looking at the face one at first may have the impression that the affected side is the sound one. This is corrected at once on asking the patient to smile, when it is seen which side of the face has the most active movement.

The *diagnosis* of facial paralysis is usually easy. The distinction between peripheral and central is based on facts already mentioned.

Treatment.—In the cases which result from cold and are probably due to neuritis within the bony canal, hot applications first should be made; subsequently the thermo-cautery may be used lightly at intervals of a day or two over the mastoid process, or small blisters applied. If the ear is diseased, free discharge for the secretion should be obtained. The continuous current may be employed to keep up the nutrition of the muscles. The positive pole should be placed behind the ear, the negative one along the zygomatic and other muscles. The application can be made daily for a quarter of an hour and the patient can readily be taught to make it himself before the looking-glass. Massage of the muscles of the face is also useful.

A course of iodide of potassium may be given even when there is no indication of syphilis.

Spasm.—The spasm may be limited to a few or involve all the muscles innervated by the facial nerve and may be unilateral or bilateral.

It is known also by the name of mimic spasm or of convulsive tic. Several different affections are usually considered under the name of facial or mimic spasm, but we shall here speak only of the simple spasm of the facial muscles, either primary or following paralysis, and shall not include the cases of habit spasm in children, or the *tic convulsif* of the French.

Gowers recognizes two classes—one in which there is an organic lesion, and an idiopathic form. It is thought to be due also to reflex causes, such as the irritation from carious teeth or the presence of intestinal worms. The disease usually occurs in adults, whereas the habit spasm and the *tic convulsif* of the French, often confounded with it, are most common in children. True mimic spasm occasionally comes on in childhood and persists. In the case of a school-mate, the affection was marked as early as the eleventh or twelfth year and still continues. When the result of organic disease there has usually been a lesion of the centre in the cortex, as in the case reported by Berkeley, or pressure on the nerve at the base of the brain by aneurism or tumor.

Symptoms.—The spasm may involve only the muscles around the eye—blepharospasm—in which case there is constant, rapid, quick action of the orbicularis palpebrarum, which, in association with photophobia, may be tonic in character. More commonly the spasm affects the lateral facial muscles with those of the eye and there is constant twitching of the side of the face with partial closure of the eye. The frontalis is rarely involved. In aggravated cases the depressors of the angle of the mouth, the levator menti, and the platysma myoides are affected. This spasm is confined to one side of the face in a majority of cases, though it may extend and become bilateral. It is increased by emotional causes and involuntary movements of the face. As a rule, it is painless, but there may be tender points on the course of the fifth nerve, particularly the supraorbital branch. Tonic spasm of the facial muscle may follow paralysis, and is said to result occasionally from cold.

The outlook in facial spasm is always dubious. A majority of the cases persist for years and are incurable.

Treatment.—Sources of irritation should be looked for and removed. When a painful spot is present over the fifth nerve, blistering or the application of the thermo-cautery may relieve it. Hypodermic injections of strychnia may be tried, but are of doubtful benefit. Weir Mitchell recommends the freezing of the cheek for a few minutes daily or every second day with the spray, and this, in some instances, is beneficial. Often the relief is transient; the cases return, and at every clinic may be seen half a dozen or more of such patients who have run the gamut of all measures without material improvement. Operative interference may be resorted to in severe cases, although not much can be expected of it.

VI. Auditory Nerve.

This nerve, forming the *portio mollis* of the seventh pair, enters the internal auditory meatus, and divides into the cochlear and vestibular branches. The cortical centre for hearing is in the temporo-sphenoidal lobe. Primary disease of the auditory nerve in its centre or intracranial course is uncommon. More frequently the terminal branches are affected within the labyrinth.

(*a*) *Affection of the Cortical Centre.*—In the monkey, experiments indicate that the first temporal gyri represent the centre for hearing. In man the cases of disease indicate that it has the same situation, as destruction of this gyrus on the left side results in word-deafness, which may be defined as an inability to understand the meaning of words, though they may still be heard as sounds. The central fibres of the auditory nerve between the cortical centre and the nucleus in the fourth ventricle may be involved and produce deafness. This has resulted from the presence of a tumor in the corpora quadrigemina, and may be associated with a lesion of the internal capsule.

(*b*) *Lesions of the nerve at the base* of the brain may result from the pressure of tumors, meningitis (particularly the cerebro-spinal form), hæmorrhage, or traumatism. A primary degeneration of the nerve may occur in locomotor ataxia. Nuclear disease is rare. By far the most interesting form results from epidemic cerebro-spinal meningitis, in which the

nerve is frequently involved, causing permanent deafness. In young children the condition results in deaf-mutism.

(*c*) In a majority of the cases associated with auditory-nerve symptoms the lesion is in the *labyrinth*, either primary or the result of extension of disease of the middle ear. Three groups of symptoms may be produced—hyperæsthesia and irritation, diminished function or nervous deafness, and vertigo.

(1) *Hyperæsthesia and Irritation.*—This may be due to altered function of the centre as well as of the nerve ending. True hyperæsthesia—hyperacusis—is a condition in which sounds, sometimes even those inaudible to other persons, are heard with great intensity. It occurs in hysteria and occasionally in cerebral disease. As already mentioned, in paralysis of the stapedius low notes may be heard with intensity. In dysæsthesia, or dysacusis, ordinary sounds cause an unpleasant sensation, as commonly happens in connection with headache, when ordinary noises are badly borne.

Tinnitus aurium is a term employed to designate certain subjective sensations of ringing, roaring, ticking, and whirring noises in the ear. It is a very common and often a distressing symptom. It is associated with many forms of ear disease and may result from pressure of wax on the drum. It is rare in organic disease of the central connections of the nerve. Sudden intense stimulation of the nerve may cause it. A form not uncommonly met with in medical practice is that in which the patient hears a continual *bruit* in the ear, and the noise has a systolic intensification, usually on one side. I have twice been consulted by physicians for this condition under the belief that they had an internal aneurism. It occurs in conditions of anæmia and neurasthenia. Subjective noises in the ear may precede an epileptic seizure and are sometimes present in migraine. In whatever form tinnitus exists, though slight and often regarded as trivial, it occasions great annoyance and often mental distress, and has even driven patients to suicide.

The *diagnosis* is readily made; but it is often extremely difficult to determine upon what condition the tinnitus depends. The relief of constitutional states, such as anæmia, neurasthenia, or gout, may result in cure. A careful local examination of the ear should always be made. One of the most worrying forms is the constant clicking, sometimes audible many feet away from the patient, and due probably to clonic spasm of the muscles connected with the Eustachian tube or of the levator palati. The condition may persist for years unchanged, and then disappear suddenly. The pulsating forms of tinnitus, in which the sound is like that of a systolic *bruit*, are almost invariably subjective, and nothing is audible with the stethoscope. It is to be remembered that in children there is a systolic brain murmur, best heard over the ear, and in some instances is heard in the adult.

(2) *Diminished Function or Nervous Deafness.*—In testing for nervous deafness, if the tuning-fork cannot be heard when placed near the meatus, but the vibrations are audible by placing the foot of the tuning-fork against the temporal bone, the conclusion may be drawn that the deafness is not due to involvement of the nerve. The vibrations are conveyed through the temporal bone to the cochlea and vestibule. The watch may be used for the same purpose, and if the meatus is closed and the watch is heard better in contact with the mastoid process than when opposite the open meatus, the deafness is probably not nervous. Practically, disturbance of the function of the auditory nerve is not a very frequent symptom in brain-disease, but in all cases the function of the nerve should be carefully tested

(3) **Auditory Vertigo—Menière's Disease.**—In 1861 Menière, a French physician, described an affection characterized by noises in the ear, vertigo (which might be associated with loss of consciousness), vomiting, and, in many cases, progressive loss of hearing. The term is now used to include all cases of sudden vertigo accompanied by noises in the ear and deafness. The frequency of vertigo with ear symptoms is striking. Thus, of 106 cases noted by Gowers, in which there was definite vertigo, in 94 ear symptoms were present, either tinnitus or deafness or both.

Symptoms.—The attack usually sets in suddenly with a buzzing noise in the ears and the patient feels as if he was reeling or staggering. He may feel himself to be reeling, or the objects about him may seem to be turning, or the phenomena may be combined. The attack is often so abrupt that the patient falls, though, as a rule, he has time to steady himself by grasping some neighboring object. There may be slight but transient loss of consciousness. In a few minutes, or even less, the vertigo passes off and the patient becomes pale and nauseated, a clammy sweat breaks out on the face, and vomiting may follow.

The deafness, which is always of a nervous character, may be in only one ear and is never complete. The tinnitus is described as either a roaring or a throbbing sound. Ocular symptoms may be present; thus, jerking of the eyeballs or nystagmus may develop during the attack, or diplopia.

Labyrinthine vertigo is paroxysmal, coming on at irregular intervals. Sometimes weeks or months may elapse between the attacks; in other cases there may be several attacks in a day. As a rule, the patients have no affection of the middle ear. The disease rarely occurs in young persons, is most frequent after the fortieth year, and is more common in men than in women.

The pathology of the disease has been much discussed. There are two theories concerning its origin—one, that it is due to affection of the labyrinth itself, which causes a disturbance of equilibrium, such as is proved by experiment to be associated with lesion of the semicircular canals; the other that it is really a trouble involving the centres presiding over hearing and equilibration.

It has also been held to be a vaso-motor neurosis of the vessels of the labyrinth. The condition of the labyrinth in these cases is variable. Acute disease with hæmorrhage has been described, or slow progressive degeneration of the nerves. Giddiness and vomiting may, however, be produced by irritation in other parts of the ear; thus, there are instances in which pressure on the drum or irritation of the external meatus is followed by an attack of giddiness and vomiting.

Diagnosis.—The combination of tinnitus with giddiness, with or without gastric disturbance, is sufficient to establish a diagnosis. There are other forms of vertigo from which it must be distinguished. The form known as gastric vertigo, which is associated with dyspepsia and occurs most commonly in persons of middle age, is, as a rule, readily distinguished by the absence of tinnitus or evidences of disturbance in the function of the auditory nerve. This variety of vertigo is much less common than Trousseau's description would lead us to believe.

The cardio-vascular vertigo, one of the most common forms, occurs in cases of valvular disease, particularly aortic insufficiency, and as frequently in arterio-sclerosis.

There is a remarkable form of vertigo described by Gerlier, which is characterized by attacks of paretic weakness of the extremities, falling of the eyelids, remarkable depression, but with retention of consciousness. It attacks only men, and has occurred in epidemic form among laborers in the canton of Geneva.

Aural vertigo must be carefully distinguished from attacks of *petit mal*, or, indeed, of definite epilepsy. It is rare in *petit mal* to have noises in the ear or actual giddiness, but in the aura preceding an epileptic attack the patient may feel giddy. Giddiness and transient loss of consciousness may be associated with organic disease of the brain, more particularly with tumor. Vomiting also may be present. A careful investigation of the symptoms will usually lead to a correct diagnosis.

The outlook in Menière's disease is uncertain. While many cases recover completely, in others deafness results and the attacks recur at shorter intervals. In aggravated cases the patient constantly suffers from vertigo and may even be confined to his bed.

Treatment.—Bromide of potassium, in twenty-grain doses three times a day, is sometimes beneficial. If there is a history of syphilis, the iodide should be administered. The salicylates are recommended, and Charcot advises quinine to cinchonism. In cases in which there is increase in the arterial tension nitroglycerine may be given, at first in very small doses, but increasing gradually. It is not specially valuable in Menière's disease, but in the cases of giddiness in middle-aged men and women associated with arterio-sclerosis it sometimes acts very satisfactorily.

VII. Glosso-pharyngeal Nerve.

This nerve contains both motor and sensory fibres and is also a nerve of the special sense of taste to the tongue. It supplies, by its motor branches, the stylo-pharyngeus and the middle constrictor of the pharynx. The sensory fibres are distributed to the upper part of the pharynx.

Symptoms.—Of nuclear disturbance we know very little. The pharyngeal symptoms of bulbar paralysis are probably associated with involvement of the nuclei of this nerve. Lesion of the nerve trunk itself is rare, but it may be compressed by tumors or involved in meningitis. Disturbance of the sense of taste may result from loss of function of this nerve, in which case it is chiefly in the posterior part of the tongue and soft palate. Gowers, however, states that there is no case on record in which loss of taste in these regions has been produced by disease of the roots of the glosso-pharyngeal; whereas, on the other hand, disease of the root of the fifth nerve may cause loss of taste on the back as well as the front of the tongue, as if the taste fibres of the glosso-pharyngeal came from the fifth.

The general disturbances of the sense of taste may here be briefly referred to. Loss of the sense of taste—*ageusia*—may be caused by disturbance of the peripheral end organs, as in affections of the mucosa of the tongue. This is very common in the dry tongue of fever or the furred tongue of dyspepsia, under which circumstances, as the saying is, everything tastes alike. Strong irritants too, such as pepper, tobacco, or vinegar, may dull or diminish the sense of taste. Complete loss may be due to involvement of the nerves either in their course or in the centres. Disturbance in the sense of taste is most commonly seen in involvement of the fifth nerve, and it may be that this nerve alone subserves the function. Perversion of the sense of taste—*parageusis*—is rarely found, except as an hysterical manifestation and in the insane. Increased sensitiveness is still more rare. There are occasional subjective sensations of taste, occurring as an aura in epilepsy or as part of the hallucinations in the insane.

To test the sense of taste the patient's eyes should be closed and small quantities of various substances applied. The sensation should be perceived before the tongue is withdrawn. The following are the most suitable tests: For bitter, quinine; for sweetness, a strong solution of sugar or saccharin; for acidity, vinegar; and for the saline test, common salt. One of the most important tests is the feeble galvanic current, which gives the well-known metallic taste.

VIII. Pneumogastric Nerve.

The vagus nerve has an important and extensive distribution, supplying the pharynx, larynx, lungs, heart, œsophagus, and stomach. The nerve may be involved at its nucleus with the spinal accessory and the hypoglossal, forming what is known as bulbar paralysis. It may be com-