, and over the surface of the genio-hyo-glossus to the tongue, through which they spread. As their function they have to draw the tongue backwards and downwards, so rendering it convex on the dorsum.

(c.) The third pair is the stylo-glossus (Fig. 15, *n*). At one end it is attached to the styloid process (Fig. 15, *f*) of the temporal bone, whence it passes down near the upper part of the pharynx, then forwards to the apex of the tongue, on a higher level than the hyoid bone. This muscle also draws the tongue backwards but in an upward direction, by which it is pressed on to the epiglottis, and assists in delivering the masticated food to the oesophagus, in pressing down the glottis for the full utterance of the deeper vowel sounds, or in rising towards the palate for the higher vowel sounds or guttural stops.

These are the three principal pairs of lingual muscles. They are all attached at one extremity, but perfectly free at the other. If the points of attachment are considered, it is evident that they resemble three cords in an ascending order, firmly attached to enable the tongue to move freely in these directions.

But in addition to these the tongue has three other muscles situated within itself and attached only to points in its own structure.

These are (1) The lingualis longitudinalis inferior, or the lower long tongue muscle. This is a round band running the whole length of the tongue between the first and second principal muscles.

(2.) The lingualis longitudinalis superior, or upper long tongue muscle. This a large flat layer of minute fibres which spread over the entire dorsum under the mucous membrane.

(3.) The lingualis transversus. A collection of separate bundles of muscles which spread through the tongue transversely.

These three sets being unattached, are free to act on every point, and adapt the tongue to any angle, curve or surface; to arrest the air or voice, or to secure their full or partial emission. The function of the two longitudinal muscles, by their contraction, shortens the body of the tongue, thus rendering it wider and thicker.

But the longitudinalis superior contracts the upper side only; the inferior, the lower side. When the former is acting the tongue curls upwards; when the latter

downwards. Again, if the muscle is acting only on one side, the other comes outwards by sympathetic attraction.

The capacity for motion with which these muscles endow the tongue is practically unlimited, as is well exemplified in the phonetic elements of the languages of all nations. We need not wonder that it became synonymous with language itself, for it has the lion's share in most of the modifications of sound. In addition to these functions it also provides ducts and glands, the sub-maxillary and Wharton's duct, and sublingual gland, for the secretion and conveyance of the saliva necessary to mastication and the free action of the organs of speech.

77. THE NOSE ; ITS CAVITIES AND MUSCLES.—The nose, like the mouth, has a principal place in the emission and modification of the voice. It is the alternative passage for respiration and the seat of the sense of smell. On account of its peculiar structure and resonant properties, whatever vocal sounds pass through it, differ both in timbre and pitch from those emitted through the mouth. Hence they are called nasal. The entrance at the apex of the pharynx (Fig. 14, behind *v*) is narrow as compared with the chamber into which it expands. As a whole it may be described as a small chest open at both ends, but unlike it in its internal structure ; for, instead of having only bare walls on every side, it is divided by partitions into smaller chambers connected by corridors and outlets, whose walls are bent and curved,—with the exception of the septum, or partition—into a little labyrinth (Fig. 14, *n*). These are formed of cartilages and bone. The cartilages are of two different kinds ; one almost bone and the other soft and more like the neighbouring cuticle. Bone above, and cartilage in the remainder, it seems a prolongation of the skull. The great mobility of the extremity of the external nose permits the regulation of the air which enters the cavity ; and a ring, formed principally by the lower lateral cartilage, keeps the nostrils open for its admission.

78. It is admitted that speech is accompanied by visible facial movements, arising from the muscular action of the organs in the articulation of the sounds. The mouth, lips, cheeks, jaws, nose and tongue participate in their turn in the

utterance of every word; for many of the muscles which govern articulation are also outward, and have movements corresponding with internal action. It is true that there is little formal resemblance between them and the sounds, but as they are uniform they can be observed and registered like any other class of natural phenomena. And when this is done it is found that there is an alphabet of motions, produced by the phonetic alphabet. Not that every sound is sufficiently expressed on the face to be read with ease, but that the majority are so, and by their union with the weaker in syllables, words, and phrases, they can all be read.

These are muscular movements, and the muscles are chiefly in the face, so that their position, attachments, and areas of action can be ascertained. If this is carefully done we know what muscles will act in any sound or combination of sounds. There is no uncertainty in this if the sounds are fairly well pronounced. Lip-reading is, therefore, founded on the laws of motion, and not on imaginary semblances. The teacher ought, therefore, to acquaint himself with all the muscles engaged in these expressions, so that he may know where to look for them, what is their value, and how to lead his scholar to their perception.

79. FACIAL MUSCLES.—Each muscle has place, attachments and functions, and to know these will suffice for our purpose.

Levator labii superioris alæque nasi (Fig. 17, *i*). This muscle is attached by a small tendon to the nasal process of the superior maxillary, or cheek bone, close by the tendons of the orbicular muscle of the eyelids (Fig. 17, *f*). As it approaches the nose it is spread out into two portions, one of which is inserted into the ala or cartilage of the nostril, and the other into the upper lip (Fig. 17, *i*). It is concealed by another superimposed muscle, but beneath where it is attached to the nose and upper lip its action is seen in raising the ala of the nostril and the upper lip. Hence all sounds such as *m*, *w*, *oo*, require its elevating force.

Levator labii superioris (Fig. 17, *k*). Its origin is in the lower margin of the orbit, and its insertion in the upper lip. Its function is to protrude and raise the upper lip.

Levator anguli oris. Its origin (Fig. 17, *l*) is from

the canine fossa, and its insertion is in the angle of the lips. It raises the angle of the lips.

Depressor alæ nasi. A small fleshy bundle below the ala (wing) of the nostril. Its origin is from the incisive fossa of the superior maxilla, and its insertion is in the septum and ala of the nose. By contracting it depresses the ala.

Compressor naris (Fig. 17, *h*). Its origin is in the superior maxilla, and its insertion is in the fibro-cartilage of the nose, and it blends with its fellow over the bridge of the nose. Its action is visible in the compression of the nostrils.

Buccinator, cheek muscle (Fig. 17, *s*). Its origin is from the outer surfaces of the alveolar processes of the upper and lower jaws, and from the pterygo-maxillary ligament. And it is inserted into the angle of the mouth. Its function is seen in the dilatation and contraction of the cheeks in the sounds in which the muscles of the pharynx take an active part, as *e*, *t*, *z*, *k*, *g*, and *y*. Associated with *m*, it assists in drawing back the angles of the mouth.

Levator menti, elevator of the chin (Fig. 17, *r*). Its origin is in the incisive fossa, or hollow of the lower jaw, and it is inserted into the integument of the chin. Its action is seen in *p*, *b*, *f*.

Depressor labii inferioris, depressor of the under lip (or *quadratus menti*) (Fig. 17, *p*). Its origin is in the oblique line of the lower jaw, and its insertion is in the integument of the lower lip. Its action draws the lip downwards, and is seen in *a*.

Depressor anguli oris, depressor of the angle of the mouth (Fig. 17, *o*). This muscle is more superficial than *p* and *s*, and triangular in form. Its origin is on the oblique line of the lower jaw, and it is inserted into the angle of the mouth. Its function is to depress the angle of the mouth. It expresses grief, and in *y* and *l* takes a part.

Zygomaticus major and *minor* (Fig. 17, *m*, *n*). Both are on the side of the face, and have their origin in the malar bone. The major *m* is inserted into the angle of the mouth, and the minor *n* blends with *k*. They raise the angle with the adjacent part of the lip upwards and backwards.

Masseter (Fig. 17, *v*.) Its origin is from the malar process of the superior maxilla and zygomatic arch, and it is inserted into the upper half of the ramus of the jaw, and coronoid process. Its function is in closing the jaws and masticating.

The Temporal muscle has its origin in the temporal fossa, the temporal and parietal fascia, and its insertion is into the coronoid process. It draws the lower jaw upwards.

Pterygoideus externus is situated in the zygomatic fossa, and its origin in one part is on the external surface of the pterygoid process, and in the other to the zygomatic temporal surface of the sphenoid bone. It is inserted into the anterior part of the neck of the condyle of the lower jaw. This muscle draws the jaw to the opposite side and forwards.

Pterygoideus internus (Fig. 23, *l*). It arises from the pterygoid fossa. Its fibres, tendinous and fleshy, are attached mostly to the inner surface of the external pterygoid plate, and also to the palate bone. Thence arching downwards with a direction backwards and outwards, it is inserted into the rough mark on the inner side of the ramus of the jaw (Fig. 23, *r*). Its function is to elevate the jaw.

The masseter, temporal and internal pterygoid muscles are elevators of the lower jaw, and generally acting in concert bring the lower teeth into forcible contact with the upper.

Orbicularis oris, circular lip muscle (Fig. 17, *t*). This muscle is a chief agent in all lip movements. It surrounds the mouth, has its fibres in the substance of the lips, and blends by its outer border with the several muscles converging to the mouth, especially the buccinator. It consists of two sets of fibres, an inner and an outer. The former act in projecting the lips, as in *ū*, and the latter in closing them, *p*. It modifies most labial vowels and consonants.

Digastric muscle (Fig. 15, *e*). Its origin is in the mastoid process of the temporal bone, and forming a broad band of tendinous fibres in the neighbourhood of the hyoid bone, passes through a fibrous loop attached to it, and terminates in a small depression of the lower jaw. It assists in raising the hyoid bone, or depressing the lower jaw, according as one or other of these bones is fixed by antagonistic muscles.

II.

ELEMENTS OF PHONATION.

EDUCATION OF DEAF - MUTES.



ELEMENTS OF PHONATION.

EDUCATION OF DEAF - MUTES.

LIP-READING.

80. Lip-reading as a name is misleading, for other parts of the mouth and face participate in the muscular action on which the reading is founded. The lips are undoubtedly the most active and expressive organs in speaking, but they are not alone, the teeth, tongue, jaws, cheeks and nose also contribute their parts, so that it is facial rather than labial. But this is only another instance of a part being put for the whole.

Now the assumption in lip-reading is that the action of the organs in speaking is so fully indicated on the face, as to enable those who make it a study to find out what is spoken, independently of hearing. But this assumption does not imply that these visible indications bear much resemblance to the organic positions and motions in the production of the sounds, but only that they are sufficiently apparent and distinctive to permit an alphabet or syllabary to be formed of them, so that they can be read as the same sounds are by the written alphabet. The radical difference between them being, that in lip-reading rapid movements are the signs, but in writing or print, fixed characters. Both are signs of signs.

Now, as speech is formed by vocal and muscular action, it is certain that some indications of its presence are apparent in the participating movements of the parts indirectly affected by it, especially the lips. This is admitted, but there are some sounds, and chiefly the guttural and palatal, in whose utter-

ance very little, if any, visible indication can be found, and hence it is asserted that this is enough to render the assumption futile. This was Dalgarno's opinion, and it is still held by many, of whom it may be safely averred that they have not given the subject all the study it deserves. The fact remains that numbers have been educated by speech and lip-reading, and can converse freely with their friends by them alone. This is not denied, but either doubts are entertained, or the whole system is made to hinge on the ability to read what is said by any public speaker or to transact business *viva voce*. But oral teachers refuse to limit the benefits of their system to such an exclusive test, for it ignores the greater advantages it confers in the education of deaf-mutes through the sole use of the vernacular, and in the ordinary intercourse of domestic life. At the same time they remind sign-teachers that their test is still more applicable to scholars taught by signs, who have to resort to writing, or the manual alphabet, knowing nothing of what is spoken, either in the pulpit, or, unless signs are the medium, in the transaction of business; and that oral scholars can do the same if they cannot make out what is said by another.

The action of some sounds may be invisible in their inception, but their immediate connection with others may at once suggest them, and enable the reader to supply them as if the action were apparent. The assertion is not made by experienced masters that the eye can detect the action of every sound, for they do not found their method on the individual phonetic elements as units of speech, but on the syllable only, which combines two or more elements, and involves varied muscular movements. If *p* and *pa* are compared in this aspect they differ materially.

81. But syllables differ; all are not made up of one consonant and one vowel. Many have two initial, or two final consonants, or both. Some, too, have three consonants in either place, and the result is that the muscular action required in their articulation is both varied and expressive. Let *blo*, and *blotch*, *branch*, and *slink* be pronounced, while the muscular action is carefully attended to, and it will be seen that the lips, cheek, jaws, teeth, and tongue are all engaged in complex lines of movement.

(2.) This is not all, for many words are formed of two or more syllables, which are pronounced together — except where the accent introduces a marked pause—leading to still greater muscular action, and uniting stronger elements with weaker. These are easily detected, and provide enough for the lip-reading of the whole.

(3.) Then phrases and sentences are made up of stronger and weaker elements, and if they are often used, the eye becomes familiar with them, and they are freely read off from the rapid mental supply of the associated sounds. Mr. A. Farrar says, "That with constant practice, a large number of common words acquire a particular facial expression, or look of their own, which renders the labour of reading their individual letters or syllables unnecessary, just as in reading print we take in the words as wholes, and not as spelling every letter. It will frequently happen that words are more easily recognised on the lips when spoken in their unity, than if the syllables were separately pronounced. This explains why it is often possible to read rapid speech when the discrimination of all the facial movements would be impossible if the reading were confined to the perception of all its component parts."

(4.) Fortunately for lip-readers, the eye, like the ear or the hand, lightens her labour by habit and economy of effort. There is a method in seeing. When we look down on some fresh scene, instead of beginning with its details, we catch up the principal objects, and the others group themselves about them. Then through these we ascend to the whole. Once this is gained we can examine the details, and dwell on whatever most excites our admiration as parts of that whole. The very same habit is formed in hearing, till a few notes or a few words bring the whole piece to our recollection. The musician finds out how sounds are so closely associated, that the thought and attention he had at first to bestow on the holding of his instrument and the placing of his fingers seem no longer required ; as if instinctively moved, they drop into the right places, so that he feels in possession of a magic power to do as he pleases with his instrument. It is exactly the same in lip-reading. Accustom the eye to the different facial movements till it becomes familiar with them, and it will read them so that in process of time they will be as easy

as print. Nature has more in her treasury than we often give her credit for.

(5.) All familiar forms of speech have what we may call their key words, with which all the others are closely associated by their frequent repetition, so that these can be almost dispensed with when the first are pronounced, as *How do you do?* Here *how* and *do* suffice to convey what is meant without hearing the other words. So the lip-reader becomes familiar with these key words. No better drill in lip-reading can be devised than to pronounce a number of sentences to a class, and find out who can most quickly read them on the face, and then to inquire what was specially seen by each which suggested the whole. Bonet's pupils could do more in lip-reading than he could account for, because he did not allow for all the expression and the power of habit.

(6.) Above all, accustom the eye of the learner to all the movements in a word, phrase, or sentence. They might be reduced to a series of zigzag and curved lines linked together, and these can be remembered. This, however, applies only to words, not mouthed, but distinctly spoken. In teaching we must needs express the elements firmly, but this ought speedily to give place to a natural form of utterance, else we unfit our scholars for the intercourse of life.

Lip-reading must be taught as well as speaking. The assumption that it will be learned at the same time, because speech itself is learned by lip-reading, is too great. No doubt to some extent it would be, but not with the intelligence and accuracy which result from constantly directing the attention of the learner to the special muscular action of each element of speech as it is taught. In this manner it becomes an essential part of his education in speech-language, and the eye constantly assists touch to reproduce the right sounds, for only these excite the right facial movements. But as the phonetic elements of speech are taught progressively from the easy to the difficult, and from the simple to the complex, lip-reading will be taught in the same manner, and in close association, till both are learned. All the details will, therefore, be found in the following descriptions.

In addition to the movements and dispositions of the

organs above referred to, there is one which calls for special attention, that of the lower jaw. This is known to recede or advance in compliance with the action of the tongue. When guttural sounds are articulated it falls back, and when labials it advances. These changes are indicated by the lips and teeth in their relation to one another, for when the sounds are guttural the upper teeth and lip are in advance of the lower, but when labial or dental they are almost on the same line.

A PHONETIC ALPHABET.

82. We have a collection of letters, but they are not an alphabet. The elements of speech are separate sounds appreciable by the ear, and limited in number, so that each can be represented by one sign or letter. These would form a phonetic alphabet, so that each when seen would at once suggest the sound of which it is the sign. The possession of such an alphabet would be a great boon to deaf-mutes, for their eyes would always lead them to the right sounds. How different our so-called alphabet is from this is evident at a glance. There are at least thirteen vowel sounds and only five letters for them. While some of the consonants, as *f*, *b*, *m*, and *c* are phonetic, others are superfluous, as *c* or *k*; and some have no proper sign of their own, as *th*, *ch*, and *sh*, but are represented by two signs, neither of which suggests the phonetic value; and on the other hand, *x*, *q*, and *j* are double consonants. These are not all the defects in our alphabet from a phonetic point of view, but there are others still graver and more formidable from a psychological. We strive to train the senses to correct perceptions, and thus to put the mind in possession of facts, or we labour to acquaint them with the real and not the deceptive; but here, on the very threshold of their education, we introduce them to a set of signs for the names we give to objects, yet they are so defective, so uncertain in their phonetic value, that they cannot trust to their senses, but have to look at their teacher or to memory, or the place of the letter, for their correct sounds. No doubt much of this springs out of the attempt to make a Greek or Roman alphabet serve for every other language. But

it is time that it was righted, for the waste of time and the labour spent in learning and using it, the uncertainty which attends it, the difficulties it lays in the path of foreigners learning our language, which otherwise is one of the easiest, render it a burden and a loss to everyone, but most of all to deaf-mutes, who have to spend much of their time in learning to pronounce every word, when they ought to be laying up knowledge. If we could trust our ears in spelling, and they their eyes, it would be an immense relief. Whether the reform of our alphabet will be soon attempted, we cannot say, but the time will come when the nation will demand it, and the literary defenders of the old will have to yield.

In teaching, many expedients have been tried to obviate these defects.

83. A Phonetic Alphabet was invented by Dr. Melville Bell, of new characters, each of which has its own fixed value, and which when learned is ever suggested in reading. The sound and its sign are therefore associated as closely as a name and its object. This seemed a great improvement; and undoubtedly it would have much facilitated the work of oral teaching, but unfortunately the old alphabet was not displaced by the new, but had to be reckoned with before a single word, as now printed or written, could be read. This not only meant that two alphabets had to be learned, but that the second had to be conformed to the first by diacritic marks, or some other expedient to guide the learner to its phonetic use as taught by the new alphabet. Our own experience does not entitle us to utter any opinion on the relative gain or loss of Dr. M. Bell's new alphabet, but we have heard that teachers who once used it have returned to the old rather than teach two alphabets.

In the eyes of some teachers diacritic marks are objectionable on account of their complexity. They are said to be like Hebrew points, which are ever distracting to the learner. This is true and might suffice if some better expedient could be devised, but as yet no lexicographer has been able to do without them in some form or other. Had we the ear to assist us a simpler device could be found, but as deaf-mutes have only the eye they ought to be able to read the sound by the presence or absence of some discriminating sign.

Mr. Walker used numerals as diacritic marks, and placed them on familiar key words, by pronouncing which the vowel sounds could be determined. F¹äte, f²är, f³äll, f⁴ät, m¹ë, m²ët, p¹ine, p²in, n¹ö, m¹öve, n³ör, n⁴ót, t¹übe, t²üb, b¹üll. Oil, pound, thin, this.

Ogilvie, in his new Dictionary, has the following : Fäte, fär, fat, fall ; mē, met, hér ; pīne, pin, nōte, not, möve ; tübe, tub, büll, oi, pound. (It ought to be noted that *u* in tube is a diphthong, made up of *y* and *u*.) ü Sc. abune ; *y* Sc. fey ; *ch*, chain ; *jo*, job ; *n'*, ton ; *ng*, sing ; wig, whig ; *zh*, azure. The guttural *ch* aspirate is not pronounced in England, nor the *ü*, as in abune. Neither is *y* heard as a final. But this is too elaborate. The following seems to us to answer all necessary distinctions : Fäte, far, fäll, fät ; mē, mēt ; pīne, pīn ; no, mōve, or oo, nör ; tube (this is the diphthong *yu*), tüb, büll (like *oo*), *th* in this, *th* in think. There is no one dictionary in the hands of our children, and therefore, unless they are taught the meaning of the diacritic marks in that which they use, they will be destitute of a guide to the pronunciation of words they have either never learned or forgotten. This is a matter for the thoughtful attention of the teacher.

But, whatever the manner of marking the correct sounds of the vowels and consonants, it ought to be written or printed in large type, and suspended where the class can conveniently see it, and use it for immediate reference, so that the pointer can remind the learner of the key word in which any sound is used. This will save time. But there are many modifications of sounds which can only be learned by the organic actions which precede or follow them, and of which no picture can be drawn or sign invented of any value to the learner. Sight and touch actively employed must discover them and frequent articulation make them familiar. The primary alphabet is in the positions of the organs and the aerial or vocal sounds emitted by them. Let these be mastered, and their signs will not be difficult to find.

Continuity of vocal sounds.—When a note of a given pitch is blown on a small organ pipe, the pitch is the same from first to last. While the intensity may vary, there is no variation in the number of vibrations per second.

This uniformity follows structure and material, which are uniform and fixed, so that every sound passing through is subject to the same modifying conditions. But not so with the organs of speech. They do indeed form a tube, but it can be so acted upon by the muscles, and is so elastic in material and structure, as to be capable of so great variations in length, diameter and voice, as to be a series of tubes of considerable compass and modification of tone rather than one. Being neither stationary nor rigid, but capable of many shifts and adaptations under the control of the will, these organs are subject to great variations in adapting themselves to the fresh requirements of tone, pitch and intensity, so that none of the notes are uniform, like an organ pipe, but usually begin and end on a different pitch or glide through several notes from organic shifts or relaxations. Musical instruments have been constructed to imitate the human voice in their tones, but never with this power of blending and yielding to the will of the artist. In the voice, every emotion and form of thought finds such expression, that it seems more mental than material.

84. Mechanical Action of the Organs.—But the action of the organs of speech is muscular or mechanical, and can be reduced to mathematical expressions. Enough for our purpose to say that straight lines, curves, angles, are formed by them in the production and union of sounds.

(1.) With respect to the vocal chords, they open, close, contract, or expand in response to all the requirements of vowel sounds. The laryngoscope reveals these movements, and they are uniform in uttering the same notes.

(2.) The larynx rises or sinks from muscular action in response to the requirements of the vocal chords and the extent of the tube.

(3.) The lower jaw, provided with suitable joints and under the control of its muscles, is capable of a fourfold set of movements. Starting from the point of its usual contact with the upper jaw it can descend, advance, retreat, move to either side, and therefore co-operate with the lips, teeth, tongue and larynx in the formation of all the sounds. These motions ought to receive great attention, for they have much to do with effective articulation.

(4.) The lips, from their great mobility and expansive power, can produce a variety of movements; but they can be all determined as in protrusion, withdrawal, rounding, elongating, &c., with which we ought to make our scholars acquainted.

(5.) The cheeks, too, can be expanded and contracted, advanced or withdrawn by the action of the under-jaw, as well as by their own muscles, by means of which the tube is increased or diminished.

(6.) And the tongue, though somewhat bound, can take any shape or position within the mouth, or protrude beyond it, pressing lightly or forcefully. Yet all its action, being muscular, is mechanical and capable of expression by lines.

(7.) And the nasal cavities, by the action of the velum palati, are either an alternative tube for the sounds we called nasal, or silent when the sounds pass only through the mouth.

85. By these mechanical contrivances and motions the vocal tube can be lengthened or shortened.

(1.) Lengthened, by depressing the larynx, by protruding the lips. The increase in length is about $1\frac{1}{4}$ inches.

(2.) Shortened, by elevating the larynx, drawing back the under-jaw, and drawing the lips close to the incisor teeth. The difference between these extremes is $1\frac{1}{2}\frac{9}{10}$ inches. These movements are effected in pronouncing \bar{a} and \bar{e} .

The action of the jaw, lips, and tongue modifies the form and size of the tube very considerably, and permits the variety of the vowel sounds.

(i.) When at its greatest extent, by the opening of the mouth, the close pressure of the tongue on its bed and the larynx at its lowest point, the fundamental note a is heard. But the full resonance of all parts of the tube makes it somewhat guttural.

(ii.) But the rise of the jaw, near the upper incisors, the tongue very near to the palate, and also the larynx raised, and the vocal chords approximated, reduce the tube to very narrow dimensions, while it is shortened at the same time, and \bar{e} , our highest vowel sound, is heard.

(iii.) Again, if the posterior part of the tongue is drawn near to the palate, and a free space left for the voice with a corres-

ponding rise of the larynx *u* is formed. In both these palatal vowels there is a decrease of the resonating surface.

But there are other conditions by which these are affected:

(1.) By the perfect formation of the whole cavity.

(2.) The elevation or depression of the larynx. While it is possible to pronounce, after a fashion, all the vowel sounds without elevating the larynx it is not the natural order. By this law it has been determined that the larynx shall ascend and the vocal chords contract with ascending vowel sounds.

(3.) The conformation of the mouth. This varies much, and hence differences of pitch and timbre.

The conditions on which the utterance of the clearest sounds depend are :—

For *a*, a large orifice in the cavity of the mouth.

For *i* short, the lips drawn close to the incisors.

For *u*, the tube flat, as in the protrusion of the lips and depression of the larynx.

86. These are the principal conditions, but they are seldom available in untrained deaf-mutes. This is easily accounted for, if it is remembered that the use of the organs in speaking is special and artificial. Guided by the ear the sounds are imitated as spoken by others, and in the process the organs take up the positions, not without considerable effort in their articulation. Of this a child can give no account, yet it is brought about as efficiently through tendencies and laws as the use of the feet or the hands. But as the special use of the organs of speech is unknown to deaf-mutes, they have not acquired their command and the habits on which the utterance of the clearest sounds depends. The muscular power over the tongue, lips and jaw is not developed, except in the reception of food, which is much less than in speaking. The scholar may open his mouth wide, but the extent of the cavity is small because the tongue is allowed to fill part of the space, when it ought to be close down in its bed. The lips are either not protruded, or widened, or drawn close to the teeth; for they are not accustomed to such efforts. The cheeks are not pressed close enough to the molars for a similar reason. The conditions, therefore, do not exist, and till they are secured clear sounds cannot be pronounced.

Now, over the larynx, jaw, cheeks and lips the teacher's control is all he wants to train them for clear speech. The tongue is his great difficulty, for it is both out of place and deficient of the conscious use possessed by all who hear. Anyone may satisfy himself, in a few moments' trial and reflection, that in the pronunciation of certain sounds, as *a*, *ā*, he is in the habit of pressing down his tongue, specially at its base, to leave the cavity above it as large and free as possible for the vowel sounds. This is unknown to deaf-mutes, but must be learned. But how? Well, artificially. Referring to the history it will be seen how De l'Épée succeeded. His own finger and that of the scholar were enlisted, first to feel the position and then the nature of the pressure; for unless he comes by touch to perceive this he will never arrive at it by sight only. The finger, spatel and tongue-presser used by medical men are resorted to; but the finger surpasses all others, for it can be used freely and at the points where it is most needed. It is not enough if at first the scholar seems to keep his tongue in the right place. He will fail afterwards. He lacks the sense-consciousness or intuition. Better to teach him at first and the habit will be formed.

DYNAMIC PRINCIPLES OF PHONATION.

87. (1.) Voice is a form of vibration, and therefore an effect of force. This force is generated in the lungs by setting in motion the air collected for this special purpose, by the action of the respiratory muscles.

(2.) The air involuntarily expired from the lungs produces no vocal effects, but is heard in breathing only.

This is called the indifferent state of the vocal organs.

(3.) The air is made sonant by a special disposition of the vocal apparatus called the glottis, voluntarily adjusted, and acted upon by the air expired from the lungs for this purpose.

(4.) But in escaping from the glottis the sonant air, before joining the external, has to pass through a tube capable of great variation, by which it is modified into a number of different sounds or elements of speech.

(5.) When air alone is transmitted and the organs have the same positions as when sonant, it is also modified in a similar manner, so that the sounds can be read as if sonant. This is called "whispering," and shows how much is done for speech by the other organs, apart from the glottis. But in this whispering the larynx participates.

(6.) Voice, as heard, is made up of the fundamental tone intensified by the harmonics formed in the tube by its extent and resonant properties. The tube can be varied in length and diameter so as to produce a limited scale of notes with different degrees of resonance. These notes are heard in the vowel sounds and some of the consonants.

(7.) Much of these actions can be seen and felt as well as heard, by the movements of the chest, the rushing of the air, the vibrations of the glottis and the other organs, by their positions and by the muscular action of the organs in shifting from one position to another.

(8.) Deaf-mutes can also perceive them by sight and touch, and can imitate them.

(9.) As the action of the muscles in speech is not confined to the lips and cheeks only, but more or less employs most of the facial muscles, the eye of the learner can be educated to regard them as a whole as well as the parts principally affected. ✓

(10.) As speech is voluntary, and dependent for its excellency on the control possessed by the learner over all the organs employed in its production, all his exercises ought to be conducted with this object in view. Those already described would do much, yet not all that is required. Long and short respirations, the air expelled at a single impulse or driven out slowly, a small quantity escaping at one moment and a larger at the next, in anticipation of what will be required in speaking. The principal object is the possession of the power to use the air for speech at pleasure.

(11.) But by those who hear, this power is expressed in accordance with the laws which direct and control muscular action in other parts of the frame, and which show that nature ever strives after the smallest expenditure of force, with the least friction, and the greatest facility. In primitive dialects, many of the sounds are rugged and imperfectly

articulated ; but the more polished and refined a language becomes, through its literature, learned and popular usage, the more does it conform in speech to this principle. The musical culture of the ear has no doubt much to do with the change, but constant exercise for all vocal purposes still more.

88. (12.) Each vowel, when naturally pronounced, has its own pitch. From the fundamental *a* up to *e*, five distinct sounds with their harmonics are heard. Three classes of muscular action are successively employed in their production. In the fundamental tone, the larynx is depressed and the tube extended in length and capacity, while the vocal chords are relaxed to secure the right number of vibrations per second. Thus there is an arrangement of all the parts of the organ for the production of this vowel sound. But if *ā* as in *fate* is required, then there is a slight rise of the larynx, a partial closing of the tube by the corresponding rise of the jaw and tongue, so that the tube is smaller and shorter while the vocal chords are drawn closer for the production of the higher pitched note. But now let *e* be produced, the larynx has risen much higher, the jaw and tongue have drawn nearer to the palate, and the vocal chords are much closer for this vowel of highest pitch. This is evident to touch, and can be understood by our scholars, so that they are provided with the suggestions to a similar use of their own organs.

Formally expressed it amounts to this: (A) That there is a simultaneous action of all the organs of speech in the production of every vowel, and many of the consonants, peculiar to themselves.

And (B) That the variations in tone, accent, and cadence, are dependent on these, and therefore deaf-mutes ought to be assisted by touch and sight to employ their organs in a similar manner.

The complaint is often made that their voices are monotonous, but the reason is that they do not shift the organs into the positions of the different sounds, but try to make them all on the fundamental note. If this is counteracted by the raising and lowering of the larynx, touch will discover the difference. Our ear unconsciously aids us to all this ; another sense must take its place in deaf-mutes.

89. (13.) When performing on a wind instrument it is

found that there is a definite proportion between the form, the direction, and the tension of the current of air and the sonorous capacity of the instrument; and only when this proportion is obtained, or the equilibrium between the force of the air and the harmonious vibrations, is the right sound evoked. This sound is at once the simplest, the easiest for the muscles, and the most pleasing to the ear. So with the vocal organs. The quantity and tension of the air introduced for speech must be in equilibrium with the capacity of the vocal chords to convert it into pure sound, free from strain or feebleness. The hearing ear perceives this, but from its absence the deaf mute generally errs, either in excess or deficiency of muscular force, so that the voice is either strained or feeble. He ought, therefore, to be led by a number of well-directed trials to produce the right tone; for, when this is attained, he will himself begin to feel that it is the smoothest and easiest for his organs. The vibrations of a pure note are equal and harmonious, but those of a noise, broken and harsh. The fundamental sense-relation of touch to sound enables the deaf to perceive these and manifest their pleasure or dislike. It is in tune with their feelings or not as the case may be.

✓ If a finger is placed on the hollow of the thyroid cartilage above Adam's apple, and a gentle downward pressure is exerted, then it will be found that the vowel sound pronounced in these conditions is lower according to the pressure. By such means a falsetto voice may be gradually brought down to the ordinary pitch.

90. (14.) But it is a well known fact that all organs are unequal to the discharge of their functions when they have not been employed for a long time. Muscles and nerves are especially subject to this decrease of power, and it is also known that they cannot be restored without much exercise. But as the vocal organs of congenital deaf-mutes have never discharged their special functions, and have suffered in consequence, it is very plain that their primary efforts to produce vocal sounds must be very defective both in execution and in the discriminating touch which would determine their correct form. Nothing but thorough training can overcome this deficiency of sense and muscle power.

91. (15.) The force required in producing full vowel sounds is also sufficient to produce associated consonants without a fresh impulse. But should the organs be imperfectly adjusted, say in *s*, *sh*, *b*, *d*, &c., then an additional impulse is required to make it audible. This is a dangerous defect, and its correction can be best made by placing the organs in the right positions. The habits of speech in us have established the proportions of force required by these combinations. Deaf-mutes can only attain to them by touch. But if they are allowed to indulge in wrong positions the sounds will at first be feeble, and afterwards omitted altogether. Correct sounds are best remembered.

Again, when a word or syllable begins with a single or double consonant the force exerted in its production ought to be that required by the following vowel as well, so that no fresh impulse is necessary. But when a number of syllables have to follow in rapid succession, then it ought to be seen to that the volume of air in the lungs as well as the energy it receives in pronouncing them, is equal to the demands of the whole, so that there is no falling off in force from exhaustion. The exercises already learned are useful here, but they are not so good as graduated lessons beginning with one syllable and advancing to many, for the expenditure of air in single syllables differs much from what it is in continuous expulsion.

92. (16.) The modifications of vowel sounds, as will be more fully evinced in our detailed description of those used in our language, are endless, from the changes which can be made in the positions of the organs and the extent of the resonators. These are all vowels, and may be found in the languages of the world. But they are modifications of the principal vowels, arising from their relations to consonants or to one another; for the shifts which follow from the positions required by the first to those of the second or third may be considerable, and still the voice is escaping and glides rapidly through the intervening full and partial tones till the last is reached. Let *da* illustrate this. Here *d* is formed by the tongue arresting the voice by pressing against the palate, but to arrive at *a* the organs have to shift to its position by dropping the jaw, lowering the tongue into its

couch and opening the mouth, but in doing so the voice glides over the intervening vowels. The effect is similar to that which is heard on a violin when the finger only is shifted and the bowing continued. This modification of the vowel from transition is a considerable factor, and must be taken into account.

93. (17.) Now the fact being that consonants have no independent value as sounds apart from vowels, neither syllable nor word can be formed of consonants alone. They are only the organic expedients by which a few vowel sounds are varied, in order to meet all the demands of speech. Apart from vowels there is no intelligible explanation of them. "They have, in fact, no real independent existence, they are nothing but the inventions of grammarians, and their combination would only give rise to meaningless sounds, never to significant roots."—(Dr. Max Müller's *Science of Thought*.) And if this is their nature and value, their place is with their vowels, and the manner in which they modify them ought to be carefully noted; for it is found that the vowel has to yield to the new conditions imposed on it by the initial or final consonant with which it is united, both in the positions of the organs and in the character of the sound. While, then, we should seek to secure the correct articulation of every consonant, it ought to be done solely with the view of its more perfect articulation in union with vowels, or, rather, that the vowel modifications effected by it may be as distinct as possible. Some teachers never separate them, but many more teach them apart, for they are convinced by experience that, owing to the absence of the guiding and correcting ear, the learner is left in great uncertainty as to the exact phonetic value of the consonants, and from this there is no escape, unless by learning them apart.

(18.) Let the syllables *pa*, *ta*, *ka*, illustrate this law of muscular action. In *pa* the initial consonant *p* is formed by pressing the lips firmly together, which leads to their slight protrusion. Now this position is very favourable to the full and free pronunciation of *a*, for the jaw has only to drop to its position and no other organ is called into action in the sound but the glottis. Ease and facility characterize

this syllable in its muscular action. Again, in *ta*, *t*, as the initial consonant, is formed by pressing the apex of the tongue against the hard palate, but to facilitate this action the jaw has first to retreat somewhat to accommodate its leader, the tongue, in its backward movement to secure the requisite muscular pressure by its apex on the gum. The altered relations of the teeth prove that this movement has taken place. What then is the result in regard to the *a* with which it is combined? Does the jaw return to the same position as in *pa*? No; it retains the position it took up for *t*, except in downward action, and hence the vowel is modified by the tongue and the shorter tube. This, too, is for muscular ease and facility.

(19.) But in *ka* this is still more evident, for *k* being guttural the jaw still more retreats for the accommodation of the tongue on the soft palate, and there is no attempt to advance it to the *pa* place, but *a* is pronounced in the guttural position, and hence is guttural also. Thus in each there is a modification of the vowel, determined by the position of the initiatory consonant both for ease and facility in its pronunciation.

The same law is found when the consonant is final and the vowel initial, for in order to execute the consonant with ease the organs anticipate its articulation by taking up the guttural position, and therefore in *ap*, *at*, *ak*, the jaw moves into the position for each before the vowel is pronounced, and hence is modified by the final consonant for muscular facility. An attempt to pronounce *a* in the *pa* place after *t* or *k* would show how great is this accommodating muscular action.

Now, to some these distinctions may seem trivial and of little practical use; but not so, for if admitted they must considerably influence our arrangement of the elements of speech in teaching.

If Nature is ruled in her action by this law of the greater ease or facility when she teaches the elements of speech to hearing children, should we not endeavour to follow her example with the deaf? Should the *a* in *ta* or *ka* be taught before the *t* and *k*, or reserved till the initial consonant determines it according to the law? Evidently the

latter, for as the vowel is modified by the consonant with which it is conjoined, the modifier ought to precede the modified. But this law is co-extensive with all similar consonant and vowel combinations, and ought to determine the arrangement of the phonetic elements.

94. (20.) Again, the positions of the organs in the articulation of the consonants are modified by the vowels which follow or precede them. The cause is evident, for Nature strives to reduce the distance by bringing the sounds as near together as is convenient for muscular effort and ease. Now if *p* is united with *a*, *ā*, *o*, *u* and *e*, it will be perceived that in *pa* the lips are in their normal position; but, as we advance to *pā*, *po*, *pu* and *pe*, they gradually rise, because the jaw rises, till in *e* they approach the nose. Hence it may be safely affirmed:

1. That the consonants modify the vowels with which they are associated, in position, tone, inception and termination.

2. That the positions of the organs in articulating the consonants are influenced by those of the vowels which precede or follow.

3. And it is also manifest that the organs of speech are always endeavouring to minimise muscular effort in combining sounds for the sake of ease, or, as in mechanics, to economise force and avoid undue friction.

4. But the action of the organs of speech is facile or difficult, simple or complex, according to their relative positions and the muscular energy required in shifting them.

(21.) Sounds formed in the anterior of the mouth are more facile to the learner than those formed in the posterior, for there is not only more space for the free action of the organs and the assistance of the eye, but also for the employment of touch.

95. (22.) Anticipative Organic Action.—Many consonant combinations would be most difficult to pronounce, from the muscular effort required in passing so quickly from one to another so as to prevent the intervention of a vowel. But Nature has an expedient which avoids this danger. This we name anticipative organic action. In the union of *b* and *l*, as in *blow*, the tongue does not wait for the completion of *b*, but rises and

advances to the *l* place; so that it is almost in the position to begin *l* immediately on the completion of *b*. Even in the very difficult union of *g* and *l* the tip of the tongue turns towards the palate while its base is delivering *g*. The learner can be made aware of these movements by directing him in *bl* first to raise his tongue towards the *l* place and keep it there till he has articulated *b* with his lips.

If each element in such combinations is not well learned, their union is certain to increase the imperfection, and a hybrid, understood by none and unknown to the language, takes the place of the true sound. The exercises in which they are first pronounced apart, with a pause between, which is gradually lessened till they coalesce, are the most effective to secure their exact articulation.



ELEMENTS OF SPEECH.

96. Now, if in general education the facile or simple ought to precede, so ought it still more in the education of deaf-mutes. No teacher of a musical instrument begins with the most difficult movements. He selects the simplest, in which the required muscular effort is least, and advances with increasing command till facility grows into habit. If, then, the voice of the deaf is an instrument on which the learner has also to perform, surely we ought to begin with the simplest sounds and gradually advance to the more difficult! This is the manner of nature with those who can hear. Under her control they begin with the simplest, first, as Papa and Mama; and because their muscles are still feeble and little exercised, most of them say *tüm* for come, *to for go*, and *voo* for you, because the guttural consonants *k* and *g* are more difficult than the palatal *t*. Double consonants are formidable, and they usually drop one of them, as *seep* for sleep, *bin* for bring, because the muscular effort of uniting them is too great for them. And we suffer all this because we know that exercise and habit will one day enable them to articulate all the sounds perfectly. And how much more ought we to be like kind

Nature in our treatment of those who cannot hear, whose organs of speech have become rigid from long disuse, and whose mental control over them is not instinctive but acquired by thought and effort! We speak our own language fluently, but it was not always so; and when we apply ourselves to learn a foreign tongue, with sounds new to our organs, we find them very difficult to master. The difficulties of deaf-mutes must therefore be proportionately greater, for all the sounds are new, and their organs familiar with none. Our rule, therefore, in teaching speech to the deaf and dumb is,

97. To begin with the simplest and most facile sounds, and thus to advance in the order of their increasing difficulty till all are learned.

In conforming to this fundamental rule, these elements must find places.

The simplest and most facile must be sought, not from our own, but the deaf-mute's point of view. We have three senses for the purpose, they have only two. Hearing is included in ours, excluded in theirs: so sight, touch, and muscular facility must determine what is most facile for him. Whatever, therefore, he can see best, touch best, and execute with greatest facility, should have the preference. The last of these is the most important, but sometimes from the inability to see or touch the organs in action, the learner has little to assist him to form any idea of what he should imitate. A more difficult sound for the muscles may, therefore, prove more facile to imitate because its position and action can be clearly perceived. This is the manner of Nature. Let the vowel *a* serve as an illustration. The muscular action is simply opening the mouth to its proper width, avoiding effort. The tongue rests in its bed, the voice issues freely from the glottis, and escapes between the open lips. These positions are visible, while touch feels the vibration of the vowel on the external side of the larynx. Its imitation is, therefore, facile, and it supplies the three elements of greatest ease.

98. SERVICEABLE NATURAL MUSCULAR ACTIONS.—These have been formed by habits unconnected with speech and arising from the reception, tasting, enjoyment, mastication,

and absorbing of food, with exhaling and inhaling the air and with blowing the nose, which ought to be utilized as far as possible for teaching speech, because the muscular actions in both have something in common and are already familiar to the learner.

In breathing, the air escapes through the mouth or the nose, or both. Little children and deaf-mutes generally breathe through the nose. But some use the mouth, especially in sleep. Greater command of the lip and jaw muscles leads to a larger use of the nose, and concentrated effort, whether mental or physical, to close-pressed lips and contracted cheeks. But whether through the mouth or nose there is a special though unconscious rising or falling of the *velum palati*, similar to that required for all the phonetic elements confined to the mouth or nose. Sound only has, therefore, to be added to these natural functions in breathing for the one class or the other. Some deaf-mutes seldom breathe through the nose, there seems some obstruction; but it is usually a result of dumbness and the absence of the mental control of the organs which growing intelligence would have supplied. In such cases breathing only through the nose ought to be made a frequent exercise. This would lead to the free fall of the *velum* and prepare for the nasal sounds. Again, if breathing through both mouth and nose at the same time has become a habit, it should be broken and each made thoroughly independent of the other by many exercises. If this is neglected the vowels will have a nasal twang.

Blowing the nose is a special effort. Many children do not like it, but all ought to be able to do it freely, for it forces the air through the nose, pressing down, at the same time the *velum*, and increasing the lung force to provide the blast. The sound, too, may be heard as well as felt by deaf-mutes and suggest the vibrations which accompany it to hearing as well as touch.

Again, tasting employs the tongue in rolling the food about the mouth, in pressing it against the hard palate, the *t* place; and if the substance is sharply astringent the pressure is greater. Possibly Heinicke got his analogue from this. Attention can be easily directed to this habit when we are introducing the learner to the *t* consonant.

But the lips are also much used in sucking from the dawn of life, and sweets are the joy of children. We reprove the 'smacking' but we overlook the service it has rendered in calling the labial muscles into more efficient use.

And then the action of the tongue and larynx in swallowing, which is as great towards its base as speech will ever require, is its natural preparation for the guttural sounds which are our chief difficulties. Let the learner be made acquainted with this action by placing his finger on the upper larynx, and he is in possession of a similar action required for guttural sounds.

Try to teach them to whistle. The command of the lips and the air is a good exercise.

99. But in addition to these, there are serviceable forms of facial expression common to most deaf-mute children which might well be utilized in preparing for speech. Nearly all the muscles employed in speech are active in them, and by increasing this activity artificially, and directing attention to it, they can be at once referred to when speech requires their aid.

Laughing is one of these. Two muscles are chiefly engaged in this expression. The *Risorius*, which is attached to the angles of the mouth and spreads out over the *masseters*. The *buccinator* also takes part in this action. But these muscles are also active in *y* as heard in youth, and in some of the rear palatal vowels.

Anger is usually expressed by closing, compressing and protruding the lips, and raising the chin. The muscles employed are *t*, *k*, and *r* (Fig. 17), for the lips, and *s* for the cheeks. The more intense the passion, the more muscles are engaged, as *h* in depressing the nostrils. In *p*, *w*, and *ō*, the action has points of similarity.

Wonder is expressed by elongating the face, by dropping the chin, opening and protruding the lips, as in *o*, and contracting the cheeks. This draws down the upper lip, and depresses the lower. *ā* in law requires a similar muscular action about the mouth.

Fear and wonder are closely related in expression, only the former withdraws the angles of the mouth, exposes

the teeth, and has less effect on the length of the lips. Guttural sounds produce a similar action of the mouth.

Great joy is akin to laughing, and raises and draws backwards the angles of the lips, *m* and *l* (Fig. 17), still more.

Nothing more is intended in referring to these facial movements than to suggest the manner in which the muscles can be used.

Scorn is expressed by projecting the lips, swelling the cheeks, and elevating the chin. These motions bring many of the muscles into action which are used in labial vowels and consonants. Altogether a most useful expression. Sometimes in mocking and contempt, one cheek, generally the right, is contracted, and the angle of the lips much withdrawn. The look is angular over the right shoulder at the same time. If the expression is repeated on the other side of the face, the muscular exercise will be still greater, and aid in *k* sounds.

Generally, it may be said that the gentler emotions relax, while the fiercer contract the muscles.

100. The arrangement of the phonetic elements of speech, in that order which would most facilitate their acquisition, has engaged the attention of all the distinguished teachers from Bonet to Tarra. Its importance is considerable, for a bad arrangement would delay and vex the learner by making demands on his organs and his patience which he is not prepared to satisfy; but on the other hand, a good arrangement, in which the sounds follow in the order of their increasing difficulty, would facilitate his progress.

How, then, ought the letters of the alphabet to be arranged? On this Bonet says, "Arm yourself with patience; for what you have not succeeded to obtain at first you can hope to obtain in the end by multiplying your attempts. If you despair to get your scholar to pronounce at once this or that sound, proceed to a new one. Another day he will breathe better, and pronounce this sound. 'Con paciencia y este arte se alcanzara todo. With patience and this art all will be achieved.'"

But this is a confession that as yet he had not arrived at the right arrangement, and, therefore, submitted to be guided by the ability of the scholar, rather than by ascertained principle. No doubt the principle is there, but he had not discovered it.

Juan Pablo Bonet, secretary of the Constable of Castile, 1620. Bonet follows, 1st, the vowels as they are in the alphabet: *a, e, i, o, u*. Then the consonants in the same manner: *b, c, d, f, g, h, l, m, n, p, q, r, s, t, x, y, z*. *i* is treated apart as a diphthong. This has been ascertained by inspecting his work.

Dr. J. Wallis, F.R.S., Prof. of Geometry, Oxford, 1653.—The order in which Wallis takes the letters in describing their formation is as follows:

Vowels: a, ě, ů; ä, è, ē; ô, û, u (as in tune, new, etc).

Consonants: p, t, k; b, d, g; m, n, ng; f, v, w, th, s, dh (=th in the, etc.), z, l, r, ch, h, gh, y.

“*Fed. Maurice Hill (1874), Inspector of the Weissenfels Institution:*

h, a, o, u—p, t, k—o, e—au, ei—s, ss, ch—w, s, j—ä—b, d, g—sch—m, n, ng—l, r—ö, ü, eu.

“*Guillaume-Daniel Arnold (1879), Director of the Riehen (Basle) Institution:*

h—f (v), s, ss, ch, sch—b, p (pf), d, z, t, (sp, st), g, c, x—m, w, q, n, ng, l, r—a, u, o, e, i (j)—au, ai, (ei), ä, ü, eu (äu), ö.

“*Edouard Rössler (living still), ex-director of Hildesheim:*

a, p, b, u, f, w, o, t, d, ss, s, h, l, sch, m, e (ä), k, g, ch (in ach), i, ch (in ich), j, n, ä, ö, ü, r, ng.

“*Jean Vatter (recently deceased), Director of the Frankfurt Institution and Editor of the Organ:*

a joined to the consonants p, b, t, d, f (v), s, ss, ch, sch, g, k, m, n, h, w, ng,—a, o, e, i, always joined to the series of consonants.

“*Nicolas Weisweiler (still living), director of the Cologne School:*

h, p, a, t, o, u, f, au, s, e, i, m, n, l, w, ä, ö, ü, ei, ai, eu, äü, b, d, h, ch, g (after e, i, ä, ö, ü, ei, eu, äü), j, sch, k, g (at the beginning of a word), ch, g (after a, o, u, au), ng, r, z, x, chs.

“*Magnat, Director, Paris, 1884.*

a; o; ou; é; i; e—p, b, t, d, u; f, v—k, c, q, g, gu—m, n—s, z; ch, j—l; r; x, h—eu; u—ia, ya; io, yo, iau; ié,

iai; oi, oy; ieu, yeu; oui; ui; iu — an, am, en, em — on, om, eon, aon; in, im, yn, ym, ain, aim, ein; un, um, eum; oin; ion; yon; ien; iam; ian — ill; gn.

“The Abbé J. Tarra, of Milan, thus arranges his alphabet:

	a			
	o	u	e	i
<i>p — t — c</i>				<i>f — s — z (ts)</i>
<i>b — d — g</i>		h		<i>v — s — z (ds)</i>
<i>m — n</i>		<i>ce — ci</i>		<i>sce — sci</i>
l		<i>ge — gi</i>		<i>gna — gno</i>
r				<i>qua — quo, etc.</i>

Augustin Dubranle (still living), Censor of the National Institution for the Deaf-mutes of Paris:

a, o, ou. — p, t, k. — f, s, ch. — è, é, i. — b, d, g. — v, z, j. — l, m, n, r. — eu, u. — gn, ill. — an, on, in, un.”—Tarra.

101. A glance at these phonetic alphabets is enough to prove that no two of them agree. They all differ on some principal points. While some begin with the vowels, others with the consonants, and a third class mix them. Evidently the authors have not been guided by the same or any well-founded principles, else such variations of arrangement could not exist. However, a closer examination of two of them, Rössler’s and Vatter’s, reveals the influence of the guiding principle of organic facility for the learner. While Rössler begins with the vowels and consonants of the labial class, Vatter associates the principal vowels with all the consonants in succession. The former is evidently influenced more by organic facility, while the latter takes the syllable as his basis, but he is not indifferent to the order of the consonants. This seems to be the direction in which a satisfactory leading principle is to be found. The learner’s command of his own organs always determines his rate of progress. But this command is slowly acquired; for he is like an infant beginning to speak, and must have all the help that can be received by sight and touch. To begin with those which require considerable organic action and nice adjustment, and which he cannot imitate in another, would be a mistake. On the contrary, to begin with that

which is simplest and most perceptible to his senses must be best adapted to his condition. It seems then that we ought to be guided by these three conditions :

1. Facility of muscular action.
2. Visibility.
3. Tangibility.

Or, the organic effort he is required to make should be for him that of greatest ease. He ought to be able to see it in his teacher, able to feel its effects in its vibrations, and thus make it intuitional in his vocal imitation.

The sounds in which these conditions most fully unite ought to be first taught, for, while they are the least difficult, they educate the organs for the more difficult.

102. The following classification of the sounds has been adopted on this principle and those previously stated.

1st Class, *a, p, f, o, th, u = oo, m, h, ā, ā, ō, ō, v, th̄, b.*

The three conditions unite in all these.

2nd Class, *t, ā, ē, ī, ě, n, ě, w, l, s, sh, z, d.*

These are more difficult, for the conditions are changed. While the muscular action is more complex, the eye is not so helpful as in the first class.

3rd Class, *k, ā, g, y, è, à, ù, ng, j.*

These are nearly all guttural, and therefore still more difficult to the learner, whose sight and touch are no longer so helpful in their articulation.

4th Class, *ch, j, q, x, r.*

FIRST CLASS.

1ST CLASS, *a, p, f, o, th, u = oo, m, h, ā, ā, ō, ō, v, th̄, b.*

103. *p* as in *pa*. *a* has been already learned. *p* is an air stop, which implies that the air is pressed forward from the lungs, of which the learner ought to be made aware, and arrested by the lips. They are closely pressed together and somewhat protruded. The tongue is close down in its couch, its tip touching the lower incisors, the cheeks close to the molars, and the *velum palati* well up, so that the air is pent up in the channel thus formed and ready to explode as the lips are opened. All these points should be carefully explained to the learner. One hand on the teacher's chest and the other before his own lips will enable him to perceive

the action of the lungs and the explosion of the air. When the muscular action of the sound has become facile, then it ought to be united with *a*; and this introduces the conversion of air into sound, which lessens its force and produces the vibrations which can be felt on the larynx, cheeks, and lips. There is some danger that an attempt will be made to deliver *p* first and pronounce *a* independently, but this can be prevented by making it evident by touch that they are united in one impulse. The absence of the strong explosion further assists in distinguishing an air consonant from a vowel. The muscular action in *pa* is considerable, but all simple, visible, and tangible; and it ought to be thoroughly learned, for it is the first stone in the phonetic edifice.

Reading.—The muscles chiefly employed in *p* are *a*, (Fig. 6), and *t*, *r*, *m*, *n* (Fig. 17), and in the syllable *r*, *pa* (Fig. 17), in opening the mouth for the vowel. The action in both elements is marked, but when united it is large, and distinguished from all others. First the tension, then the relaxation of the lips, their opening and the fall of the jaw can be seen by the learner and closely imitated as a primary element in lip reading.

104. *f* as in *fin*. The consonant is not an air stop, but air fricatively modified. It is labial and dental, for it is formed by the gentle pressure of the upper cutting teeth on the lower lip, which is drawn somewhat inward to meet them.

The spaces left by the form and position of the teeth provide the escapes for the air, which is forced through by the lungs, which creates its broken sound. Were the lip pressed against the teeth instead of on them the air could not escape, so that there would be no sound. It must be, therefore, closely seen to that it is placed right under them. The teeth and lip can both be seen, and the learner ought to have no difficulty in imitating their position in *f*. Now let it be united with *a* in *fa*, and the change of the air into a vocal form can be felt by both hands. The usual defect is in the force with which the air is expelled.

Reading.—The muscles employed in *f* are for the lower lip, *r* *m* to draw back the angles, and *s* to press the cheeks against the lower molars (Fig. 17). *r* is used

Osculation
Dep. mentis
Zygomaticus
Angulus Oris

Dep. mentis
Angulus Oris
Mucronatus

to raise the lip to the teeth. The learner can be aided by the finger laid in the hollow of the chin, and pressed gently against the lip, which may be thus moved to its right position. Two syllables are now available for exercises, *pa-fa*, *fa-pa*; and it will be seen that the muscular movements from *pa* to *fa* are very considerable, and so from *fa* to *pa*. The syllables are, therefore, the best indicators of the sounds.

105. *o* in pole. The whole vocal tube, of which the lips are the visible opening, conforms to the roundness, for the tongue presses close at its root, the cheeks are drawn close, the jaw is dropped, and the lips rounded to let the sound escape through a round aperture. The larynx also takes a part, for it is drawn upwards, and the vocal chords are closer, because *o* is on a higher pitch than *a*.

Learners usually fail in the form and size of the lip orifice. It is either too large or too small. Much depends on the dropping of the jaw. If this is great the lips will round better, but if only partial the muscular power in the lips will not be equal to the demand. A finger or a piece of wood of the same shape will suggest the size and form. The cheeks, also, are pressed close to the under molars, and to secure this action fully a finger and thumb might be pressed against them above the molars. This also aids in protruding the lips for rounding.

Reading.—The muscles most employed are *t* for rounding the lips, *digas.* for the opening of the jaws, *s* for the cheeks, *pter. ext.* (Fig. 17) for advancing the angles of the mouth to enlarge the space. The form and position of the lips, jaw, and cheeks are the best indicators of this vowel. In contrasting it with *a* the difference in muscular action is considerable. Their union, also, with the consonants already learned, *fa, po, fa, po, fo, pa*, develops the muscular action which passing from one syllable to another requires. Let the finger of the learner on his larynx feel its movements in pronouncing these syllables, and he will more closely imitate their action. Another phase of muscular action will be apparent which elsewhere we have called anticipative. The position of the lips in the *p* of *pa* differs from that of *po*, for in order to lend themselves the more readily to the *o* they

are raised to its level, and projected before *p* passes into it. This is evidently for facility. The learner may be led to imitate it if he is shown to raise his lips as if he were about to pronounce *o*, but in this position let him close them, pronounce *po*, and he will perceive the difference in facility.

106. *th* as in *think*. Here two letters serve only for one sound. In formation it is analogous to *f*, but, instead of the lip, the tongue presses against the upper incisors, and the air flows through the open spaces between.

That the tongue may act freely, and permit it to press against the teeth at a convenient point, and yet leave a free passage for the air to escape through the gaps still left, the jaw rises and retreats somewhat. The under lip also presses up against the tongue and assists in preventing any escape of the air in this direction. In fact the organs are so arranged as to confine the air to the channel between the tongue and palate. If the learner were to place a hand before the teeth he would feel the place and force of the current in his teacher's articulation of the sound. By holding the tongue in the *th* place while the lips are parted more widely, he will also see how it presses against the upper incisors and against the molars. Let the teacher place his finger on the hollow of the chin and gently raise up the lip till it is in the right position. At first, very likely, the air will be permitted to escape at other points, or the tongue too much protruded or withdrawn, but all this can be obviated by directing attention to *f*, in which the air is confined to similar gaps in its escape. Then let him pass on to *th*.

Reading.—The principal muscles employed are those of the tongue, pter. *v*, Fig. 17, and Fig. 23, *i*, in advancing the jaw. The lower lip is raised by *t* and *r*, and the cheeks pressed by *m* and *s*.

The position of the lips with the rise of the lower to the tongue, the advance of the chin and angles of the lips, with the contraction of the cheeks, are the principal distinctive signs. But these, when it is united with *a* and *o*, add to the value of the traits. Out of these five elements a number of exercises may be made, including the diphthongs *oa*, *ao*, as *thoa*, *thao*, *foa*, *fao*, etc.

107. *ū* or *oo* in *put* and *pool*, and *move*, or shorter as in

bull, but longer in *rule* and *brute*. The muscular action required by this vowel is principally labial. To pronounce it the lips must be considerably protruded, but at the same time not contracted in their width. The tongue is slightly elevated towards the base, and the larynx follows, for the note is higher than *a*. This reduces the tube into the best form, while it delivers the current of sound at the lips. The whole tube is, therefore, conformed to the vowel sound. The learner's failures are in not protruding his lips or contracting them sufficiently, as in *o*, but these can be corrected by putting a finger at the angles of the mouth and gently drawing them backwards, which lengthens and narrows the orifice. The eye and touch will aid in producing the correct sound. It can also be illustrated by two slips of paper held in contact between the finger and thumb of both hands and made to part in the middle till a similar aperture is formed. The defects can be shown by reducing its length and increasing its breadth.

The exact phonetic value of this sound is difficult to determine, for it varies from *oo* in *boot* to *u* in *rule*. Possibly the reason might be found in the final consonant, or the greater facility in pronunciation on account of the whole muscular effort required by the syllable. Nothing is gained by reducing it to two or more vowels. All that is necessary is to secure its longer or shorter use, and this can be done in teaching the words in which they occur.

Reading.—The muscular action in *ū* is chiefly in the lips (*t*, Fig. 17), which must not only protrude considerably, but rise towards the nose in conformity with the form of the passage. This requires the aid of *o*, *s* and *m* also (Fig. 17) to get the lips into the flat tubular form required by the sound.

The position and form of the lips, and the rise of the chin are the best signs of this vowel. It ought to be contrasted with *a* and *o* in pronouncing them in different orders, till the eye of the learner can quickly distinguish them. Conjoined with the consonants already learned, as *pu*, *fu*, *thu*, the complex muscular action which they require gives character to *u*; and then if *pa*, *po*, *pu*, *fa*, *fo*, *fu* and *tha*, *tho*, *thu* are repeated the variations of muscular action will much

assist to their intelligent discrimination. Lip-reading thus leads to the knowledge of organic positions, which is of great use in the repetition of the sounds; for the scholar perceives that the organs must be correctly placed to furnish correct lip expression.

108. *m* as in *ma*. Of all nasal sounds *m* fills the chief place in the aid it renders to the learner in arriving at a better conception of the resonance of the organs in the formation of a number of sounds. His finger ought, therefore, to be made familiar with its nature, by being placed on the side of the nose. The muscles are chiefly employed in firmly closing the lips and letting fall the *velum palati* so that the voice may escape wholly through the nose. The pitch of the voice in *m* corresponds with that of the vowel which precedes or follows it, only a little sharper from the difference in the tube and the increased muscular pressure. This consonant is a fine instance of the manner in which the other organs follow suit in the direction of the point of greatest muscular effort. As *m* has to be delivered through the nose, the lips, jaw, tongue all move in that direction to secure its right production. As much of this as possible ought to be indicated to the learner. But fortunately Nature herself comes to his aid, for the mere passage of the sound with full resonance is usually followed by this general upward movement.

Reading.—The muscles employed are *k*, *t*, *n*, *m*, and *h* (Fig. 17). The action enables us to distinguish this consonant from *p* and *b*, for it lifts the jaw, shortens the upper lip, contracts and vibrates the walls of the nostrils. The upper lip and the nostrils are the best indices of *m*, for neither *p* nor *b* requires similar muscular efforts. The eye of the learner ought, therefore, to mark them well.

But this deflection of the voice through the nose is usually attended with grave difficulties to the learner, for he seeks to nasalize the vowel with which it is associated, especially if it follows. Better then to begin with a vowel as *am*, *om*, *um*, and guard against any escape of the voice through the nose, by having it fully pronounced before *m* is added. The head ought to be well up in this exercise to let the vowel pass freely, and admit the play of the muscles in both sounds.

When the exercises are enough to lead to a clear perception of the difference in form between the two sounds, then the inverted order, *ma*, *mo*, *mu*, can be used. At the same time, care ought to be taken that, while one error is being avoided, another is not induced by separating the *m* and *a*, so that they do not form a syllable. This lesson is complex and delicate, but it is of great importance in giving larger muscular power and control in conditions that are eminently favourable to sight and touch, which are both available. *m* is a nasal semi-vowel, and yet fulfils the functions of a consonant, for it is never used except in union with a vowel.

109. *h* is called a breathing, for it is nothing more than a mere flow of air from increased lung force, and slightly modified by the larynx in passing. The organs adapt themselves to the form required by the associated vowel in its articulation. When joined with a vowel as *a*, the change of the current from a pure aspirate into voice, is found to arise principally from the contraction of the vocal chords, and additional lung force. Considered in this form, it would appear to bear the same fundamental relation to all aspirates which *a* does to all vowels. If the learner produces it more forcibly at first, as a puff from the glottis, and afterwards more gently, its true phonetic place will be found.

Reading.—When united with a vowel the muscular effort in passing from air to voice is discernible. In other respects the muscular action is greater in *o* and *u* than in *a*, where it is exceedingly small. It is, therefore, very difficult to read. But this loss is considerably diminished by its association with other more expressive sounds.

The tendency in our phonation is to drop it altogether.

110. *ā* as in law.—In pronouncing this vowel, the vocal tube has attained its greatest capacity, and therefore its pitch is the lowest. If the finger is on the larynx, it is found to descend even below the *a* position. The tongue is drawn backwards and downwards, and a large space is left in the cavity to resonate before it escapes from the lips, which are rounded, but lower down than in *ā*. In these conditions, the vocal chords are much relaxed, so that the sound is graver than *a*. As *ā* is the extreme voice compass on the bass side, and *ē* on the treble, these vowels bring the muscles

into their largest exercise. Their thorough acquisition must, therefore, materially assist in the pronunciation of all the intervening vowels. United with *p*, *f*, *th*, and *m*, the muscles find ample exercise. But the jaw must retreat as well as fall to get into position. The finger of the teacher on the upper and lower incisors, will lead him to perceive as he pronounces *pā*, that they not only part considerably, but the lower retreats half an inch, before the *ā* place is attained. The three essential things to its full pronunciation are, therefore, the form of the lips, the position of the jaw, and the depression of the larynx.

Reading.—The most active muscles are *p* to depress the under lip, *t*, to depress and elongate the upper (Fig. 17), and the temporal to place the jaw. All these movements with added consonants are so marked and so expressive, that its lip-reading is easily learned. This vowel ought to be classed with *o* rather than *a*.

111. The vowels and consonants now learned are all formed by visible and tangible organic action, and are therefore the most facile for the scholar. But they are not all the sounds of this class. There are the short vowels corresponding more or less with the long vowels, *a*, *o*, *u*, and *ā*. These are *ă*, *ô*, *Û*. They have been reserved because they are best learned after the long sounds. Some masters teach them apart, but the arrest of the voice is not only difficult, but likely to introduce an alien element. They are therefore united with syllables ending in a second consonant, as *ă* in *map*, *ô* in *mop*, and *Û* in *sup*, for it is found that so related there is greater facility in shortening the sound. The eye and touch of the learner will aid him materially in perceiving the shortness of the vowel; *ă* in *fap* is the same sound as *a* in father, only modified somewhat by its rapid delivery and connection with another consonant. In order to secure its correct pronunciation let the corresponding long vowel be first pronounced, and then the final consonant added. Touch and sight will show how it is shortened in articulation.

The lip-reading is facile because in addition to the muscular action in *fa*, another action is added to get the organs into position for the final *p*. The finger on the

larynx will also show how much it participates in these movements. As there are many syllables in the language of the same form, lip-reading is largely provided with convenient elements.

ö as in mop.—This is *ä* pronounced short, but like *ä* modified by the final consonant. The rapidity of action in anticipating the new position interferes considerably with the fall of the jaw in *t* and *k*, but in *f*, *p*, and *m* the action is more facile. Radically it is the short sound of *ä*, and mistakes can be best corrected by reverting to the long sound.

Reading.—The muscular action is the same as in law, but the final consonant requires large command of the digastric and other muscles to get the jaws and lips into the new position; but this only increases the facilities for lip-reading, if all the motions are noted.

ũ as in fun. This might be well called another vowel, because it has little in common with *ü*. The lips are not much protruded, but only drawn apart. It would, therefore, be better to teach it independently. It has a guttural form, arising from its connection with guttural consonants. Here it is not guttural, for the tube is open though reduced in diameter.

Reading.—The position and form of the lips, by the action of *t* (Fig. 17), are sufficiently distinguishable from those of *ä* and *ö*, and the consonants with which it is united still more assist in its perception. But it would be well to have some exercises in which these short vowels might be contrasted, as fam, fom, fum, map, mop, mup, pap, pop, pup, &c.

Two principal factors unite in every element of speech, position, and sound, but as the second may be air or voice, the specific difference, in some consonants, lies in the use of the one or the other, rather than in any marked difference in the position of the organs. As already seen, *f* and *th* are aspirates or air consonants, but both, when voice takes the place of air, change their nature, and become *v* and *th*. These are called fricative, because the voice is rubbing in its escape. But they are really vibratory in respect to the lip in *v* and the tongue in *th*, for in each there is a perceptible, rapid, and rhythmic movement. The manner,

also, in which the lip and tongue are braced, proves that they are put into the posture which best fits them to vibrate under the action of the passing voice.

112. *v*.—The position of the incisor teeth in *v* is not exactly the same as in *f*. They rest lightly against the interior edge of the round of the lip rather than on its top. This permits the free vibration of the lip against the teeth, which can be felt by the finger of the scholar, and while he pronounces it in his teeth. In its production a stronger expulsion of the voice, by the diaphragm, will at first be necessary in order to produce the vocal vibration or humming sound. A partial or imperfect articulation ought not to be allowed; and to prevent failure and aid the learner, a finger and thumb ought to press firmly on the lip near the angles, drawing it back a little towards the molars to suggest the required muscular action and enable him to perceive the true nature of the sound; for, if he discovers it clearly here, he will be able to reproduce it in kindred sounds.

Reading.—The muscles employed are those in *f*. As distinguished from *f* the difference lies chiefly in this muscular tension of the lip, which for *f* is free, and in *m* (Fig. 17), drawing the cheeks still closer to the teeth at the same point. In other respects they are left free to participate in the vibration, and give space to the volume of voice advancing to the lip. Now if *fa, va, pa, vo, fo, va, tho, vu, &c.*, are alternately pronounced, and attention given to the difference of muscular action between *f* and *v* in each pair, their difference in reading will soon be learned.

113. *th* in *that*.—The position of the tongue against the upper teeth is not exactly the same as in the aspirate, but more advanced to permit its free vibration, as in *v*. The under lip is brought close to the tongue, and the cheeks to the molars, thus enclosing the space between them so that the voice may concentrate on the point of escape. Yet this pressure is light, to permit the full resonance of the sound in the cavity and on the tongue.

Reading.—The muscles chiefly employed are the same as in *th*. But the base of the tongue is well sustained to increase the facility for resonance in the tip. Happily, the learner falls freely into these positions by endeavouring to

secure the vibrations at the teeth. The differences between *th* and *t̄h* are slender, and arise from the action of air in the one, and voice in the other. The former requires some pressure, and therefore the lip muscles are contracted, but the latter must have relaxation for the resonance of the sound, and they are less active. So the sound can be distinguished.

114. *b* as in but.—A new form of sounds, part of the first class, demands special attention. They are voice stops, analogous to air stops in their positions, but generally different in substituting sound for air. In this their greater difficulty lies. The arrest of the voice, just as it is initiated, without permitting it to escape, is difficult to indicate to the learner, and still more for him to imitate. By touch he can feel the action of the voice in the larynx, and its vibrations in the cheeks and lips, but its production is concealed. Better, then, to refer to *p*, and point out that what is done for the air there, must now be done for the voice, and instead of beginning with *b*, make it final, so that it will actually arrest the flow of the voice as in *ab*, taking care that additional lung pressure is brought to bear on it, so that the resonance is continued as long as possible. Then let the hand of the learner lead him to feel that it is not explosive like *p*. The special pressure of the diaphragm can be felt and imitated, and this will secure its initial use. The mistake usually made by a learner is to let his voice escape through the nose, as in *m*; but this must be guarded against from the first by using touch to perceive the absence of sound in that direction. The acquisition of this consonant is of great importance, because it is the most facile of all the voice stops.

Reading.—The muscles acting in *p* are the same as in *b*, only with less pressure of the lips to permit the free vibration of the voice, hence *t* (Fig. 17) does little more than hold them till the sound escapes. This ought to be pointed out, and the difference between *p* and *b* is best impressed by exercises in which they alternate.

Here are three consonants, *p*, *m*, and *b*, so closely approximating in facial expression, that some assert the impossibility of distinguishing them. But a more careful study of their differences would have convinced them of the contrary. In *p* the lips are pressed together, producing thereby

evident lines, but in *b* there is no marked pressure. They are simply closed, and normal in their contour, so they can be distinguished. Again in *m* the jaw and upper lip press upwards towards the nose, the seat of the sound, and this action is sufficient to distinguish it from *p* and *b*. If suitable exercises are framed in which these sounds recur in any order, as *pat*, *bat*, *mat*, *map*, *pam*, *but*, etc., the learner will soon show that he can distinguish them.¹

SECOND CLASS.

2ND CLASS.—*t*, *ā*, *ē*, *ě*, *n*, *ī*, *ī*, *w*, *l*, *s*, *sh*, *z*, *d*.

115. The observant teacher will have seen that in all the sounds of the first class, with the exception of *th*, the tongue plays only a minor part, while the lips and teeth are the chief actors. The vigour and facility of these muscles have, therefore, been more largely increased, and advance can, therefore, be made into the next class, in which the tongue is the leading actor, but in which neither sight nor touch will be so helpful as in the first class.

t as in *top* leads, because, both by place and action, it prepares for the more facile articulation of several other consonants, which are all palatal and allied.

Before attempting to articulate *t*, the tongue ought to be put through a number of gymnastic exercises by pressing its tip on different points and substances, as against the lower and upper cutters, cheeks, and palate, beginning close by the upper cutters, and upwards as far as it can be turned. Then against the fingers of the teacher, so that in the last the pressure required by *t* may be given.

But there is a danger that instead of the tip only, the whole tongue will be raised to the palate, and so deprive the sound of the sharpness and neatness it has in our language; or that instead of the tip, the root may be pressed against the palate, and the soft *t* of the Erse follow; or pressed against the teeth instead of the gum, and the Welsh *t* follow. These errors ought to be strictly averted, or corrected if already committed. The learner should be shown that *p* and *t*

¹ All these syllables ought to be inverted when the consonants are learned, so that the consonant which was first initial becomes final.

exactly correspond in the retention and explosion of the air, by the closer pressure of the organs specially engaged, and the additional lung force exerted at the moment, but that the tip of the tongue and the gum take the place of the lips.

Reading. — The retreat of the jaw provides a greater space for the action of the tongue and positions of the teeth and tongue behind, the lips are the principal features, but its union with a vowel, such as *a*, *o*, or *u*, gives it more of character. But *tē* as in *tea* requires a quick short movement of the jaw in following the movement of the tongue from the *t* to the *ē* position. In *ī*, which is *a ē*, the intervention of the *a* increases the action, but not without modifying the *a* for muscular ease.

116. *ā* in *fāte* has been reserved because its pronunciation is affected by *t*. As already shown, in pronouncing *pa* the jaw does not retreat but simply drop, but *t* cannot be articulated with ease unless the jaw retreats to accommodate the tongue, then if the mouth is opened and the tongue falls to the *ā* position, as in *fāte*, the sound of *ā* is produced without effort. And should any of the labial consonants precede, as *fā*, *vā*, etc., the jaw retreats to the same point to accommodate *ā*. Carefully examined, the back of the tongue rises nearer to the palate, the jaws approach till the teeth are in the same line, and the larynx rises somewhat, for *ā* is on a higher pitch than *a*. The form of the tube, as well as its length and diameter, are in accord with the sound. Upon the whole the *t* position of the tongue (except the tip) and jaw are best adapted to the pronunciation of *ā*.

Reading.—Compared with *a* the differentiae lie in the narrower space between the lips, and the retreat of the jaw, which draws the lower lip along with it. The angles of the lips are also seen to act. Following *p*, *m*, *l*, and *t*, it is also seen to be the mediant of *a* and *ē*. The rise of the larynx confirms this, and shows that the tube is shorter and flatter.

Let the modifying effect of the position and pressure of the tongue against the alveolar process be carefully noted and it will be seen that to facilitate this action the jaw retreats considerably, as seen in the relation of the lips; and that as a consequence to facilitate pronunciation and avert

undue muscular effort, this position of the jaw is retained in the pronunciation of the associated vowels, by which they are considerably modified, according to the principle already illustrated.

117. *ē* in *me* is so closely related to *t* that it might be called the *t* vowel, for the tip of the tongue has only to drop a little from the *t* place and the back to rise a little towards the palate, for its production. The jaws and the cheeks are in the same relations, only it will be perceived that in passing from *t* to *ē* the tongue is withdrawn still more, while it rises towards the palate and the larynx follows. Again, in uniting it with labial consonants it is more advanced, proving that the vowels are modified by the consonants. Should this fail, then let the tip of the tongue be pressed against the lower incisors and the jaw raised, while the back of the tongue gradually approaches the hard palate till the space left suffices for *ē*; or failing this, let a small penholder or ivory knitting needle be passed underneath the tongue over the first of the molars, at the same time holding down the tip behind the under cutting teeth, then let the jaw be raised till the space for *ē* suffices. These are only expedients, for the tip of the tongue does not press against the lower cutting teeth in pronouncing pure *ē*, but retreats from them a little. Nor is the relation of the tongue to the teeth of the lower jaw uniform, as the palate varies considerably in depth.

Reading.—The acting muscles are *m*, *v*, and *s* (Fig. 17), for drawing back the angles of the lips, raising the jaw and pressing the cheeks. And these are the principal indicators of this vowel. But the larynx has also an upward movement, for the pitch of *ē* is the highest vowel sound and the tube is at its smallest dimensions. Labial consonants best assist in giving it expression, as *pe*, *be*, *fe*, *ve*, *me*, and then with final consonants, as *peep*, *meet*, *beat*, *feet*.

118. *ē* as in *ten*. This is the short sound of *ā* in *fate*, but, like others, modified by the consonants which precede, and follow: as *pen*, *fen*, *bet*, *set*, *fell*, which are all pronounced with the jaw and tongue in the same positions. Owing to the position of the tongue it is somewhat guttural in tone, and lacks the clearness of the other vowels. Its

union with consonants, both initial and final, helps much in reading, for the angles of the lips are drawn back in many labials, nasals and some of the advanced palatals.

119. *n* in *no* is formed by placing the tongue in the *t* place and passing the voice through the nostrils, the velum pendulum falling for the purpose; *m* is analogous, and to avoid errors it is better to repeat it, reminding the learner how it is formed and then asking him to do the same thing for *n*.

The pressure of the tongue against the palate is, however, more extended towards the soft part, but this follows from the muscular action required by passing the nasal sound.

Reading.—The upward movement of the lip muscles and the vibrations which accompany the strong resonance of the sound distinguish it from *t*. Scholars do not find much difficulty in detecting these. The muscle *i*, Fig. 17, is active. Such syllables as *pet*, *pon*, *bot*, *bon*, *fat*, *fan*, *nap*, *net*, *nut*, *tep*, etc., bring out the differences more fully.

120. *ī* as in *I*. This is a diphthong made up of *a* and *ē* quickly combined. Some shorten or modify the *a* and give *ē* the fuller sound. Some, again, begin with *a* in *far*, others with the guttural *a* in *can*. In the west of England the latter is heard very fully pronounced.

Reading.—The organic positions of *a* and *e* have been already noticed. Their union is the principal muscular action, and this is considerable, for as the voice glides from the fundamental sound to the highest it brings the jaw and lips into continuous movement and is therefore read with facility.

121. The diphthongs *oi* as in *boy*, *ou* in *out*, can be now pronounced as all their elements have been learned; *oi* or *oy* are *ā* and *ē*, *ou*, *a*, *u*.

After learning them apart, words in which they are found, and whose other elements have been learned, ought to be collected, as *boy*, *toy*, *about*, *mouth*, *sound*, *mound*.

The marked muscular action seen in their pronunciation renders them easy to distinguish and read. As voice exercises they are invaluable, for, rising from the lowest tones and gliding on to the highest, they touch several partial tones, and form good exercises for the control of the glottis and the improvement of the voice.

122. *w*, as in want, has a special sound when used as a consonant, but elsewhere it is a vowel or silent. The muscular action in *w* is similar to that of *oo*, only the lips are more protruded and brought closer together. The voice, when forced through the passage, vibrates the lips, and seems to receive some additional resonance from the walls of the greater space anterior to the teeth. And, more than this, the rapid retrocession of the lips against the current of sound very probably assists in giving the character peculiar to this semi-vowel. The vowels with which it is usually joined from their organic positions require rapid glides and considerable muscular exertion, so that it is difficult to determine its exact form. Joined with *a* it glides quickly into it, but with *o*, as in *wo*, the latter requires a separate vocal impulse from the similarity of their forms. Here *w* is heard more independently, and approximates to *oo*, but requires a still greater muscular effort in the lips. There is little doubt the whole tube participates in giving *w* its resonant form.

The muscles usually employed are the outer fibres of the lip muscle, *t*, by which the lips are protruded, and the cheek muscles, *m*, *s*, pter. ext., Fig. 17, with the advance of the jaw, bringing it into position. The protrusion of the lips largely assists in all this action by lengthening the tube, so that the pitch of *w* is lower than *a*.

Reading.—The muscular action in *w* is so much greater than that of *oo*, and so varied by its union with vowels, as to make the signs so full and distinctive that it can be soon read. It ought, therefore, to be articulated with them, as *wa*, *we*, *wi*, *wo*. Placed after a vowel it is either \bar{u} or silent, as in *slew*, *slu*, *sow*, *so*, *mew*, *mu*. But united with a consonant, as in *twin*, it retains its initial value.

123. *ɪ* as in pin. The *t* place of the tongue is very favourable to the pronunciation of *ɪ* short, as in *tip*, *nip*, and it would be well to select final consonants like *p*, *n*, *m*, in *sip*, *sin*, *sim*, to sustain the tongue in its position, for there is a muscular attraction of the tongue in the same direction. The normal position of the tongue is very near the gum, and between the two a very narrow space is left for the sound to escape. In this narrowness of the passage it resembles \bar{e}

as in *me*, but its more advanced position lengthens the tube and lowers the vocal pitch.

But this is not the only short *i*. It has also to yield to the modifying power of the consonants, for when it follows *k*, *g*, and *r*, as in *kit*, *gim*, *sik*, *ring*, it is formed on the soft palate, and is rather a short *e* than *i*. Such vowel changes are more or less prevalent throughout, and are results of the same cause—the modifying power of the consonants with which they are united.

Reading.—The distinct feature of *i* as compared with *e* is in the former the protrusion and rise of the lips, and the narrow orifice left for the voice to escape. But in the latter the lips are drawn somewhat closer to the incisors, and are wider apart. The teeth for these reasons differ in their relative positions, for while in *i* they are almost on the same line, in *e* they are on different lines and a short space apart. In the modifications of *i* referred to above, these distinctions do not hold good. The muscles most engaged are those of the tongue, lips, and jaws.

124. *l*, a semivowel, as in *lo*, is the only consonant in the alphabet, except the nasals, in which the voice is allowed to pass without arrest or impediment. But the space is so narrow, and the resonance of the sound in passing so great that it has led many to class it with the trilled *r*. There is, however, neither trill nor hum in this consonant, but greater resonance. The division of the tube into two smaller, deflects and divides the voice, so that the resonance of both tongue and cheek is more fully evoked, and this has been thought a trill. Here the tongue is in the *t* position, but contracted and bent downwards, yet not touching the lower incisors. The lips are open and relaxed, and the cheeks, instead of being drawn close to the molars, are apart from them, permitting the voice to escape through the intermediate spaces. If the hand of the learner is on the teacher's cheek he will feel the vibrations from the passing sound. If air also, instead of voice, is allowed to escape, it becomes aspirate, and resembles the *ll* Welsh, while it aids us to perceive more fully its vocal form. It is lower in pitch, for the glottis has yielded to the backward pressure of the tongue. Should the teacher find any difficulty in leading the learner

to place his tongue properly, let him begin with the *a* position of the organs, and show him the rise of his own tongue from this to the *t* place, then pronounce the sound with his hands on the larynx and cheek. Touch is the best prompter in this more difficult sound.

Reading.—The muscles engaged in *l* are the same as in *t*. But *s*, Fig. 17, expands the cheeks. The vibrations excited by *l* are not very perceptible to the eye, and the positions of the organs so much like those of *a*, that independently it can with difficulty be detected, unless from the position of the tongue which can be seen between the teeth. But united with certain vowels, as *a* in *la*, it is so different from kindred sounds that it can be read; but in *lē* the external indications of its presence are confessedly so limited, that it must be classed with a few more sounds which depend on their connection with others for their suggestives. Compared with *t*, *s*, &c., the incisors and lips are more apart. In such words as *lap*, *lip*, *lop*, &c., contrasted with *tap*, *sip*, *ship*, this difference is more apparent in the action of the jaw, and enough to guide a reader.

125. *s* as in *so* is sibilant or hissing, and very dependent on the disposition of the organs for its pure sound. The upper and lower incisors are brought close, almost into the same line, the lips drawn close to them by the retreat of the angles, and the tip of the tongue advanced till it almost touches the upper incisors and the gum. The sides of the tongue press against the molars to prevent any escape of the air unless through the narrow space in front left between its tip and the teeth. The muscular action required for *s* is considerable. First, that of the jaw upwards and forwards; second, in withdrawing the tongue to its right position, and in its pressure against the upper molars so that none of the air is allowed to escape over or under.

This is the pure sound of *s*, but there are alternatives, all more or less imperfect, as by placing the tip of the tongue against the lower incisors, then raising it till the back almost touches the gum above, and through the narrow space which intervenes the air if pressed becomes sibilant. When the upper teeth are very wide apart, and the air too freely escapes, this form may be an improvement. However, it ought to be

remembered that the sibilant sound is more dependent on the narrow space between the tip of the tongue and the gum for its correct form, than the setting or spacing of the teeth.

Reading.—The muscles employed are pteryg. inter., and *s* in Fig. 17, for the advance of the jaw, and for retracting the angles of the lips, and *p* for lowering the under lip. From the lower teeth being brought to the upper, the lower lip is somewhat contracted, and this increases the muscular action of the jaw and lips in retreating to the place of the vowel which may follow, as *sa*, *so*, *su*, *si*, &c., or when final as *os*, *us*.

126. *sh*, as in *ship*, is the second strong sibilant of our language, and formed on the palate, but not in the *t* place. Here the tongue is raised rather to the *e* position, so that if this is first pronounced, then air takes the place of voice, *sh* will follow, only the tip will rise a little nearer to the palate to secure the full sibilant form of the sound. In *s* the air is confined to a narrow space, but in *sh* spreads over the sides of the tongue also, and gets its character from this diffusion of the current. The tongue is the chief agent in this sound. Its proper disposal is therefore essential. If it is not permitted to touch any of the teeth of the palatal cavity, except the rear molars, but brought near to them and the hard palate, the narrow space left between will suffice to create the sound. The back is not raised. The hand aids by detecting the difference of the currents of air in *s* and *sh*. A forcible expulsion may produce something like it when the tongue is in another position, but it is better to avoid this, for it is not the sound. The muscles chiefly employed are *t*, *s*, *o*, Fig. 17.

Reading.—As the tongue is withdrawn somewhat in *sh*, the teeth are not on the same line, but the upper incisors are in advance of the lower and overlap them a little. The lips are also protruded in advance of the incisors, but the lower more than the upper. These are sufficiently distinctive signs to make this letter comparatively easy in lip-reading. Its union with vowels long and short brings out these traits still more fully. As an exercise of the muscles it is excellent, and its full expression a good indication of organic power on the part of the learner.

127. *z*. Let voice take the place of the air in *s* and this buzzing consonant will be formed. But in the change from the sibilant to the buzzing sound the tongue will press closer and flatter to the gum to secure the full resonance. As *v* and $\bar{t}h$ are analogous the learner would obtain a better notion of its nature by repeating in succession the syllables, *va*, $\bar{t}ha$, *za*, then *fa*, *tha*, *sa*, till touch discriminates them. Failures in articulation often take place in these sounds, and therefore they ought to be thoroughly mastered. Sight is of little use here. To touch chiefly the function remains of discovering the peculiar vibrations of *z*, and therefore it ought to be called into active service. The plurals of nouns are distinguished by *s* and *z*. They are ever recurring, and their correct articulation is necessary to the meaning.

Reading.—The positions of the teeth and lips as seen are well marked in *s* and in *z*, the closer pressure of the tongue on the gum leads to a similar action of the under-lip which presses more towards the upper and retreats somewhat, because the tongue also retreats higher on the palate. In other respects the positions are very much alike.

The differences of muscular action between the air and voice sounds to which *s* and *z* belong, will be better appreciated by comparison. First *f*, $\bar{t}h$, and *s*, then *v*, $\bar{t}h$ and *z*, and it is evident that in the first three the lips and cheeks are braced more closely than in the last three, in which they are relaxed to promote the strong vibration. If a set of exercises were formed of these sounds first with long vowels, as thought, and afterwards with short, as sit, san, thin, than, it would be found that the eye of the learner would soon become familiar with most of them.

128. *d* as in do is closely analogous to *b*, but formed on the *t* place, only on account of the nature of the sound as a vocal stop, the tongue presses on a larger surface and higher up on the gum and hard palate. The pressure is less than in *t*, to permit the resonance to be fully developed. In touching the larynx it will be found that while ascending in *ta*, it falls in *d* from the guttural nature of the sound, and rises to the *a* pitch as soon as *d* is uttered. The suggestions under *b* are suitable here, and if attended to there will be little difficulty with the sound. The arrested vocal form is the chief

point, for the learner is in danger of letting the sound escape through the nose or unguarded parts of the mouth. *p* and *t* may suggest the stoppage of the sound in *d*, as they stop the air.

Reading.—The muscular action in *t* and *d* are much alike, except in the difference already noticed between an air and voice stop. In *t* the tip of the tongue presses on the gum, and this permits the lips to be more apart than in *d* when it is pressed over a larger space to increase the resonance. This brings the lips more closely together and raises the angles, so that *t*, *m* and *v*, Fig. 17, are in more active use.

THIRD CLASS.

3RD CLASS.—GUTTURALS.—*k, ā, g, y, è, à, ù, ng.*

129. *k.* All the sounds of this division are either purely guttural, or so much affected by the leading gutturals, as to belong to them as a distinct class. The *k* position is the leading one, and when well learned renders the others much less difficult. Like *p* and *t*, it is an air stop, but formed by the posterior part of the tongue pressed against the edge of the hard palate. For this purpose it is drawn backwards, raised, and rounded upwards till it touches the palate and closes the passage. If one hand of the learner is placed on his teacher's chin, and the other on the larynx, he will feel the double muscular action which this position of the tongue involves. Then if he removes the hand off the chin, and puts it before the lips, he will feel the explosion of the articulation, and at once learn that it resembles *p* and *t* in this respect. The other hand on the larynx will also inform him of its rapid descent from relaxing the engaged muscles. The danger of allowing the escape of the air through the nose is less here than in *m* or *n*, because the velum is pressed up by the tongue. But the learner is not a stranger to this backward action of the tongue. Every time he swallows a kindred action takes place, and he never breathes through the mouth or through the nose without the rise or fall of the velum palati. Nature has, therefore, provided all the muscular energy and

exercise that this sound specially requires for its articulation. Let him then swallow something and feel the movements of the tongue and larynx, then breathe alternately through mouth and nostrils till he is conscious of both, and he will have made the best preparation for the articulation of *k*. But should he not succeed after these suggestions, let him press the tip of his tongue against the lower incisors till the back rises against the palate and stops the air. The pushing back of the tongue with the finger or spatel is not desirable, for it is not the learner's own voluntary muscular effort, but that of the teacher.

Reading. — The retreat of the jaw with the relative positions of the incisors, and the lips, and the jerk in the explosion, are the external indices of *k*, and enough to distinguish it from other consonants. A sharp well delivered *k* aids in the pronunciation of guttural vowels, as

130. *ā* in cape. This vowel is guttural because it is preceded by *k*, and therefore it has been reserved till now. Any attempt to pronounce the *a* in pay would fail, for the shift of the jaw to its place would require a greater effort of the muscles than they are capable of. Ease and convenience make it guttural.

ā in cap, *ò* in cot, and *ù* in cut, are of the same class. The first is usually classed with *a* in pat, but incorrectly, for the organs are in different positions. Compared with *ē* (118), *ā*, *ò*, *ù* (111), and it will soon appear that they differ, because the consonants with which they are united differ. In ten the tongue is in the *t* place, and, therefore, when dropped permits the free escape of the voice without any special muscular effort, but in kept it is in the *k* place, and the vowel *è* becomes guttural because the muscular action is more facial. The same holds good of *ā* in tap compared with cap. The first is more open and full, the latter confined and rough. Were *ò* and *ù* also compared, the same principle would be evident. These vowel sounds ought to be reserved till the guttural consonants which determine their peculiar forms are learned. In the same manner *ì* in kick is guttural from the position of the tongue.

As a final, *k* affects the preceding vowel almost as much as when it is initial. If such words as sack, lock, book, tack,

dock, sock, muck, are pronounced, and the action of the organs carefully followed, it will be found that in anticipation of the final *k*, the jaw falls back to its position, and the vowel is either guttural or much modified. But when the guttural *r* and *k* are final, then the vowel is evidently so, car, core, choir, and these are our most guttural vowels.

Reading.—The initial or final *k* as now seen, gives these vowels a peculiar character, from the place and action of the jaw, as well as the position of the lips and quick retreat of their angles. In lack the lower is drawn close to the incisors, in lock the lips are rounded for *ò*, and in puck protruded for *ù*, but the movement from these positions in the direction of *k* is considerable, and therefore very favourable to lip-reading. In such words as kine, cost, and cup, the muscular movement, if represented by lines would not only show a great variety, but striking differences also. These are the elements provided by nature for advanced lip-reading.

131. *g* in give. The place of the tongue in *k* prepares for this voice stop. Its correct sound has been anticipated in *b* and *d*, which ought to be repeated, and the learner reminded of their nature before he attempts *g*. As in *b* and *d*, the organs are more relaxed, and their contact broader to facilitate vibration, so in *g*. The tongue covers a larger space on the palate, and the pressure is much less than in *k*. Now if the finger and thumb of the pupil are placed on each side of the throat above the teacher's thyroid cartilage, he will feel the vibrations which follow on the arrest of the voice. Like *k*, the voice in *g* is not likely to escape by the nose. Unless the resonance is well formed, *k* will become a substitute, and *g* fall out from the alphabet.

Reading.—Attention ought to be directed to the wider opening and greater depression of the lips in *g* than in *k*. By uniting it with the same vowels as *k* and pronouncing the syllables in varied order, their difference in muscular expression will be more apparent.

132. *y* in you. This is the purest of all our semi-vowels. It is formed at the *k* place. The base of the tongue is moved still deeper into the cavity, but leaves a narrow space for the voice to escape, which vibrates considerably on account of its action on the tongue and soft palate. This can be felt by

the learner if his hand is placed as in *g*. If the analogous vowels *ǝ*, *ɛ* and *ɛ̃* are first pronounced and attention directed to the nearness of the organs, its form may be suggested, but many scholars find it difficult. The teacher will observe that in *you* the tongue moves from the *y* place to the *e*, so that the vowel sound is prolonged and modified till it ends in *u*. However, this may be, for some time, too difficult for the student.

Reading.—The buccal action is seen in the cheeks. The muscles *m* and *s*, Fig. 17, and *k*, Fig. 16, *o*, Fig. 15, in the large withdrawal of the angles of the lips conjointly with the movements of the tongue, mark this consonant sufficiently for reading when united with vowels as *you*, *ye*, *yo*, *yah*, *yea*.

133. *ng* in *sing*. This is the last of the usual semi-vowels. The tongue occupies the *g* place, the mouth is left open, and the voice ascends through the nostrils, for the velum palati has fallen to allow it to pass. This action will be much facilitated if *m* and *n* precede, and the finger of the learner is placed on the side of his teacher's nose, where the vibration is the greatest. In *m* the addition of the cavity formed by the mouth in which the voice resonates adds to the nasal resonance. But owing to its guttural position *ng* lacks these additions, and must therefore be well sounded to be made audible.

Errors principally arise from misplacing the tongue. Secure the proper position first, get the head well back, and the sound will follow the vocal effort. As it never precedes but always follows a vowel, as in *ong*, *ing*, *ung*, it would be well to collect the words of one syllable containing it and read them over till they are familiar. But the provincial error must be guarded against of adding another *g*, as *ging* when there is a repetition of the sound, as in *sing-ging*, this is analogous but not correct. By separating the repeated sound, as *sing-ing*, it will be avoided or corrected.

Reading.—Compared with other sounds in which the tongue is in the *k* place, it differs from them in one important feature. As the vocal form of the sound does not require any special action in terminating, like *k* and *g*, the organs quietly resume their usual position. Because the

sound is nasal the other organs, according to the law, tend to follow, and this gives the jaw such a movement that the molars almost meet. This is expressed in the cheeks and angles of the lips, providing good marks for reading. Its repetition in singing, bringing, is characteristic.

j. This is really a double consonant whose first element is *d*, and its second soft *g*, as in *gin*. If *sh* is treated like *z*, the sibilant is resolved into a humming sound by softly pressing the back of the tongue against the hard palate, and forcing the voice between them; thus the hum is produced. In French it is a single consonant and pronounced softly. Preceded by *d*, the pressure is greater and the sound harder. If the approach is made from *f* and *v*, *th*, and *th*, *s* and *z*, the analogy will suggest its relation to *sh*.

Reading.—In *sh* the lips are apart and drawn back at the angles, but in *j* they are much closer, and protrude considerably. As a double consonant, it will find its place in the next division.

ch is also a double consonant, being formed of *t* and *sh* sharply pronounced. It will also be referred to in the next division.

FOURTH CLASS.

With the exception of *r*, the consonants in this class are either double, as *ch*, *j*, *q*, *x*, or modified consonants and vowels already learned.

134. *j*, as in *join*. The second element in *j* has been already described. The first remains, but this is *d* which has also been described. Both elements are palatal, and formed by the tip of the tongue against the gum. In fact the second is effected by relaxing the pressure in *d* till the sound escapes in a humming form like *z*, only softer. The precise difference between these two sounds is that *z* retains much of the sibilant arising from its *s* position, while *j* is destitute of it. The so-called soft *g* has nothing to do with its hard form, either in place or manner of production, for the first is palatal and the latter guttural. Were our alphabet phonetic, *j* and *g* soft would be represented by one character and *g* hard by another. In *hallelujah*, *y* takes its place, but this is from the origin of the word.

Reading.—The additional action of the tongue in relaxing from the *d* pressure, and rising along its back to the palate for the buzzing *j*, effects a slight secondary movement of the lips, very perceptible in the lower. This is its only distinguishing expression from *d*; but in combination with vowels, the movement of the lips is better developed, as in John, James. Compare these with dawn and dames, for confirmation of this analysis.

135. *ch* as in chip, is a double consonant, viz., *tsh*, as in Charles, in which this is evident, so that each element has at first only to be clearly articulated, and then quickly united. Under the head of Double Consonants, this union will be more fully treated. In some connections, the *t* is not so clearly articulated. But *ch* is also a single consonant after *l* and *n*, and then it is *sh*, as in bench, filch. In words derived from the classics, it is *k*, as cholera, chorus, chord. Thus the same letter has three different phonetic values, which so destroy analogy, that each word in which it is used has to be taught independently to avoid mistakes in pronunciation.

Reading.—As *tsh*, the muscular action is compounded of *t* and *sh*, and is analogous to *j*, only the lower lip in *sh* takes a different form; there is enough to distinguish it from *j* as in chip compared with join.

136. *x* as in box is also a double consonant, *k* and *s*. From the guttural place of the first element, and dental place of the second, the muscular action in uniting them is very considerable, but as they are both air, and the first a stop, the explosion provides for the sibilant *s*. But like the sibilant, it becomes *z* in certain relations. Where it ends a syllable with the accent it is *ks*, as in excellence, or on the next syllable when it begins with a consonant, as excuse. But when the accent is not on it, and it is followed by a vowel, it is *kz*, exempt, exist, and in example the *k* is almost *g*. Its reading is simplified by its compound form, because the muscular action of both *k* and *s* or *z* is increased by their union, which is most expressive.

q as in queen is a double consonant, *k* *w*. It is always followed by *u* which becomes *w* from the *k* sound which is its first element. If *k* is first articulated, then *w*, apart, and

afterwards combined with it, the learner will find no difficulty in this double consonant. The reading, too, is simplified by this union, for like *x*, the muscular action which it requires is both considerable and characteristic from the protrusion and form of the lips.

137. *r* guttural, as in work, requires the fullest command of the organs for its correct articulation, and therefore it has been reserved till now. The letter *r* has three distinct forms, two of which are not so difficult as the third. These are the guttural and labial. The guttural is peculiar, and is effected by drawing back the tongue till it presses heavily against the epiglottis. This disposes the organs so that the voice in passing vibrates either the top of the epiglottis or the uvula. The former is most likely, for there is nothing nasal in the sound. Myer says "it arises from the vibration of the uvula in a groove formed by a depression of the root of the tongue." This may be true of the French guttural *r*, but not of the English, whose seat is lower. The Germans have a palatal *r* formed by the vibration of the ridge of the tongue against the soft palate, but it is foreign to our language. Our guttural is heard in such words as lord, board, sword, etc., but by most it is very imperfectly articulated, being displaced by a strong resonance, produced in the narrow space left for the passage of the air between the tongue and the palate. This is likely to be the guttural *r* of the future from its greater ease in articulation. As a final this is its usual form.

138. The labial *r*, as in pray, can hardly be called a distinct kind, but rather a manner of introducing the trilled *r*, for when this is preceded by a labial as *p* or *b*, through a sort of attraction, it introduces the trill which is fully developed in the palatal. It exists in some languages as a labial *r*, disconnected from the palatal. But it serves a useful end, for it may suggest the nature of the trill. If the back of the hand is brought near the lips, and *pr* is forcibly expressed, the trill is perceptible, and then it can be shown that the tongue trills in the same manner against the palate.

139. *r*, as in roll. Trilling is formed on the *t* place, generally on one side. The muscles employed are those at the base of the tongue to hold it firmly. Usually also it is

pressed against the right molars for the same purpose. The trill itself is involuntary and an effect of the voice catching the apex of the tongue and compelling it to vibrate strongly against the gum. If these positions are observed the trill is quicker and better delivered. Others do not confine the action to one side of the tongue, but allow all the apex to vibrate. This is the Italian form, and it is slower and softer than the first.

Again, others do not confine it to the apex, but allow a considerable part to press against the palate, where it vibrates freely. This is an Irish form.

The learner, if not better instructed, starts with the design of producing the trill by voluntary muscular action, and of course fails. Better point out how he is to hold his tongue, approach the tip near the gum and then utter *a* forcibly, and the proper trill imperfectly may be produced. This is likely at first, but once done it can be improved. The gargling of water in the throat, the vibrations of a slip of paper, are also suggestive of the right action. The hearty co-operation of the scholar will insure success, but its absence render the best suggestions futile.

Reading.—When introduced by a labial or dental consonant it can be easily detected, but when it is confined to the palate the lower lip vibrates, and this is still more evident when followed by a vowel, as in roll, roast, rib, rust. The lips too are more advanced at the angles, and assume almost the *u* form. In the guttural *r* the opening of the mouth, the withdrawal of the angles and the muscular action in combining it with another vowel or consonant, are special; still it is one of those sounds which only a practised eye can detect.

VARIOUS ARTICULATIONS.

140. One of the most fruitful sources of these sounds is the defective state of our alphabet. A phonetic alphabet would provide for every sound, but when one letter has to do the service of two, and two the service of one, with no guide but custom as to which is right, the learner who has no ear to guide him must ever be in danger of mistakes, if he

pronounces from analogy. Every word must be learned if these are to be avoided. Some of these anomalies are here given, because they can be partly accounted for by the dynamic laws already illustrated.

b is silent after *m* in the same syllable, as *lamb*, *limb*, *comb*, *dumb*. Evidently the difficulty of uniting two consonants so closely related in articulation, has led to this, for the voice has passed another way in the first. However, in *rhomb* it is heard. It is silent before *t* for a similar reason.

c and *g*. Generally *c* and *g* are soft before *e*, *i*, but we have *sceptic* and *ocean*, *skeptic* and *oshean*; and in words of Saxon origin, *g* is hard, as *gear*, *geese*, *gift*, and many more. But when it ends a word or syllable it takes the place of *g* hard.

Before *y*, *g* is soft, as *elegy*, but there are many exceptions of Saxon origin, as *bogy*.

It ought to be noted that when the termination *ng* of one syllable is followed by a vowel in the next syllable, *g* retains its own guttural value, as in *anger*. Here in the first syllable it contributes to the nasal *ng*, and in the second it is pure *g*, as *ger*.

d. In verbs ending in *ed*, preceded by an air-stop or aspirate, the *d* is changed to *t*, as *stuffed*, *stuffed*; *tripped*, *tript*; except in the solemn style; but when the consonant is a voice stop or humming consonant, as *b*, *d*, *g*, *z*, it retains its voice sound, as *doubled*, *lived*, *buzzed*. On the same principle, when a verb ends in a liquid it retains its pure sound, as *joined*. Such combinations as *raspt*, *scratcht*, *bridl'd*, are very harsh, but still, to be avoided, the whole termination must be changed, for they follow the general rule. The adjective, with few exceptions, retains the *ed*, as *learned*.

s is a hissing sound, but does not always retain its character, for in the plurals of nouns, preceded by a vowel or a voice consonant, it is *z*, as *pen*, *penz*; *chair*, *chairz*; *rib*, *ribz*. Evidently it follows the mechanical law of greater facility. When verbs have to be distinguished from nouns, while they are spelled alike, they are pronounced differently, as *grease*, *greaze*; *abuse*, *abuze*.

141. Again *s* before *ion* becomes *zh*, as evasion, evazhyun; but in expulsion it is shun. The change of *t* into *sh* in *tion* final seems very anomalous. Walker well observes of this, "Now the vowel which occasions this transition is the squeezed sound of *e* as heard in *y* consonant, which squeezed sound is a species of hiss; from the absence of accent it easily slides into *s*, and *s* easily into *sh*; thus mechanically is generated that hissing termination *tion*, which forms but one syllable as if written shun." Add to this that *n* final seeks for the convenient *sh* as its precursor.

f. In *f* and *s* before *t*, the *t* is assimilated, as often, offen, castle, cassle. "And there is a strong tendency to change the *f* into *v*, confounding the plural with the genitive case," as wife's-jointure.

gh. In words beginning with this combination, *h* is dropped, as ghost; but in the end of words it is changed into *f*, as laugh, and sometimes into *k*, as hough, lough. However, in these it takes the place of the guttural aspirate. In ght it is silent, as flight, night, bought. Here again it is the lapse of the guttural aspirate which is still heard in Scotland.

Scotland.
Ch (Guttural)

k and *g* before *n* are silent, as knee, gnat, but retained in German.

l is mute in almond, half, and some others; also between *a* and *k* in the same syllable, chalk, talk; also between *a* and *m*, as alms, balm. In would, could, should, it is suppressed, and takes the burden of *e* in table, circle, able, etc.

In doubling it is partial, and has been much blamed in consequence. Webster makes short work of these doublings, for he dismisses them unless necessary to the articulation of the words.

142. Teachers know well that in pronouncing such words as writing, there is some difficulty in separating the final syllable, *ing*, from the *t* of the first syllable, because an additional muscular effort is required, but when pronounced writ-ting, this is avoided, and the articulation unobjectionable. The same holds good of travel-ler and travel-ling. The rule that the consonant is doubled before *ing*, *et*, *er*, etc., when the accent is on the last syllable, except in the

case of *l*, but single when it is on any preceding syllable, does not satisfy, for a close analysis of all these proves that in rapid speech all are actually doubled, or, what is tantamount, that the consonant of the prior syllable passes on to the final syllable, as travel-ling, not all the consonant indeed, but its final movement which coalesces with *ing*.

r. The palatal *r* usually begins a syllable, and the guttural ends it, as *roar*, *rare*. In dissyllables also this order prevails, as *roller*, *railer*, etc.

re. In a final unaccented syllable terminating in *re*, the *r* is pronounced after the *e*, as *acre*, *acer*; *centre*, *center*. This is evidently for greater ease, for *tr* are difficult to combine when final.

The combination of sounds in *onion* and *union* is peculiar, but presents no real difficulty if separated into syllables *ūn-yūn*, *yūn-yūn* as in *minion*, and *pinion*. Now when these are referred to muscular convenience, it is seen that a nasal or some other semi-vowel precedes, making *y* more facile for articulation than *io*. Thus nature aids our work when art interposes its absurd anomalies in spelling. Let the teacher study his own organs well in their muscular action, and he will always be able to solve the difficulties created by our spelling.

143. DIPHTHONGS.—Some of the diphthongs have been already noticed, but only as combined vowels, each retaining its full phonetic value. However, they rarely retain this equality in the composition of words, and are subject to mutual influences which modify their sound. They may be divided into three classes according to their value.

1st. Those in which each vowel is heard either more or less, as the following, *oy* in *boy*, and *oi* in *boil*, *ou* in *hound*, *ow* in *fowl*.

2nd. Those in which one predominates, and the other is nearly absorbed, as *ei* in *either*, *ē*, or pronounced *eīther*, *ī* predominates, *ea* in *eagle*, *ē*, *aw*=*ā*, as in *law*, *ie* *grief* *ē*, *ou* in *soul* *ō*; and *o* absorbs *a* in *shoal* and *foal*, *ew* in *few* is resolved into *yu*, *ay* long *ā*, *au* in *Paul*, *ā*, *ao* in *gaol*, *ā*.

3rd. Those in which they are pronounced apart—diæresis—as in *iodine*, *eolian*, *hyaline*.

144. (a.) But the vowels of the first class do not equally

contribute to the syllables they unite in forming. There is an evident tendency of the stronger to absorb the weaker, or to yield to the consonant, as in $I=ae$, e is chief; in *ou*, houses, the u is chief. In *eider* i is principal, but i being itself a diphthong, the muscular action it requires reduces the value of e . When the first vowel is long, and the second short, it is called trochaic, as in *moan*. And when the first is short, and the second long, it is iambic, as in *mouse*.

However, in all these diphthongs, neither vowel retains its own full tone, but is modified by the consonant for facility, as in *boy*, the o after b has to yield to the vowel which follows some of its fulness. Sometimes it is only a compromise between both, as ei in *eight*, a and ai in *airy*, \bar{a} guttural. A list is added of peculiar modifications.

cean = shan in ocean.	sial = shal in controversial.
ceous = shus in farinaceous.	sion = shun in mansion.
cial = shal in commercial.	sion = zhyun in confusion.
cian = shan in optician.	tial = shal in martial.
cious = shus in ferocious.	tion = shun in nation.
gious = jus in religious.	tious = shus in sententious.

145. The syllable as the unit of muscular action in lip-reading may consist of a vowel, or a vowel and consonant, either before or after, or a vowel between two consonants, or followed or preceded by two or more consonants, each of which presents a new form of muscular action, and the last a great advance on the first in force and fulness, by which the materials for a quicker and safer translation of these expressions into speech language can be attained. Numbers of them are oft-recurring and fixed elements, and their repetition would soon make them familiar to the eye.

Many of the strong verbs of the language are only monosyllables. They might be printed on a large sheet, and form an exercise in lip-reading, while memory treasured them for composition. And in teaching them, the eye ought to be directed to the syllable as a whole formed of its several elements, so that they might not only be united as letters, but as sounds in their muscular changes, as we are in the habit of doing as we read. Let their eyes become familiar with

the whole syllable, as a set of motions, and thought anticipates the remainder when well begun.

The key words of the language, devised by Professor Melville Bell, will furnish a few illustrations of this principle.

1, One.	8, Eight.	15, Lamp.	21, Dog.
2, Two.	9, Book.	16, Onions.	22, Monkey.
3, Three.	10, Watch.	17, Boat.	23, Cage.
4, Four.	11, Saw.	18, Curt.	24, And.
5, Five.	12, Feathers.	19, Tent.	25, Bird.
6, Six.	13, Tongs.	20, Houses.	26, Canary.
7, Seven.	14, Whip.		

DOUBLE AND TREBLE CONSONANTS.

146. Some languages abound in these ; others have comparatively few. In some they are always pronounced apart, in others they coalesce into one continuous sound, as far as their elements will permit. There are many in our own language, and they form a chief difficulty to all children, but especially to deaf-mutes, for they make great demands on muscular energy and quickness of movement. They have, therefore, been reserved till all the consonants, of which they are combinations, have been singly learned, and the organs have acquired sufficient mobility for greater efforts. The tendency is strong, at first, to interpose a vowel between them, as *pil* for *pl*, and where the organic shifts are considerable, as from *g* to *l*, its exclusion is most difficult, even for hearing children. When two consonants are situated between two vowels, a hiatus or pause is resorted to, and it is pronounced in two syllables instead of one, as *milder*, *mil-der*. A hiatus is inevitable when the consonants are air stops or aspirates, as *pits*, but if they are resonant, or voice stops, then the tone of the first passes on to the second, and there is no hiatus, as in *blow*, and the combination resembles that of two vowels in a diphthong. But, from the very nature of consonants, as stops or modifications of air and voice, this union is never so complete as in vowels. Three elements, therefore, determine the ease or difficulty of these combinations for deaf-mutes.

I. The degree of muscular effort.

II. Their organic relations.

III. The character of the sounds.

147. (i.) On the first it may be noted that both consonants may be closely related in locality, and, therefore, little effort is required to shift the organs from one to the other, as *st*, which are both formed at the same point of the palate. A slight rise of the tongue is all that is required. But if *gl* are articulated, they are so far apart, and the muscular effort also so very considerable, that to shift the action from the root of the tongue at *g* to its tip at *l*, cannot be executed so quickly as to exclude an intervening vowel. The latter combination must, therefore, be the more difficult for those who have not the ear to assist them.

(ii.) Proximity of place does not always secure facility of combination. The muscular effort between them may still be considerable, as from *t* to *l*, where the tongue retains its *t* position, but has to bend downwards in the middle of the back to let the voice pass on either side. But usually the closer they are related in place the less effort is needed. The gutturals *gr* are formed side by side, and easily combine, but *spr*, *tr*, *br*, and *sk* refuse to be united, and a hiatus must intervene.

(iii.) But facility of combination very much depends on the forms of the sound, whether they are air or voice stops, or aspirate, or a nasal semi-vowel. Voice stops and semi-vowels combine better than air stops, because the voice is sustained between them, as in *dl*, *bl*, *gl*, as compared with *ps*, *st*, *sf*, *sk*. The first class more resemble diphthongs, but the latter are only related in time, without any connecting link. If the first is an air and the second a vocal stop, they may unite better, as the one prepares for the other, as *pr*, *fr*, *tr*, *kr*, in regard to muscular effort, for the air of the first becomes the voice of the second, but no real combination has taken place. If *sm*, *sn* are carefully examined, they are both difficult, for the aspirate *s* does not assist either nasal as a sound, and the muscular effort between is very considerable. As a rule these are of the most difficult for the scholar.

148. Final double and treble consonants.—The number of treble and quadruple consonants as initial syl-

lables is not so great as final, but the difficulty of combining the latter seems in practice not so great as if they were initial. The probable cause lies in the vowel which precedes, arrested by the voice stop or nasal, as *amble*, *ample*. In the second, *a* provides voice for *m*, and the consonants all stand in convenient relations. But such a combination as that in *sixths*, called *barbarous*, containing four consonants, *k*, *s*, *th*, *s*, is very formidable, even for well-trained organs. They are air stops and aspirates, and can only be articulated by introducing short pauses between, to permit the organs to shift to the next position. To start with such combinations, as some do, while the muscles are still rigid, seems an inversion of the natural order. This is from the complex to the simple.

Dalgarno, in his *Essay on Double Consonants*, says, "The most natural and easy composition of consonants, either in the beginning or ending of a syllable, is that of the mutes and semi-mutes following the sonorous letters of their own respective organs of formation as in these examples, *mb*, *lamb*; *mp*, *lamp*; *nd*, *hand*; *nt*, *ant*; *ng*, *thing*; *nk*, *think*." This may be true for the hearing, but for deaf-mutes organic facility, and the absence of the liability to conform the consonants to each other as vocal or aspirate is best for them, as *sp*.

The teacher soon finds out that these consonants are better articulated when joined with a vowel than by themselves, and that this arises from the impetus given to the organs by the force exerted in the vowel. The vowel, too, being usually the sound to which the consonant is only initial or final, and on which the volume of voice is chiefly expended, there is a strong organic tendency to unite the consonants as closely as possible on account of the vowel. This facilitates learning the consonants.

149. In teaching all these consonants, they must be fairly articulated apart, before they are united, and this ought to be at first slow, and gradually accelerated, till their union is complete, without any sacrifice of their phonetic value. Imitation may assist when the sounds are labial, but when palatal or guttural, touch only can secure their correct articulation. It ought also to be remarked that our fine dis-

tinctions between these combinations of consonants are unknown to deaf-mutes. Touch distinguishes the difference between air and voice, but only from the presence of vibration in the latter, and not the sound, by which we distinguish them. The muscular effort in their production, as the less difficult, is, therefore, the principle that ought to determine the order in which they should be taught.

150. Reading.—We have already assigned the syllable its place in speech and lip-reading; but then it was made up of a vowel and a consonant, or two consonants separated by a vowel, and on account of the increase of the number of sounds, the muscular action is enlarged, and the number of signs by which such syllables can be perceived is increased. But when double consonants initiate a syllable, or end it, or both, then the muscular action of the whole syllable is still more increased, and the reading rendered proportionally easier. In fact it may be stated as a rule, that the greater the muscular action required, by one or several syllables forming a word, the greater is the facility in reading them if the eye is made familiar with the movements.

The value of these combined consonants for this purpose has been already stated and enforced, but now that nearly all the phonetic elements of the language have been taught, a little more space may be devoted to the subject in its more advanced bearings.

I.—FINAL DOUBLE CONSONANTS.

Arranged in the order of their facility of articulation.

151. ASPIRATE AND AIR STOP:—

— *sp*, asp, hasp, cusp, lisp, rasp, wasp, wisp.

— *st*, best, bust, boast, coast, dust, fast, fist, feast, foist, guest, gust, ghost, hast, hoist, joist, last, lest, list, lost, least, lust, mast, mist, most, miss-t, must, nast, nest, past, pest, post, quest, rest, wrist, roast, rust, taste, test, toast, toss-t, vast, vest, wast, west, wist.

— *sk*, bask, busk, cask, desk, disk, dusk, husk, mask, musk, risk, rusk, task, tusk, whisk.

— *ft*, baft, eft, defft, ha(1)ft, laught, left, lift, loft, luff't, puff't, quaff't raft, reft, rift, ruff't, soft, sift, swift, tift, waft, weft.

— *sh*t, clasht, disht, fish't, gasht, mash't, pūsh't, quasht, rusht.

152. AIR STOP AND ASPIRATE:—

— *ps*, dips, fips, fops, caps, laps, lips, loops, leaps, maps, mops, mōpes, nips, paps, pips, pops, pups, quips, saps, sips, sops, sups, taps, tips, tops, tups, types, wipes.

— *ts*, bats, bets, buts, bōats, boots, bouts, dots, doubts, fits, fātes, fūts = foots, gātes, gets, goats, hats, hits, huts, hēats, cats, kits, cots, cuts, kītes, lets, louts, lūtes, mats, meets, meats, mits, moots, nets, knits, nuts, pats, pets, pits, pots, puts, pouts, peets, puts, quits, quoits, rats, roots, rites, routs, sets, sits, sots, tits, vats, vōtes, wits, wātes.

— *x*, —*ks*, backs, becks, bucks, beaks, books, decks, docks, ducks, dūkes, dykes, fo(1)ks, hacks, hooks, jacks, jōkes, kicks, rocks, cooks, keeks, coax, box, dux, fix, fox, cox, lax, mix, sax, tax, six, wax, tacks, ticks, tucks, sacks, seeks, socks, vex, racks, reeks, rocks, rucks, sacks, sucks.

153. SEMIVOWEL AND AIR STOP:—

— *lt*, bilt, belt, bolt, built, dealt, dolt, fault, felt, filt, gilt, salt, silt, wilt.

— *lh*, bulk, dilk, folk, hulk, milk, silk, sulk.

— *mp*, bump, damp, dump, gimp, hemp, jump, camp, lamp, limp, lump, pump, pomp, ramp, rump, vamp.

— *nt*, bent, dint, dōnt, fōnt, hunt, haunt, jaunt, joint, count, cant, lent, lint, meant, mint, pant, pent, punt, point, sent, vant, vent, want, went, wōnt.

— *nk* = *ngk*, bank, bunk, funk, junk, hank, lank, link, monk, pink, rank, rink, sank, sink, sunk, tank, wink.

— *rp*, harp, carp, warp.

— *rt*, cart, curt, court, dart, dirt, hart, heart, hurt, mart, part, pert, quart, sort, tart, wart.

— *rk*, bark, burk, dark, dirk, fork, hark, jerk, lark, lirk, lurk, mark, murk, park, pork, quirk, turk.

154. TWO SEMIVOWELS.

— *rl*, carl, curl, dirl, furl, hurl, marl, merl, narl, peārl, purl, whirl, whurl, twirl.

— *rm*, arm, barm, farm, firm, form, harm, germ, norm, term, warm, worm.

— *rn*, barn, bern, born, burn, bōurne, corn, darn, fern, learn, lōrn, morn, tarn, tern, torn, turn, warn, yarn.

SEMIVOWEL AND VOICE STOP.

— *ld*, bald, bāld, build, bold, boil'd, bell'd, fill'd, kill'd, poll'd, pull'd, rail'd, roll'd, rul'd, sold, soil'd, till'd, told, toil'd, veil'd, wail'd, wold, will'd.

— *md*, fām'd, gām'd, gum'd, hem'd, hymn'd, lām'd, lim'd, nām'd, num'd, ram'd, rim'd, roam'd, seam'd, tām'd, sum'd, tim'd, teem'd.

— *nd*, and, band, bend, bond, bound, bind, dīn'd, don'd, dūn'd, fan'd, fend, find, found, gāin'd, hand, hind, hound, land, lend, lōan'd, man'd, mind, mound, mend, moan'd, nām'd, pen'd, pīn'd, pound, rend, (rhynd) rind, round, sand, send, sound, tawn'd, tan'd, tōn'd, tin'd, tend, tun'd, wand, wend, wean'd, wind, wound.

— *rd*, bard, beard, bird, board, fear'd, ford, fir'd, furr'd, gird, gor'd, gourd, hard, heard, hoard, card, cord, curd, cūr'd, lard, lord, lūr'd, marr'd, nard, near'd, pared, pour'd, pair'd, peer'd, rear'd, roar'd, s(w)ord, seer'd, surd, soard, tarr'd, tir'd, to(w)ard, tower'd, ward, word, wir'd.

155. TWO AIR STOPS :—

The *ed* termination is pronounced *t*, and here printed so.

— *pt*, dipt, happ't, hipp't, hōp't, hopp't, hoop't, kept, cook't, cup't, lap't, leap't, lipp't, map't, mōp't, mop't, nap't, nip't, pap't, pip't, peep't, pip't, pop't, rapt, rip't, sap't, sip't, sop't, sup't, tap't, tip't, top't, wept, wipt.

— *kt*, bāk't, back't, book't, cook't, kick't, cock't, lack't, lick't, lock't, look't, lik't, (k)nock't, pack't, pick't, pōk't, quack't, rack't, rock't, suck't, tack't, tuck't.

156. SEMIVOWEL ASPIRATE AND VOCAL FRICATIVE.

When a semivowel precedes a final *s*, it is softened into *z*, but when a vowel follows it retains the air aspirate sound.

— *lf*, pelf, gulf, delf, self, sylph.

— *ls = lz*, fällt, fells, fills, feels, foils, fouls, pälls, päl's, pil's, pools, quells, quills, rails, reels, rolls, rills, sells, sills, sol's, soils, tells, tills, tools, toils, wälls, wells, wills.

— *lsh*, belsh, milch.

— *lth*, filth, health, tilth, wealth.

— *rs = rz*, bars, bears, boars, burrs, dār's, doors, fāres, firs, furze, wears.

— *rs (s)*, farce, gorse, hearse, parse, purse, horse, coarse, force, nose, pierce, tierce, worse.

— *ms = mz*, dams, dāmes, bombs, dīms, deems, dōmes, dooms, fame's, foams, gāmes, gums, jems, hams, hems, hums, hym(n)s, home's, James, John's, com(b)s, comes, lam(b)s, lāmes, limes, mames, nāmes, num(b)s, pa(l)ms, qua(l)ms, rams, reems, roams, sums, tomes, times.

157. TWO ASPIRATES :—

— *fh*, fifth, twelfth.

VOICE STOP AND HUMMING ASPIRATE :—

— *ds = dz*, adz, aids, bīds, beds, deeds, bōdes, buds, God's, gads, goods, guides, goads, heeds, hides, hods, jādes, kids, cuds, lads, lids, lēads, loads, meads, mōdes, needs, nōdes, pads, pods, quids, rads, reeds, roads, rides, seeds, suds, toads, tydes, weeds.

— *bs = bz*, bibs, dubs, fibs, fobs, hobs, jōbs, jībes, cobs, cubs, cubes, lobs, (k)nobs, nibs, rabs, ribs, rōbes, robs, rubs, tubs, tūbes.

— *gs = gz*, bags, bogs, bugs, digs, dogs, fags, figs, gigs, hags, hugs, jags, gigs, jigs, jūgs, jogs, cags, cogs, lags, legs, logs, lugs, mugs, nags, pegs, pigs, pugs, rags, rigs, rugs, rōgues, tags, tugs, wags, wigs.

AIR STOP AND SEMIVOWEL :—

— *kl*, buckle, hackle, cockle, fickle, kackle, knuckle, mickle, pickle, sickle, suckle, tackle, tickle.

— *tl*, battle, bottle, beetle, little, nettle, rattle, scuttle, tattle, tittle, title, wattle, whittle.

— *pl*, couple, dapple, nipple, ripple, tipple.

II.—INITIAL DOUBLE CONSONANTS.

158. ASPIRATE AND AIR STOP :—

sp—, span, spar, spat, spell, spill, spin, spite, speak, spoke, spoil, spout, spot, spawn, spur.

st—, stab, stag, stage, stale, stall, stand, starve, stain, star, stair, stave, state, stay, step, stew, steep, steel, steal, stole, stove, stub, stun, stum, stump, sty, style.

sc or *sk*—, scab, scale, scan, scape, scar, skate, scathe, scheme, scoff, school, scoop, scope, score, sconce, scot, scour, scout, scowl, scud, scull, scum, sky.

ASPIRATE AND SEMIVOWEL :—

fl—, flag, flail, flake, flame, flank, flap, flare, flash, flask, flat, flaunt, flaw, flax, flay, flea, fleck, fledge, flee, flew, fleece, fleer, fleet, flesh, flight, flinch, fling, flint, flip, flirt, flit, flitch, float, flock, floe, flog, flood, floor, flounce, flour, flout, flow, flue, fluke, flume, flush, flute, flux, fly.

fr—, frail, frame, franc, freak, fraud, fraught, fray, free, freeze, freight french, fresh, fret, frieze, fright, frill, fringe, frisk, frith, frizz, fro, frog, from, front, frost, froth, frounce, frow, frousy, frown, fruit, frump, frush, fry.

sl—, slab, slag, slam, slate, slap, slash, slay, slave, sleep, sleet, slide, slight, sling, slip, slim, slit, slow, slop, sloop, slope, sloth, slug, slum, slur, slut.

sm—, smack, small, smash, smell, smile, smite, smith, smoothe, smock, smoke, smote, smug, smut.

sn—, snack, snail, snake, snap, snarl, sneak, sneeze, sneer, sniff, snipe, snore, snort, snout, snow, snub, snuff.

shr—, shred, shrew, shrink, shrine, shrimp, shrive, shroud, shrub.

sw—, swab, swain, swim, swam, swum, swan, swãth, sweat, sweet, swell, swift, swig, swing, swine, swoop, sword = sord.

thr—, thrash, thrush, thread, threat, three, thrice, threw, throw, thrift, thrill, throat, throb, throng, through, thrum, thrust, thrush.

AIR STOP AND ASPIRATE :—

ch = *tsh*—, chafe, chaff, chain, chair, chalk, charm, chance, change, chip, chart, chase, chat, chaw, cheer, cheap, cheat, check, cheer, chess, chest, chew, chick, chide, chief, child, chill, chime, chine, chin, chirp, chit, choice, choke, choose, chop, chōse, chuck, chum.

159. TWO ASPIRATES :—

sph = *sf*—, sphere, sphinx.

AIR STOP AND SEMIVOWEL.

pl—, place, plan, play, plain, plague = plãg, plait, plãne, plaice, plant, plat, plãte, plead, pledge, plight, plot, plough = plow, plumb = plũm, plũme, plump, ply.

tr—, trace, track, trade, trail, train, tram, trance, trap, tread, treat, tree, tremble, trench, trial, tret, tribe, trick, trifle, trill, trim, trine, trig, trite, troop, trot, troy, trout, trough, truce, truck, true, trump, truth, truss, trust, try.

tw—, twain, twang, tweed, tweak, twelve, twice, twill, twin, twine, twinge, twist, twirl, twit, twitch, two.

kl = *cl*—, clack, claim, clamp, clan, clang, clap, clash, class, clause, clap, clay, claw, clean, clear, cleave, clerk, clew, click, cliff, cleft, clim(b), clime, clinch, cling, clip, cloak, clock, clod, clog, close, close = cloze, clot, cloth, clothe, cloud, clout, clove, club, clump, clutch, clung.

160. VOICE STOP AND SEMIVOWEL :—

bl—, blab, black, blade, blame, blanch, blank, blush, blast, blay, blaze, bleak, bleed, bless, blind, block, blink, bliss, blithe, blood, bloat, bloom, blu(e), blunt, blur, blush.

br—, brad, brag, bran, brew, bride, brig, bril, brine, brock, broad, broke, broil, brook, broom, broth, brow, brown, browse, bruise = bruz, bruit = brüt, brush, brute.

dr—, drab, draft, drag, drain, dram, drape, draw, draw-well, drawl, drawn, dread, dream, drear, dree, dress, drift, drill, drink, drip, drive, dröve, drone, drop, dross, drouth or drought, drove, drown, drowse, drug, drum, dry.

gr—, grape, graff, graft, grate, grain, grate, great, grand, grant, grave, graze, green, greet, grew, grey, grief, grieve, grill, grain, grim, grind, gripe, grip, grit, groan, groom, groin, grop, gross, grote, group, ground, grouse, grove, growl, growth, grub, gruff, grunt.

gl—, glag, glade, glair, gland, glare, glaze, glass, gleam, glebe, gleet, glen, glib, glide, globe, gloom, gloss, glove, glow, glue, glum, glut.

MODULATION OF THE VOICE.

161. Accent, Emphasis, and Tone.—Syllables alone do not admit of much play of the voice, beyond the difference in their vowel sounds. As has been already proved, each of them has its own relative pitch, and if the position of the larynx and its control have been carefully attended to, absolute monotony is impossible. The scholar knows by touch that he can produce slow or quick vibrations by depressing or elevating his larynx. The fundamental principle of vocal modulation is therefore known, and his education in speech as expressing thought, emotion, and musical feeling, can be carried forward. Thought seeks to call attention to some of its expressions more than others, and to this accent and emphasis respond in speech. Emotion is earnest, tender, persuasive, beseeching, excited, and vehement in its phases, and the voice lends itself to corresponding musical forms of tone and cadence. No doubt the ear is the chief conductor in these variations, but the parent force is in the mind. We think, and therefore speak.

We cannot provide the deaf with ears, but we can lead them to understand that they can make their voices take the colour of their thoughts, and put the life which stirs within into the mechanical action of the organs of speech. The consciousness of this will be pleasing, and aid the teacher in his novel task.

162. Accent is "the more forcible utterance of a particular letter or syllable, by which it is distinguished from others." In the syllable itself, accent is of two kinds, one on the vowel, and the other on the final consonant. When the vowel is long, as in *tone*, the accent is on the *o*, but when short, as in *tun*, on the *n*, from the rapid pronunciation required by the short vowel. This has been already learned, but it ought to receive constant attention, because it helps in the pronunciation of longer words. It has a principal place in words of more than one syllable, in all of which it is found. In dissyllables it is generally on the first. If a few are selected, and in their utterance one finger of the scholar is on his teacher's larynx, and another on his own, he will perceive the increase of vocal muscular force on the first syllable and its decrease on the second. If the accent is on a consonant, then it is sharper, with a slight rise of the voice on the preceding vowel; but if on a vowel its tone is fuller, with a perceptible rise. Compare *puppet* with *mótion*, and it is evident that the second permits of a richer play of the voice than the first, which ends in an air stop, and, therefore, it would be well to begin with words in which the first syllable ends in a vowel, semivowel, or aspirate. Curved lines, ascending and descending, might be placed over the first and last syllable to describe the stronger tone, and the opposite over the second to describe the falling tone.

163. It need hardly be said that the one necessitates the other. The muscular tension employed in the accent will be relaxed for ease in the second syllable. Like a wave, it sinks to the level from which it rose. But when the accented syllable has a long vowel before a final consonant, the vowel takes the accent, and the consonant participates in the fall of the last syllable. Compare *spóuting* with *spotting*. The accent on the *t* in the last is much stronger than the first. In words of a number of syllables, in which the muscles

need some relief after considerable effort, a second accent is introduced, in some instances because the word is a compound of others, which retain their own accents, as *em-ply-fi-cā-tion*, or because muscular convenience requires it. Better, however, to attend at first to the principal accent, and when this is familiar refer to the other. The exercises on accents ought to be plentiful and well directed on words of two syllables, as they are numerous in the language, and hence the tendency will grow to accentuate all such words on the first syllable. The exceptions may follow when language requires their distinctive meaning to be taught. In words of more than two syllables, it will assist the learner if the syllables are separated by hyphens, with that marked which bears the accent, and then is pointed out the difference in accentuation between these and dissyllables, while touch assists in its perception. The manipulation of the larynx in pronouncing all these words, whether of two or more syllables, will reveal the fact that the larynx is elevated on the accent in every one ending in a consonant; but that on those in which a vowel has the accent, the larynx acts in accord with the pitch of this vowel. The reason is obvious, from the greater muscular effort required by the consonant, while the vowel requires only an increase of lung-force.

164. Emphasis.—Accent is confined to syllables, but emphasis extends to words, phrases and sentences. (A.) In simple sentences it sometimes marks the word to which the speaker wishes to lead the attention of the hearer, but generally it is placed on the principal words as the subject and the predicate, about which the others cluster, unless there is a special reason to the contrary. (B.) In sentences communicating some startling news it is placed on the words chiefly conveying it. (C.) In commanding, entreating, or praying, it is placed on the word or words which most convey the intention or desire. (D.) In negative sentences, it falls on the negative adverbs. (E.) In interrogative sentences, on the term which suggests the required answer. (F.) And in contrasted or antithetical words, phrases, or sentences, on the words which express the antithesis. Generally the other parts of the sentence are pitched on a lower key to permit the voice to ascend in the emphatic part. (G.) Quotations

made to establish an opinion are usually more emphatic ; and parenthetic words or sentences are spoken in a lower pitch, that the leading thought may be kept before the mind.

These are not refinements in speech, but distinctions in thought, to which they give expression, and to know them is to increase the ability to understand the logical relations of all the members of a sentence, or parts of a composition. There is a grammar of sounds as well as of words, and they correspond, but thought must provide the text.

165. Rhythm.—Prose has its rhythm as well as poetry, only more varied. The ear of the people when the language was growing found out that sweet tinkling of sounds, in which the words fell into the order which best pleased, and where the union was not complete, a process of attrition began, which smoothed away the rougher and left the sweeter sounds to blend their music. Alliteration is not confined to poetry. It often finds a fitting place in prose, and a repetition of the same vowel sound, if it be a favourite, enriches a word or phrase : “Look before you leap,” “land and water,” “time and tide,” “Bel boweth down, Nebo stoopeth,” “A bruised reed shall he not break, and the smoking flax shall he not quench.”

“In those rural seasons of the year, when the air is calm and pleasant, it were an injury and sullenness against nature not to go out and see her riches, and partake in her rejoicing with heaven and earth.”—Milton. The balance of the members, the flow of its numbers, and the completeness of the whole sentence charm our ear, while thought reflects each picture as it passes, and admires its exquisite beauty. We cannot get our afflicted pupils to join us in these perceptions, but we can get them to feel the march of the syllables and emphatic words.

In general there are words whose place is fixed, as the articles, adjectives, pronouns, and prepositions, with few exceptions.

There are also prepositions which become adverbial as complements to the sense, as *get up*, *sit down*, *lean to*, which are invariably associated with them in expressing the complex action. All these ought to be pronounced together, that sound and sense may chime in unison ; but there are

other combinations whose parts permit a pause to separate the feet and allow time for the renewal of the air in the bellows.

“A good book || is the precious life-blood | of a master spirit | embalmed and treasured up || on purpose | to a life beyond life.”—Milton. Here we can pause at *book*, then at *life-blood*, then at *spirit*, then at *treasured up*, then at *purpose*, and lastly at the close. The double lines mark the longer pauses. The first consists of three syllables, the next two six each, the fourth three, and the last six. “Not | that I loved Cæsar less || but | that I loved Rome more.”

(A.) At first it would be better to separate the subject from the predicate by a short pause, William | writes his lesson.

(B.) When a word ends in a consonant, and the word which follows begins with a vowel, they ought to be united, as *get-up*, *put-it-in*, *take-it-out*, and then lip-reading would be assisted. Teachers know that *is* is difficult to pronounce alone. This would be obviated considerably by combining it with other words as *it-iz*, *he-iz*, *she-iz*, and familiarizing the eye with the muscular action.

(C.) There is also a disposition in easy talk to avoid the hiatus that must be if one word ends and the next begins with a vowel, by dropping the vowel of the second.

I am He is She is We are You are They are Do not
I'm. He's. She's. We're. You're. They're. Don't.

Shall not Will not May not Can not Could not Should not
Shan't. Won't. Mayn't. Can't. Couldn't. Shouldn't.

While these forms, in the first instance, are written and taught in full, their abbreviated form could be taught when the learner is able to distinguish the colloquial from the graver style of speaking.

EMOTIONS.

166. It has been already stated that the emotions influence the voice, so that it gives them appropriate expression. Joy or sorrow, pain or pleasure, indolence or earnestness, anger or patience, love or hatred, can be heard in its tones. It

would appear that the connection between these mental states and the nerves of the system is so intimate, so responsive, that to think is to feel, and to feel is to think, when the subject is exciting. This intimacy brings the voice muscles into active play through the influence of the nerves. Sometimes the expression is explosive, in fierce anger or great joy, and sometimes it takes a prolonged and rhythmic form, as in great sorrow. Those who have heard the wailing of mourners in the East have been impressed with its plaintive and measured character.

The power over the organs of speech to give suitable expression to strong emotion is very considerable, for it seems to range over the scale, and produce effects unknown to ordinary speech.

Nor does it depend so much on the number of words, as the manner in which they are uttered. Oh! may be used in surprise, pain, or joy, as Oh, he is here! Oh, my foot! Oh, happy day! But the manner or force with which each is uttered, differs rather than the pitch. In a similar way Ah! and Ha! express satisfaction, astonishment, surprise, and displeasure, as Ah, I have caught you; Ha, I expected it!

Alas! Woe is me! are appropriated by sorrow, as Alas, I have lost a son. David cried, Oh, my son Absalom, my son, my son Absalom.

Bravo! Sudden approbation, as Well done, bravo!

Halloa! Is used to arrest or invite.

Hush! Sudden desire to suppress some word or noise made by another.

Hurrah! Sudden joy in a masculine form of expression.

In addition to these there are imperative forms, as Stop thief! Take care! Come along! Stand back! which express strong emotion, fear, or anxiety, and whose utterance is marked by intensity.

If the exercises on them could be conducted in harmony with the different emotions they excite in those who actually feel them, then while the muscles of the glottis are strengthened, the soul of the learner would taste a little of the rhythm of speech. Our scholars ought to be able to use their voices in expressing their emotions, as we do, in these interjectional forms, for they are an elementary part of

language. Not, however, by overstepping the modesty of nature, and splitting their own voices, and the ears of all about with barbarous noises, but by a more intense expression of the proper vowel sounds. Nature has prompted and trained us to use these forms ; let us consult her closely in teaching them to imitate us. The real always surpasses the mimic in education.

MODULATION OF THE VOICE.

167. Though poetry may seem less fitted than prose to exercise the vocal-organs of the deaf, on account of its musical structure, yet it is far superior, for the feet or bars of which it is built up are measured by time and movement. Its rhythmic form is, in fact, recurrent undulations of similar lengths of sound which please the ear, and may be made apparent to the eye by the baton or the hands as regulated motion. Hence, poetry finds in music its highest expression. Deaf-mutes can therefore appreciate poetry by two of their senses. They can measure the bars by the time spent in their expression ; and the long and the short, the twos and the threes, the strong and the weak, the high and the low, can be felt as sounds, and the time spent in their utterance should be measured by the beats of the baton, or the tread of the foot. Associate these with the reading of poetry, and it will be seen that the scholars enter with spirit into the exercise, for it is stirring motion. If they are also taught to recite some pieces of poetry, and suit the action to the word, they will also put into the voice some of the buoyant feelings excited by the thought. Accent, emphasis, and modulation, all find their place, and are best illustrated in poetry ; and the rhythmic recurrence of the emphatic syllable leads to the larger volume of voice or force of articulation, which assists the organs to still greater efforts in modulation. If we remember we have to deal with muscular action capable of being stimulated to the utterance of every sound heard in fine speaking, we have only to provide this stimulus to free the voices of our scholars from the dull monotony so often complained of. Poetry provides us with one of our best expedients.

But upon the whole it would not be profitable to trouble them with the minute refinements of the prosody, which has been borrowed from the classics, and is hardly fitted to our language, for we do not read by the "longs" and the "shorts" so much as by accents.

When, then, a perception of its structure has been conveyed, it would be well to make the learning and repetition of verse a frequent exercise.

THE EAR.

168. Teachers of deaf-mutes have exceptional opportunities and facilities for dealing with their hearing, not as would-be medical experts, but as observers prepared to ascertain and utilize whatever may exist for their benefit, and their own special work as teachers of speech. Deafness is seldom absolute. It is, in fact, of every degree, according to the nature and extent of the organic defects. But whether the ability to hear be great or small, any improvement would assist the learner,

1. By enabling him more fully to perceive the intuitive place of sound.

2. By stimulating the organs of speech to its more natural and active production.

3. By assisting the vital forces to stimulate the unimpaired parts of the organ into greater activity, and to restore the waste caused by disease.

His resources for these purposes are :—

- 1st. In teaching speech, for its constant use not only acts upon the organ through the sound entering the open ear, but also by passing through the cartilages and bones of the mouth and skull, to the middle and inner ear. A better knowledge of the functions of these parts in our own hearing would prove that we are largely indebted to them for the clearness and fulness of what we hear. Every conductor of sound, connected with the ear, takes part in the general result, and speech by its external and internal action employs the majority. Hence, the more perfectly it is taught, the greater will be the effect.

2. In the use of appliances, as organ pipes, strips of wood,

the fire-irons, audiphone, or any other which by contact with the teeth, jaws, skull, or ears, may intensify the vibrations of sound more than speech, and so reach the organ. Perhaps the best in this respect is a bar of iron suspended by a string to the finger, pushed into the ear, or which is held between the teeth. Let this be struck with a knife or any piece of metal, and the vibrations will be felt vividly, if not heard.

3. This is incidental, and depends indirectly on the general health of the scholar, and the full development of his nerves and muscles, for the weaker parts must participate more or less in the advance of the stronger. But still more the increasing mental control of the senses directs the attention and desire to the organ, which is followed by nerve action, and the endeavour to hear sounds still better.

Defects in the organ of hearing are usually confined to the inner and middle ear. Up to the tympanum there is little danger, for it is only a bent tube. But there the danger to hearing begins. Disease, a blow on the head, a fall or fits in teething, and sometimes the insertion of something into the external ear when there is a gathering, may so injure the tympanum or the osselets of the middle ear, as to impair the hearing for life. Yet cases are on record of the loss of the tympanum, and still partial hearing has remained. Possibly this might have been increased. We ought never to despair with the young, but do our best to restore or to improve whatever remains. Of the defects of the inner ear, where the auditory nerve has its seat, little is, or can be known, for it is hid away in the very substance of the cranium, and cannot be reached without peril to its functions. Here, should the defect be in the nerve, as weakness or atrophy, relief looks almost hopeless.

But when the deafness is congenital, and arises from malformation, or a complete failure in the structure of the organ, little can be done unless enough of the essential parts remain, which may be stimulated into greater activity. The attempt ought to be made, for a little hearing is better than none in learning speech.

One of my own pupils had lost his hearing in childhood, but by keeping up and improving his speech, in process of time he could hear so well, by the aid of a trumpet, that he

can converse with his friends with sufficient facility for daily intercourse.

169. A description of the structure of the Ear.—The Ear consists of three essential parts; the External, Middle, and Inner, with the brain connection of the auditory nerve.

THE EXTERNAL EAR is first the auricle (Fig. 18, *f*), a shallow, grooved, and indented cartilage, more elliptical than circular, terminating in a lobe below, and gradually increasing in depth till it joins the meatus or entrance to the ear itself (Fig. 18, *b*). Though the auricle is not essential to hearing, as has too often been proved by its excision, yet doubtless, by its adapted conformation, it catches, concentrates, and conveys the waves of sound into the ear in greater intensity. When dogs and other animals strain to catch distant sounds, they prick up their ears, evidently to make them more receptive than when relaxed.

The Meatus is a tube about $1\frac{1}{4}$ inch in length, and $\frac{3}{8}$ of an inch in diameter. It is neither straight, nor of a

Fig. 18.—SECTION OF THE SIDE WALLS OF THE SKULL TO SHOW THE PARTS OF THE EAR. *f*, concha, or external ear; *b*, external auditory meatus; *c*, tympanic membrane; *d*, one of the ligaments of the malleus; *g*, styloid process; *i*, Eustachian tube; *m*, incus; *n*, malleus; *l*, placed on the vestibule of the labyrinth near the fenestra ovalis; *e*, cochlea; *k*, apex of the petrous bone; *h*, by the mastoid cells of the temporal bone; *a*, the semicircular canals.

Fig. 19.—THE OSSICLES OF THE MIDDLE EAR (magnified). The parts of the malleus are lettered *M*; those of the incus *I*; and those of the Stapes *S*.

Mc, capitulum or head of the malleus; *Mn*, its neck; *MI*, the processus gracilis, or slender process; *Mm*, the manubrium or handle.

Ib, body of the incus; *Is*, its short, *Il*, its long process; *Io*, orbicular process.

Sa, arch of the stapes; *Sb*, its base; *Scr*, the crura or legs; *Sh*, the head.

Fig. 20.—VIEW OF THE LEFT TYMPANIC MEMBRANE AND OSSICLES FROM THE INNER SIDE. *m*, malleus; *i*, incus; *s*, stapes; *d*, pyramid, from which the tendon of the stapedius muscle is seen emerging; *o*, tendon of the tensor tympani cut short near its insertion; *p*, handle of the malleus; *a*, superior ligament of the malleus; *b*, ligament of the incus; *c*, anterior ligament of the malleus; *x*, chorda tympani nerve passing across the outer wall of the tympanum.

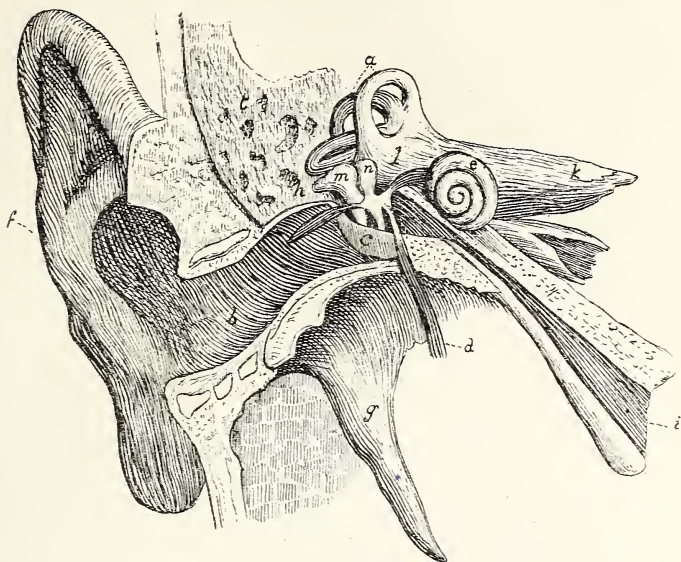


Fig. 18.

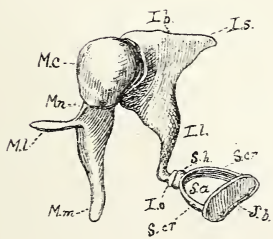


Fig. 19.

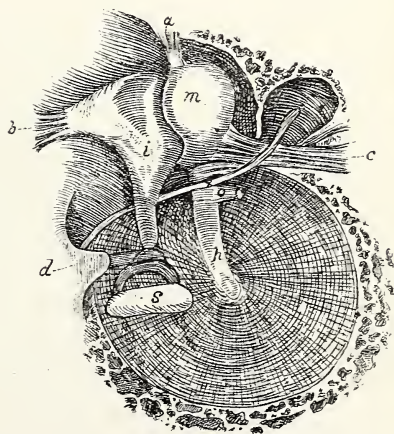


Fig. 20.



uniform width, but curves upwards, and then slightly downwards, ending at the tympanum (Fig. 18, *c*). It has nothing but a number of fine hairs on its walls, and the opening of the glands which secrete the serous matter used in its lubrication. But its terminus is not at right angles to its axis, for the tympanum slopes from the top inwards, at an angle of about thirty-five degrees.

The Tympanum (Fig. 20) is a thin elastic membrane stretched on a frame of small bones, not perfectly circular nor complete. Thus it resembles the head of a drum, from which it gets its name. When the sound-waves beat against this drum, it vibrates according to its disposition and tension as acted upon or braced up by appropriate muscles. In describing the osselets its functions will be more fully detailed.

170. MIDDLE EAR.—This, which is much shorter than the meatus, begins at the tympanum and ends at the wall of the inner ear (Fig. 18, *l*). In form it is more varied, for its contents require space to permit their free movements. These are chiefly three small bones called osselets (Fig. 19, *m, i, s*) which united form a chain connecting the tympanum with the inner ear. The functions of this chain in the transmission of sound are of essential importance to hearing (Fig. 18, *m, n*). The bone nearest to the tympanum is the malleus (Fig. 19, *m*), the next the incus (Fig. 19, *i*), and the third the stapes (Fig. 19, *s*).

The Malleus, or Hammer, so called from its supposed resemblance, has a round head, a short neck (Fig. 19), below which it divides into two parts or projections, standing out at different angles (Fig. 19, *Ml, Mm*). One of these is longer than the other. This fills the place of the handle (Fig. 20, *p*), and is terminated by a rounded head which is attached to the tympanum, a little below its middle. This makes it take part in all the action of the tympanum. The neck of the hammer, and both processes are connected by elastic ligaments to other parts of the ear, and these are so stationed as to permit its free oscillation (Fig. 20, *c*).

The Incus, or Anvil.—This has also a round head with long and short processes (Fig. 19, *Il, Io*), but on the side next the malleus it is indented to receive the head of the latter, which, thus articulated, forms a joint, and connects

them closely. The shorter, but thicker process (*I*s of Fig. 19), projects horizontally into the rear cavity of this chamber, and terminates in a blunt point which is articulated by a little facet to the posterior wall of the ear.

The other process, which is longer, and descends in a line parallel to the handle of the hammer (Fig. 19, *I*l), is curved at its extremity, and terminated by a small lenticular button, which is articulated into the stapes, *I*o.

The Stapes, or Stirrup Iron, which it closely resembles, has an elliptical end for its plate *S*b, which is attached to the body of the covering membrane of the fenestra ovalis.

Attachments.—In addition to the ligaments which unite the malleus, incus, and stapes, there are three muscles by which the osselets are put in motion. The internal muscle of the hammer, which is attached at one extremity to the cartilage of the Eustachian tube, and at the other to its neck above the long process (Fig. 20, *c*). This gives the hammer a see-saw motion, head outwards and handle inwards. This is the tensor muscle of the tympanum.

The external muscle of the hammer. This is attached at one extremity to the cochlea, and at the other to the short process of the malleus (Fig. 18 below *l*). It draws the hammer forwards and backwards, and relaxes the tympanum.

The muscle of the stirrup, stapedius (Fig. 20, *d*), which is very small, is attached at one end to the neck of the stirrup, near its articulation with the anvil. It can give the stirrup a see-saw motion, by which its plate is pushed into the fenestra ovalis, and the opposite extremity in a contrary direction.

171. The Functions of the Osselets and Tympanum.—Dr. Savart, quoted by Professor J. Gavarret, in his work on Phonation, who has sought in his researches to determine the functions of the tympanum and of the osselets in the transmission of sonorous waves, says, "In a state of repose, the internal muscle of the hammer acts upon the handle, which moves inwards; under this influence, the membrane of the tympanum takes a slightly concave form outside, and receives a moderate tension." The experiments of Dr. E. Savart have proved that in this normal state of tension the

membrane begins to vibrate under the influence of any sound whatever, but that when it parts with this degree of tension, the membrane vibrates with much greater difficulty because the tension is greater. This accomplished physician has also established, by direct experiments, that the vibrations of the tympanum are very exactly communicated to the handle of the hammer, and thence transmitted by the chain of osselets to the fenestra ovalis. "From this it appears," says Dr. Savart, "that the hammer fulfils at the same time two distinct functions; the one to modify the tension of the tympanum by means of these muscles, in order to guard the organ from too intense impressions, and to dispose it suitably to receive the faintest; and the other to participate in the movements of the tympanum in transmitting them to other parts."

Woollaston has also shown that, when the air in the middle ear is too rare, pain follows from the pressure inwards of the tympanum, but that this is removed by forcing the air through the Eustachian tubes. He has also observed that hardness of hearing is produced by an excessive tension of the tympanum, and does not extend to all the musical scale, but exclusively to bass sounds. "The rumbling noise of a vehicle passing over a bridge," says Müller, "or that of a cannon drawn past my house, or of a distant drum, is instantly effaced when my tympanum has more tension in either way, while at the same time I hear very well the stamping of the horses, and the rustling of paper. The effect is very remarkable in regard to the tic-tac of a watch placed eight feet off, which I can distinguish quite as well, if not better, than in the ordinary state when my tympanum is taut, while, at the same time, this very tension instantly silenced to me the noises of the street."

172. But as the transmission of sound to the fenestra ovalis is the special function of the tympanum and osselets, the question of greatest practical interest is, in what manner does this take place? Now, it has been already stated, that the tympanum is not flat like the taut head of a drum, but somewhat concave, from the action of the handle of the hammer; were its tension equally distributed, its fundamental tone would be in exact proportion to its contents, and were

such a membrane brought into close connection with another, the latter would not repeat this fundamental note unless it were the same size. But the fenestra ovalis—the tympanum between the middle and inner ear—is not more than one-tenth of the diameter of the large one. How is this provided for? In this manner: On account of its concave form it has really no fundamental tone, but is capable of transmitting sounds of every pitch.

“It is so constructed as to answer equally well to any tone from 40 to 40,000. This property is communicated in a two-fold form, first by its funnel shape, by which it is unequally or slightly stretched, and, second, by being sustained by the ear-bones. It has, therefore, no fundamental tone, and can transmit waves of different degrees of rapidity with equal ease.” “And another important effect produced by this funnel-shaped membrane must be mentioned. The apex of the funnel bulges inwards, and the point of greatest vibration cannot be at the margin, but at the apex or some intermediate point between the apex and the margin. But as the force of the vibrations passes from all sides towards the centre, the vibrations at this point are at their greatest intensity, and their force sets the ear-bones in motion.”

173. Next, the construction of the ear-bones is such as both to transmit and regulate the waves of sound (Fig. 19, at *M m* and *S b*). It has been seen how they are articulated and connected with the inner side of the tympanum, by the handle of the hammer. The vibrations of the tympanum are communicated to this handle, but the elastic muscles by which its neck, long and short processes, are attached, form an axis by their relative positions, which permit it to oscillate to and fro. Therefore, all the points of the hammer situated below the axis will be driven inwards by an inward impulse of the tympanum, and all the points above the axis will be driven outward. These vibrations are communicated to the anvil, which, by its articulation with the hammer, forms a continuation—both moving together. This gives a swinging motion to the long process, similar to that of the hammer-handle, which is communicated to the stirrup, whose foot-plate strikes against the fenestra ovalis, and thence the sound passes through into the labyrinth.

The ear-bones, therefore, perform a simultaneous motion round a common axis, like a bent lever, for unitedly they are too short to convey the waves of sound in a right line to the inner ear.

174. EUSTACHIAN TUBES.—The middle ear is connected with the pharynx by the Eustachian tubes (Fig. 18, *i*). As seen in the diagram they begin near the wall of the inner ear, and, descending obliquely, enter the pharynx (Fig. 14, *e*).

These tubes admit the air into the middle ear, and carry off any secretions whose presence might impede its functions. But they are not open at all times. The entrance of the air is regulated by the reception of food, for when we swallow they are opened by muscles attached to their walls, and the air is forced up into the middle ear. If the mouth is filled with air, the lips and nose being tightly closed so that none can escape, and then we attempt to swallow, immediately we feel it ascending into the middle ear. Valsalva has also pointed out, in his experiments, that the tympanum is pressed outwards by this inflation, but by a second act of swallowing this pressure is removed. In a similar manner the air in the cavity can be rarefied by closing the mouth after a strong inspiration, followed by the act of swallowing. This draws the air from the cavity, followed by the bulging inwards of the tympanum from the external pressure of the air, but at the moment it is found to deaden our hearing. The general closure of the Eustachian tubes prevents the disagreeable effects which would be felt if they were open, and at the same time admits enough to equalise the pressure of the air on both sides of the tympanum.

175. THE INNER EAR (Fig. 19).—This is the extreme and most concealed part of the auditory organ; for it is embedded in the solid substance of the skull, and the action of its different parts can, with difficulty, be learned. It consists mainly of a complicated system of bony canals or tubes, called the bony labyrinth, having within them a corresponding series of membranous tubes (the membranous labyrinth) in the form of a lining; which latter are not, however, close to their bony casing, but separated from it by a space, which, as well as the membranous vessels themselves, is filled with a limpid fluid, the former called the

perilymph, or surrounding fluid, the latter the endolymph, or inner fluid. Water is known to be a much better conductor of sound than air, but it is very probable that the lymph serves other ends also in respect to the more delicate parts of the organ.

The bony labyrinth is divided into three parts, with a corresponding part to each in the membranous structure, viz., the vestibule (Fig. 18, *l*), the semi-circular canals (Fig. 21, *a, b, c*), and the cochlea (Figs. 21, 22).

The vestibule is a tubular funnel of irregular shape, communicating with the middle ear by the fenestra ovalis, by which the vibrations of the osselets are transmitted to its interior, and also by the other small "window," or fenestra rotunda. At one end it branches into three loops, the semi-circular canals, of unequal length, which return again into the vestibule.

At the other end it gradually narrows into a long thin tube, which, however, is not straight, but winds round in a graceful spiral, closely resembling that of a common snail-

Fig. 21.—VIEW OF THE INTERIOR OF THE LEFT LABYRINTH. (The bony wall of the labyrinth is removed superiorly and externally. The membranous canal is left in the upper semicircular canal, to show the manner in which the membranous labyrinth lies in the bony case.) *i*, fovea hemi-elliptica; *o*, fovea hemispherica; *d*, common opening of the superior and posterior semicircular canals. *a, b*; *c*, horizontal or external canal; *h*, opening of the aqueduct of the vestibule; *g*, opening of the aqueduct of the cochlea; *l*, cochlea; *e*, spiral tube of the cochlea (scala tympani); *f*, scala vestibuli; *k*, ampulla of the superior semicircular canal.

Fig. 22.—VERTICAL SECTION THROUGH THE COCHLEA. *Cn*, cochlear nerve; *m*, modiolus or central column; *i, i*, lamina spiralis; *o*, scala tympani; *u*, scala media; *e*, scala vestibuli.

Fig. 23.—VIEW OF THE MUSCLES OF THE SOFT PALATE, ETC., FROM BEHIND. (The back of the pharynx has been divided from top to bottom, and the sides turned back so as to expose the interior. The lining membrane has been removed, showing the constrictor muscles of the pharynx.) *h*, part of the sphenoid bone; *e, f*, the azygos uvulæ muscle, the lower part of which, *f*, is called the uvula; *e, e*, palato-pharyngeus muscles; *o*, tongue; *p*, epiglottis and opening into the larynx; *d, d*, superior constrictor of the pharynx; *i, i*, angles of the lower jaw-bone; *g, g*, mastoid processes; *b, b*, tensor palati muscles; *a, a*, levator palati muscles; *l, l*, internal pterygoid muscles.

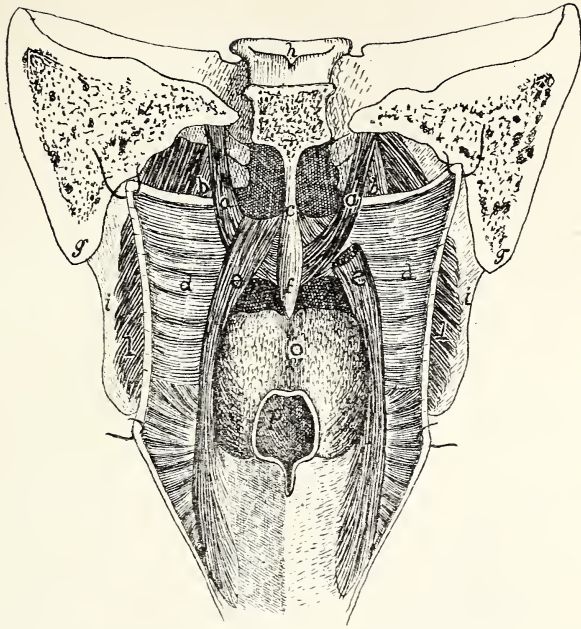


Fig. 23.

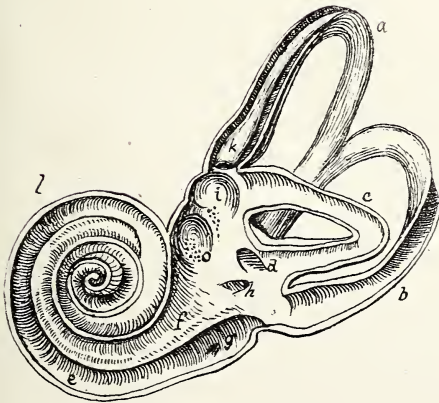


Fig. 21.

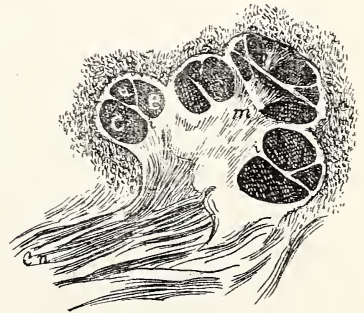
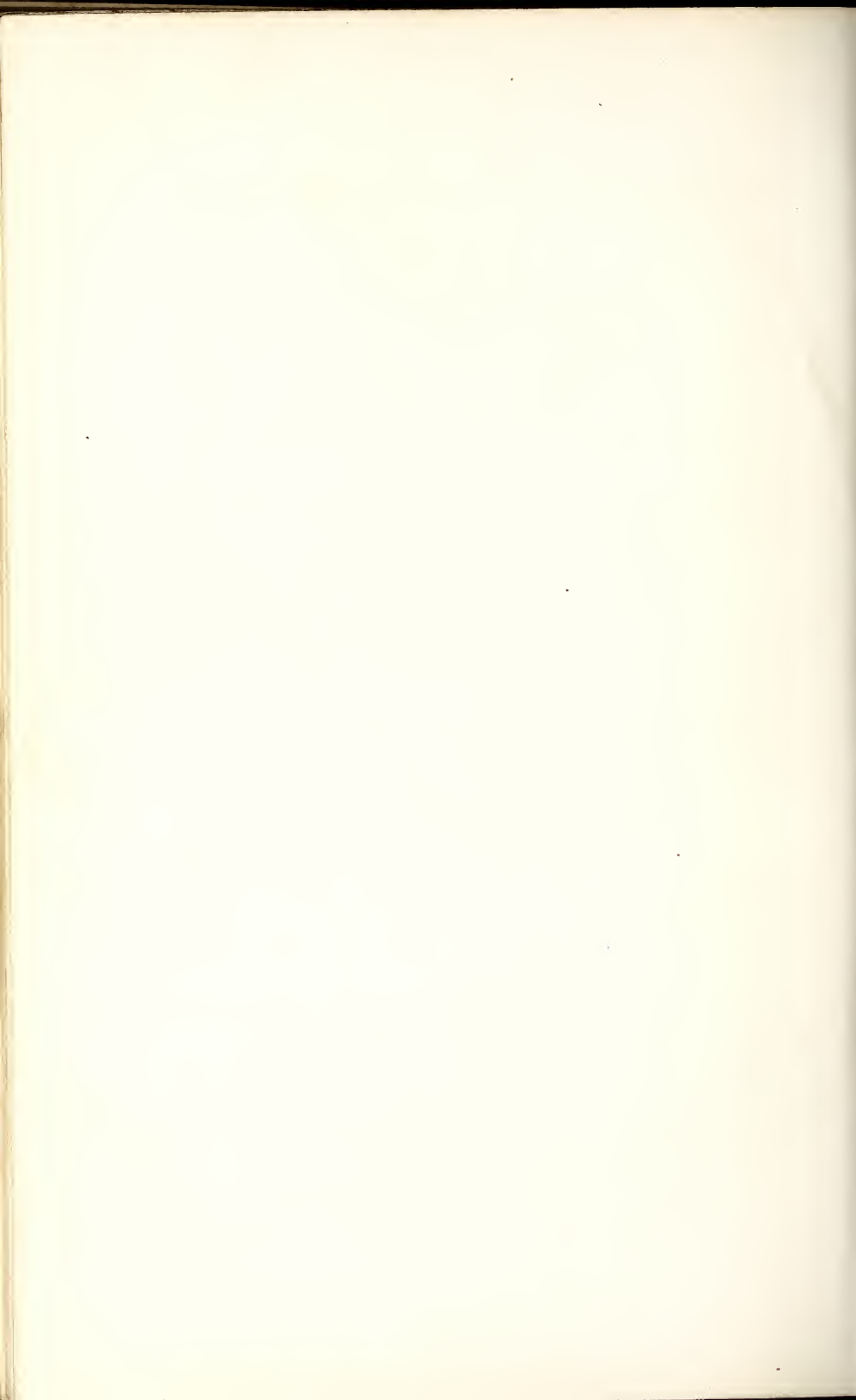


Fig. 22.



shell, whence it derives its name of the cochlea. This spiral is composed of about two and a half turns. The spiral bony tube thus formed is divided into two canals by a thin partition wall of bone—the osseous lamina spiralis—running horizontally across the cavity from the axis of the spiral to its outside wall, so that there are actually two spiral “staircases,” running one above the other all the way up; the lower is called the scala tympani (Fig. 22, *o*), because at its lower origin it is in direct communication with the tympanic cavity or middle ear by the fenestra rotunda; the upper “staircase” is called the scala vestibuli (Fig. 22, *e*).

The cochlea, from its structure and contents fulfils the most important functions in relation to sound of the inner ear. It possesses the well-known properties of shells in reverberating and intensifying every sound that enters. A number of the fibres of the auditory nerve run to it, spreading out like a fan over the surface of the spiral bony partition which, as mentioned above, separates the upper from the lower “staircase.”

The structure of the membranous labyrinth differs slightly from that of the surrounding bony casing. Instead of a single cavity within the vestibule there are two, connected however together, namely the utricle, which is the larger, and the smaller called the saccule.

The utricle is an elliptic bag occupying the superior and posterior part of the vestibule. Its walls are free in their entire extent, except in their superior part, where they are united to the osseous walls; here some fibres of the auditory nerve enter, and at this point, called the “acoustic spot,” the structure is thicker and denser.

The saccule is a smaller and more spherical pouch; it has no communication with the utricle, though joined to it. It is supported by a narrow neck, which opens into the canal of the cochlea, mentioned below.

The semicircular canals (Fig. 21), three in number, differ in their direction and their connection with the vestibule, but are much alike in general form. Thin at one end where they arise, they swell out into flask-shaped bodies, ampullæ (Fig. 21, *k*), at the points where they return to the

utricle and saccule ; it is here that they are penetrated by the fibres of the auditory nerve, which are collected together in a crest or ridge, and terminate in the fibres of a ciliated epithelium floating freely in the endolymph contained in the canals.

Only a summary of the contents has been given. More would be of little practical value, for physiologists are still divided on the precise functions of many of its complicated parts.

Were the bone removed and the lining only remaining, it would be found to consist of three sections. First the lining of the semicircular canals, which as a padding covers the bone like a soft carpet—the epithelium. The second is that over which the branches of the auditory nerve are spread ; and the third that which winds round the walls of the scala tympani and scala vestibuli. Here it is like a pad, and covers the organ of Corti. But it should be observed that when the cochlea is virtually cut into two sections, a third scala is seen, the scala media, or “canal of the cochlea” (Fig. 22, *u*), and in the wall separating this from the scala tympani, there is a narrow space into which the auditory nerve penetrates, and which contains a complicated structure of spherical cells and rods, named after their discoverer Corti, with delicate fibres of various lengths which from their form and arrangement seem to be adapted like a musical instrument to catch every sound according to its pitch and harmonics, for transmission to the sensorium. Nothing but a number of diagrams, or an inspection by the aid of the microscope, could give a clear idea of its structure. Suffice to say that it consists of a double series of diminishing rods following the spiral of the cochlea, about 3,000 in number. Their bases are separated, but their upper ends unite at an angle, “forming a sort of spiral gable roof.” It has been imagined that it is by these that the pitch of sounds is distinguished, each vibrating with one note, and transmitting the wave to a special twig of the nerve of hearing. See Schäfer’s “Essentials of Histology” and Bernstein. The theory which was held by these physiologists is that this elaborate structure was intended to receive the vibrations of all the sounds simultaneously entering the inner ear, and so differencing them by

corresponding receptive vibrations that each could be mentally perceived. But a more recent investigator has shown that no matter how many different sounds may fall at once on a diaphragm connected by an electric wire with a resonator, each will be distinctly heard, and that hence the structure of the inner ear seems to answer other purposes in relation to sound.

Near the wall of the membranous labyrinth some small masses are found, called otoliths, ear-stones, composed of carbonate of lime. These are attached to the wall, which is covered with epithelial cells, and fine hair over their surface, by nerve fibres. It is supposed that being set in motion they bend the hairs backwards and forwards, so as to excite the nerve fibres. As this inner ear has still some secrets to even the most accomplished physiologists, it would seem presumptuous on our part to venture beyond this meagre description. We wait for their fresh discoveries.

Evidently the ear is a most delicate organ, and its functions are easily deranged. The most skilful aurists make few experiments in attempting to revive and restore, and they also earnestly warn against attempts being made by parties, wholly ignorant of its structure, to deal with its affections by inserting instruments, sponges, pieces of cloth, corners of towels, or any other expedients for their removal. To keep it clean with tepid water, and protected with a little cotton wool, is the best that can be done. The aurist ought to be consulted for anything that threatens the loss of hearing.

We as teachers must also take care that our endeavours to rouse the dormant nerves and muscles do not give pain, or discomfort, but are such as nature can conveniently endure. Experiments have proved that there are points on the skull, not by the ear, but above or behind it, from which sound is much better conveyed than through the auricle itself. The Roman law, already quoted, refers to this, and it has been more fully treated in an essay by A. Eli Buchner, a Professor of Medicine and Natural Philosophy at Halle. He refers to different expedients that were employed, and among others of one in which by the application of an ointment specially prepared it was said that hearing was in-

creased. But that they were of little value is evident from the fact that medical science knows nothing of such remedies. However, an instance has been found in our own experience of a pupil who could hear much better when spoken to at the back of the head than any other locality. Loud sounds are also proved to affect the hearing of some deaf persons while they last, so that they can hear tones which at other times were inaudible. Holder makes much of this in his work, and assigns as the probable cause, the bracing up of the tympanum by the louder sounds.

Whether such experiments, had they been continued, would have led to any permanent improvement in hearing, still waits for sufficient experience, but in the meantime it would be well to employ every means approved of by science to increase the sensitiveness of the deaf ear, especially in the young.

III.

LANGUAGE.

EDUCATION OF DEAF - MUTES.



LANGUAGE.

EDUCATION OF DEAF-MUTES.

INTRODUCTORY.

176. It has been abundantly shown in the preceding sections that speech can be taught as a purely muscular exercise of the vocal organs, without the cognition of a single known word, for there is nothing magical in sounds which tells their meaning, nor any connate resemblance which leads from the one to the other. Their union is arbitrary, and subsists because sound is the best known means for exercising and expressing thought. Sight and touch are excellent in their place, but they introduce pictorial images to the mind, while hearing introduces no pictures but only sound vibrations, which unite themselves so closely with thought that we take no account of them till we have lost a word or require a name for a new conception. To teach language is to bring about this union of thought and sound as speedily and efficiently as possible. Had deaf-mutes heard this would have been done for them at home, but being deaf, articulate sound has no place in their sensations, and therefore no associating process is possible till they are taught to speak artificially. Now as hearing children learn by having the names of things spoken, and imitating them when they are actually seen or used, so must deaf-mutes be taught to apply names in the same manner. The problem for solution therefore is—How can this process of associating thoughts and their names be most conveniently and efficiently effected? Or

177. I. What is the best method of teaching language to deaf-mutes? and

II. How can it be best applied?

(I.) The answer usually given to the first of these enquiries is, the Mother's Method, which means that as intelligent parents teach language to their children, so ought deaf-mutes to be taught. The method itself is natural, simple, direct, and well adapted to the capacity and strength of the child. All the favourable relations, circumstances, and occasions of domestic life, furnish the matter of the first lessons. As a mother has minds to instruct, and hearts to gratify, she unreservedly devotes her best graces and attainments to the discharge of this noblest and divinest of her services. She does not trouble her pupils with grammar and composition, but, after using all within doors, leads them forth among the flowers, by the streams, in the woods, up and down the hills, or into the town to see all the wonders of the shops and markets, and talks to them about them all. To amuse, astonish, and delight are her best means of provoking inquiry. A thousand questions are asked, and as readily answered, for curiosity is potent in children and the mother's best helper. Then as the occasions for their repetition are ever recurring, the learning of language is constantly advancing through use and habit, till in a couple of years enough is known to enable them to enter on elementary studies. No better method than this can be imagined. But can it be employed with the same facility and efficacy to deaf-mutes? A comprehensive term is very useful in theory, but it may sometimes conceal more than it reveals. It seems so here, for the conditions are different, and this is likely to necessitate a difference of procedure. A deaf-mute does not and cannot learn language like a hearing child. His mother cannot deal with him as with her other children. Between them they invent a few mimic gestures to express the commonest things, but beyond this little progress is made, and long years have to pass away before he is placed under a competent master, who, if he does not use signs, has to leave him in language as he found him, till he is taught to articulate vocal sounds.

178. (II.) And further, when he is able to speak, it is hardly possible to instruct him like a hearing child, for (1.) He is destitute of the impressions left by often hearing words with their order, accents, and intonations, before speaking is

attempted. He has no recipient sense of sound. (2.) He knows nothing of the direct relations of the names to their objects as perceived by a hearing child who can at once imitate and apply them, but when the name of an object is uttered by the teacher, and repeated by the deaf learner, it has no meaning to him till associated with that object, by pointing to it, or in some other manner which will unite them in conception and memory. Word by word, sentence by sentence, has to be taught in this manner, till a vocabulary has been collected, and a sufficient knowledge of the simplest elements of construction to permit the teacher to talk to his deaf scholars as a mother does to her little children. A course of lessons has, therefore, to be constructed to meet these changed conditions, and there are considerable differences among teachers, both in opinion and practice, as to the form these lessons should take in adaptation to the special mental and physical relations of the scholar to spoken language.

179. (III.) The early Spanish and English teachers used natural signs, the manual alphabet and writing conjointly with speech. Bonet and Wallis associated speech and the manual alphabet directly with the objects. Dalgarno pronounced for writing chiefly, without speech, but none of them held with Heinecke that speech alone should have the primary place, to the exclusion of signs; or with de l'Épée that signs should be the language of the deaf to the exclusion of speech. They thought they were free to use any means which seemed to facilitate their work. Either they did not perceive or seek to discover a formative logical principle for their method. They used natural signs as far as they would go, and never sought to develop them into a language. They used SPEECH as a means of one-sided intercourse, for lip-reading was not sufficiently cultivated to enable scholars to read what was spoken by another, nor as the foundation on which language should be built. They used the manual alphabet, but only to give greater facility in uniting words, and as more rapid than writing, so that the mind of the learner was ever flitting between these different media instead of using the language of sound in its well defined meaning, and clear logical relations.

180. Oral teachers object to these combinations on these grounds :

1st. That they permit mimic gestures, to which deaf-mutes are naturally predisposed, to become the instrument of thought and expression, so that deaf-mutes think in them as we do in sound; but as they are rude, limited in number, without syntax, and incapable of ever being made equal to an artificial language, accurate translations could not be made with ease from the one to the other, and therefore their use would deprive deaf-mutes of the intellectual, moral and social culture inherent in the knowledge of the vernacular, and so relegate them for life to a lower intellectual grade.

2nd. That they multiply artificial substitutes, and bind thought almost exclusively to material forms and relations, to the exclusion of the purely mental, for mimic gestures prevent thought from rising higher in meaning than the things they represent.

3rd. That they invert the order of words and their logical sequence as established by custom in the vernacular, and compel a perpetual rearrangement of them in speaking and writing, so that the labour of learning is much increased, thought ever liable to become confused, and composition defective.

181. To Heinecke belongs the honour of having clearly understood the inferiority of signs in comparison with an artificial language of speech, and he formulated these leading principles.

1. "That language—as spoken—is the sole instrument of thought" for deaf-mutes.

2. "That every object should teach its own proper name."

3. "And whatever is the language used for life by deaf mutes should be the language of the school, and of daily intercourse."

Thus he not only affirmed the principle that one form of language, and not two, ought to be taught, but that this form ought to be speech; on the other hand de l'Épée affirmed that signs should be the sole form, and not speech, and therefore he made no attempt to combine them.

At present our exposition is confined to the oral methods of teaching language. Afterwards, if spared, the sign method will receive equal attention.

182. In the history of the methods used by oral teachers, these three—the grammatical, pictorial, including reading, and intuitive—are the principal; all others are either modifications or combinations of these. But before proceeding to state and examine these methods in their order, let us inquire about the ends we seek to attain in the teaching of language:—

1st. To provide the scholar with a copious vocabulary of words for the purposes of thought, so that its expression may be full and correct.

2nd. To familiarise him with the order in which the language has placed them in composition, so that he may be able to think and speak in precisely the same order as others do.

3rd. To make his method of acquiring language promote, as much as possible, the development of his understanding, and the exercise of all his mental powers.

The first of these is accepted by all. Without a very extensive knowledge of the names of objects, actions and relations, discursive thought, free speech, and social intercourse, would be impossible. They are the very materials or stuff out of which language is framed. The second also commends itself to every thoughtful teacher, for if the words are not in the same order, but inverted or displaced by chance, then their relations are lost, and their precise meaning, both in thinking and expression, undiscoverable. Language is a matter of order as well as of naming. This is allowed, but strangely ignored when signs, as the instrument of thought, are brought into comparison with speech. Let it be admitted that a highly developed and cultured language is the greatest achievement of human reason. That it has in its vocabulary words and forms selected and framed to express every shade of thought—the very key of literature, arts and sciences—and all must confess that it is a marvellous structure, more airy than the palaces called into existence by the touches of Aladdin's lamp, yet more enduring than the nation which has laboured in its construction. Thought and invention are apparent in every phrase

and particle of such a language. It is moulded in the matrix of innate reason, and, when rightly used, its parts unite like the polished stones of a temple. Are signs such a language, or can they ever be developed into such a language? If not, then it is our duty, if possible, to put our scholars into its full possession. To learn it is an education of no mean order. Some of the greatest thinkers never had more. We want our scholars to think as well as to talk, and we are in possession of the very best instrument for the purpose. They have the mental structure, the capacity, the senses—hearing excepted—whose efforts in others have formed this language; and, if we go about the work rationally, it will be found in them that Nature acknowledges her own offspring.

The poor deaf-mute has failed of his best time to come into its possession. As teachers, we have to fill the place of the home and the playground, and to restore artificially, and as speedily as possible, what has been too long withheld.

183. The first method of teaching language was the Grammatical. This was most likely from the scholastic training of the early masters, and from their limited knowledge of the precise conditions and requirements of their work. It seems strange to us that they did not perceive that a grammatical method was not adapted to one who was ignorant of the very elements of the thought and speech on which grammar is founded. But let it not be supposed that they began with the rules of grammar. They were not simpletons. What they really did was to begin and proceed in the etymological order of the parts of speech as set forth in the Latin Grammars of the time. This order, as found in Bonet and Wallis, did not aim at putting the scholar in possession of language by a logical development of the sentence, but to make him acquainted with its members in all their accidents preparatory to uniting them into propositions. It was therefore the inversion of the natural method which makes memory the minister of reason. It is true that Bonet seemed to apprehend the better method when he taught names of objects and acts either as present or reproduced. Pereira also seems to have imitated him in

this respect. Still the tendency was to teach language in its analytic rather than its synthetic form. The materials were either collected or distributed, but building was reserved. This gave rise to the maxim, "First collect the materials, then build." It does not appear that Amman published anything about teaching language beyond a few words already referred to, but they imply that he followed Wallis. De l'Épée, in translating signs into the vernacular, followed the same method. He begins with—(1) Nouns, and their declensions ; (2) Articles ; (3) Cases, numbers, and genders ; (4) Adjectives ; (5) Their comparisons ; (6) Abstract nouns formed from adjectives ; (7) Nouns of number ; and then (8) The verb to be. Thus, not an affirmation or act of reason, in the form of a proposition, was taught till all that precedes the verb to be was learned. See his "Method," pp. 10—19.

The Germans were the first to protest against this method. They began to feel that it was artificial, fragmentary ; and, while exercising the memory, did little or nothing for the understanding, and was therefore unfitted to the condition and wants of deaf-mutes. Like Pestalozzi, they found that art had displaced nature, and the scholar was treated more like a machine, through which language could be ground, than a being endowed with mental and moral powers to whom language ought to be given for their exercise and development. But the Germans did not at once emancipate themselves from the old forms of teaching. While pronouncing against signs, and teaching language in grammatical order, they adopted a sort of compromise in the—

184. Pictorial and Reading Method designed and applied by Mr. F. M. Hill, which was undoubtedly, in some respects, a great advance in the right direction. In principle he adopted the mother's method of teaching language ; but, instead of the actual objects, events, and circumstances, which provide the mother with the materials or stuff from which she draws her lessons, he designed a set of 384 pictures of the principal objects which attract the eye in daily life, and on these he constructed a series of graduated lessons, in which everything expressed by these pictures is clearly, simply, and forcibly taught, first by the exposition

of every new term, and then by a series of apt interrogations with exercises in collecting similar terms. It is thorough as far as it goes, and the scholar who learns it must acquire, not only a considerable vocabulary, but numbers of the forms of speech required for life. But pictures have been objected to on these grounds :—

1st. They are not real and actual, but ideal and factitious. Another mind has interposed, and reproduced his mental pictures, so that they are seen, not by the eyes of the scholar, but through the eyes of the artist. They are not the objects or actions, therefore, but their lifeless shadows. Now this is not in harmony with Heineke's second law, "That every object should teach its own proper name"; but, instead of the direct intuitive perception received from the mental gaze on the object, as Nature has it, the image of it only—never perfect—is substituted. This removal from contact with the objects of nature to the artificial is evidently erroneous.

2nd. A picture is inevitably limited to one moment of time. It has neither past nor future, unless supplied by history and reflection—of whose possession the deaf-mute is almost destitute—and therefore it fails in the actual progress, change, and variety of the scenes of active life of which the mother of the hearing child is always availing herself. The attempt to teach a hearing infant, principally by pictures, to the exclusion almost of the real, would prove a failure, if it were carried out.

3rd. No matter how well they may be designed, or how numerous they may be, they do not and cannot cover the whole field of the actual, but leave untouched numbers of the most familiar objects and stirring events quite as important to a knowledge of the language as those taught by Mr. Hill's pictures.

185. As an evidence of the validity of these objections, let us carefully follow Mr. Hill's lessons on objects in which we find that the present tense only is taught, and the mind of the learner is confined almost exclusively to what is expressed by the picture, whose setting is not the whole scene, but only a part. This is arrested action, and not the warm activity and changes of actual life. But an attempt has been made to supply this evident defect by

introducing features into the picture which may be made expressive of the past and future. Here is one—of some boys bathing. This is the present; others are on the banks dressing. They have bathed; this is the past. Others again are running to the bank to bathe; this is the future. They will bathe. But the picture does not say this. It tells us that some boys are bathing; some dressing and others running to the river. The deaf-mute sees no more unless he has already seen and remembers the facts as the artist saw them. Surely it would be better to teach him through the facts. The past and the future are therefore not expressed by the picture, but supplied by the memory of the learner or of the teacher from other sources.

Pictures therefore fail in some of the most essential elements of language, and ought not to be made the principal medium for teaching it to deaf-mutes. Nature surpasses all her shadows, and we teach best when we bring the minds of our scholars into close living touch with her. Possibly, the fear of introducing or promoting signs had something to do with this large use of pictures, for it was thought if action took the place of pictures, it might soon become pantomime, and then mimic gestures; but experience has already convinced many of the most advanced teachers of France, Italy, Germany, and England, that there are not only no grounds for this fear, but that action excludes signs, while it is eminently adapted to the tastes and tendencies of deaf-mutes.

Pictures are very useful to represent objects and scenes which are foreign to the school or neighbourhood; but, beyond this, they ought not to fill a larger space than they do in the education of hearing children.

186. The Natural, Intuitional and Logical Method.—If the manner in which a hearing child learns language is carefully considered, the meaning of these terms will be illustrated :—

1st. (*a.*) It sees and becomes familiar with the objects and acts of the persons that surround it; (*b.*) It hears their names and imitates them till it can also use them for ordinary purposes.

2nd. Its perceptions of them is therefore natural, direct, or intuitive, as Degerando defines it; for he says (vol. I., p. 197), "There are two sorts of intuition; the one, that which we call real, the other we call rational. By the first, the mind perceivès, immediately and directly, that which veritably exists; it is the intuition of things or their images. By the second the mind perceives the conditions, the relations of the ideas which it forms by itself. This is intuition, logical and reflective, by which the mind gives account of that which it thinks. Our use of the term is at present the first of these."

3rd. "It is logical, because not names only, but names as elements of sentences are learned, so that reason as well as perception and memory is exercised from the first.

Most of the German teachers have adopted this method more or less fully, and chiefly Vatter, in his "Der verbundene Sach- und Sprachunterricht," 1st and 2nd parts, in which are found no more lessons on pictures, but on the objects, persons and their acts, as seen and done in the school, or its neighbourhood. It is, in fact, a thoughtful, practical, introduction to the learning of language. The second part is grammatical in arrangement, and the lessons are selected or composed to illustrate the relations of words and sentences, but analysis and conversation are most closely applied, so that the sentence is fully taught. Yet this method does not satisfy a large class of teachers, for they say that it is not consistent with itself; but while admitting the logical structure of every sentence, it does not developè its subject and predicate systematically in the process of teaching language, but waits till the materials (stuff) are considerably accumulated before it directs the learner's attention to grammatical relations. Now they say, if the structure of every sentence is logical in its simplest, as well as in its most elaborate form, why not, from the first, unite the collecting of materials with the logical development, so that the elements of the subject and the predicate shall be learned in their living relations, and reason cultivated by the process? This may be done without the sacrifice of a word or phrase found in the ele-

mentary lessons of Vatter's first *Lesebuch*, and in a manner much more congenial to the nature of the scholar.

187. But, in addition to this, there is a point of no small importance touching the exact manner in which the course of elementary lessons shall be taught. Since signs are excluded and pictures are defective, how shall we proceed to name acts as well as objects, so that the learner may obtain an intuitive perception of them? The question can be answered best by referring to the manner in which hearing children learn to name them. The fact is, they see them, and they are therefore as direct in perception as the actors. Nature makes no difference between them, for she treats the verb of action as she treats the noun. Both are alike real, only the one is matter, and the other motion. Now, if this part of the mother's method is also to be imitated, deaf-mutes should be taught, as far as practicable, in the same manner. But, in addition to this, there is a still greater inducement to employ this realistic method, for it is in the line of the signs in which deaf-mutes delight; but free from their linguistic abuses. Of signs, motion and action, so congenial to and eagerly sought by the young, are the chief elements. Now both can be enlisted in teaching language, but instead of associating mimic gestures with them, we associate their names, and hence the mental relation of the learners is precisely the same to them as if they heard. And then the meaning and logical relations of the different elements of the sentence can be best exhibited by action.

This is not an unsupported theory. Many of the most distinguished teachers of the Continent have adopted and are now actively applying it with marked success. In France, M. J. J. Valade-Gabel is its chief expositor in his "*Guide des Instituteurs Primaires*" and other works, and in Italy, the Abbé Julius Tarra, rector of the school for the poor deaf-mutes of the Province of Milan. Both of these gentlemen were once sign teachers, but they turned to nature again and found light and direction in teaching language by the oral method:

Tarra's best exposition of the method is to be found in the "*Suballegati*" to the "*Rendiconto per gli anni dal 1876 al 1878*"

della Commissione Promotrice l'Educatione dei Sordo-Muti Poveri de Campagna nella Provincia di Milano," and in his "Cenni Storici e Compendiosa Esposizione del Metodo sequito per l'Instruzione dei Sordo-Muti Poveri," both published by S. Giuseppe at Milan. There is a French translation of the latter by Messrs. A. Dubranle and M. Dupont, Professors of the National Institute of the Deaf and Dumb, Paris.

Tarra calls his method intuitional and logical. By the latter he does not mean grammatical, but the sentence or simple proposition, as the fundamental affirmation of all thought, developed in all its forms and relations, till the structure of the language is learned as well as its vocabulary. This he calls the mother's or nature's method, and enforces its claims by very convincing proofs and arguments. He has not exemplified his method by a book of lessons, but Professor Perini, his former able assistant and under his direction, has published the "Metodo per Insegnare la patria lingua ai Sordo-Muti colla viva Parola," Milan, 1883. A translation of this work would be most serviceable.

188. To this method strong objections are made by some teachers, for they say that it is the old grammatical method in a new dress, and not the mother's method, but a tedious, complex and difficult logical method which occupies the time of the learner to the exclusion of a more practical and efficient one of teaching language. This is a grave charge, but not well sustained, for it ignores the fact that deaf-mutes cannot be taught exactly like other children. Deafness has removed them from the conditions of the hearing, and they must be taught, both speech and language artificially, by a well-constructed series of lessons. The practical point is as to the principle on which they shall be constructed. Will it suffice to leave the scholar to learn the lessons of Hill or Rossler, with their associated studies, in which no special provision is made to put him in possession of the logical structure of the language, or adopt one which, while it provides for this, does not neglect the other? Surely the latter commends itself most to those who wish to make language an instrument of mental culture also. But it has been retained. The structure of the language has not been

neglected in our method, but is taught in every sentence; while this concedes the principle, and its formal adoption will best secure its completer application.

189. But the subject demands a fuller statement and a closer examination. Many distinguished German teachers have abandoned Hill's Pictorial Method, and sought to supply its place by reading books of graduated lessons so devised that nearly all the forms of speech, and all the words used in common conversation, and found in the literature of the country, can be read and learned through the exercises constructed on them. They must be very comprehensive as well as varied in matter to satisfy such promises. But now, in attempting this, the necessity for making some provision is confessed, and the question may still be asked, May not this be more effectively done by a series of graduated lessons on all the forms of words and principles of construction, whereby each shall be dealt with in the most thoughtful and impressive manner, so that the mind may be able to grasp them in their logical relations as seen in every member of the sentence? Or could this be done better in the reading lesson? We humbly think it could not, for a reading lesson is made up of many sentences, and has a special interest of its own to which they all contribute. It therefore does not furnish the opportunity of dealing with the logical structure as lessons written exclusively for its illustration. A reading book, well-constructed, is an excellent auxiliary, but it is better to turn to it with minds prepared to catch the meaning, when new words only have to be taught. Let the ablest teachers like Vatter write reading-books as wide as the language in their range, but let us train the minds of our scholars to think and reason by the education which the logical study of language will most assuredly provide.

190. Objection may be taken to some of the principles taught by Pestalozzi and Froebel, but the great honour must be accorded to them of exposing the errors of the old scholastic methods, and of bringing back the minds of educators to the nature of the scholar, and the imperative need of adapting the matter and manner of instruction to it, so as to enlist the desire to know, secure the attention and

stir the emotions with pleasure and satisfaction. Knowledge is the food of the soul, but it must be made palatable.

If, like Pestalozzi, we can re-unite the parted members, and if, like Froebel, we can take play into our service and make the lesson almost a game, by little tableaux which teach names and acts at the same time, let them by all means be done, for deaf-mutes, of all children, need to be roused and animated.

Objects, in their great varieties of form, size, colour, and material are interesting to children, but action is still more so. Who can forget his intense delight in the gambols of a kitten, the running of a dog or horse, and the flight of a bird? We long to imitate them, because our nature is replete with action and energy for its conflict with natural forces. Now, in language the Verb or the Word is the expression of this motion or action, and, joined to a noun, it becomes a sentence or proposition. The bird flies. This is the work of reason; the living, mental association of the act with the actor as perceived and the words which express it. Objects and their motions can be seen as percepts, but when we affirm them of one another, as *The dog runs*, we reflect, compare, unite and affirm, and it becomes a part of our mental property. When we can get a deaf-mute to perceive, affirm and pronounce the words which describe an act, his mental development has begun. Pereira understood this, and began to teach sentences by action.

191. A hearing child is ever learning language from the almost uninterrupted flow of conversation about him, much of which, though not intended directly for himself, yet interests and instructs him. His opportunities are, therefore, practically unlimited. But a deaf-mute, for the first two years at least, is almost wholly dependent on his teacher for his lessons, and the time devoted to direct teaching is not more than an hour or, it may be, two at the utmost per diem. The other lessons may add to his vocabulary, but do little for his real progress in language. And in addition to this, hearing children begin to learn language as soon as they can speak, but a deaf-mute usually begins, it may be, at five, but more frequently at seven or nine, when the time which nature renders most prolific in acquisition has passed

away, and the labour of learning is increased tenfold; and then, instead of eight or ten years to retrieve his great losses in time and opportunity and enjoy the advantages possessed by children in elementary schools, he is most unreasonably allowed five, six, or seven years at the utmost for his education. We cannot, therefore, wait for the occasions of daily life, which a mother finds, to teach her child, but, under the pressure of these hard conditions and our profound interest in our scholars' future, which is much in our hands, we are morally bound to find out the best and quickest method to put them in full possession of the instrument in language which is the key of all knowledge, and the power to make their life useful and tolerable. We must, therefore, anticipate nature, collect and arrange her objects and incidents, invent and array others which will set forth the principal phases of this manifold life, and all this in the form best adapted to the capacity and dispositions of our scholars. If, as a practical teacher, for some thirty years, of about twenty pupils, personally conducted, I may be permitted to express my opinion, there is no method which I have found so efficient in their mental culture as the logical and intuitional, whose exposition will be found in the following pages.

192. The half is in the method. An imperfect method in the use of a poor teacher must prove a disastrous failure, but a good method in the same hands will lead to some success. Often, also, the teacher is better than his method, and supplies deficiencies as they appear, but the right method in the hands of a good teacher must lead to eminent success, for in no other kind of education is method so productive of good or bad results as in teaching language orally to deaf-mutes. But, as the nature is the same in the deaf as in the hearing, the general principles taught by experience and psychology are, with some modifications, equally applicable to both. These principles are best stated by Herbert Spencer in his "Education, Moral and Intellectual," and it will be seen that they are in substance those once formulated by Pestalozzi and Froebel.

"1st. That in education we should proceed from the simple to the complex.

"2. The development of the mind, as well as all other development, is an advance from the indefinite to the definite.

"3. Our lessons ought to start from the concrete and end in the abstract.

"4. The education of the child must accord, both in mode and arrangement, with the education of mankind considered historically.

"5. One of the conclusions to which an inquiry leads is that in each branch of instruction we ought to proceed from the empirical (taught by experience) to the rational.

"6. In education the process of self-development should be encouraged to the utmost.

"7. And as a final test in education should come the question, Does it create a pleasurable excitement in the pupils?"

The fourth is practically useless. It is needless to say that with these principles we generally agree. They are acted upon by the best educators; but it must be candidly confessed that the test of the last rule would not be satisfied in teaching speech to deaf-mutes, and were it enforced, the work must be abandoned. However, the state of the deaf-mute is exceptional; nature has failed to provide him with hearing. He knows nothing of the pleasant emotions excited by music, nor does he know anything of the language of words whose skilful use and suggestive putting enable the wise teacher to delight while he instructs. He is like one suffering from an evil disease, and till it is subdued there is pleasure in nothing; or it may be compared to a muscle becoming rigid from disuse, which can only be restored to its normal state by much exercise, not at all times pleasant. The sign teacher might here interpose and say, Why not abandon the disagreeable task and leave the work to signs which bring pleasure from the first? But our reply is, We know full well all the difficulties and disagreeables attendant on oral teaching both to teacher and scholar, but we are so convinced of the superiority of speech over signs in mental and moral education, that we are willing to encounter and suffer them for a few months rather than abandon our pupils to a defective method with all the privations it entails. Let the

deaf-mute be taught to speak, and then Herbert Spencer's test question will find a satisfactory answer.

THE METHOD.

193. As already stated, the sentence or proposition in its simplest form is the foundation of our method, because it is at once natural, intuitive, and rational, and can be taught with the greatest facility.

In teaching, the subject and verb of action are before the learner, so that he perceives them, pronounces their names after the teacher, and then by himself till they are associated in his memory, so that when the subject and action are again seen their names are at once suggested and can be repeated.

A. Very likely the name of the subject, if it be present, is well known, so that he has only to be told to do some simple act, as walk, stand, run, etc., and if ignorant of this, then it may be illustrated by one already familiar with it, and on repeating the command the former will at once obey.

B. Upon the whole it is better for the teacher himself to set the example and pronounce the verb. At the same time let him tell the scholar to do it, as Tom, walk; but if he fails to comprehend the meaning repeat the process with an older scholar, emphasising the verb, and very likely it will be imitated by the learner.

C. To associate them closely in the memory of the learner, the names, apart from the subject and verb, or in their absence, ought to be pronounced by the teacher, and if their meaning has been forgotten, the process revived and repeated till the association is perfected. Then the words will lead to the action, or the action suggest the words.

D. Where writing is used the words ought to be written on the black board or slate and associated with their pronunciation and the action, till, when seen on the board, all three elements are at once remembered.

This is the same in principle as that used by the mother in teaching her hearing child, only adapted to the conditions imposed by deafness, for (1) it is the direct mental perception of the material elements of the proposition as seen at

the moment, and then (2) of the names to express it as spoken by his teacher and repeated by himself. Thus thoughts and words are made one and his emancipation has begun, for his knowledge and use of the language of speech is the same as our own; and by reading the words on our lips when we pronounce them he reads them as our thoughts also, enters into our society, and so far is a possessor of our great national heritage in its spoken and written form.

THE SIMPLE PROPOSITION OR SENTENCE.

194. All language consists of sentences. Every thought takes this shape. It is the logical unity. It may be simple, complex, or compound, but whatever its form, every word or phrase used in its construction enters into this unity. It may be described as a similar mental act to the material act which is perceived.

The simple sentence consists of a Subject and a Predicate, or an agent, and what he does, or what he is.

The Subject may be one or more, male or female, or neither, acting, commanding, addressed or referred to, modified or completed by other words or phrases, but still having a certain completeness.

The Predicate is the word which states the action done by the subject, or affirms what he is; and while agreeing with the subject in some of its relations, differs from it as an act in time, place, manner, and circumstance, which require modifying forms, words, and phrases, but whatever these may be, they are regarded as united in forming the predicate.

But it ought to be carefully noted at this point that all predicates are not formed of verbs of action, but that quite as many are formed by verbs that affirm the identity or similarity of the predicate and subject. In the following exposition these two classes of verbs will be treated apart, but as verbs of action best arrest attention, and are easiest to comprehend, they ought to have the preference.

Of course it is understood that the logical and grammatical terms used throughout are intended only to explain the method more clearly, and to assist the teacher in its

practical application. They are only the scaffolding of the building.

APPLICATION OF THE METHOD.

195. A custom has prevailed in many schools of teaching a number of nouns, or names, of objects present in the room, like collecting stones for a building, before entering on the real work of teaching language.

But this is objectionable, for the impressions already made by them on the minds of the learner are not those of separate and unattached things, like a heap of stones, but as used, active or related to other objects. To teach them apart is therefore to separate them from what may be called the natural logic of thought in which they are perceived. No doubt in teaching articulation, many simple words have been learned, but they are verbs as well as nouns, and have had only a passing reference made to them. Now that not speech, but language, has to be taught, better to go back to the mother's method, and teach words as they form sentences, expressive of what is seen and done. Still further, children are much more attracted and impressed by things in motion than quiescent, so that their names are more readily learned and remembered. It is the difference between still and active life, and every child prefers the latter. But the process must be gradual, leading on from the simple to the complex, and from the concrete to the abstract. Our scholars are infants in thinking. They want thoughts as well as words, and we must try to give them both.

196. But, as the verb is the word which expresses life and action, it should at once be associated with a subject which represents them with the vivacity which makes learning a pleasure. Sitting still, or standing at a board, or looking at a picture has little life or interest in it. The scholars should be able to move freely about, and to do or see done what is commanded or repeated in action. They have feet and hands, and they can use them. Verbs of action are of two classes, transitive and intransitive; but the latter is the better for primary lessons, because the action is confined to the subject.

INTRANSITIVE VERBS.—If the names of the scholars are familiar to themselves and all the class, as they ought to be, then such verbs as stand, walk, run, leap, spring, bound, ride, go, come, dance, turn, twist, smile, laugh, cry, speak, cough, whisper, breathe, sniff, blow, puff, shout, hiss, moan, etc., can all be taught by commanding; as, *T*— stand; *L*— walk; *G*— leap, etc., till they are all learned in the manner described above. Nor should the commands be confined to the teacher. The scholars ought to take his place, and give the same commands to one another. Speech, as a power, is soon discovered by this exercise and lip-reading improved. After learning them by speech only then let them be written, and the sounds associated with the written characters.

Nouns only are used in these subjects. But they differ in case. The one who commands is in the first person, and the one commanded in the second. The third person can be introduced by stating what another does, as, *T*— leaps, *J*— blows; and to get this done the command may first be given to another. The intransitive verb answers this purpose, also, better than the transitive, on account of the nature of its action.

The time spent in perfecting these exercises will be far from lost, for they originate a manner of looking at things and a mental habit in conformity with the order of the words and their logical connection. When any one is afterwards seen doing the acts the mental affirmation will correspond, as, *J*— rides, etc.

The plural, also, can be introduced by uniting two or more in the command, as, *T*— and *L*— get up; *S*— and *T*— run, or *S*—, *T*— and *W*— dance; and in the same manner for the third person. And as a conjunction is introduced here, its use will soon be understood, for if, in commanding two, first one and then the other is addressed, with and interposed and distinctly spoken and repeated by the learners, they will speedily catch its meaning, and write it in its proper place.

197. When all these have become mentally connected, so that one word draws or suggests the next, then it would be

well to begin the process of analysis, so that each sentence may be known as subject and predicate.

Every proposition is a synthesis or the binding together of two different elements, as the subject; and what he does, the predicate. This is a mental act. Now, analysis is the separation of these elements by an interrogative or question addressed to the speaker, as, Who walks? The answer will be, *T*—, the subject. But if the question refers to the action. Then, What does *T*—? finds the answer walks. This is analysis as applied to the sentence—the loosing out of what had been previously united. This analysis makes considerable demands on attention and reflection. The interrogative terms, as who?, what?, what does?, or who does?, are applied to the scholars of the class, seeing what is done by others, asking those who do not, as well as those who do, till the discriminating force of the relative is understood. As do is the verb of action, its meaning, as expressive of everything which can be executed, is soon learned. And at this stage we would advise the form does rather than does do, which is confusing. In a similar manner did instead of did do might be used.

Analysis and synthesis are also used in a transcendental sense, but this would be out of place here.

Here also, to give more freedom to the teacher, and introduce the conception of past, as well as present time, the question when one has done something might be put, as, What did *L*—? But the difference between present and past must be well exhibited by the action itself about which the question is asked.

Hitherto the exercises have been limited to the scholars, but the field may now be appropriately extended to objects within the range of the scholars' view, in which the action of intransitive verbs is visible, as The sun shines, A bird flies, A dog barks, The snow falls, or The rain falls, The wind blows, The leaves shake, The flowers bloom, A horse gallops, The lambs skip and bleat, The kittens play, etc. To each the interrogatives Who? What does? or What did? can be applied.

The introduction of the definite and indefinite adjectives

in these sentences is better than their omission, because it is their usual place, and for the present it will be enough to say that *a* is one, and *the* refers to something already learned or well known. The opportunity for a fuller illustration will come at a more advanced stage.

As the union of speech and thought in language is the primary object, so that the learner may increasingly feel the superiority of speech to either writing or signs to express his thoughts to others and learn what they say, he ought not to be allowed to supply the place of fitly uttered words by a nod, or look, or sign of any kind, but utter them distinctly and fully. This is self-evident, but too much neglected, to the great loss of the learner.

198. COMMON AND PROPER NAMES have been used indiscriminately in the above exercises, but their difference ought to be observed as leading to our first indication of abstract thinking. Common names are descriptive of a class. They bring to mind something of the nature or quality of the objects, as stone, wood, etc., but a proper name is not necessarily so. It is usually distinctive, and suggests nothing more than the person or object to which it is given. Common names include whole classes, and are definite in this respect; but as used of individual members of these classes, they are indefinite and purely mental. Our idea of a tree is not that of any one tree, but of all trees, and therefore has not the distinguishing marks of a known tree, but is a dim outline, or abstract of all the trees we have seen. It is, therefore, an instance of abstract thought, in which little children indulge most freely. Once let a boy see, taste, and hear the name of an apple, the next offered to him is at once named by him, so that the concept or mental image of apples in general has been formed by Nature's own teaching. Deaf-mutes, too, are found to have such concepts before they have learned their names, for they will make rough drawings of them with pen or pencil. Their tendency in this respect is as strong as that of the native of New Guinea who called the first horse he saw a pig, because it had some points of resemblance to his familiar domestic. The abstract in thought has therefore its root in our primary conceptions, and it will be seen, as we advance, that it is an essential

element of language, and that the power will grow best from the study of the sentence. It is in the opposite direction, as Pestalozzi has forcibly stated, that clear thinking and mental effort lie. To distinguish one object from another, so that their differences, as well as resemblances, shall be fully appreciated, most surely leads on to knowledge. But this is a more advanced stage, for which better preparation has to be made.

199. TRANSITIVE VERBS, as their name implies, have direct objects, and these only complete the action of the verb in respect to its end or purpose, as *Poke the fire*. On the other hand, intransitive verbs have no real or direct—but what is called an indirect—object, which is nothing more than the direction, initial point, instrument, terminus, or resting-place of the action, and therefore the preposition which is used to express this relation shares with the verb in its conception. Sometimes it stands alone in this respect, as *Get up, Sit down*. But as the direct object is the simpler and more concrete in use it ought to precede the indirect.

Strike the table, Open the door; or, in the third person, *T— strikes the table, L— opens the door*, are examples; but the number of such verbs is great, and they open a wide field to the teacher for stirring exercises in both numbers.

This form of the sentence increases the items for analysis. We can now ask, not only, *Who did the act?* but also, *What did he strike?* to learn the object of the action; and it would be well to employ it to enable the learner to distinguish between the act and its object. A great number of the verbs of the language expressive of action, and arranged systematically, will be found at a more advanced stage. They can be largely introduced into similar sentences, and their indefinite past taught by the interrogatives used in their analysis. As these form a great part of the very body of the language, a thorough knowledge of them in the present and past will increase the learner's vocabulary with ever recurring words and their variants.

Indirect objects of intransitive verbs can now find a fitting place in the exercises. As already stated

they usually express something about the direction of the action, and so complete the sense, as, Go to the door; Come from the fire; *T*— sits on a chair; *E*— stands on the floor; *J*—, leap over the stool; *F*—, sit by *C*—; Run into the greenhouse; *T*—, *W*— and *J*— stand at the door, etc.

Transitive verbs also take indirect as well as direct objects, and though more extended in form, and requiring more reflection, are simple enough for this stage, as *T*—, put the book on the table; *J*—, lift the pin off the floor; *L*—, put your hand into mine; *L*— laid the poker on the fender; *E*— put a book into the drawer; *W*— and *T*—, fetch chairs; put the chairs by the table.

Nearly all the prepositions used in these relations may be clearly illustrated by a ball and a rod. A small globe of hard wood might be made by a turner. This ought to be pierced at different angles, as well as through the diameters, with holes large enough for the end of the rod to enter them, stop at the centre, or pass right through. Then it should be suspended by a cord attached to two hooks, one at each side, between the extremities of the diameters, or 45° from the top. Take the rod and hold it over or under, or move its point to the ball, from the ball, into the ball, through it, etc., and this will make the meaning and use of the preposition self evident. Then apply this knowledge to other objects.

This relation is one of place, in fact adverbial, and to elicit it in the analysis, we ask, Where? or In what place? Place is abstract, and can be taught by pointing to the spots usually occupied by familiar objects, or seats at the table, desk, etc. Where did *E*— put the book? Where did *T*— put the chair?

This is the natural definition or actual use of the word, and can never be surpassed by descriptive terms. Possibly none of us ever used a dictionary till we went to school, and yet we all knew the meanings of thousands of words that had been taught us in the same manner.

The subject might now be extended by an adjective, and the predicate by an adverb as simplest members, but as they

cannot be conveniently taught without the aid of the pronoun, better to proceed to its illustration. ✓

200. PERSONAL PRONOUNS. The pronoun is an abstract part of speech, for it is not the name of any object, but of a substitute for the name of every speaker, or person spoken to, or person spoken of, as well as their plurals. It is, therefore, only a convenient sign common to each and all of these classes. The first person, *I*, has risen to great eminence by expressing self-consciousness and individuality as no other word in the language can do. Little children never use it. They speak of themselves in the third person, as if the reflection which leads to the conception of self were still inadequate. And till this comes, the conceptions expressed by the second and third persons of this pronoun are still imperfect, for self-knowledge must always precede our knowledge of others. The intelligent use of the pronoun is therefore an advance in language, and the order of nature has been followed in reserving it till the reflective power is sufficiently developed by exercise on simpler forms of thought to grasp this personal concept. In teaching it care must therefore be taken to make its meaning apparent by the exercise. If the scholar Tom is told to do something, as, Open the door, and when it is done, he is asked, Who opened the door? He will probably reply, not *I* opened the door, but Tom (in the third person) opened the door, and then the substitution of *I* for Tom can be made for him, so that he will learn to say *I* opened the door. Better to repeat this by a number of similar acts, till the use of *I* becomes familiar. In the same manner the third person can be taught, for if the question is put to the other members of the class Who opened the door? The reply will be John, but for this he can be substituted. As you and not thou is commonly used for the second person, better to teach it. For this let the teacher himself open the door, and then inquire Who opened the door? The reply will be Mr. S— opened the door, and for this you can be given as its substitute. With the other genders and numbers there will be no difficulty (See Dalgarno's method, p. 58).

But the pronoun serves other important uses in addition

to preventing the frequent repetition of the noun : it also distinguishes the genders and numbers of the nouns, so that when it is joined to a verb, it supplies what is generally absent in our language—except in the second and third persons singular, present tense, and the second singular of the others—the personal terminations found in Greek and Latin verbs ; and then in composition it repeats the subject, or supplies an object of a much more convenient form. However, these are points of whose importance the scholar can know little at present ; but he can be made to see, by writing out a number of his former exercises, and then substituting the pronouns for the proper names, how much shorter they are, and how they enable him to think of others in a new or abstract form.

Now, the verb of the predicate can be conjugated in the present and past imperfect tenses : as, I walk, You walk, He walks, She walks, It walks, We walk, You walk, They walk, I walked, etc., not only the words, but the actions named by the words, at the same time, as a little game. And if all the verbs already learned were treated in the same manner, much would be done to make them permanent parts of language.

201. THE CULTURE OF MEMORY.—The stage at which we have now arrived is one in which much greater demands will in future be made on the memory of the learner than in the past, from the introduction of more abstract forms of language. No progress can be made if they are forgotten, for the principal elements of thought will be lacking. The truth of a proposition is often dependent on the person or tense of the verb, and therefore the names that express them ought to be familiar. How is this to be done ? Some teachers would answer, “Go on with the illustrations, till memory distinguishes all these differences with ease.” This is not satisfactory. And then it is a great expenditure of time which might be saved by a better method. Experience has attested that the memories of deaf-mutes are usually bad. They have not been exercised, and therefore they have not the tenacity that arises from the culture enjoyed by hearing children. Suppose they had heard, then these verbal forms would have been repeated thousands of times in their hear-

In elementary teaching, too close an analysis ought to be avoided. As the subject and predicate are the essential parts, they ought to be sharply distinguished; and for these two forms will often suffice—Who? or What? for the subject; What does he do? or What is he? for the predicate.

203. There are a few verbs in our language which are very often used, and have to do double service. They are, at the same time, principal and auxiliary. As principal they have their own distinctive meaning, but as auxiliary they are for the most part only signs of certain tenses of other verbs. This double service and meaning make them difficult to teach, for if their principal sense is first learned the scholar is likely to associate it with the verb of which it is only an auxiliary, which creates confusion of ideas. To avoid this is difficult. Some masters have endeavoured to obviate it by first teaching their tense use as auxiliaries and afterwards their use as principals, but this delays their introduction when their services are in greatest demand. They might be called the small change of language, without which little can be done, and therefore it is more of necessity than of choice to teach their principal meaning first, and afterwards their secondary, guarding the learner, at the same time, against error, by pointing out their purely tense value. These verbs are *have*, *be*, *do*. They are all three abstract, and one of them, *be*, has several special functions.

HAVE, as a principal verb, is not a verb of action so much as of state or condition. In one of its uses it simply means holding, as *I have a book in my hand*; but in another it means possessing, as *I have twenty pounds*. This is abstract, for it means property. But it would be out of place to introduce this difference of use at this stage. Its abstract meaning will soon be learned from the strong natural tendency of every child to appropriate whatever he likes.

The present tense of *have* ought to be fully illustrated and well learned, as, *I have a hat*, *You have a coat*, *She has a dress*, etc. The more fluent the scholars become, the greater will their progress be, for they are ever recurring forms. By the use of its interrogative form, exercises can be multiplied at will, *Have you a knife?*

and the answer ought to be full, Yes, I have a knife, or No, I have not a knife. The idiomatic uses of this verb, as instead of be, "Shall we have a fine day?" instead of "Will the day be fine?" ought to be reserved till its principal sense has been well learned. Webster quotes the following from a German poet as finely distinguishing these verbs :

"Hast thou anything? Share it with me, and I will pay thee the worth of it. Art thou anything? O, then, let us exchange souls!"

The imperfect past tense had ought to be also well learned.

204. Do, as a principal verb, stands in relation to action as be does to existence. It may be called the abstract and general mental concept of all action, voluntary or involuntary, material or spiritual, right or wrong, and therefore its interrogative use, when the kind of action and its result would be learned. What did he do? covers the whole predicate of verbs of action. Its frequent use as an interrogative term is very essential in the education of deaf-mutes, for it compels mental effort in giving the answer which they most require in learning to think. The emphasis ought therefore to rest strongly on the do, does or did.

To illustrate its abstract use, let a number of different acts be written, such as

James strikes the table	} What does..... ?
Charles writes a lesson	
Emma sweeps the hearth	
Robert writes a letter, etc.	

Then bracket them, and ask the question, What does? of each in succession. The answers will bring out the sense.

The idiomatic form, How do you do? means little more than, How are you? whatever it may have meant. If the latter is substituted for it a few times the learner will find out its meaning.

THE ABSTRACT FORM OF THE PREDICATE.

205. TO BE.—In the section on the education of the senses

it was stated that the principal object in their culture was to obtain the attention, imitation, and observation necessary for learning speech successfully. That this has been done is evident from our scholars being able to speak. But this is not all, or even the highest object of this education of the senses. Then we sought to reach the mind through the senses, in order to stir it up to the more active and efficient use of its own powers of perception and thought. Now, the reverse process is initiated of putting the mind into the full possession and control of the senses as its instruments or servants to be used for its own special purposes, as a self-conscious, self-controlling, spiritual energy, their master and not their slave, in full command of them and all they can contribute to the formation of correct conceptions, fair criticism, and right decisions according to the eternal laws. This is its highest prerogative and function as judge in its own court. Nature abandons deaf-mutes to the service of the senses. The signs to which they resort are only mimic forms of the material, and their habits of thought arising from their use are necessarily of the same order, and therefore in their education this tendency ought to be counteracted by the forms of language that are more purely mental. Fortunately this is largely provided for in the very structure and material of language.

Verbs of action are most useful in its elementary study, for they appeal to the senses, and the ideas formed by them resemble pictures, which have only to be translated into speech. The propositions thus framed simply certify or report the facts as perceived. As when we say, *S*— walks, *The sun shines*, we only report what we perceive without comparison or criticism. A language consisting only of such affirmations would be little better than that of a dog, if he could speak. Mental development depends chiefly on a class of verbs not expressing motion or action, unless it be mental, but the oneness of the subject and predicate in some respect, as *Twice two are four*. In verbs of action the predicate is in the verb; whatever is added is only its complement; but in this form of a proposition or sentence the predicate is a noun, adjective, or some equivalent word, and the verb is only the band or copula

which expresses the identity, mentally affirmed, as God is good. Sicard thought he saw in this form only an attributive relation, and therefore he transposed the predicate into an attribute, as The good God, but this robbed it of its essential logical nature as a purely mental act arising from the comparison of two objects, and the assertion of their identity or the contrary. The senses no doubt supply the matters on which these judgments are formed, but no picture can be made of the mental acts themselves. The word is abstract and only a literal sign of what cannot be translated into pictorial speech.

206. To be means to stand, to be fixed, and then to exist. Very probably its abstract meaning as expressing existence or being, as opposed to nonentity, was derived from this primary use. Its other meanings, such as becoming, remaining, and being present in a place, are derived from that of standing. I was in London yesterday, is, I was present there.

Its simplest use is seen in affirming the identity in fact of two nouns, as *T*— is a boy, *E*— is a girl, I am a man, Mamma is a woman. Then an adjective as predicate. I am old, You are young, *W*— is little, *F*— is big, The tree is tall, etc. If, in teaching, the attention of the learner is specially directed to this conception of a common property or resemblance, as *T*— and *L*— are little, or in such examples as One and one are two, Three and two are five, the use of this verb will gradually be perceived.

Most deaf-mutes readily perceive close resemblance or similarity in two objects, and if permitted to use signs they would place the index fingers side by side to express this likeness or sameness. This is the natural or material ground of the conception, and through it the thought can be led on to the abstract copula.

In the above examples the identity of one noun with another is first given, because the simpler. The senses lend their aid; in fact, it is the affirmation of something self-evident. But when an adjective is the predicate, then reflection has to assist, as in Tom is little. To verify it a comparison has to be made and memory must provide

the variations in height which led to its use. The exercise is therefore more abstract and complex.

TENSES OF THE VERB.

207. Time is inseparable from either movement or thought. Events occur at certain times and places, and we think at certain times and places. Yet time and space are infinite. Hence time and space measure all things. But they are abstractions destitute of substantial existence. They are, therefore, metaphysical distinctions, but necessary to a right conception of the nature of tense, for it means present, past, or to come, the moment of the action thought of, as distinct from the moment in which we are speaking. These are the three great distinctions of time, but they do not suffice for all the movements to which action or thought refer. The past is divided into three tenses. First, to express the completion of an action then and there, as, I have written my letter; this is called the perfect past, or present perfect. Second, as having taken place at some past point of time, as "I wrote my letter." But this is incomplete, and therefore an adverb or adverbial phrase is usually added to make it more definite, "I wrote my letter yesterday;" "He came at one o'clock." The interrogative, when? shows the relation of the adverb to the verb in the answer, as marking the time more exactly. This is the imperfect past. Third, when two past events have occurred in close relation, one prior to the other, and the second is referred to because it aids in giving a more exact conception of the moment of time of the first, as "I had written my letter before the post-boy came." It will be observed that the dependent sentence is in the imperfect past, while the principal sentence is called the pluperfect past. Again the future has two tenses. The First, which refers the event to an indefinite moment in the future, as "We shall see him," and therefore an adverb or adverbial phrase is added when the moment of time wants a more definite statement, as We shall see him tomorrow, or at twelve o'clock. The Second future, resembles the pluperfect in being used of two events, the second more exactly fixing the moment of time of the first,

as "The moon will have risen, before we set out." The time of setting out will be after the rising of the moon. The student will observe that the adverbial sentence follows the principal, and that the present tense is used instead of the first future. Sometimes an adverbial phrase takes the place of the second tense, as "We shall have done at one o'clock." We are, therefore, affluent in tenses, and can describe the points of time very clearly. This renders our work as teachers more difficult, but our resources are equal to the occasion. The idea that at one time prevailed among teachers of deaf-mutes, that only the three principal tenses could be taught, had its birth in defective methods, and a want of a clear perception of the relations of action to time. Had it been observed by them that the complex sentence requires all the tenses, they would not have concluded so hastily on the inability of deaf-mutes to advance beyond the principal tenses. Oral teaching has the advantage of signs in this respect, for we have only to persevere in the logical development of the sentence up to its complex forms, to find out that they can understand the uses of the secondary tenses as well as the principal.

208. Time and Number are closely related, for time is measured by intervals of seconds, minutes, hours, days, etc. These we count and number, as twenty minutes, twelve hours. Yet little children learn to count before they take much note of time. The intervals of night and day, of eating, sleeping, and playing, are among their first conceptions of time as present, past, and future. But it is long before they can make out what is meant by a minute or an hour. These require a power of reflection and of noting the progress of events measured by a known standard, as the moment or minute, to which they have not as yet attained. But the necessities of life are their best teachers. When a child is anticipating some great pleasure, he begins to count the hours which intervene.

Deaf-mutes are much less advanced, and their notions about time are very indefinite. Yet they too discover that the world does not stand still, that there is unceasing change. They see the sun rising and setting, the food cooking for their meal, and perhaps attain to the Indian's idea of the

present being over him, the past behind him, and the future before. Learning to count prepares the way, but speech helps them to the hours of the day, the days of the week, and the months of the year. Better, however, to begin with the first, if there is a clock at hand with a seconds pendulum. Point to its beats, let him count them, one, two, etc. And if he can go on to sixty show him that sixty of them make up a revolution of the seconds hand. This is the best measure of time for him, for he can now advance to the hour by counting sixty of these revolutions, and as twenty-four hours fill up the day, he gets a tolerably intelligent conception of how time passes. Yesterday and to-morrow now become more definite, for his conception of the length of the passing day serves him to measure it in the same manner for the past or future. These definite ideas about time will be the scholar's best preparation for the tenses of the verb. The present, past, and future tenses ought to be taught in connection with these lessons on the progress of time. The adverbs now, not yet, to-day, this morning, this evening, yesterday, to-morrow, ought to be illustrated by asking questions on the events of to-day, etc.

Let all this be so well done that any question on the divisions of time is readily answered.

209. Here, if anywhere, the simple must prepare for the complex. To attempt to teach the tenses in their grammatical order would be worse than useless. Their right places are determined by the time in which they are thought, not only as present, past, and future, but in relation to other events, or as parts of complex sentences. At present the simple sentence alone occupies us, and, therefore, we have only to consider the tenses it requires.

A practical difficulty is in our way in respect to the past. We have two tenses, the present perfect, or perfect tense, as I have written, and the past indefinite or imperfect, as I wrote, to express the past of an action. Which shall it be, the perfect or imperfect? Tarra says that "at first the near past should be preferred to the remote, for in fact, though compound, it is easy, its conjugation less varied, less irregular, and it lends itself better to the primary exercises on the past—exercises which are always related to the action al-

ready complete." But as our tenses do not quite correspond with those of other languages, there is something special to them which determines their place. I have written my letter is complete in relation to time and object, but I wrote my letter, incomplete in relation to time. The inquiry may follow, When did you write your letter? The perfect would, therefore, seem to be the simpler. But on the other hand it very much limits the room for exercises, and as the imperfect has been already learned in the analysis of sentences, and the adverb in completing the predicate, both tenses may be freely employed, only the exact use of the perfect ought to be first taught by a number of acts, terminated immediately before, and witnessed by the scholars. Have you written your copy? I have come from town. We have seen the flowers in the greenhouse. The sun has set, etc. The interrogative ought to be in the perfect form also, to elicit the right answer.

Then the imperfect past. When did you see papa? I saw papa at Christmas. Such sentences ought to be multiplied in conversation.

210. AUXILIARY VERBS.—The use of have in the perfect introduces an auxiliary verb, in fact a second verb involving an apparent complexity which is likely to confuse the learner. Whether they are a gain or a loss, compared with the tense forms of Greek and Latin, is difficult to say, but the loss of these forms has compelled us to resort to what are called auxiliaries to make up the deficiency. Accustomed to this form from childhood, we hardly take account of its peculiarities and differences from the other tenses. Here two words do the service which one might have done as well if not better. Now if auxiliaries were exclusively for this purpose, and merely signs of time, their use would be less perplexing, but they are at the same time principal verbs, each having its own specific meaning and use; but some of them have to part with this, as have, shall, be, do and let, and become a tense sign, while others retain their meaning, as can, may, will, must, ought, as principal verbs, and lend it to the verb of the preposition. Care must, therefore, be taken in teaching to make this difference clear, and save the learner from

attempting to combine have, as holding, with the verbs with which it is united as an auxiliary, and of which it is a mark of time only.

211. Have is used with all the perfect tenses, past and future, active and passive, and in the potential and subjunctive moods, either in its present or past form have and had. In addition to these it is used in the infinitive perfect, active and passive. Be is specially appropriated by the passive voice in all its moods and tenses. It has hence become almost a sign of the passive, but the learner must be led to distinguish it from the active by the perfect participle, with which it is united. But there is also an active use of be when the present participle in -ing is used expressing progressive or continued action.

Let is used in the imperative, and

Do finds its place in the present and imperfect indicative and subjunctive, as adding emphasis to the verb.

Shall and will are the auxiliaries of the future. The first a tense auxiliary, but the second retains its principal meaning and implies volition. In their past tenses should and would they are found in the potential mood, with their own meaning, I should know you, He would not see me.

In addition to these will in the 1st person, shall in the 2nd and 3rd persons, have an imperative force.

May and can are appropriated by the potential, each retaining its meaning as a principal verb.

Must and ought are peculiar in expressing necessity and duty.

212. The four tenses of the verb now introduced enable the teacher to extend and vary the exercises on the simple sentence used to express the events, pursuits, and ends of life and action. But the use of each tense should be taught independently before they are employed in their different uses as free conversation may require.

The Present has been already learned, and the

Present Perfect also, the next in order, as, Have you written your letter? Yes, I have written my letter. Has Edward written his letter? Yes, he has written his letter. Has John returned from the Post Office? No, he has not returned. As an illustration of the Perfect,

such a series of questions as these might be asked : Did you see a ship (yesterday)? No, I did not. Have you seen a ship? Yes, I saw a ship at the sea, etc. William, write on the black-board. The sun has risen. Have you written the sentence? Yes, I have written it. The moon has not risen. Have Thomas, James, and William finished their sums? No, they have not finished them. A number of examples like these will make this tense familiar.

The Imperfect Past.—What time did you rise this morning? I rose at seven o'clock. Where did you go yesterday afternoon? You did not come to school? James and I went to town. Did you learn your lesson last night? No, I learned it this morning. What did you buy at the market yesterday? I bought five oranges. How much did you pay for them? I paid twopence.

First Future Tense.—Did you bathe yesterday? No, when will you bathe? We shall bathe on Saturday next. Do you learn drawing? Yes, who teaches you? Mr. A—, but we shall have a new teacher next Monday. Such sentences should be taught *virâ voce* and form a primary series of conversational exercises, as—Fetch me a pen. Here is the pen. Where did you find it? I found it in the case. How many pens have you? I have three pens. Who gave you the pens? You gave them to me. Are they good pens? One is a good pen, two are old and bad. How old are you? I was six years old last Monday. How old is William? He will be seven years old on the second of March.

213. These exercises ought to be made lively by the introduction of stirring action and the use of incidents which have excited attention.

Every verb employed in them ought to be written out on the black-board in the four tenses, as write, have written, wrote, and shall write, and all the persons of both numbers repeated in the usual order, as, I write, you write (not thou, for it is rarely used), he writes, she writes, it writes, etc. When a verb has been taught and learned in this manner, then the scholars should be encouraged to compose sentences on its different tenses and their persons. One will probably begin with the sentence I write on the black-board, and the teacher may take occasion to ask, With what did you write? He will reply, I wrote on the black-board with a piece of chalk; and this prepares the way for some very useful exercises on what in Latin we should call the ablative of cause, manner, or instrument, but in English it is classed with nouns, etc., in the objective case. If the exercises on these tenses are continued as suggested, the teacher will soon find that his scholars are beginning to distinguish the prin-

cial points of time in any action and to reflect much more about the events of their lives. The time of the predicate has taken its proper place in the pupil's mind, and this is a great advance in its development.

214. THE INSTRUMENTAL MEANS.—The instrument or agent employed in an action as above referred to can be illustrated in this manner: Procure a piece of board, a hammer, and some nails. Take one of the nails, and holding it in the left hand, with the hammer in the right, begin to drive it into the board, saying, I drive the nail into the board with the hammer, making the adverbial complement emphatic by look and gesture. Then ask, With what do I drive the nail into the wood? The answer will be, "With the hammer." Again take the key in your hand and lock the door, showing that it is locked. Then ask, "With what did I lock the door?" The answer will be, "With the key." Now the pens, pencils, and whatever else is used in this instrumental manner will furnish abundant exercises for the class in a *vivá voce* conversational form.

Such illustrations furnish a very suitable occasion to exercise the scholars in tracing effects to their causes. Let their attention be directed to the hammer and the nail, and the teacher inquire, What drives the nail into the wood? The answer will very probably be, The hammer. This is the proximate cause, but not the primary. Now let him ask, What moves the hammer? The answer will be, Your hand and arm. Yes, but what moves my hand and arm? Probably this will lead to some thought, and some sharper lad will say, as he points to the head, Your thought. Here it ends, as this is the primary cause. Words as yet not learned are required to complete the expression, but the elements are here.

215. Again, the MATERIAL of which anything is made or composed is usually expressed by the preposition of before the noun, as A sheet of paper, A fire of coal. What is the table made of? Of wood. But we also say A deal table, A coal fire. The form with the preposition is that generally used when the material is inquired after, as Of what is this chair? Of oak.

As yet the present tense of the verb only, in its most

indefinite form, has found a place in the development of the sentence, but our language is richer than most in providing other forms, one in respect to time and another to the emphatic force of the affirmation. To say 'I write' may or may not refer to any but the present moment. The action may extend over a long period of time, as I play at ball. I spend the winter in France. But if I say "I am writing," the action is affirmed to be passing forward at the time when it is spoken of. But its chief value lies in describing the continuity of the action from the past into the future, which is often required to express it precisely.

Again, when an action is doubted, questioned, or requires emphatic expression, *do* is employed, as I *do* write my lesson. He *does* speak the truth. Do not come here. He *does* love his parents. These forms have also a past imperfect tense, as *was* writing, *did* love.

The verb to be does not admit of these forms, as it does not express action. A number of appropriate examples of these uses ought to be introduced, and their difference of meaning shown by action, as I write on a slate and in my exercise book. I am writing my lesson. Do you learn your lesson? I fear you are idle. Yes, I do learn my lesson.

216. ADJECTIVES.—The adjective and adverb can now be freely taught, for the verbs have been learned which can best illustrate them and provide for the analysis of the sentences in which they are used. Objects are known only by their qualities. Form, size, colour, weight, density, smell, taste, consistency, and temperature are the principal, and they are chiefly known through the senses used to describe and distinguish objects. In teaching them the eye, touch, smell and taste are actively enlisted, and rapid progress is made when the objects themselves are submitted. Those in most striking contrast ought to be taught first, as white, black, big, little, round, square, old, young, strong, weak, etc. Coloured objects are most attractive; they ought to be utilised in teaching not only the adjectives but the nouns to which they belong.

217. NUMBERS.—Whether very young scholars know anything of abstract numbers is difficult to say. Most of them, if permitted, would reckon on their fingers, and use them

as signs in thinking. But this ought not to be permitted, for it is not only opposed to the oral method in principle, but a lame substitute for a rapid mental act, chiefly the work of memory. Probably we all began our arithmetic by making strokes on the slate, or counting beads, so that we were satisfied of the accuracy of the result from the process; but when memory said twice two are four, we dropped this process and adopted a remembered result. Numbers thus treated are purely abstract. Hence mental effort is saved and the process facilitated. We ought, therefore, to instruct our scholars as early as possible in these abstract forms. So much lumber is disposed of by them. If they find it very difficult at first, place the tables before them and let them supply what is forgotten. Language, too, will gain if they learn to recite the addition or multiplication table audibly. This tends to make speech a matter of memory, and much of what we say is nothing more. Dr. Max Müller says that "Language is only another name for reason," and that "Reason is only adding and subtracting." The function of numbers is, therefore, a very important one, if reason and speech are one. Teachers have observed that up to twelve the numbers contain many of the elements of speech. Dr. Melville Bell calls them key-words, and their frequent repetition in learning arithmetic would be among the best of exercises in phonation. Only the teacher must hear the articulation, else bad habits may be formed.

Fetch five books. Put them on the table. How many books did you fetch? Where did you put them? What did you do?

Count the books on the table. How many books are on the table? How many feet has a dog? Have you four feet? How many fingers have you? How much money have you? By interrogating the scholar in this manner the numeral adjective is taught.

Then take one of the pictures in such a book as "See and Learn," No. 2. How many girls do you see? Five. What are they doing? One sits on a block, two run, and two fall down. How many feet have five girls? Two and two are four, and two are six, and two are eight, and two are ten; or

five times two are ten. What did you see? I saw five girls; one sat on a block, two ran, and two fell down.

218. If the abstract terms which are used to express the inherent attributes of every object—as shape, size, colour, and weight—are now taught, they will assist the learner in this form of thought; for we ought to proceed from the concrete to the abstract.

COLOUR is the simplest. Red is a colour, Blue is a colour, Green is a colour, Orange is a colour; and thus for all the colours. These sentences should be spoken with the colours near, and pointed to; the emphasis being laid on colour, and then repeated by the scholar. The abstract relation of colour to each will be apparent and perceived. As a proof of this, if the scholar is asked, What is red? the answer will be, A colour. Or again, What colour is this? the reply will be, Red.

SHAPE, or FORM, affords a good opportunity of dealing with natural and artificial solids. Round is a shape, Square is a shape, Straight is a shape, Crooked is a shape, etc. Then, What shape is a ball? What shape is a table? What shape is a window? In the same manner, size and weight can be taught. Then a question can be asked which includes them all: as, What size, form, colour, and weight is a shilling? It is little, round, white, and heavy.

The demonstrative adjectives, this, that, these, those, assist in some of these sentences; and they ought to be taught by referring to objects at hand: as, This book is small, for the nearer; That book is large, for the more distant. These books are new, for the nearer, disposing them so; and Those books are old, for the more distant. Then let appropriate commands impress the meaning: Put this book on the floor, Put that book in the drawer; without pointing or otherwise directing the attention of the learner to them, so that he may be guided solely by speech.

219. OBJECTIVE CASE OF PRONOUNS.—Pronouns have been learned only in their nominative case, but they are also used in the objective and possessive cases as substitutes for nouns; and in the increasing development of the sentence, they are

required for its complete expression. In the objective case, they are easily taught by commands: as, Give T—— a book, Give him a penny, Give me a slate, Fetch J—— a pencil, Give her a pen, Put this book on the shelf, Give it to T——, etc., for the plural. This exercise ought to be repeated and imitated by the scholars, to familiarize them with the form, and its place in the sentence.

220. POSSESSIVE CASE OF NOUNS AND PRONOUNS.—As the possessive case has its own termination, it ought to be taught independently. Its relation to the noun is expressive of property, and its place is that of an adjective: This is John's book; and the more abstract and emphatic form, This book is John's. Whose book is this? John's. The writing materials of the members of the class can be used in a lively exercise to learn this case; and some ought to be written, to familiarize them with the termination. The corresponding possessive pronouns, as substitutes for the noun in the possessive case, naturally follow: Where is my hat? Where is T——'s coat? Where is his cap? Put our slates in their places. Fetch me William's, Robert's, and George's copy-books. Fetch me their ink-bottles. Open your mouth. Shut your eyes. Clap your hands. Fetch her boots.

Like the noun in the possessive, used as the predicate, so the pronoun is used absolutely: This book is mine, That slate is yours. The difference in the ending, as the predicate, ought to be noted, and a number of sentences transposed quickly and frequently, to make the respective forms familiar.

221. ADVERBS.—The adverb expresses the relation of the action or state of the predicate, in time, place, manner, etc. An action takes place at some one time, in some one place, and in some one form; but as the verb cannot express all these relations by itself with the necessary precision, other words are found to serve the purpose, and complete the action, as it has been perceived. In many adverbial relations, a single word supplies all that is wanted: as, here, there, now, then, well, yonder; but these are abbreviated phrases. Here, in this place. There, in that place. Now, at this time. Then, at that time. Well, in a good

manner. Yonder, in yon place. The sun is there. The fire is here. It is now ten o'clock. When he is here, then you shall see him. The river runs yonder. Usually, the adverb ends in *ly*: as, quickly, slowly, wisely, foolishly, etc. Come quickly, Walk slowly, He writes badly.

The relation of the adverb to the predicate is similar to that of the adjective to the subject. Their difference lies in the one expressing a quality or attribute, and the other a manner or form of action or state, and the pointing out of this in action will help the learner to distinguish them. In the more advanced lessons it will be seen that phrases often fill the places of the adverbs, as, I put this book on the table, I put this book there. The verbs already learned should now have adverbs united with them, and their subjects with adjectives, The east wind blows cold, The coal fire burns brightly, The gas smells badly. That old man walks lamely. This is how language grows under the teaching of Nature, for she is ever adding some new thing which has to be related to the old.

222. TELL, LET.—These two verbs are so often required, and so necessary to free progress, that it would be better to anticipate their introduction.

Tell, or bid him to come, has the infinitive mood, as the indirect object of the predicate, and three persons are acting in every such command:—1st, the person giving the order; 2nd, the person addressed; and 3rd, the person to whom it is to be delivered. This requires some reflection, and the scholar will probably fail in one or other point at first. More ought to be expected of him in delivering his message than to say, Come to Mr. ——. Such an exercise aids much in developing the power of reflection.

Let. This verb also involves complex relations in its use, for it, too, requires a third person to execute the command. Let him come. The second person is addressed; who is to move the third to do what is required. Its presence in the imperative requires its frequent use, and therefore it ought to be known. As a principal verb it has the sense of permit or suffer, but it is generally used in an auxiliary relation as its sense requires another verb for its completion.

223. **THE INFINITIVE MOOD.**—Objects and their attributes have hitherto supplied both the direct and indirect objects of transitive and intransitive verbs, but they are not always appropriate, and another verb or another sentence may fill the same place. The complex sentence is composed of two sentences in this relation, for one action may be the cause or occasion of another, or one affirmation require the addition of another to complete its meaning. But one of the resources of language, however, is not to state the second sentence in a complete proposition, but to use the infinitive mood as a substitute, Tell him to come. This is the form generally adopted where the action only requires to be expressed; but when something more is required to complete the sense, as, Tell him that I am waiting, tell him to come not being enough; the infinitive mood is therefore not used in this case, and it might be said that the infinitive, as the object of an action, takes the place of the dependent member of a complex sentence. The exercises for the present ought to be confined to the infinitive alone. When the complex sentence is taught it may then be more fully illustrated. If sentences, in which nouns are objects, alternate with those in which infinitives take their place, the learner will better comprehend their relations to the principal verb: He learns arithmetic; He learns to write; We have to play. What does he learn? etc.

But the infinitive mood may also be the subject of a proposition, as, To write well is praiseworthy; To eat too much is bad; To live soberly is our duty; To help the poor is a great pleasure. This is, however, a use of the infinitive which may be deferred.

Sometimes the present participle takes the place of the infinitive as subject or object of a proposition, as He learns reading and writing. Reading and writing are taught at school.

The perfect infinitive is also used as the subject or object of the predicate, as, He is said to have spoken well. Here it is the object. (There is an old rule "Verbs of naming and gesture take the same case after as that which precedes," but it is really an objective.) To have followed the plough is no disgrace, the subject. These, however, belong to a later period of study.

COMPARISON OF ADJECTIVES.

224. Adjectives, as the names of qualities, are fruitful subjects of thought, for they lead to comparison, classification, and abstraction. Of substance, as such, we know nothing. It is an abstraction, a name for that in which the qualities we perceive are united— or the substance, that which stands under them. It is, therefore, by their qualities that we distinguish, compare, and classify the objects about us. They are called phenomena or appearances—whatever the senses report of them, and these are the subjects on which science exerts its marvellous energy in the discovery of resemblances, differences, and the causes which lead to them. But to do this we must compare or put things together, and closely observe in what points they agree or differ. Little children can do this, and no better exercise can be provided for them. They must think, if they compare; and if they think about the qualities of things, and learn to speak about them, they are led to separate in thought the quality from the substance, and this is an abstract of the first degree.

225. Pestalozzi's first two principles:—"How many objects and of how many kinds has he under his eye? What are their appearances, their form, and their outline?" are enquiries directing the attention of the learner to the examination of the qualities of things seen by him. Their kinds can only be learned by their resemblances and differences; and their appearances, forms, and outlines by comparison and reference to names already learned. If he had added colour and size to his chief qualities he would have made them more complete for our purposes. The interest which children feel in the colours, the forms, and the odours of flowers and fruits is intense. Deaf-mutes will learn to arrange the colours of a pattern, to construct buildings, and to distinguish mathematical solids before they can utter a word, and most of them, by the training of their senses, are in possession of a large stock of concepts to which names only have to be given. These names ought to be taught, but as elements of sentences; as, Give me a white marble. Something

has already been done in this direction, but more now, and the interrogation Which? can be taught, as, Here, Robert, I give you a red rose. Here, Emma, I give you a white rose. Then ask, Which rose did I give Robert? The red. Did I give Emma the red rose? No, you gave Emma the white rose. Where is my red cap? Your red cap hangs up in the passage.

226. In comparing two or more things there are a few general conceptions under which they can be all classed, for they are like or unlike, the same or the different. All comparisons imply these distinctions. They are abstract, but capable of the fullest illustration. They find a place also among the earliest conceptions of children. But to prepare the way for exercises in the comparison of adjectives it is very desirable that these names should be well taught.

The same, and the different. These can be well illustrated by numbers, colours, weights, and balls. Let two of each, which exactly correspond, be laid side by side, and their sameness be pointed out. Then let same name this agreement. Again, let two of each which differ be placed side by side, and their difference from one another made evident.

Different will name this also. The exercises of this form ought to be numerous, in order to habituate the learner to the use of the terms. Identical may also be used as an alternative word for same.

The like and the unlike. These are often used for the same and the different, but not correctly, for like suggests an idea of resemblance, and is therefore less definite than same. We say these two brothers are very like one another, but not they are the same. Like therefore admits minor differences, which are excluded by same. This ought to be attended to in illustrating them.

227. Exercises in Comparisons.—Fetch two long pointers. Place them on the table side by side. Tell me, Which is the longer? This pointer. Which is the shorter? That pointer. Now fetch two short slate pencils; place them upright, side by side. Which is the shorter? This. Which is the longer? That. Fetch three big books; place them together on the table. Which is the tallest? This is the tallest. Which is the shortest? That is the shortest. Now fetch two big books; lay them on the table. See, which is the taller? This is the taller. Which is

the broader? That. Which is the thicker? That. Which is the heavier? This. Now let all the class stand up in a line, side by side. Which is the tallest boy? Tom. Which is the shortest? William is the shortest. Which is the strongest? Charles is the strongest.

Now, where are your marbles? Here. Fetch them, and put them on the floor. See, which is the largest? This is the largest. Which the smallest? This one. Which is the smoothest? That one. Which is the roundest? I think this is the roundest. Which is the hardest? We cannot tell. What are they made of? Of stone. What do you call the stone? Marble.

Now, by these exercises, it will be seen that *-er* distinguishes the comparative from the positive, and *-est*, the superlative, from both. The exercises in this form ought to be numerous enough to make the scholars not only familiar with these terminations, but also quick in comparing. In the same manner there ought to be suitable exercises in comparisons which require *more* and *most*, instead of *-er* and *-est*.

Fetch two roses from the greenhouse. Look at them. Tell me which is the more beautiful? Which is the less beautiful? Smell them. Which is the sweeter? This red one. Which is the less sweet? That white rose.

After these, a few of the irregular comparisons—as *good*, *better*, *best*, *bad*, *worse*, *worst*, *little*, *less*, *least*, *much* or *many*, *more*, *most*—ought not only to be well illustrated, but learned off till they can be repeated with facility. The regular comparisons are less difficult to remember.

228. The above forms of comparison are incomplete, and therefore only introductory to those commonly used. But this requires a complex sentence, which may seem too difficult at this stage of the learner's progress. This is, however, less real than apparent, for in practice it is found that he can learn it without any special mental effort, for the sentence seems simple, though really complex. The conjunction *than* is the pivot word of this relation of two compared objects. As a term, it is purely comparative and indifferent to the greater or the less in either object: as, *J— is taller than T—*. This chair is larger than that. The inversion of the sentence does not affect its meaning: as, *That chair is smaller than this*. It would, therefore, be well to return to

the previous exercises, and express them in this manner, not forgetting to transpose each of them as above, on account of the greater exercise they afford to reflection.

In the superlative, but must be introduced, and this belongs to the compound sentence. Its ease in use is, however, a sufficient reason for its introduction; and then it illustrates one of its several meanings. Here it is not so much adversative as comparative, for it fills the same place, between the comparative and superlative, as that filled by than in the comparative.

Place three objects together, differing in size or colour. Compare the two smaller first: as, The red book is larger than the blue, but the brown book is the largest. The exercises on comparisons can now be repeated in the superlative also. Much more of mental effort is required in these comparisons than appears at first sight, for they involve the use of abstract forms, which have to be mentally treated, as if they had material existence; and therefore a large familiarity with them greatly increases the power of reflection on ideas and their relations.

Classify.—If, in addition to this, the teacher requires the scholars to collect and arrange adjectives under the heads of form, size, colour, weight, etc., and then to apply them to appropriate objects, their conceptions of them will become clearer.

The Concrete and The Abstract.—Adjectives are the names of qualities, and when we wish to describe any object—as, an apple—we do it by reciting its qualities: An apple is a round, smooth, red-cheeked, soft, light, sweet, and nutritious fruit. All these names are used in the concrete, because they are associated with the object. But suppose we want to think of one of them specially—as, This apple is red—we make a predicate of the quality red, and so far abstract it or take it away from its object. This is called abstraction in the first degree. But again: suppose we wish to think of one of these qualities alone, without reference to the apple or any other object, then we have to add to it a termination—ness—which expresses this mental process: as, whiteness, blueness. We love him for his goodness. The brightness of the sun dazzles my

eyes. But not always, for we say, I like green better than blue.

“Adjectives,” says Dr. Max Müller, “were in fact formed at first exactly like substantives, and many of them could be used in both characters. There are languages in which adjectives are not distinguished from substantives.” In these, the quality and the substance must have been confounded. Mill says that abstraction is “a process rather than a power, a function rather than a faculty.” He uses the term abstract as opposed to concrete. By an abstract name he means the name of an attribute; by a concrete name the name of an object. Whately says, “When we draw off, and contemplate separately, any part of an object presented to the mind, disregarding the rest of it, we are said to abstract that part of it.” But if these definitions are correct, then we must not limit the term to qualities only, but extend it to every similar process in which we mentally present to ourselves, not one object, or one as in association, but a combination of abstract qualities. Every common noun is an abstraction: as, tree, man; for our concept is made up of abstracted features. There is no one tree corresponding with our concept of a tree, and no one man with our concept of a man. The difference is evident in such a sentence as this: Edward is a boy. Edward is concrete, the predicate, boy, is an abstract of the class to which he belongs. Again: there are many verbs which are abstract: as, do, have, live, die, etc.; because they no longer describe one act, or relation of one object, but whole classes of similar acts and relations, as, Do, that you may do. The verb to be affirms the relation of similarity or identity between subjects and predicates; it is therefore abstract, as the copula.

229. Now, it has often been said that deaf-mutes cannot attain to abstract thought, but that all their thinking is concrete. Were they taught by signs only, this would be apparently true, but not really so, as has been seen; but if they are taught orally, it is not correct, for language itself is so constructed that to learn it in the order of its logical development is to think abstractly from a common noun on to an abstract quality. Did those who speak their native language correctly never learn a rule of grammar or

a page of logic, they would use the abstract as well as the concrete, like philosophers.

The abstract has its root in the concrete, and if we would lead forward our scholars, we have only to proceed from the one to the other to teach them to abstract like ourselves. Fetch two flowers, a red and a blue. Which do you like better or more? A —, I like the red better. B —, But I like the blue better. Do you like red more than blue? Yes. But I like green best. This is abstraction, and the more fully the scholar is exercised to think in this manner the greater will be his progress. These are really complex sentences, but as they are an easy introduction to the use of the conjunction than, it is better to teach them.

Adjectives are usually classified by grammarians, into those of Quantity, Quality, and Distinguishing; but these distinctions are of little practical value in the preparation can of our lessons. As the senses are our principal agents, and the material the best way to the mental, the qualities which most excite attention ought to have the preference. The union, also, of the greatest contrasts provokes attention and sometimes amusement.

230. A still wider field, and requiring maturer mental energy than the qualities and properties of the material can furnish, lies open to the teacher in our mental and moral attributes. This is more purely abstract because the qualities themselves are mental or emotional. To think, to perceive, to remember, to know, to forget, to learn, are all abstracts, as are thought, perception, memory, knowledge, forgetfulness, learning. But they can be taught by resorting first to their active form. Tom forgot his lesson last night. He is forgetful. I have thought much about the poor man we met yesterday. Poverty is not a sin. He was very miserable. His clothes were ragged, and he had no food. Many give little thought to the miseries of the poor. Did you remember your lesson? No, I forgot it. Your memory is not good, you are forgetful.

In the same manner the emotions can be taught, as anger, joy, etc. Tom was angry, and struck William. Anger is bad, it leads to sin. As all abstracts are from concretes, the

rule to proceed from the concrete to the abstract in explaining them is the best in practice.

231. Most deaf-mutes seem to share the moral instincts of our nature. As soon as they can use signs, or are able to think and speak a little about common things, they perceive the difference between right and wrong, good and bad, true and false. They have a moral nature, and its instruction and development are of greatest importance to their future lives. Now there is a fitting opportunity for doing something efficiently in this direction. Our best method is to point out the moral qualities of the good or evil incidents of school life, and then to supply the abstract noun as the moral of the lesson. Valade Gabel has written a little work on these lines, but the teacher can construct his own lessons, for nothing is equal to the actual for moral instruction. The Bible furnishes many little histories which might be recounted in simple words, as in the death of Abel, the flood, the destruction of the cities of the plain, the selling of Joseph, and his reconciliation with his brethren. When the scholars are a little more advanced this is a subject which can be reverted to with profit both morally and mentally. It would be well to write out a selection of the adjectives and abstract nouns used to express moral laws, and as opportunity offers to illustrate them carefully.

ABSTRACT ADJECTIVE AND NOUN.

232. Dr. Müller attempts another explanation of the concrete and abstract from a psychological point of view. "If we say, a black man, a black woman, a black child, a black dog, and a black cat, it is possible that we either let 'black' drop through, and thus arrive at a name applicable to man, woman, child, dog and cat, namely animal, or we may allow man, woman, child, dog, and cat to drop and thus retain 'black.' But in that case, too, black is clearly an abstract term. It is not the name of things, but of something belonging to things, expressing a quality or an attribute that cannot be touched or moved. It can never be called a concrete noun till we give it with the article, and thus get 'this black,' i.e., 'this black man'" (Dr. Müller's work already quoted, p. 465).

Arranging these sentences so as to make the change more evident to the eye might assist deaf-mutes to apprehend the difference.

Drop the adjective. $\left. \begin{array}{l} \text{A (black) man} \\ \text{A (black) woman} \\ \text{A (black) child} \\ \text{A (black) dog} \\ \text{A (black) cat} \end{array} \right\}$ is an animal.

or

Drop the noun. $\left\{ \begin{array}{l} \text{A black (man)} \\ \text{A black (woman)} \\ \text{A black (child)} \\ \text{A black (dog)} \\ \text{A black (cat)} \end{array} \right\}$ or $\left\{ \begin{array}{l} \text{The man is black.} \\ \text{The woman is black.} \\ \text{The child is black.} \\ \text{The dog is black.} \\ \text{The cat is black.} \end{array} \right.$

In this case the attribute is affirmed to be common to all and at the same time abstract.

233. COMPARISON OF ADVERBS.—As actions and qualities are modified by adverbs in a similar manner as nouns are modified by adjectives, they are also compared in the same manner, according to their degree, as, A rook flies swiftly, but a pigeon more swiftly. Let three boys walk, one slowly, another more slowly, and the third still more slowly. Now you can say, William walks slowly, Edward more slowly, Robert most slowly. From their former exercises on the comparisons of adjectives, these comparisons of adverbs will be soon learned, only the difference between the adverb, as expressing the manner of the action, and the adjective the quality of the noun ought to be carefully attended to, else they will be confounded.

The predicates of most of the simple sentences are formed by verbs of motion, and to express that motion more accurately as to Time, Place, Order, Manner, Degree, or Cause, the materials are abundant, not only to illustrate the adverbs used in these modifications, but to introduce comparisons: Tom plays ball well, Robert better, but William best; Mr. M— has much money, Mr. B— more, but the Queen has the most. The irregular comparisons ought to be well illustrated, as they are frequently

used, and when learned the analogy of the regular comparisons assists the learner.

Many adverbs are formed from adjectives, as wise, wisely, and these are compared by more and most. Some adverbs of Time, Place, Cause, etc., are not compared, because they are used of specific or distinct modifications. I hope to be here when he comes. Here means in this place, when at the time, and do not admit of comparison.

Three of the moods of the verb have been already employed in the development of the simple sentence; two more remain, the potential and subjunctive. Of the subjunctive nothing need be said at this stage. It will be illustrated in the complex sentence to which it belongs, and the infinitive as the subject or object of a sentence has found its place already.

234. THE POTENTIAL MOOD.—This mood presents considerable difficulties to the learner, because the verb itself fails to express the requisite modification, and this has to be supplied by auxiliary verbs, not of tense only, but also in signification. In fact they are verbs pressed into this special service, and if their own meaning is well known, their auxiliary use will be more quickly learned.

These auxiliaries are, may, can (past might, could) should, would, must, and ought.

MAY means possible, able, permissible. Radically, it is the same as can, but is now used to imply some other will, reason, or law, influencing the action, whereas can is of what is more in the power of the actor. When the question is asked, MAY I go home? the will of another is appealed to, so that the power rests with him to grant or refuse the request. "I may go," implies that permission has been given. But sometimes the reference is to some rule, principle, or reason, which the party feels bound to obey. I may not play now, for I have to learn my lesson. We may not stay longer; it is time to return.

CAN at first meant to know, but has come to express the possession of power, mental, moral or physical, rather than of knowledge. This power is possessed by the agent, and he can use it if he wills. "I can write," implies the ability to

write when I please. It might be taught by such exercises as these. Robert, can you lift that table? Try. I can lift it. William, can you leap over the house? No, I can not; but I can leap over a form. Can you read? Yes, I can read a little. Can we have a walk to-day? No, you cannot; it rains. May we play in the playroom? Yes, you may. Can you lend me five shillings? No, I can not. I have only one shilling.

The past tenses of may and can are used in the complex sentence, and are therefore reserved.

MUST means obliged, constrained, or compelled—physically or mentally—to do or be anything. You must not play in school. You must not strike your brother. I must punish you; you are a bad boy. May we steal? No, we must not steal; it is wrong. God says, “Thou shalt not steal.”

OUGHT, expresses the abstract conception of moral obligation or duty—what we owe and should pay to God and man, as We ought to obey the commandments of God. The will of God ought to be obeyed by all men. We ought to love our neighbour.

Now, to lead the scholars to the clear comprehension of this verb requires a considerable knowledge of language, and it would therefore be better to delay its full illustration than to risk an imperfect conception. Should and would are reserved for a later stage.

235. Articles or Distinguishing Adjectives.—In speaking of one or more things, the individuality of which we seek to distinguish, certain words are employed, called by some indefinite and distributive pronouns; by others adjectives. The fact is they fill the functions of both. Their great value lies chiefly in their distinguishing character. They confine or direct the attention to the objects which are to be most attentively considered at the moment, and thus avoid the confusion arising from having other objects as well before the mind. Of these *a* and *the*, formerly called the definite and indefinite articles, stand first.

The indefinite *a* is another form of one, and indicates that we are thinking of only one of a class. If I say, Give me *a* book, while one book only is asked, it is left to the

finder to take any book and give it to me. But when a second time I ask for the same book, I say, "Give me—not *a*, but the book," for this is the one I want, and no other. Therefore the is definite, not only as to number, but also as to sort. We are in the habit of using this definite adjective of persons and things well known, as the queen, the prime minister, the sun, the moon, etc., because the person or thing is at once suggested. It is also used when there is no danger of being misunderstood, as Go to the door, when there is only one door in the apartment; but when there are two it fails, and we must employ this or that. *A* is appropriate when we would speak of any one of a whole class: *A* child soon learns to speak; *A* wise man prepares for the evil day. The, as used in the predicate here, implies that an evil day comes to every man; and therefore its definite form.

An old man is at the door; he seems poor and cold; Where has the old man gone? Fetch the old man; Give him *a* penny, and let him warm his hands at the fire. The use of an before the vowels will early have the attention of the teacher.

236. INDEFINITE AND DEFINITE PRONOUNS. — Objects often present themselves in the relation of groups, parts of groups and individuals. This is a numerical relation, and belongs to every thing which can be counted or measured, and to express it conveniently we have a number of words which we call adjectives, but they are also pronouns.

All is used when we would speak of the whole group without special reference to the units of which it is composed, as All the trees of the wood are now green. The stars are all shining to-night. All is well that ends well. But in strong contrast to this, and definitely expressing the units of the group, we use each, as Each tree has leaves, and Each star is a sun. How many boys are in the class? Give each of them a pencil; and when this is done, and we wish to ascertain its completeness, we ask, Have all pencils? Hence all is definite in respect to the whole; each to the units of which the all is composed.

But when we would speak of the units less definitely, but more definitely of the whole than each implies, every

is used, as Every soul on board the ship was lost. Every one of us must die.

Again, when parts of a group are spoken of, we use terms which express their numerical relation to the whole, as Many of the stars are very small. How many books are on the table? Twenty. How many of them have brown bindings? Ten. Have any of them red bindings? Yes, a few.

Any evidently refers to the whole, and asks if a part of it has red bindings. It is therefore indefinite as to the part, but few is definite in respect to the smallness of the number. We may also inquire, Are any of them old? And receive for answer, Some of them are old. This is more than a few, but still indefinite. Some is also used of quantity, Some of the hay is spoiled by the rain, but little of the corn.

When the part of a group we seek after is wanting, none or nothing is used. As, Have you any money? No, I have none. What have you? I have nothing. In the use of all these adjectives the teacher ought, first, to observe their relation to the whole, and then of their special relation to each of its parts. These are the ruling and regulating conceptions in illustrating them clearly.

237. COMPARATIVE PRONOUNS.—Comparison begins with two objects as the simplest form, so that the habit is acquired of looking at things by pairs, and we have several words specially appropriated to express the different relations in which they may stand to each other. Here are two rings, one of them is gold and the other is silver. Which will you have? Thank you, I do not want either. Both are beautiful. Neither is too good for you. Here are two books, Give me one of them. Then, give me the other. I will give you neither the one nor the other.

238. THE PASSIVE VOICE.—All the verbs hitherto learned are in the active voice, or that in which the subject and predicate express the agent and the action, or the subject and affirmation. The order of thought is therefore first the agent and secondly the action, but when the object must first be spoken of, or the order inverted, the verb takes a new form in accommodation to this, and the agent becomes an ablative. This is called the passive voice. The horse

kicked the groom. The groom was kicked by the horse. Dr. Max Müller accounts for the origin of this voice by "the transference of our acts and states to the objects of nature." And he gives the following as an illustration:—

- "1. Active : The wind shakes (it blows).
- "2. Neutral : The tree shakes.
- "3. Passive : The tree shakes (is shaken) by the wind.
- "4. Active Transitive : The wind shakes the tree."

This may be the history of the manner in which this voice grew into use, but practically, and for the greater ease of the learner, it can be treated as the inversion of the direct order of the sentence to accommodate speech to thought. A pane of glass has been broken by an unlucky boy, and the question follows, By whom was this glass broken? The answer is, It was broken by Edward. How was it broken? He broke it with a ruler. See here, I strike the table. Now let us think of the table first, and the order will be, The table is struck by me. But the agent is often omitted because it is well known, as "In the volume of the book it is written of me." The prophet wrote the words; so that we can restore the sentence to its active form, "The prophet has written of me in the volume of the book."

Let a number of active verbs be thus inverted in the different tenses. As before observed, the verb to be is used in all its tenses and moods as the auxiliary of this passive form.

Intransitive verbs do not admit of a passive voice, for there is no object which can be made the agent.

Let this use of the passive be carefully considered. See that house, It was burned last night. Who set it on fire? An incendiary.

239. In teaching language, the end has been already described as : (1.) To put the learner in possession of the names for all common objects ; (2.) To put him in possession of the logical order in which they are arranged ; (3.) To enable him to express his reflections to himself and to others. The first might be taught independently but it would be almost useless—a mere jumble of materials without cohesion or relation. On the other hand, if the structure alone, or almost exclusively, occupies his time, then he lacks what the Germans call the

stuff, or material of thought ; and his thinking is limited to a narrow circle, instead of being as wide in its range as the language provides. Both means ought, therefore, to be employed. Teach words as quickly as possible, but teach them as parts of discourse. If this could be done by a reading book, all very well ; but if more efficiently by the culture of the reasoning faculties, through the logical development of the sentence, then this ought to be followed up systematically. Two distinguished writers on words are agreed that the principal word of every sentence is the verb, and that from it has been derived nearly all the other parts of speech. They also agree that the verb usually expresses motion or action, and both confirm their conclusion by furnishing us with a list of the principal verbs of the language.

Webster, in the Introduction to his Dictionary, says : " As the verb is the principal radix of other words, and as the proper province of this part of speech is to express action, almost all the modifications of the primary sense of the verb may be comprehended in one word, to move." Then he gives a list of the principal verbs, and adds : " But it must be remarked that all the foregoing significations are not distinct ; so far from it, that the whole may be brought under the signification of a very few words. The English words : to send, throw, thrust, strain, stretch, draw, drive, urge, press, embrace the primary sense of a great part of all the verbs in every language which I have examined. Indeed, it must be so, for the verb is certainly the root of most words ; and the verb expresses motion, which always implies the application of force." Language, therefore, according to Webster, is dynamic.

Dr. Max Müller says : " Such seems to me Noiré's suggestion that roots"—about eight hundred, meaning something real, something actually used in conversation—" owe their origin to the clamor concomitans of our early social acts. I look upon this clamor, not only as concomitans, but significans, namely : as soon as it is used for the purpose of reminding ourselves and others of these acts themselves ; and I therefore see the true origin of language and thought in the roots, as signs of our acts." It is not very easy to make a concept of this origin of language, for

he says a conception is an act, its product a concept; while the instrument is called by various names—intellect, understanding, reason, etc. This looks like reason without language.

240. However this may be, it is evident that these concepts are the primary elements of language, and that their possession must put the learner in the most advantageous relation to all the other words formed or derived from them. They are the names of the principal acts, states, and relations of life; and to know them thoroughly must provide reflection with its best materials. They ought, therefore, to be carefully illustrated in the order suggested by the following arrangement; for it has been compiled on the principle, that acts when closely related, as, walk, run, etc., can be better distinguished and named by their associated reproduction; for related acts limit one another till the precise meaning of each is defined.

1. Action towards the actor.—Pull, draw, drag, strain, stretch.
2. Action from the actor.—Push, drive, thrust, throw, pitch, send, press on, force, spread, scatter.
3. Action in arresting.—Stop, stay, arrest, prevent, check, resist, oppose, hold.
4. Action in striking.—Strike, smite, beat, whip, punch, poke, flog, buffet, stab, pierce, prick, punish, spear.
5. Action to destroy.—Kill, slay, murder, shoot, burn, drown, flay, hang, behead, smother, smash, crush, destroy, annihilate.
6. Freely exerted motion.—Go, walk, run, pass on, go by, advance, retreat, leap, fly, spring, bound, trip along, trot, gallop, canter, rush, dance.
7. Moving on the surface.—Creep, crawl, slide, skate, skim.
8. Motion towards an object.—Come to, approach, draw near, advance to.
9. Motion from an object.—Go from, retreat, leave, desert, forsake.
10. Circular motion.—Turn, twist, twine, roll, wind, turn round, run round.
11. Expanding motion.—Swell, open, germinate, bud, bloom, spring up, flourish, thrive, shoot, grow, burst.
12. Contracting motion.—Shrink, contract, shrivel, decay, wither, fade away.
13. Action on or near the surface.—Sail, row, paddle, steam, float.
14. Action below the surface.—Dive, wade, dip, dredge, fish, plunge.
15. Suspended action.—Hang, suspend, hold up, swing, dangle, cling.

16. Action in moving a body.—Shake, stir, agitate, rouse up, toss, tumble.

17. Action in fastening a body.—Nail, glue, paste, pin, peg, bolt, screw.

18. Involuntary action.—Fall, tremble, slip, shake, quake, shiver, writhe, wriggle, stagger, reel, stumble, trip.

19. Action in conflict.—Fight, wrestle, strive together, battle, resist, overcome, conquer, attack.

20. Action in dressing.—Dress, put on, don, cover, adorn, comb, brush, pin, button, tie, bind, brace.

21. Action in undressing.—Undress, take off, doff, uncloth, throw off, loose, pull off, untie, put off, unbutton.

22. Action in raising.—Lift, take up, raise, hoist, snatch, heave up, elevate.

23. Action of the senses.—Hear, see, touch, smell, taste, feel, smart, pain, behold, look at, watch, observe, listen, hark, thirst, hunger, pine, yawn, sleep, awake,

24. Action causing friction.—Rub, smooth, scratch, scrape, polish, file, sweep, brush, scour, scrub, grind.

25. Action causing injury.—Hurt, bruise, break, crush, squeeze, pinch, bite.

26. Action in bearing.—Carry, fetch, bring, convey, cart, import, export.

27. Action in separating, involuntary.—Open, gape, crack, split, burst, explode, fly in pieces.

28. Action in separating, voluntary.—Separate, pull into pieces, tear, smash, break, rend, rip.

29. Application of water.—Wash, cleanse, clean, bathe, water, sprinkle, sponge, scald, boil.

30. Application of heat.—Warm, melt, smelt, dissolve, burn, parch, roast, broil, singe, fry, seethe, cook, toast, kindle, light, set on fire, liquify.

31. Action of cold.—Cool, chill, freeze.

32. Sound produced by man.—Speak, say, talk, whisper, breathe, groan, sigh, cough, sneeze, snuff, snore, cry, weep, lament and shed tears, laugh, moan, stammer, stutter, bellow, roar, hoot, hiss, blow, puff.

33. Expressive action.—Smile, frown, look cross, look sad, look solemn, look happy, look angry, look proud, look pleasant, look silly, look wise, look foolish.

34. Action for an end or purpose.—Try, do, work, make, labour, attempt, strive, endeavour, aim at, begin.

35. Action in completing.—End, finish, accomplish, achieve, bring about, succeed, gain, win, attain, arrive.

36. Action in cultivating.—Dig, rake, hoe, plough, harrow, drill, sow, plant, clean, weed, dress, manure, cut, reap, mow, bind, carry, stack, gather, glean, thrash, winnow, dry, grind, sift.

37. Action in cooking.—Bake, knead, cook, leaven, raise, roast, boil, fry, toast, warm.

33. Action of the emotions.—Love, hate, joy, rejoice, sorrow, rage, fear, dread, desire, long for.

39. Action in seeking.—Ask, pray, beg, seek, entreat, implore, request, urge, invite.

40. Mental action.—Think, perceive, conceive, know, understand judge, reason, examine into, discover, find out, remember, forget, suppose, guess, design, plan, imagine, devise.

41. Action in producing.—Weave, sew, spin, knit, net, hem, seam, build, paint, glaze, print, engrave, join, cast, weld, shoe, turn, tin, paper, trim, clip, cut, etc.

241. To learn these verbs is to do something more than increase a vocabulary, or become familiar with words most frequently used; it is being put in actual possession of the terms by which a multitude of other words can be explained and illustrated, because they are either derived from or synonymous with them. The teacher often finds himself at a loss to explain some new word, and spends time in searching for suitable illustrations, but he will have much less of this work to do if he has already taught these root concepts. They furnish the keys for many more. One of the improvements of our methods will be to find out, arrange, and teach these words, so that our scholars may, as soon as possible, learn all the essential elements of the language. Some of our most distinguished writers used no more than nine or ten thousand words in their compositions. In three years they could all be learned at the rate of ten a day, and three hundred days per annum. This would not only economise time and labour, but endow them with all the forms of language required by reason. A mind which is in possession of all that is fundamental in thought can easily advance to all its developments.

The treatment of the simple sentence contained in the preceding sections is far from being exhaustive, and intentionally so. This would not have answered the purpose, which was by a series of lessons on the principal parts, to put the learner in possession of such a knowledge of the general structure as to enable him to proceed by analogy to the completion of the building by reading, writing, and speaking. Our own experience is confirmatory, for where thought and memory become habituated to a certain order and relation in language they are almost certain to be followed from analogy

in thinking and speaking of every fresh addition to knowledge. Custom has determined this for ourselves, and it ought to be instituted as speedily as possible in the studies of deaf-mutes.

This can be done only by frequent repetitions. Now that the vocabulary is greater, and the reflective power more vigorous, a revision of the earlier lessons, with the introduction of prepositions and adverbs, which had to be excluded on account of the inability of the learner to comprehend them, and at the same time using other nouns and verbs, would confirm the associations already formed and increase the vocabulary.

242. Composition also ought to be encouraged, for our hold on language is never confirmed till it becomes the vehicle of our own thoughts in speaking and writing. We are builders when we can write our own concepts in fitting words. Previously we only collected the materials. Much, however, depends on the disposition and capacity of the learner. All are far from being alike. Some are timid or nervous. They need encouragement, to be lured onward by the interest excited, and then shown the way. Others are dull, almost to stupidity. They want rousing, not by force but by attraction. Like the bird which "raises and takes her young on her wings," so must the teacher stir up, lift up, almost inspire these slow thinkers, till he astonishes them by the discovery that they, too, can write a sentence. Latent power may be deep down. It is worth while to try and bring it forth into active use. Others, again, are quick, ready, but as changeable as the breeze; quick to apprehend, but as quick to forget, they require holding to, controlling, and quieting to receive deeper impressions, and to think more closely.

Get them to say what they think about what they see; to ask questions about them; to tell you what they saw yesterday; or in their walk; in short, any incident that excited their attention.

No matter how simple and imperfect these may be, they are a beginning, and enable you to correct their errors and complete the expression of their thoughts. Lead them also to pose one another with questions, for to shape a question

correctly implies some conception of the right answer. Let the verb to be have as large a space in these exercises as verbs of action, for its use requires a greater power to abstract.

These are the preparations to make in order to deal successfully with the next stage, on

THE COMPLEX SENTENCE.

243. A sentence is said to be complex when made up of two or more simple sentences. But this does not define its logical relations or clearly distinguish it from the simple sentence. Something more is wanted.

In our treatment of the simple sentence it has been seen how the subject and predicate may be expanded and completed to form an adequate expression of the proposition in its different relations as it appears to the mind of the speaker; and that for this purpose prepositions, adverbs, adjectives and other nouns had to be introduced, by which the subject and the predicate were more accurately described; but it sometimes happens that these additions do not suffice to present the proposition in all its relations and all its parts; and for this purpose other simple sentences must be introduced to complete the meaning. They are therefore only further expansions, and as subordinate to the simple affirmation as the additions already made in its development. But a new proposition or affirmation cannot be treated like an adverbial complement. It has its subject and predicate, which stand in various relations to the principal sentence on which it depends, and these have to be clearly expressed by connecting words called Conjunctions, but which are really the words on which the nature and value of the relation depend.

244. Of these Tarra says, "Though the conjunctions or particles destined to unite two judgments may be undecidable and invariable, it is always very difficult to form an exact idea of them, just because they express a particular rational connection between the ideas." "Their use is not so easy, for in the verb, and in the construction of the phrase, they imply modifications, which vary with the nature of the relation. Would we confine the language, which is

transmitted to our scholars as a patrimony, to the limits assigned by usage, we cannot, in the mean time, dispense with initiating them into the reflective study of the relations between the judgments and the manner of expressing these relations. Without this knowledge they can, in fact, neither reason nor comprehend reasoning, nor the discourse of another, nor acquire the knowledge of history, religion, and morality which borrow their real rational value from these relations. They are, one may say, the pivots of the great mechanism of language, placed in relation to the ideas—pivots fixed and immovable, on which all the wheels revolve—which are bound to give motion to reason in all its spoken manifestations; the absence of which would only create trouble and stoppage. Though the reason, in its internal and wholly abstract exercise can conceive these relations among the ideas without knowing the words and the constructions which correspond to them, yet it is certain that without these words and these constructions no one would ever be able to make others comprehend his reasons or comprehend those of others." A simple illustration will make this clearer; suppose I say to a friend, I met the poor man again to-day. He may inquire for better information, What poor man? and I reply, The poor man to whom you gave a penny yesterday. The dependent sentence at once enables my friend to identify the man by his own action in giving him a penny, and this relation is expressed by *to whom*, and so the predicate is expanded by the addition of another sentence.

245. To teach our scholars the complex sentence in all its forms is not so difficult as it at first appears. If the teacher would divide the sentence into its principal and dependent parts, and write it out in such a manner that he can introduce the dependent sentence in a parenthetical form in its proper place, separating it by brackets from the principal, and then link it on to that part of the subject or predicate of which it is the expansion, he will lead his scholars to perceive the nature of the relation between the propositions; as, The young gentleman (who was here this morning) is a deaf-mute. This is a literal illustration by what had previously been known.

Here, if anywhere, the rule must be observed, to advance from the simplest to the most complex. "The different kinds of relations existing between the ideas must be classed in such a manner that from the simplest and most sensible the scholar is led up by degrees; and from those which require a more facile construction to those which demand in the phrase a more complicated movement." (Tarra.)

The learner would also be aided if the teacher at first availed himself of the objects and acts about which the pupil wants more information, or which would suggest the dependent sentences, as, The sum which you have done is wrong, and to suggest the dependent sentence, ask What sum? The sum which I have done.

Another helpful expedient is to reduce a complex sentence into simple unconnected sentences, as The silver coin, which I gave you, is very old. I gave you a silver coin. It is very old. Remove the complex sentence and let the scholar reconstruct it from the simple sentences. Sometimes the relation is so intimate that it cannot be treated in this manner without affecting its meaning.

Grammarians divide subordinate sentences according to their relations :—

(1.) When the noun or noun phrase is expanded into another sentence it is called a noun sentence.

(2.) When the adjective to the noun of the subject or object is enlarged into a new sentence it is called an adjective sentence.

(3.) When the adverb or adverbial phrase is extended into a new sentence it is called an adverbial sentence.

246. I. NOUN SENTENCE.—Now in order to approach the first of these relations of the dependent sentence we ought to consider how we or others stand related to ideas.

1. I may tell what I see, as I see my friend coming. 2. I may tell what I think about it. I suppose he is my friend. He wears the same dress and walks like him. 3. Or I may give my own reflections about it. Ah, It must be he, for he promised me when here yesterday that he would come to-day. 4. Or, I may relate what another says or thinks, as "My brother told me this morning that he heard him say he was coming to-day." 5. Or I may call the attention of another to what I see or think. Come and look at this boy climbing up the tree, I think he is in great danger of falling down. 6. Or I may command another to go and tell what we

say or have seen. Go and tell E—— that I want her. Tell mamma that I have seen Thomas this morning. 7. Or relate what another told me of what he has seen or thought about something. Mr. C—— told me this morning that he saw a house on fire in the Drapery last night, and he said it was very terrible to see the flames and smoke. Much property was destroyed, but no lives were lost. 8. Or we may repeat what we have read in a newspaper or a book, as, I read in the "Times" of yesterday that a woman was found drowned in the canal. She had lost her way in the fog and fallen into the water.

Many of these are noun sentences, for the dependent sentence fills the place of a noun object to the verb. But before proceeding to their full illustration and prepare the learner to grasp the whole sentence clearly, it would be better to select some of the simplest forms, as in the use of that. First, as already illustrated, it is a demonstrative adjective or pronoun, pairing with this, and their plurals these, those.

Then it is a relative pronoun almost equivalent to which, who, or whom. He (that is industrious) does not lack bread. Here it takes the place of who.

It is also used as a noun or representative of a sentence, as When he heard that—something said before—he went away.

And as a conjunction, but at the same time filling the place of an adjective to the dependent sentence. He said that (he would give me some money to-morrow). The examples already given of this use can again be referred to.

Sometimes it takes the shape of a relative explanation, as six times four are twenty-four, that is, six added to itself four times makes twenty-four.

If the learner has a number of exercises framed to exemplify these different uses of that, they will increase his power of distinguishing the word according to its relations, but it would be better not to do this till its place in the complex sentence has been taught.

Upon the whole the simplest form of illustrating the noun sentence is first to speak or write a sentence in which a noun is the object, then remove it, and substitute the dependent sentence.

What do you read? I read words. But what do the words say?

They say, that there was a great storm in the Channel yesterday. What is only expressed in "words" of the prin-

cial sentence is expressed by "that there was," etc., in the dependent.

Again, the school relations provide ample illustrations.

Tell *T*— that I want him. What did you tell *T*— ? I told him that you wanted him. What did you say to *M*— ? I said he was idle. Go and say to *M*— that I want to see her. Well, did you tell her ? Yes, I told her that you wanted to see her.

Such exercises require reflection, in the use of the different tenses which exercise the intelligence of the learner.

The teacher is aware that there is a class of verbs which require this complex form, such as say, tell, think, suppose, believe, and that they imply the relation of the actor to another action either expressed or implied; I think there will be a storm to-day. Here the thinking is one action, and the coming storm another, which is the object of the thinking.

247. II. ADJECTIVE SENTENCE.—As this dependent sentence fills the place of an adjective in relation to either the noun of the subject or predicate, it can be introduced immediately after its noun. As the adjective qualifies its noun, so the dependent sentence qualifies the noun, subject, or object of the principal sentence, as The book (which lies on the table) is your arithmetic.

The relative pronouns, who, which, whose, what, whom, and that, are the pivot words in these adjective sentences, but in addition to these there are certain adverbs and prepositional phrases and participles, as when, where, wherein, why, wherefore, and how, by which the relation can be expressed.

The book (which lies on the table) is mine. Adjective dependent sentence.

The book (lying on the table) is mine. Participial adjective phrase.

The book, on the table, is mine. (Which is) is understood. Prepositional phrase.

The house (in which we are living) was built by me. Adjective dependent sentence.

The house (where we live), etc. Adjective dependent sentence.

The time (at which he will arrive) is twelve o'clock. Adjective dependent sentence.

The time (when he will arrive) is twelve o'clock. Adjective dependent sentence.

Put the book on the shelf (where you found it). Adverbial dependent sentence.

Put this book on the shelf (on which you found it). Adjective dependent sentence.

Pay me the money (which I lent you). Adjective dependent sentence.

Or, Pay me the money (I lent you). In this the relative is omitted.

This is (what I wanted). This is the thing (which I wanted).

Sometimes the relative is the object of the dependent sentence, as the boy (whom you see) is William's brother. Here whom is the object of see; but the sentence is adjective to boy.

The flower (whose smell is so sweet) is a hyacinth, or The sweet smelling flower. Here the relative sentence is in an adjective relation to the noun.

These different forms of expressing the relation furnish teachers with ample means of illustrating it, but it would be better at first to teach the simple relative relation to prevent confusion. When that is familiar the other forms can be introduced.

248. III. THE ADVERBIAL SENTENCE.—This is the expansion of the adverb into an auxiliary sentence.

As the adverb stands in a similar relation to the verb of the predicate that the adjective does to its noun, the adverbial sentence modifies the verb.

Its adverbial nature will be found by using an appropriate adverb as an interrogative, as I found the book (where I laid it). Where did you find the book? The chair fell down (when you got up). Here in the predicate fell down, the point of time is supplied by the adverbial sentence, when you got up.

These examples are in relation to place and time.

This relation to time may be of simultaneous acts. Let Tom write while you read.

Or one may be antecedent to the other. They had finished their lesson when you began.

Or one may be subsequent to the other. We played after you went to town.

In one of these examples the pluperfect tense finds its place; better therefore, that it should be repeated as a whole and well learned.

The second future also may be illustrated in the same manner.

But to put the learner in possession of the precise relation of these tenses, better extemporise them in action, which can be done by two persons or two groups. Both acts ought to be in the past, but the one preceding the other, as, *T*— had said his lesson before *L*— came in.

The second future may also be exemplified in the same way, as When we go out to play we shall have learned all our lessons. This can be done and seen. The sun will have set when you go to bed.

The duration of time may also be expressed adverbially.

I will read while you play. These are simultaneous acts.

Whip your top till I come. The first antecedent to the second.

When I return you can play. The second subsequent to the first. Or an action may be repeated.

You play in the field as often as the weather is fine (as many times).

(1.) Adverbial sentences relating to place. These include rest in a place, motion to or from a place, and occupy an adverbial relation to the principal verb.

Where thou dwellest I will dwell. Put the book where I told you. The wind bloweth where it listeth. I do not know where to look for him. Where the tree falls there it lies. Where the bee sucks there suck I. Better in such sentences to substitute the adverbial phrase for the simple adverb. Where thou dwellest, in the place.

(2.) Adverbial sentences of manner, number, and quantity. A comparison of some kind is usually implied in these. The objects are equal, unequal, the one greater, the other less. Than, as, so, so — as, as — so, more — than, as — as, less — than, are employed to express the relation.

Than as already seen is indifferent to the greater or less, but is never used of the equal. This tree is taller than that. That tree is shorter than this.

As—as express equality: *T*— is as old as *J*—. The dining room is as large as the drawing room. He does as he has always done. Do as you like. As soon as you return we will go home. As long as I live will I praise Him. This pointer is as long as that.

Not so—as, inequality, the less and the greater. This house is not so large as ours. *T*— is not so tall as *W*—. (Or, inverted, *W*— is taller than *T*—.)

So—as, equality, Is it so old as you said? So be it as you say.

More than, The greater and the less. Less than, The less and the greater. As much as, equality.

He has more money than I. We have more fruit trees in our garden than you. *J*— is less than *W*—. Do you love your brother more than your sister? No, I love the one as much as the other.

As—so, equality. As we sow we shall reap. As we make our bed, so we must lie. (Old Proverb.) As two are to four, so are six to twelve.

In the analysis of such adverbial sentences it will often be found that the adverb fills the place of a relative pronoun as well as that of an adverb, for it not only indicates the adverbial relation of the dependent sentence, but at the same time is a relative pronoun or conjunction to connect the sentences. The names of the parts of speech are convenient but not always correct, because they have different functions.

(3.) Adverbial sentences of cause. 1st. Reason or ground. In all there is a strong tendency to excuse their own faults. This is found not less in deaf-mutes than in other children. And as to excuse is to assign a reason, because soon finds a place in their vocabulary. Their curiosity or interest in things novel or astonishing prompts the inquiries, How? Why? if not in word, in look or manner. These dispositions are very much in their favour when learning adverbial sentences of cause.

Because, for. Why have you not learnt your lesson? Because I had no time. Why did you strike Tom? Be-

cause he struck me, or directly, I struck Robert because he struck me. Edward was punished for he was a naughty boy. How was he naughty? He told a lie, which is a sin. Why did he tell the lie? Because he was afraid to tell the truth. What was the lie? He stole some of Tom's money, and denied it; so you see (that) one bad deed leads to another, and punishment is the consequence. The plants in the greenhouse grow well, for they are watered every day, and have plenty of light.

As takes the place of because in some sentences. As you have not learned you must stay at home while we go for a walk.

The Why? and Wherefore? may now be asked of many things which can at once be referred to. Why does gas give us light? Because it is made from coal. But why does coal burn and make gas? Because it is formed of plants that contain oil.

(4.) Conditional relation of Complex Sentences. Sometimes the doing of one action depends on that of another for its completion. The relation between them is, therefore, called contingent, or the first cannot be or be done without the second. To express this relation the verb has a special mood called subjunctive, preceded by a conjunction or pivot word, which is still more closely descriptive of the relation.

Give me a pencil, is a demand; Give me a pencil, if you please, a request, for the giving of the pencil is contingent on the will of another. The best illustrations to convey this contingent relation are found in school life, as If the rain ceases, we shall play a game of cricket, but if it does not cease we shall play in the schoolroom. If you write your exercises well, I will let you see the picture book. Shall we skate to-morrow? If the ice is strong enough. Shall you get a prize at Christmas? Yes, if I learn my lessons well. Will the other boys love you, if you are a bad boy? No; they will love me, if I am a good boy. These ought to be taken out of the interrogative form and written in the direct. We shall skate to-morrow, if the ice is strong enough, etc.

Unless, except, express the contingent relation more

emphatically or exclusively. Unless ye repent ye shall all likewise perish! If you do not repent, etc. I will not let thee go except thou bless me.

Unless is another form for if not. Unless we sow we shall not reap. If not can be substituted for unless and except without affecting the meaning much.

Though, yet, concede something in a contingent form to strengthen the principal proposition. Though he die yet shall he live. Death itself will not prevent his living. Though he slay me I will trust in him. If he were to slay me yet I would still trust in him.

Whether—or, two contingencies. We mean to go whether it is fair or foul. If fair, if foul, we mean to go. No matter whether he is rich or poor we will not leave him.

Sometimes the condition implies a purpose or object. I will study well that I may please my parents; or to please my parents. This implies: If I study well I shall please my parents. Why should you think much? That I may learn well. We must work, that we may eat.

249. The patience and ingenuity of the teacher will be fully exercised in teaching these conjunctions. His lessons may be well devised and very appropriate, but they will not suffice for all his purposes. Something more will still be wanting to put the learner in their full possession, and this will be best found in the stirring events of life, which ought to be closely observed for the purpose; or, in their absence, in interesting stories, reports of accidents selected from books and newspapers, which contain the words or phrases to be illustrated, for they supply better conditions than might occur to the teacher in the composition of the lesson, and excite the enthusiasm which stimulates thought and quickens invention.

Such exercises would do much to strengthen and develop the ability to connect the different parts of a narration, to catch its drift, and to test the correctness of its statements.

The experienced teacher knows full well that his scholars seem to lose hold of the earlier parts or thread of a story, not because memory is so defective, but that the connecting links which bind the thoughts into a whole have not been supplied or understood. The conjunctions are these links, and

ought to be well learned. It is not enough to advance from the beginning and pass on to the conclusion ; the conclusion itself ought at times to be made the starting point, and then, sentence by sentence, follow in an inverse order till the whole is joined like the stones in a wall or the links in a chain. This can be done by interrogation. Short passages should be specially selected, and taught till every sentence is mentally connected with all the others. It is not enough to analyse them till every part is supplied ; they ought to be re-composed from the answers, and great care taken that the proper conjunctions are supplied, for it is usually found that the failures are chiefly in this direction.

250. Dialogue is excellent, because it enables the learner to state his own thoughts in his own words on any subject. But more than this is wanted. He ought to be encouraged to narrate, observe events, give his opinions on special points in which truth, justice, and correctness are concerned. Then to tell what others have narrated, and his opinions about it. On account of the intervention of a second party this requires constant mental reference to him as well as the subject. The beginning of the exercise is in asking such questions at an earlier part of the course, as What did he say ? What did he do ? etc.

“These exercises confirm and extend the idea and the employment of the logical connections. They permit the arrangement, the execution or the relation of the actions and judgments which are therein recounted. They permit the application of dialogue to the objects and the events in such a manner that the scholar can make practical use of their connectives. Further, they present the following advantages :—

1st. A conjunction being given, to find out and to tell the different applications to the point of view of the observations, the recollections, or the historic and social ideas of the scholar.

2nd. The union of two or more propositions by given conjunctions, as when two single propositions are given, to turn them into a complex sentence.

3rd. To reason briefly on a fact or a truth.” Tarra.

But however clear the expositions of the different forms of

the complex sentence may be, or, however well devised the exercises on them, an element remains, which can only be supplied by the teacher himself to make the relations so evident to the mind of the learner that he will readily imitate them when sentences are similarly related. This element is his own ability, readiness, tact, and moral control of his scholars in leading them to perceive and apply the illustrations suggested by the very circumstances and influences under which they are living at the moment, in the form best known or most likely at once to articulate into propositions which only needed this new pivot to make them one. To lead, direct, and fix the attention on the precise point, and then to illuminate it by stirring action or recital is his highest art,—more than art, inspiration, or magnetic power, if you will, by which he calls into best exercise the very laws of thought under which he is himself operating. To teach well is to feel strongly and apprehend clearly. But nothing by force. When mental effort becomes wearisome or distasteful to the learner, all after labour is lost. Active thought is life in its best impulses, exercised in favourable conditions.

Charm your scholars till they long to know more, and difficulties will disappear.

COMPOUND SENTENCE.

251. The exact difference between the complex and compound sentence has not been satisfactorily determined by grammarians. According to Morell "A sentence is called compound when it contains two or more principal sentences co-ordinate with each other."

Co-ordinate may mean standing in the same rank or degree, not subordinate, or standing in a certain relation to something higher or lower. Now the latter must be its meaning in Morell's use in this place, for sentences are not strung together without any closer relation than that of time or place. There is one leading proposition, which the others are intended to limit or expand, illustrate or correct, else their union is of no logical value, but on the contrary tends to obscure and distract, rather than concentrate, the attention

on the main topic. In the complex sentence, the dependent member finds its *raison d'être* in the principal, but in the compound sentence this subordination ceases, yet there is, and must be, to serve the purposes of logical association, not only a relation of concomitancy, but also of support and expansion to the leading proposition. A compound sentence forms a unity as well as a complex, but its parts are of the same rank as sentences.

In teaching compound sentences the main proposition should, therefore, be first clearly ascertained, and the relations of the other co-ordinate propositions to this will be readily perceived, for though informal, there is an intimate association, as, "The wind increased to a gale, the sea rose mountains high, and many a good ship was lost." These are co-ordinate, but they unite in telling how the ships were lost. The conjunctions used in such sentences imply addition, as *and*, moreover, furthermore, the one and the other, the former and the latter, both—and, etc. The day dawned and the lark rose. These are co-ordinate and yet the rise of the lark depends on the dawning of the day. The sun rose and the darkness fled away. The latter is really an effect of the first, but in its present form it is co-ordinate.

The relations of compound sentences are 1, Copulative; 2, Disjunctive; 3, Adversative; 4, Conclusive; 5, Assigning an effect or consequence.

252. 1st. Copulative Co-ordination. In the progress of connected thought, one proposition often follows another as a simple addition, not by chance, but as a part of a statement of facts witnessed by the narrator, and succeeding in the order of time; as, "David went up by the ascent of the Mount of Olives, and wept as he went up; and he had his head covered and went barefoot; and all the people that were with him covered every man his head, and they went up weeping as they went up." This is a simple copulative relation, in which every sentence finds its place in the picture of the manner of the king's departure. Little children usually think in this manner, for they are incapable of understanding complex relations. Their letters abound in *ands*. Deaf-mutes resemble them, and ought to be led on from the simple to the complex. Better then to take the

illustration from familiar objects. The principal thing is to secure a mental place for the relation. Once learned, it will be repeated when the conditions are alike.

Fetch five pencils and lay them on the table. Two and two are four, and three and three are six. It rains and it blows. The sun rose at six to-day, and set at six. These examples, with many more already learned, teach the meaning of the conjunction *and*, for it is learned, not by definition, but by use, as in fact all the conjunctions are learned.

Sometimes several subjects have one predicate, these will be united by *and*. *T—*, *J—*, and *W—* played at cricket. Sometimes, also, the predicate is followed by several different objects, He sold his house, furniture, books, horses, and dogs. The *and* ought to be supplied at first to each of these objects. Afterwards their removal and the use of the comma, except in the last, can be taught by writing them out fully on the black-board, and then erasing the superfluous *ands*.

Also (*all-so*) expresses the closest relation between the sentence and that which precedes. Learn your grammar well and geography also. If you are here at eight, I shall be here also. "Where your treasure is, there will your heart be also." In these it is more adverbial than conjunctive. *Too* expresses this relation less forcibly. I was there too.

Likewise, or *in like manner*, is almost identical with *also*, only resemblance in the form is more fully expressed. He is a good musician, likewise an excellent painter. They slew all the men, likewise all the women and children.

Besides—*by the side of*, and *Moreover*—something in addition. The first denotes that some relation exists between what has been said, and what is about to be said. After stating several things descriptive of an object, or relating associated actions, *more over* expresses an important addition to be made to them. After describing the excellency of the divine law—"More to be desired are they than gold, yea than much fine gold; sweeter also than honey and the honey-comb. Moreover by them is thy servant warned."—The use of *also* and *moreover* is finely illus-

trated here. But their difference from and is more apparent than real; yet usage does not permit one to take the place of the other in certain relations. There is a literary propriety or fitness which rules their introduction.

Both—and. The meaning of both is two, or the one and the other, and is used of persons and things when two are closely related. He is both wise and good. Wisdom and goodness are both united in him. I both love and admire him. In this example, and follows both as its complement. Fetch two maps; put both on the table. Here it is a pronoun. He sent *T*— to Northampton and *W*— to Kingsthorpe; both returned at the same time. The spade is in the garden and the rake in the cellar; fetch both. In teaching, both ought to be referred to each of its antecedents as uniting them closely.

Only, like one, is used as an adjective, and placed before its noun. He had an only son.

253. 2nd. Disjunctive Co-ordination. This means that though formally related, the propositions are diversely or in some sense negatively opposed.

Either—or, express an alternative relation, Whose pen is this? It is either *T*—'s or *J*—'s. He is either a fool or a knave. If one of these is true the other is not. *T*— is either poorly or pretending. It is so very cold that it will either rain or snow. There are two books on the sofa. Give me either (pronoun). Here it is used for one indifferently, "On either side of the river," on each side. Its use in these last examples is not disjunctive. "Either he is talking or he is pursuing, or he is on a journey, or perhaps he sleepeth." Either refers to each of these, but the alternative relation remains. Or is other. If the concept of an alternative relation is fully held the different uses of both can be fully illustrated.

Neither—nor, not the one—not the other. They are simply the contraries of the preceding either and or, and as these affirm one to be true, those exclude both. He is neither a fool nor a knave. He is neither poorly nor pretending. Here are two books, Give me either. No, I will give you neither. He has neither stolen nor lost the money.

If the sentences were separated, as *He is a rogue, He is a fool*, the learner can be led to see he cannot be both, but one of them, and this would show him the reason for the construction. They are both capital mental exercises, for without reflection they cannot be understood.

254. 3rd. Adversative Co-ordination. When one proposition asserts something and another denies it, this is called adversative co-ordination.

Not. The strongest term of negation is *Not* or *No*, because it wholly excludes the affirmative proposition. We cannot say *he is a good man, and not a good man*.

But, in one of its uses is a participle, *buten* (excepting, besides, unless), and this ought to be carefully distinguished from its conjunctive sense.

None but the brave deserves the fair. None except, etc. It is also used instead of *only*. *He has but five shillings, i.e., only five shillings. But few are happy, i.e., only a few are happy.* There is an understood antecedent sentence. *Many are miserable, few, etc.*

But is really a noun, Webster says, though called a conjunction, and serves to supply what is wanting to the completeness of the former proposition.

The rain is falling, but the sun shines. He is poor but honest. Many suspect the poor of being dishonest, "but honest" guards against it. You are clever, but not thoughtful.

In these and other complex sentences, in which the adversative relation is sufficiently suggestive, the members might be written out, and the space left vacant for the conjunction, which the learner ought to supply, as, *You have a slate not a pencil. The clouds are heavy it does not rain.* But to avoid a mechanical supply of the right word other forms of the complex sentence should mingle, so that reflection only can be exercised on the relations.

Only is used in limiting number, quantity, quality, etc.

Have you much money? No, I have only five shillings.

Yet, like but, is used to supply something that is want-

ing, that is over and above, or contrary. Time is often implied in yet.

Many never think about God, yet He provides for them and protects them. He is very poor, yet he aids others by kind words and good deeds. The widow took meal out of the barrel, and oil out of the cruse every day, yet neither failed.

Still is closely allied to yet, but implies the prevalence of the opinion or condition of the previous states. As an adverb it means always, till now, continuing.

After all you have said against him, I still think he is a good boy. What? Are you still idling? He plays, and still he plays. See if T— is still in bed. These are adverbs of time.

255. 4th. Illative Co-ordination. When the second of two sentences stands in such a logical relation to the first as to express an inference from it, this is an illative relation. This is the best use of the compound sentence, for it reflects the highest efforts of reason in searching after causes and effects. As in the simple sentence qualities are compared and the difference stated, so here facts are compared and their efficient relations stated.

Therefore. The shadow of the earth, seen on the moon in an eclipse, is round; and therefore we infer the earth is round.

Because. Because he is poor he is despised; or, he is poor, and therefore he is despised. A is equal to B, and C is equal to B, therefore A is equal to C. We live because God lives. He was sentenced to death by the judge, because he shot a poor old man. The judge was just, and he therefore inflicted a severe punishment.

Consequently. He never told a lie, and consequently every one believed him. Solomon was the wisest of men, and therefore the Queen of Sheba came to Jerusalem to hear his wisdom. For what reason did you scold William? Because he said I had taken his penknife. You went out without your overcoat in the rain; consequently you caught cold, and now suffer.

Since you will not hear me I must depart; or seeing you will not hear me. A reason or cause is expressed by since in this relation.

256. Analysis.—The knowledge of the sentence in all its forms and relations prepares the way for its analysis in composition, so that the logical relations of all the sentences in a composition to one another can be exhibited, and the subject fully comprehended. Till this is achieved, it cannot be said that the learner's knowledge of language, as the instrument of thought, is complete. This is the practical outcome of the whole process, and the test of his ability to think clearly in the language of articulate speech. This analysis ought therefore to be applied in harmony with the leading principle on which the method has been based—"from the simple to the complex"—so as to form a series of practical illustrations or praxis of all the forms of the sentence already taught, such as grammarians usually provide, only collected and arranged in the order best suited to the capacity of the scholar and the extent of his vocabulary. To facilitate this exercise the following suggestions are made:—

1. Let the whole passage be carefully read over, and every difficult word fully explained, so that the mind can grasp the full meaning of each sentence without stumbling or uncertainty.

2. Let the principal sentence—which all the others are only intended to illustrate and enforce—be ascertained, and placed first in order.

3. Then let all the dependent sentences be written underneath, in the order of their occurrence; and

4. The pivot words, or conjunctions, relatives or adverbs, which unite these sentences to one another, should now be set out, and their relations to the principal sentence clearly shown.

"I hope that we shall have a fine day to-morrow, for the clouds are red in the west."

I hope. Principal sentence.

(that) We shall have a fine day to-morrow	}	Dependent sentences.
(for) The clouds are red in the west.		

The first dependent sentence has for its pivot word *that*, which connects it with "I hope" as its substantive object. It completes what is hoped for. The learner will understand this relation from having studied the complex sentence.

For is the pivot word which connects "The clouds are red

in the west" as the ground or reason for the hope, and therefore stands in the relation of an adverbial sentence to the principal sentence. This is an illustration of our suggestions, and the teacher would do well to write it out—after pronouncing and letting his scholars repeat the whole passage—on the black board, and make the connection of its separate members evident to the eye of the learners by appropriate connecting marks. These will assist in the close association which they must have with the principal sentence, that the whole may be comprehended. By numerous exercises of this kind the mental power of uniting related thoughts to each other will be so fully developed that the learner's own thoughts will begin to fall into the same relations and his compositions shaped accordingly.

257. *Derivative Words.* As already seen, there are principal words, not roots in the etymological sense, but names of things and actions from which others are derived; and these derivatives are known by their terminations, which are limited in number, and easily remembered, as Print, print-ed, print-er, print-ing; Produce, producé, produc-ed, produc-er, produc-ible, produc-ing, produc-t, produc-tion, produc-tive, productive-ness, productive-ly.

Here ed expresses the completed action, and is an adjective. In print-er, the doer of the work is expressed by er, and it is a noun. In print-ing, the addition of ing may express either the nature of the instrument, as a printing-press, when it is an adjective; or the work done by it, when a noun, This is good printing. In the next example produce is either the act or its result. Produc-ible expresses the power or ability which produces, and is an adjective. Produc-t or produc-tion, what is produced, both nouns. Product-ive, producing well, adjective, and productive-ness its full abstract, a noun. Productive-ly is the adverb of manner. Here ed, er, ible, ing, t, tile, tion, ive, ly, and ness are the distinguishing terminations, and these, with some others, are used throughout the language as signs of like meaning. It therefore seems very desirable to make the scholar acquainted with each by suitable exercises, so that he may be able to supply the sense when he knows the principal word, and this can easily be done by sentences in

which each form finds its place. "Ward and Lock's Standard Etymological Dictionary" has this arrangement of derived words.

AUXILIARY STUDIES.

258. A knowledge of many words and the logical construction of sentences has been gained by the series of lessons suggested by the preceding exposition. Language, as spoken, has become the instrument of thought, and the teacher of knowledge. But the field is limited, because the vocabulary has been chiefly confined to the lessons which were framed of the simplest names and incidents. Had the voices of the many been heard confirming the old and introducing the new, the number of words and illustrations of forms would have greatly increased; but in their absence, and to supply the consequent deficiency, recourse must be had to auxiliary studies, all taught in the form which will increase knowledge and language at the same time.

A graduated series of reading lessons should be constructed, not in advance, but following the lessons in language, by which they could be still more illustrated, repeated, and confirmed. At first they would necessarily be in the simplest words and forms of construction according with the language lessons, without making too great demands on the time and attention of the learner in explaining new terms. They ought to be interesting and amusing as much as instructive. In fact, they ought to supply the stimulus which whets curiosity and satisfies expectation. Many such lessons have been written for the hearing, but few for deaf-mutes. A good reading-book is at the present time most needed in our schools. The materials are abundant, and only wait the hand which can collect and arrange them. They ought to be well illustrated by engravings, when the subjects are not to be seen, and fresh names explained in words already known by the learner.

Family life abounds in incident. Something new comes with the day to be talked about, and causing sorrow or joy. The good or the evil, the beautiful or the ugly, the desired or the detestable, all follow one another there, and

fix themselves in the heart and memory without an effort, through the speech which tells of them. But the deaf-mute, who has been deprived of all this, ought to be made acquainted as speedily as possible with the language which will restore him to all the life of his home. By signs there and at school something is learned about the most striking events, but unfortunately little of the language of thought and deep emotion. Whatever is therefore best fitted to supply the deficiency ought to be provided in the reading book and the *vivâ voce* lessons of the teacher. The newspaper, the weather, birds, insects, flowers at hand, and in the fields, with cattle, sheep, horses, and all kinds of farm labour, supply much to interest and instruct. Language brings the minds of hearing children into close contact with all these objects, so that they think about them, dream about them, and excite themselves by anticipating the sight and enjoyment of them. Teachers of deaf-mutes have to do the same service through language for them.

But there are other auxiliary studies that can be introduced with the advance of the scholar which will increase language and knowledge.

259. Numbers.—In addition to what has been already said about teaching numbers, it may be added that little children soon learn to count. There is not a game or a play in which they are not used. The part each is to take, the division of the playthings, the gain and loss, with the excitement of the sport, and the strife for mastery in which number decides in the end, teach all to add and subtract, to compare the many with the few, the equal with the unequal, and these are the principles of arithmetic. At first all numbers are concrete, or associated with objects; but in time are thought of in the abstract, or simply as numbers. Now let us find words to express these numbers, and play with our scholars, leading them to repeat the sentences in which they occur: as I have one, Tom has three, William won four, but James lost four; and so on, till words take the places of the mute gestures previously used. Numbers require close attention and clear thinking. They individualize the objects or associate them in groups, and therefore are a good preparation for the clear thinking and

naming of other objects and actions. They belong more to the world of thought than material things, and gradually lead the learner to discover that he can treat abstractions as if they were realities. We would, therefore, begin to teach numbers as soon as the scholar can articulate their names. They often learn them without speech by usage, or by the things themselves as signs. Better, however, to displace these as soon as possible, and prevent their mechanical use, by the abstract forms expressed in words. We may say at first, Twice four are eight, and prove it by adding the units so as to have them all in our mind; but we soon drop the process, and say, Twice four are eight as a thing of memory only, and thus save much time and thought; but children who use signs only are ever repeating the process on their fingers or by strokes. To escape from this must be an improvement. This is the function of numbers in relation to language.

260. History.—As a record of past events history abounds in stirring and instructive accounts which can be profitably used in the education of deaf-mutes. Their sympathy, enthusiasm, and emulation are excited by great and heroic deeds, by the sufferings of the just, the punishment of the wicked, and the vindication of the innocent falsely accused. Their hearts are deeply moved, and their moral feeling instructed and strengthened in love for the good and dislike to the evil, when these recitals are made in simple, forcible language. But at the stage in their education when these histories could be introduced, any attempt to teach chronologically would be out of place, for the many dry details would excite no interest. What is done must be by a selection of the great events and moving incidents of Biblical, Grecian, Roman and English History, connecting the date and king's reign with each, so that they may be made land-marks of history, with which, in process of time, the events of less interest might be connected.

Short lessons could be written on each of these great events in which the teaching of language would find many opportunities to introduce and illustrate new phrases and forms of expression. The gradual introduction of the works from which these historic lessons are taken could be attended

to, and the passages read under the influence of the interest that has been excited in the events.

It must be confessed there is no book comparable to the Scriptures in this respect. As the best history in existence of its own times, it contains reliable accounts of some of the truest, wisest, and best of men and women that the world has ever known, told too in the simplest words and phrases, and therefore best adapted to the limited knowledge of language possessed by our scholars. God himself is revealed in its pages, and His law taught in commandment and precept, while it is most amply illustrated in the lives and rewards of the good, or vindicated in the severe punishments of the wicked. Above all, it contains the life, teaching and sufferings of the Son of God in narratives that can be read and understood by our scholars till His image is formed in their minds and His great redeeming work made clear. In such lessons the conscience will be enlightened, moral law receive its best exposition, and the attractions and inducements of a just and holy life be the greatest. Other histories teach us much, but this more than all that we need to know.

261. Geography. History without geography would be incomplete. Time and place belong to every thing, and often the place has much to do with the event. It would, therefore, be well to refer to a map for the place, and to any available illustration to give some idea of it. Every child learns geography from the moment he receives an intelligent perception of the objects which surround him. He may afterwards learn their names, find out their relations and uses, but none of these ever equal the wonder, delight and awe with which he first gazed on the glorious works of creation. He is therefore already in possession of his first lessons in geography and has mental maps of what he has seen. These are the elements from which we can advance in our lessons. The house, garden, fields, hills, and streams are already known, and we can plan or map them while we teach their names, for drawing helps much to fix and define floating ideas.

To begin with definitions would only be a loss of time. These will be in place when the objects themselves are

either seen or well described in words and pictures. A map looks most uninviting. It is made up of lines and names. Political boundaries mean nothing to so young a mind. Would we teach wisely let nature lead the way. Suppose we have climbed to the top of some high neighbouring hill or tower, and are looking about us. The elevation enables us to view the whole scene. It is spread out like a map. Hedgerows divide it into fields. Trees, woods, farm-houses, villages, and perhaps a town or city are included. Or still more, a river like a silver thread winds over the plain, and distant hills clearly outlined shut in the view. Here then we can sit down and draw a rough map of the whole, name the objects and talk about them till memory takes full possession of them. But the river, whence does it come? Out of the deep valley which divides this hill from the next. The slope is quickly descended to find it, and after a tumble down race we stand on its bank, now only a brook. Along this we hasten up the valley, and at last near its head find a great rock with precipitous front, at the foot of which is a well. This is the source of the river. The water springs up bright and clear there, and escapes on one side between some large pebbles. This little stream, this brooklet, is the beginning of that large river. The objects are named and recorded. We follow the stream, which is very shallow, and so narrow we can leap across it with ease. Its course is not straight, but it winds about—meanders and tumbles over rocks in tiny waterfalls, rushes by great stones, and at the bends forms little eddies and whirlpools, or runs slowly through a deep channel where the fish lie or leap after the flies that sport above. But it does not long run alone. Other brooks join it from lateral valleys, till it grows into a river with high banks, and leaving the valley, enters on the plain where we saw it from the height above.

This description may seem superfluous, but it will not prove so if the teacher and his class can repeat the trip for themselves, so as to form a real and intelligible connection between the geography of nature and that of books, and so enrich the vocabulary of the scholars with many new names and phrases taught by the objects themselves.

As we would deal with history, so would we with geo-

graphy. Instead of attempting to describe the globe, its seas, continents, and lands, we would select some of its most striking scenes and objects, as Mont Blanc, covered with snow and glaciers, the birth-place of rivers; or Vesuvius, pouring out smoke and streams of lava; or the falls of Niagara; a storm at sea, a sand-storm in the desert, or making a lesson of each, point to their places on the map, and sketch them. The earth has many scenes of greatest interest and importance to man, and when well taught they become centres or points of connection with others of less importance, till gradually the great world lies before the mind. These should be our first lessons in geography.

We venture to think that geography would be more interesting and instructive if we began with the mountain ranges, as the Rocky Mountains in America, the Pyrenees, Alps, Carpathian and Balkan, in Europe, the most prominent features of the surface of the land. They are the backbones of the continents. The great rivers rise on either side, and flow down to the seas. Their waters and deposits fertilise the lands which produce our corn or feed our flocks. In earlier ages they connected kingdoms and were waterways for commerce, war, or pleasure. Most of the great capitals were built on their banks, so that to name them recalls the history of civilisation. Would it not be better to begin with the features, which would afterwards enable us to show the connection between physical and political geography? The other features might follow in the order of their connection with these.

When we would teach something about the kingdoms of the world, the British Empire ought to have the first place, for it is second to none in extent, diversity of surface, and variety of productions. Our possessions are in every clime. Every English child is personally interested in their wealth and prosperity. Many will go to the distant colonies, or receive letters from relatives who are there. The time has come in which the geography of the Empire must have a prominent place in our lessons. Maps, photographs and drawings are acquainting us with its physical features, and specimens of its many productions are accumulating in the rooms of the Imperial Institute, and museums of large towns.

A visit to any of these, but chiefly to the Imperial, would interest and instruct. But our own beautiful islands must not be forgotten. To visit many of its famous places would be best, but failing this, there are books, such as "The Land we live in;" two volumes of "Picturesque Europe" on the British Isles, and many others which would enable the scholar to get tolerable ideas of the land and water, with the minerals, manufactures, great cities, and famous scenes.

The study of geography is much aided by drawing. Maps give the divisions, boundaries, mountains, rivers, etc., of a country, and these can all be copied and fill the place of an outline picture in the mind, so that when we think of any one spot we seem to be there, though we have never visited it. This ability to localise a place, and know something of its surroundings, is most helpful in reading or conversation. Drawing contributes little to language, but it greatly assists in giving clearer conceptions of objects about which much may be said.

But for deaf-mutes drawing is a great addition to their sources of enjoyment. Some of them have become eminent as painters. Deprived, as they are, of the pleasures and refining effects of music, sight is the only sense through which the beauty, harmony, and glory of nature can reach their minds. It is, therefore, due to them to cultivate this sense by language, drawing, painting, and photography, till they can rise to the full enjoyment of all that light, colour, form, and space contribute in spreading a magic grace over whatever meets the eye in a fine piece of scenery or work of art. There is plenty of room for language here, and I would have every deaf and dumb child capable of their intelligent appreciation.

262. Natural History.—It is well known that children delight in animals. No other objects excite their attention or quicken their perceptions so much. All domestic animals are their friends, and some of them their companions. Every form of life interests; but the dog and the cat are much thought of and talked about. To handle, stroke, play with them, dries many a tear and brightens many an hour. A sort of kinship is felt with them, and, could they only speak, they would satisfy the heart. They are, living,

active, gentle, or fierce, and somewhat feared, for they are able to hurt when angered, but usually they put up with much rough treatment from little children. Birds, beasts, fish, insects, and reptiles, all share in this hearty interest. They are, therefore, excellent subjects for descriptions and illustrations.

It is enough at first to describe their forms, their habits in finding their food, producing their young, and contending among themselves for the mastery. A menagerie, with a kingly lion, an elephant, camel, bear, and monkeys, is a house of wonders, and there many instructive lessons can be taught about the trunk of the elephant, the talons and beak of the eagle, the foot of the camel, or the terrible fangs of the tiger and lion. To visit a menagerie, and learn nothing of language, would be a mistake. Now that we have so many excellent works on Natural History, we could turn to any of them, and after pointing to one or other animal that has been seen, give a short description of it with some stirring anecdotes about its habits and modes of life. Here the verb of motion finds its most striking illustrations, and the adjective is much required in describing form, colour, size and disposition. Many of these are common to man and animals, and were it only for the effective aid they bring to the study of words, the scholars' interest in animals ought to be encouraged.

Here we are on the borders of Science. We have only to advance a few more steps to take up Botany, Astronomy, Geology, and Chemistry, for there is nothing to hinder a deaf-mute who has learned language and the logic it teaches from pursuing any of these sciences, and it ought to be our ambition to put it in their power, if stirred by the love of knowledge, to study them under competent masters. This has been done, and may be repeated.

263. On Teaching Grammar.—The utility of teaching grammar to deaf-mutes has often been questioned, and in many schools is practically ignored. The reasons assigned for this are: first, That it is really unnecessary. If the scholars are so well instructed in the language that they can read, write, and converse freely in it, nothing more is required; and, next, That the time spent in learning gram-

mar could be better employed in the study of Arithmetic, Geography, History, and the elements of some Science. These reasons are founded rather on the lack of time than on a want of estimation of the utility of the study. It is quite correct that a fair knowledge of language can be obtained without its aid. But this does not suffice if deaf-mutes are to enjoy the same advantages of education as the hearing. No one talks of excluding it from the schools of the latter. Its great value is admitted in teaching the logic of language, and the greater command over its elements from knowing their exact meaning and relations. And if this is true for those whose acquaintance with language is enlarged and strengthened by reading and constant social intercourse, it must be still more so for deaf-mutes, who are wholly dependent on the exercises of the school classes for what they learn of it. For it cannot be said that their intercourse with others is likely to add very much to the stock. But, still further, it must be admitted that no course of lessons, and no reading books at present provided, supply every element necessary to a fair knowledge and command of the language; but the study of grammar not only revises all that has been previously learned, but supplies many words and forms which could not find a place in a first course. In reality, it gives the teacher the opportunity—from the greater knowledge of language now possessed by the learner—to explain and illustrate what he had to pass by from the poverty of his resources. He can deal with it as with arithmetic, and show the reasons for the relations in which the various members of a sentence stand to one another. Or, in other words, it carries forward the mental development for which language is pre-eminently adapted. And further, if any other language has to be studied—either ancient or modern—then a knowledge of the grammar of our own is the best preparation, for there is much that is common in the structure of all languages. The logic taught by language is equal to all the business and social demands of life. This is well-sustained by the experience of many years employed in the work.

On the method of teaching grammar there is much room for different opinions. Usually it is applied to language as

a set of definitions and examples, to be learned apart from its use as the instrument of thought and intercourse. This is enough to make it uninteresting. No enthusiasm can be roused over it in this form. Memory drudges in the weary service. No need to teach it in this manner to deaf-mutes. A better is within their reach in the method by which they have learned language. Here the simple sentence is the foundation, and it consists of a noun and a verb, and they can be taught at first, not by definition, but by the subject and the action, naming them according to their nature. If this is done with a few familiar sentences, the learner will soon find out that noun means any subject, and verb any action or affirmative word. The definition can be added when its meaning is made clear by the exercises. In this manner would we proceed, as in the language lessons, till the compound sentence could be analysed grammatically. There is interest and vitality in this method, for it is founded on the principle that language is the expression of living connected thought, and grammar its formulated logic.

THE LESSON.

264. The knowledge contained in these auxiliary studies may be taught by conversation or by lessons written, spoken, and explained, followed by appropriate questions. Could it be done by conversation or dialogue it would be much better for the learner, in the free use of language which it necessitates, and its close approximation to the manner in which hearing children are taught. But every teacher is not prepared with the matter and the forms of expressing it which are required by this method, and therefore he must be prepared with the lesson, and confine himself to its illustration and analysis. But there are two forms in which the proposed lesson could be presented. One in which it is printed or written out, and the other in which it is used by the teacher as the matter of the conversation he holds with his scholars. The latter has considerable advantages over the former, for it affords a good exercise in composition to write out the lesson in detail on slate or board as it is taught and

remembered. Speech has the primary place here, and writing follows. Scholars taught in this manner have to depend much more on speech and memory, and it is therefore a better mental exercise for them.

The form in which the lesson is prepared and written is that used by most teachers of deaf-mutes. The question is, What shape should it take? To which some teachers find it difficult to give a satisfactory answer. But it may be said in a word that the matter of the lesson determines its form. It may be descriptive of objects, persons, scenes, and events, then present, or pictorially represented. All the exercises in language, exemplified in the exposition of the logical method of teaching it, furnish the materials for such lessons. They have only to be applied in a full description of the whole object or event, instead of one of its parts, as suggested in the remarks made on auxiliary studies. But there is no lack of matter. Plants, animals, and the other objects seen at the time provide it. One can be selected and made the subject. This ought to be treated according to the relative importance of its parts. It is a unity, but made up of parts of major and minor importance. If a tree is the subject, then the stem and roots ought to be first, for these are essential to its existence. Then the branches, twigs, and leaves can fitly follow. A collection of loose sentences about it would do little for mental training, compared with the form of description, which prepares the way for dealing with the object as a production of vegetable life, and serving many useful purposes. Hill's lessons are principally descriptive, and every one of them has a purpose beyond the naming of the objects and their parts. They are foundation-stones.

Narrative and Historic. Many events have occurred within the range of our scholars' recognition, and have already excited some interest. Or there are incidents in their own lives which are well remembered. Each of these can be formed into a lesson, and language clothes what was only a skeleton in conception. Then the most stirring events reported in the newspapers or in books might be fitly told, and form a series of lessons in which geography, natural history, and personal characteristics would have their place. A map

and an engraving, if available, ought to accompany them, so that the place and action might make the account more definite and real.

History, Hebrew, Greek, Roman, and English, provides abundance of anecdotes suited for interesting and instructive lessons. There is a cause, reason, or result in them, and they usually exemplify the influence of some moral law in the happiness or misery of the actors. What has been already said about the Holy Scriptures is also true here. Many most instructive lessons could be framed out of its events, which would do much for the moral and religious education of the scholar. If he could be led, after learning them well by the lesson, to recount them in his own words, it would do still more for his education in language.

Analytic and Constructive. When a passage has been selected from some work, and made the subject of a lesson, then after analysing it and explaining all its new names it might be reconstructed by the scholar out of the matter supplied by the analysis without reference to the text, till it is completed. This enables the teacher to mark, in comparing the forms, and show the scholar the points of composition in which he has failed, and the reasons for them. These are good exercises for the more advanced scholars.

Lessons on the use or purpose of any instrument, tool, article of furniture, or machine, might be framed, in which this should be first stated, and then all that follows should show how the materials, parts, and construction unite for this purpose. The use of a knife is to cut, and there would be no difficulty in showing that all its parts contribute to this effect. Such an exercise would aid the scholar much in connecting his ideas, finding out the meaning of complex relations, and grasping the subject in its unity. Causes, effects, and natural laws, might well be treated in the same manner, and introduce natural science.

When a fable or anecdote is told to exemplify and impress some moral law or religious truth, as the subject of a lesson, the moral should be first pronounced and written. Then in the progress of the lesson, the points that most explain its terms ought to be at once referred to them, so that it may

receive the full light of the incidents. Abstract terms are best taught in this manner.

Some teachers, as Dr. Graham Bell, think that instructive exercises could be made of sentences or passages in which omitted words had to be supplied by the scholar. But his vocabulary and knowledge of construction must be considerable to make them profitable. Better to begin by omitting the principal words of a sentence, as the noun or verb already learned, and from these advance to all the other parts of speech in the order of their importance, ending with the conjunctions or pivot words. Such a process would subject the logical sentence, either simple or compound, to close examination and revision.

To teach a lesson well is a great achievement, and to excel in this respect is to attain to our chief object as educators; for our knowledge will be of little use to others unless we can present it in the most interesting and instructive form. Here, if anywhere, "the half is in the manner." Some teachers possess the knowledge, and can arrange it with skill, but somehow fail in its exposition, while others less able can lead their scholars to its clear conception. The difference must be in themselves. To say that it is constitutional is to make the work hopeless to those who do not succeed at first. We have always more in our hearts than we imagine. If our sympathies are drawn out more fully, and we rouse ourselves to more lively efforts, and, above all, get into mental touch with our scholars, the means and modes of making our lessons effectual will not be wanting. Tasso well describes how we ought to proceed :—

"Cosi all' agro fanciul porgiamo aspersi
Di soave licor gli orli del vaso ;
Suechi amari ingannato intano ei beve
E dall' inganno sua vita riceve."

"Thus the sick infant's taste, disguis'd to meet,
We tinge the vessel's brim with juices sweet;
The bitter draught his willing lip receives;
He drinks deceived, and so deceived he lives."

The greatest of all teachers has given us the best examples of how to teach, both as to manner and method. Let us try to imitate Him, but, above all, get much of His love for children.

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The above List of Works, consulted or quoted by the Author, has been made to provide any teacher, who desires to study the subject more fully, with their titles and dates, in the several languages in which they have been published, so that he may procure them through booksellers, if not to be found in an available library.





