

## Abstracts

admitted to hospital on 25th February 1927 suffering from fever, rhinitis, and cough of five days' duration; since the preceding day, a marked swelling in the right side of the neck had occurred. Temperature, 40.3° C.; pharynx reddened; right tonsil swollen; posterior to this was a swelling the size of a hazel-nut. Blood-stained secretion was present in the right ear.

Incision of the tumour via the mouth evacuated blood-stained secretion and afforded slight improvement.

27th February.—Temperature, 40.5° C. Swelling in the neck was somewhat smaller. Purulent discharge came from the incision in the throat. Occasional blood-stained discharge came from the right ear, where investigation revealed a fistula in the anterior wall of the deep meatus.

During the night, profuse hæmorrhage took place from the right ear, not controlled until the meatus was packed with gauze and adrenalin.

28th February.—Temperature, 40° C. Condition was otherwise unchanged.

1st March.—Purulent discharge came through the wound in the mouth, and blood-stained secretion from the ear.

The general condition of the child did not permit ligature of the carotid artery, and, in spite of transfusion with saline solution, death occurred.

*Autopsy.*—A retropharyngeal and retrotonsillar abscess was present on the right side, with inflammatory involvement of the lymphatic glands; in the abscess was a traumatic aneurism (the result of softening of the wall of the vessel) of the internal carotid artery; it was the size of a pea, and had perforated into the abscess and into the external auditory meatus.

## ABSTRACTS

### THE EAR.

*On the Influence of the Semicircular Canals on the Gait of Man.*

P. DE HAAN, Dordrecht. (*Acta Oto-Laryngologica*, Vol. x., Fasc. i.)

In leading up to his own observations the author deals, in an introductory way, with the earlier work of Flourens and Ewald, and further, with the investigations of Quix on animals and with the work of Bárány on the gait of man. The effect of semicircular canal stimulation upon the upper limbs can be satisfactorily studied by the past-pointing test, but he recalls that when Bárány also used this test

## The Ear

for the lower limbs he often stated the absence of these reactions. The author suggests that their absence may be explained by compensation due to reflexes of deep sensibility. He next proceeds to describe how the influence of the labyrinth on the lower limbs may be studied and elucidated in another way, namely, by the walking test.

The influence of eye reflexes are minimised by blindfolding, and those from the neck by keeping the head rigid, and to obviate the influence of body reflexes he makes use of the observation by Bárány that no falling reaction takes place when, after turning, the patient shows a nystagmus in the horizontal plane, *i.e.*, after stimulation of the lateral canals alone.

When the lateral canals have been stimulated by rotation or when one lateral canal has been disturbed by caloric stimulation, the patient, walking with the head vertical and with the eyes closed, will be found to deviate from a prescribed path (either a straight line or a circle). This deviation may be called forth by stimulation so weak as not to elicit the sensation of being turned.

In the disturbed labyrinth of middle-ear suppuration the author considers the walking test important in practice to the otologist; also in accidents to the head, and further in cerebellar cases.

A summary of his conclusions is appended and also directions for the test. He remarks that Buys, another investigator, has also recommended the study of the walking test after caloric stimulation.

H. V. FORSTER.

*Slowing of the Pulse in connection with Labyrinthitis and Diseases of the Eye.* By G. N. TH. BORRIES, Copenhagen. (*Monats. f. Ohrenheilk.*, March 1927.)

At a Meeting of the Danish Otological Society, May 1923, the author drew attention to what he claimed to be an almost unrecognised symptom in connection with labyrinthitis, when he made the following statement:—Slowing of the pulse was a frequent phenomenon in acute labyrinthitis, when a pulse rate of 60 or even 58 was to be found.

This symptom was of great clinical importance, since of course general slowing of the pulse is usually considered to indicate intracranial pressure, cerebral abscess, etc. Incidentally in a certain number of infectious, perforating lesions of the eyeball, slowing of the pulse can be noted.

The clinical aspect of these phenomena and theory relating to the causation of the same are discussed, and the article terminates by the plea, that this symptom should be most carefully observed and included in every text-book on Otology.

ALEX. TWEEDIE.

## Abstracts

*Tonus-Induction by the Otolith Apparatus.* F. LEIRI, Helsingfors.  
(*Zeitschrift für Hals-, Nasen-, und Ohrenheilkunde*, Band xvii.,  
Heft 1, p. 127.)

Leiri holds that the reactions to lifting and lowering in the guinea-pig may be present even after the detachment of the otolith-membrane, as the changes in the pressure of the endolymph may affect the neuro-epithelial cells of the macula. This is more marked in the "fall" movement. The reaction is, however, more intense when the otolith-membrane is present. For the finer adaptations the otolith-membrane is necessary.

JAMES DUNDAS-GRANT.

*On the Co-operation and Interference of Reflexes from other Sense Organs with those of the Labyrinth.* Dr R. MAGNUS. (*Laryngoscope*, Vol. xxxvi., Nos. 1, 10, p. 701.)

Gastric achylia may be present without giving rise to any symptoms, because the absence of pepsin in the stomach is more or less compensated for by the trypsin of the pancreatic juice and the erepsin of the intestine. The labyrinths provide a similar example and especially the otolithic maculæ. These same organs evoke different static reflexes. Other sense organs evoke also static reflexes of approximately the same kind, and the different static functions of the body depend, therefore, not only upon labyrinthine, but also upon other stimuli. It is necessary to have a working knowledge of all reflexes and mechanisms which co-operate with the labyrinths if we wish to demonstrate the results of disease or loss of the labyrinths.

A table of labyrinthine reflexes is appended, and these are classified as:—(1) Reflexes responding to movements governed by the semi-circular canals. (2) Reflexes resulting from position governed by the otolithic apparatus.

Under the heading of co-operating reflexes are the following:—(1) Tonic neck reflexes on limbs. (2) Tonic neck reflexes on eye muscles. (3) Rotatory reactions on eye muscles. (4) Body righting reflexes acting on (a) the head, (b) the body. (5) Neck righting reflexes. (6) Optical righting reflexes.

The various reflexes as studied in animals are described in detail, but it is hard to abstract these experiments in useful form. The study of righting reflexes in man has just begun. We know that the five groups described in animals are also present in man.

Anyone interested in this branch of otology will find this article of very great interest.

ANDREW CAMPBELL.

# The Ear

## *The Present Status of Vestibular Tests in Intracranial Conditions.*

Dr L. FISHER. (*Laryngoscope*, Vol. xxxv., No. 9, p. 657.)

In the clinic of Dr C. H. Frazier of the University of Pennsylvania, practically all intracranial cases are studied neuro-otologically. On examining the records, cases were selected which were definitely verified by operation or post-mortem examination. One hundred and three cases were examined, and of these there were twenty-nine cerebello-pontine angle tumours. The vestibular findings indicated such a tumour in twenty-seven cases, while in two the findings were inaccurate. In four of these cases, the diagnosis was made by vestibular tests only. Of three tumours of the fourth ventricle, the results of vestibular examination were confirmed in each case. There were twenty-eight cerebellar lesions and the findings in twenty-one of these were correct, while incorrect in five cases. The cerebellum was excluded by vestibular tests in two cases. Twenty-eight cases were cerebral. (a) Hemispheric lesions—vestibular tests correct as to side of lesion in fifteen cases. The posterior fossa was ruled out in ten cases and in three cases vestibular tests alone made the diagnosis. (b) Pituitary lesions—tests gave correct location in ten cases, while the posterior fossa was ruled out in two cases and the tests were incorrect in the remaining one case.

Notes of a few cases are given in abridged form.

The phenomenon complex of a totally destroyed ear on one side, with non-responsive vertical semicircular canals on the side opposite the lesion, but with good responses from the horizontal canal on that side, is very typical of cerebello-pontine angle tumour. Variations may occur, as for instance eight cases retained hearing on the side of the lesion.

Vertigo and pastpointing are reliable indications of the condition of the posterior fossa. A cerebellar lesion, with very few exceptions, should show impaired vertigo and pastpointing. However, the presence of good vertigo and pastpointing is even more strongly indicative of a normal cerebellum. There is a lack of susceptibility in cerebellar lesions to vestibular stimulation. Nausea, pallor, sweating and vomiting after douching and turning were practically never encountered in cases of cerebellar disease, and their presence was used as almost a definite indication that the lesion was not cerebellar.

There is no definite phenomenon-complex for cerebral lesions. The vertical canals may or may not respond. The after-nystagmus may be shortened, lengthened or remain normal, but it is noted that cases of cerebral neoplasm tolerate very little vestibular stimulation.

In differentiating between a supra- and infra-tentorial lesion, the susceptibility or otherwise of a case to vestibular stimulation can frequently determine the point in a manner possible by no other type of examination.

ANDREW CAMPBELL.

## Abstracts

*On the Present Position of the "Hard-of-hearing" Schools in Berlin.*

GUSTAV BRÜHL. (*Zeitschr. für Laryngologie, Rhinologie, etc.*, Band xvi., September 1927, pp. 95-99.)

It is to the credit of the Berlin authorities that there are in that city six separate schools for children who are "hard-of-hearing," these numbering 410. The author estimates that this number represents only about one half of the children who should be in these institutions. Many partially deaf children, for one reason or another, remain in the ordinary elementary schools. These special schools for hard-of-hearing children are entirely separate from the institutes for deaf-mutes, of which there are three in Berlin with 405 pupils; these children, presumably, are all totally deaf and belong to the category of deaf-mutes.

For a child to be admitted to a "hard-of-hearing" school, the hearing must be less than  $2\frac{1}{2}$  m. (*i.e.* about 8 feet) for the ordinary voice, and may be as little as *loud speech ad concham* on one side only. It will be noticed that the limits for the hearing capacity are fixed far lower than is customary in our country, where the "six foot rule" for the whispered voice is supposed to be a guide. Brühl maintains that the deaf-mute and the "hard-of-hearing" child, as defined above, should not be educated together.

J. A. KEEN.

*The Deafened Child in the Elementary Schools: The Economic and Educational Aspects.* HAROLD HAYS. (*Med. Journ. and Record*, June 1927.)

The writer describes the method used in New York schools for detecting deafness amongst the scholars. Forty children at a time can be tested by the phono-audiometer. It is a combination of a phonograph and telephone system, whereby the record on the phonograph can be heard by a group of children through telephone receivers.

He states that in New York City 14.4 per cent. of the children have defective hearing.

N. S. CARRUTHERS.

*"Hearing" by Touch: Demonstration of a Case.* F. R. H. GAULT. (*Laryngoscope*, Vol. xxxvii., No. 3, p. 184.)

During the last four years the author has been working on a method whereby the fingers are made to act as a substitute for the ears for the purpose of "hearing." The speaker's vocal vibrations are instrumentally (Bell Telephone Company) communicated to the fingers of a subject in such a manner that spoken words can now be felt. The subject learns to distinguish between words felt, so that he may learn ultimately to associate feeling with meanings, and to understand speech through the medium of touch impressions. The deaf-mute, though he may lip-read, cannot hear his own voice and is accordingly unable to correct his own speech; but if he can feel his voice and that of the "teacher"

# The Larynx

in succession upon the same word, he, shortly, has cues to guide him in the act of speech.

Two of the patients taught in this way were able to interpret a story in colloquial English when they had nothing to go by except the feel of the words communicated through the apparatus to the fingers. Others were not quite so proficient, but many have acquired a familiarity of speech which was not possible before. They now know the accent, emphasis, rhythm, and tempo. These qualities can hardly be acquired by lip-reading. These patients are able to translate tactile vibrations into those of sound vibrations. Words such as "aim" and "ape," which cannot be distinguished by the lip-reader, can be discriminated by their feel. There are upwards of 2000 such words in the English language. One can feel the movement of speech more distinctly than it can be seen. The superiority of lip-touch reading over lip-reading gives assurance of a means whereby instruction in schools may be greatly accelerated and at the same time enhance the pupil's ability to read lips without instrumental aid when he is outside the school.

The hope is held out that an apt pupil after two or three years of special instruction in the lip-touch reading methods, may take his place in the regular public school and successfully compete with others. This assumes only that such schools equip themselves with the necessary tactile apparatus.

ANDREW CAMPBELL.

*A Source of Error when testing Hearing by the Voice Test.* FRANZ MRUCK. (*Munch. Med. Wochenschrift*, S. 1543, Nr. 36, Jahr. 74.)

The examiner should assure himself that when testing a patient the pitch and intensity of his voice are constant, and be aware of the distance at which a normal ear would hear his voice under such conditions. It is essential to remember that the distance at which different words are heard varies with normal hearing. Much practice is necessary so as to control the voice that its individual tones remain approximately of a like intensity.

Owing to the variations in the power of perception of different individuals, it is advisable to repeat the word on a few occasions after a momentary interval, before concluding that it has not been heard at any given distance.

J. B. HORGAN.

## THE LARYNX.

*Irradiation for Papillomata of the Larynx.* VICTOR FAIREN GALLAN (Zaragoza). (*Revista Española y Americana de Laringología*, November and December 1926, No. 6, p. 313.)

The author discusses the histology of papillomata of the larynx, emphasising the differences between those of inflammatory origin and true new growths, and between the papillomata of children and of

## Abstracts

adults, and the relation between the histological characters and the response to irradiation either with X-rays or radium. His observations are based on eleven cases of which the first six were reported at the International Congress in Paris.

In laryngeal papilloma formed by young cellular connective tissue, that is by numerous round cells with scanty fibrous tissue and an epithelial covering which is neither very thick nor keratinised, X-rays in several cases have caused the disappearance of the papilloma.

In fibrous papilloma in some cases irradiation appeared to cause arrest of growth, although none of the existing neoplasm disappeared, a similar effect to that encountered in certain uterine fibroids.

In fibrous papilloma with thickened, degenerating epithelium, true horny epidermis, irradiation with the present means has given no result, even after going so far as to give doses as intense as those employed for epithelioma (squamous-celled carcinoma) of the larynx.

Histological study of irradiated papillomata, in cases where irradiation has caused no alteration or only very little in the size of the growth, shows that the young, small, cellular elements observed before have disappeared, and nearly all the vessels, which proves that these papillomata no longer grow. In true papilloma irradiation does not give rise to cancerous degeneration. Treatment of laryngeal papilloma with Röntgen Rays demands perfect limitation of the irradiated area to avoid any action on the thyroid gland with resulting functional deficiency.

Finally it should be noted that if laryngeal irradiation is unskilfully employed, or if the patient is hypersensitive to irradiation, inflammatory reactions may be encountered, which are of gravity, because they are the starting-point of stenosis.

LIONEL COLLEDGE.

*Cancer of the Ventricular Band and Cavity of the Larynx.* H. COUTARD and A. VALAT. (*Annales des Maladies de l'Oreille, du Larynx, du Nez et du Pharynx*, May 1927.)

In a very comprehensive article the writers give an account of carcinoma of the larynx in general, and then go on to describe a series of twelve cases of this particular form of intrinsic cancer which is the subject of their thesis. Although admittedly rare, they place its incidence as high as 10 per cent. of all cancers of the larynx. Definite symptoms are only established when the lesion has reached a marked development. The voice is more often simply weakened than profoundly altered; dyspnoea is early because of the rapid and exuberant growth of the neoplasm; local pain may vary from a simple pricking sensation to one which is violent, lancinating and radiating to the ear. Hæmorrhages are far from being uncommon. There may be slight trouble with

# The Larynx

deglutition often marked for saliva and liquids, but without giving rise to a true dysphagia.

Examination shows, according to the initial site of the lesion, two different appearances, viz. :—(a) Cancer of the vestibular surface only. (b) Cancer of the thickness of the band and ventricle of Morgagni.

Both tend rapidly to spread, the former to the base of the epiglottis and opposite band and the latter into the lumen of the larynx forming a veritable hypertrophy *en masse*. Other characteristics, common to the two forms, are the abundant vascularisation and rapid growth, a bilateral tendency, the complete or relative mobility of the arytenoids, and the absence of spread to the glottis, the vocal cords always proving a barrier to extension from this region. In the progress of the lesion neighbouring structures in the periphery of the larynx, *e.g.*, cartilage, muscles, and perilaryngeal spaces are invaded, and the lymphatic glands are involved. Histological examinations have shown the epithelioma to vary from the mucosal epidermoid type of cell to that of the so-called lympho-epithelioma. The writers have in this form of cancer never met with the squamous type.

The differential diagnosis from certain forms of tuberculosis, syphilitic gummata and papillomata can only be determined by microscopy.

As regards treatment, the writers think that surgery is hardly justifiable when the bilateral nature of the lesion demands a total laryngectomy, and when the peripheral extension and glandular involvement make this operation itself impracticable. They therefore advocate Röntgen therapy especially as they find that cancers in this region appear to be often quite sensitive to the action of X-rays. To avoid the complications which the radiations are liable to cause in the region of the larynx, they advise a preliminary tracheotomy and resection of cartilages already invaded by the neoplasm. The results of their treatment by this method are set down in detail, and out of a series of eleven cases they claim six cures for periods averaging from 6 months to 3½ years. Of these six cases, one was inoperable, four refused total laryngectomy, and only one showed a lesion that could justifiably be dealt with by a partial laryngectomy.

L. GRAHAM BROWN.

*Malignancy of the Larynx and Œsophagus Treated by Radium Emanation.* FRANK RICHARD HERRIMAN. (*Laryngoscope*, September 1927, Vol. xxxvii., p. 664.)

When radium was first applied to malignancy of the larynx and œsophagus, the methods were so crude and the results in practically all cases so unsatisfactory, that it was very soon abandoned. Malignant lesions in these structures are so inaccessible and the tissues of which



## Abstracts

they are composed so quickly rendered radiosensitive that radium has now few advocates as a treatment for disease there located. In the author's clinic the use of radium has been discontinued for several years when he revived the therapy, using a new technique however—the implantation of radium emanation in screened “seeds,” directly into the affected tissues.

For laryngeal growths the technique consisted in exposure of the malignant area by direct laryngoscopy or the suspension method, the latter being preferable. For growths situated in the œsophagus, a standard œsophagoscope was brought into service. When adequate exposure had been obtained, the dimensions of the growth were carefully estimated, and the entire area of malignancy implanted at regularly spaced intervals with the removable, platinum radon seeds designed by Joseph Muir of New York. The employment of suspension laryngoscopy makes the placing of radium in the larynx a comparatively simple matter, and with the œsophagoscope and the aid of the fluoroscopic screen, it can be put in the œsophagus with equal facility. The opponents of radium in the treatment of such malignancies have continued to cite the severe reactions and distressing sequelæ which follow the use of the crude applicators first employed for work in these peculiarly sensitive structures. When the implantation technique was first instituted in the larynx, bare tubes were employed and the necrosis produced by these unscreened containers caused sloughing of the irradiated tissues, and frequently, grave injury to the adjacent healthy cartilage. In the œsophagus the caustic rays were even more dangerous, for sloughing meant lung perforation with almost certainly fatal results.

The designs of the seeds used by the author obviated practically all the difficulties encountered under the old methods. Implantation is by far the most accurate way of container, doing away with all danger of necrosis; the radioactive centres could be so placed that every section of the growth would be reached by the therapeutic rays while all caustic action was eliminated. One of the most important features of these seeds is that they are removable, as this dispenses with the difficulties involved in permitting foreign bodies to remain in the tissues of the upper alimentary canal.

Details of eight cases selected from a larger series are given. All the patients were “hopeless” so far as surgery was concerned, at the time the implantations were undertaken. When this report was made at the New York Academy of Medicine, 22nd December 1926, the patients were all alive, although the period which had elapsed since the treatment was begun was insufficient to permit the drawing of any conclusions as to the permanent relief which could be afforded. The author feels that even if no more than temporary

## Endoscopy for Foreign Bodies

palliation has been secured, this, in itself, is well worth the effort required to apply the treatment, inasmuch as every patient had been doomed to die within a few weeks, when they first came under his care. Most of them had been able to return to their regular occupations, and even those who were still obliged to wear tracheotomy tubes were comfortable and pursuing their ordinary mode of life.

AUTHOR'S ABSTRACT.

### ENDOSCOPY FOR FOREIGN BODIES.

*The Question of Removal of Foreign Bodies in the Œsophagus.*

FELDMANN (Moskow). (*Zeitschrift für Hals-, Nasen-, und Ohrenheilkunde*, Band xvi., Heft 4, p. 612.)

Feldmann protests against the use of the probang, œsophagoscopy being called for. He narrates three cases in illustration. In the first there was prolonged suffering owing to the patient's refusal of œsophagoscopy. Ultimately it was carried out and Feldmann's removal of a large meat-bone was followed by complete relief. The second was one of a copper coin pushed by means of a probang through a false passage in the wall of the œsophagus down to the level of the cardia. Death followed from pneumonia and pulmonary œdema. In the third case the probang had been several times passed before the patient was brought in great pain to Feldmann. After pumping out the mucopus he was able to see the fish-bone and to remove it by means of forceps. Double mediastinotomy gave vent to a quantity of pus, but the case terminated fatally.

JAMES DUNDAS-GRANT.

*Foreign Bodies in the Bronchi.* V. CALAMIDA. (*Arch. Ital. di Otol.*, Vol. xxxvii., 10th October 1926.)

The author reports three cases, in the first of which part of a denture 3.2 by 1.8 cm. was lying in the right bronchus. It was extracted without difficulty. The second case was one of a horse-shoe nail in the left bronchus in a boy of seven years. The first attempt at removal was unsuccessful on account of swelling of the mucous membrane and very copious purulent secretion. The next attempt was made through a tracheotomy wound, but again the foreign body could not be seen. On the third attempt the nail was seen and removed. The third case was one of a collar button in the right bronchus. On peroral bronchoscopy the author could not see it on account of swelling of the mucosa and copious pus. On the second attempt the stud was seen and grasped, but slipped from the forceps and was lost. On the next attempt the stud was found lying bottom upwards. It was seized with difficulty but was finally extracted.

## Abstracts

In his discussion of the three cases the author lays stress on the ease of extraction of the foreign body in the first case in which it had been in place only for a few days, as contrasted with the other two cases in which the foreign bodies had been in the bronchi for prolonged periods and the mucous membrane was already much damaged.

The author also states that he always uses inferior bronchoscopy in small children, and he considers it especially indicated when seeds or other vegetable bodies are present.

J. K. M. DICKIE.

*Concerning Latent Foreign Bodies in the Air Passages and in the Œsophagus.* J. GUISEZ. (*Bulletin d'Oto-Rhino-Laryngologie*, September 1927.)

Citing numerous cases met with in his practice the writer again draws attention to the importance of suspecting a foreign body lying latent in the air passages or œsophagus in those patients, especially infants and young children, where the symptoms presented are at all suggestive of an ensuing complication. He lays great stress upon the taking of a very careful history, of making a thorough clinical examination, especially in lung affections, and upon the necessity of bronchoscopy or œsophagoscopy even though the radiographic examination may be of no positive value.

L. GRAHAM BROWN.

*Œsophageal and Periœsophageal Abscesses caused by Foreign Bodies.* P. JACQUES. (*Annales des Maladies de l'Oreille, du Larynx, du Nez et du Pharynx*, July 1927.)

The writer records two cases to show with what rapidity an abscess may follow direct trauma to the œsophagus by sharp foreign bodies such as bone or fish bone. The pain of the supervening œsophagitis marks the original pain of the wound and is confused with it. Moreover, radiography is of little help in determining the presence or absence of the foreign body which is usually of a slender form, and indeed in other but expert hands may only lead to erroneous diagnosis.

Œsophagoscopy, therefore, is indicated, and this reveals the site of the lesion, usually just inside the pharyngeal opening, and likewise demonstrates the presence of the abscess and permits of its evacuation.

L. GRAHAM BROWN.

SEEING SOUND: THE STUDY OF SPEECH AND THE  
ACCURATE GRAFING OF SPEECH VIBRATION.

By Dr MAX A. GOLDSTEIN, St Louis. *The Laryngoscope*, August 1927.

(Abstracted by Dr J. S. Fraser, F.R.C.S.E.)

DR MAX A. GOLDSTEIN'S interest in the education of the deaf is well known to all otologists. The present article has an excellent historical introduction and is well illustrated.

Recorded speech from the introduction of papyrus and the stylus to the present day has been expressed by symbols. These take their origin from the form of familiar objects, or the shape of the organs of articulation in their varied positions. American investigators are now making attempts to record the phonetics of speech by the actual grafs of waves of motion, as created in the production of voice.

Helmolt, in 1667, attempted to prove that the origin of the letters of the Hebrew alphabet was based on the conformation of the organs of articulation (the tongue, lips, teeth, epiglottis, etc.). Two hundred years later (1867) A. Melville Bell and his son, Alexander Graham Bell, introduced their well-known system of visible speech. Goldstein, however, points out that there is a striking similarity between Bell's system and that of Rambaud presented over one hundred years previously.

An important advance in phonetics was made by the invention of the phone autograph (1856) of Leon Scott, of Paris, by which the vibration of the voice was recorded as a "Speech-graf." A little later came the Koenig Manometric Capsule, which consisted of a cavity divided into two parts by means of a thin, elastic diaphragm. A speaking-tube communicates with the chamber on one side of the diaphragm and gas-tubing with the chamber on the other. A current of gas is turned on and lighted, forming a pencil of light. When a sound is uttered into the speaking-tube, the air vibrations are transmitted through the membrane to the gas in the chamber beyond and the flame is thereby caused to vibrate up and down. The flame, however, vibrates with such rapidity that, in order to study the character of the changes, a revolving, four-sided mirror is employed. If one speaks into the apparatus, an undulatory band of light makes its appearance in the mirror.

Alexander Graham Bell, in collaboration with Clarence J. Blake, of Boston, was struck by the likeness between the mechanism of the phone autograph of Scott and the mechanism of the human ear, the membrane of the one being loaded by a lever of wood, and the membrane of the other by a lever of bone. Blake prepared a specimen consisting of part of the human ear containing the drumhead with the malleus and incus attached. The stapes was replaced by a stile of hay attached to the incus. A speaking-tube took the place of the outer ear. When a person sang or spoke into this ear the stile of hay vibrated with such amplitude as to enable Bell to obtain tracings of the vibrations upon smoked glass.

The author pays a tribute to the work of Helmholtz and of Marey, the inventor of the Marey Tambour. Zwaardemaker's Speech Recorder employed four Marey Tambours in different positions; it produced four simultaneous grafs of the various parts—lips, jaw, tongue, pharynx—concerned in the production of articulate speech. Next came the phonograph of Edison and the gramophone of Berliner. During the years 1924-25

## Seeing Sound

Dr Irving B. Crandall and C. F. Sacia, of the Research Department of the Bell Telephone Laboratories, constructed an apparatus by which highly accurate speech-wave forms have been procured. This apparatus includes (a) a condenser transmitter; (b) a seven-stage amplifier; and (c) an oscillograph vibrator.

In January, 1927, Mr Joseph W. Legg, Research Engineer of the Westinghouse Electric Company, announced the invention of the "Osiso," a portable and modified form of oscillograph, by means of which the study of the speech elements was greatly simplified. By means of this instrument the deaf child is shown the wave appearance of a properly made speech element and so can be encouraged to control his voice to produce the same wave. Faulty tone or voice production is corrected as teacher and pupil see together the actual, moving voice-picture. The instrument was presented to the Central Institute for the Deaf at St Louis.

To test the ability of the young deaf child to comprehend the many variations that are produced in the grafing of sound elements, Goldstein selected five deaf children, ages 4 to 6 years, and placed them, singly, before the blackboard. He then made a rapid chalk sketch of three hypothetical and difficult grafes indicating the word "cat." This was erased at once and the child directed to reproduce it. In each instance the children reproduced the grafes with fair accuracy. The deaf child can now be taught to realise his own speech mechanism, an act which he has but imperfectly performed and incompletely appreciated heretofore, by feeling the vibrations on the bones of the face or head, produced by the sound vibrations in his own larynx. The vowel grafes were found to vary considerably according to the intensity and timbre of the voice. A sensitive meter was therefore introduced between the microphone and the Osiso audion tube and an arbitrary standard (B-flat) was adopted.

Goldstein has thus made a phonetic alphabet of speech grafes which have been photographed and reproduced in half-tone blocks to illustrate the paper.

Speech to the normal child is but an imitation of the sounds he hears. If the speech model is imperfect, the imitation is imperfect. The deaf child hears no speech and other avenues must be found for his speech instruction. The two sense-organs which offer a valuable substitute for his lost sense of hearing are sight and touch. The deaf child is taught to feel the vibrations produced in the act of phonation; he is taught to see the changes in position of the mechanism of articulate speech, but he has not yet been made to realise the process which goes on in his own larynx in the production of speech. Reflected in the revolving mirror of the Osiso he sees a motion picture of his own phonetic efforts; he is taught to recognise his own imperfections in speech production and is trained to make his own correction. Goldstein emphasises the fact that the appreciation of voice vibration by the sense of touch is a less delicate messenger to the brain than the recognition of the Osisogram by sight.

The first objective, therefore, in the use of the Osiso is to familiarise the eye of the deaf child with the model Osisograms. These should be impressed on the active child-brain as readily as the symbols of the alphabet or the phonetic symbols of shorthand, and it should be possible to teach the phonetics of speech to the deaf child as readily as to teach him writing or reading by the usual symbols of the alphabet.