water should be used, or, if there is much mucus, a one per cent salt solution, or a three to five per cent solution of bicarbonate of soda. If there is much fermentation the three per cent solution of boric acid may be used, or a dilute solution of carbolic acid. It is best employed in the morning on an empty stomach, or in the evening some hours after the last meal. It is perhaps preferable in the morning, except in those cases in which there is much nocturnal distress and flatulency. Once a day is, as a rule, sufficient, or, in the case of delicate persons, every second day. The irrigation may be continued until the water which comes away is quite clear. It is not necessary to remove all the fluid after the irrigation.

While perhaps in some hands this measure has been carried to extremes, it is one of such extraordinary value in certain cases that it should be more widely employed by practitioners. When there is an insuperable objection to lavage a substitute may be used in the form of warm alkaline drinks, taken slowly in the early morning or the last thing at night.

Of medicines which stimulate the gastric secretion the most important are the bitter tonics, such as quassia, gentian, columbo, cundurango, ipecacuanha, strychnia, and cardamoms. These are probably of more value in chronic gastritis than the hydrochloric acid. Of these strychnia is the most powerful, though none of them have probably any very great stimulating action on the secretion, and influence rather the appetite than the digestion. Of stomachics which are believed to favorably influence digestion the most important are alcohol and common salt. The former would appear to act in moderate quantities by increasing the acid in the gastric juice, and with it probably the pepsin formation. Others hold that it is not so much the secretory as the motor function of the stomach which the alcohol stimulates. In moderate quantities it has certainly no directly injurious influence on the digestive processes. Special care should be taken, however, in ordering alcohol to dyspeptics. If a patient has been in the habit of taking beer or light wines or stimulants with his meals, the practice may be continued if moderate quantities are taken. Beer, as a rule, is not well borne. A dry sherry or a glass of claret is preferable. In the case of women with any form of dyspepsia stimulants should be employed with the greatest caution, and the practitioner should know his patient well before ordering alcohol.

The importance of salt in gastric digestion rests upon the fact that its presence is essential in the formation of the hydrochloric acid. An increase in its use may be advised in all cases of chronic dyspepsia in which the acid is defective.

Treatment of Special Conditions.—Fermentation and flatulency. When the digestion is slow or imperfect, fermentation goes on in the contents, with the formation of gas and the production of lactic, butyric, and acetic acids. For the treatment of this condition careful dieting may suffice, particularly forbidding such articles as tea, pastry, and the coarser vegetables. It is usually combined with pyrosis, in which the acid fluids are brought into the mouth. Bismuth and carbonate of soda sometimes suffice to relieve the condition. Thymol, creosote, and carbolic acid may be employed. For acid dyspepsia Sir William Roberts recommends the bismuth lozenge of the British Pharmacopœia, the antacid properties of which depend on chalk and bicarbonate of soda. It should be taken an hour or two after meals, and only when the pain and uneasiness are present. Glycerine in from twenty to sixty minim doses, the essential oils, animal charcoal alone or in combination with compound cinnamon powder, may be tried. If there is much pain, chloroform in twenty-minim doses or a teaspoonful of Hoffman's anodyne may be used. If obstinate, lavage is indicated and is sometimes striking in its effects. Alkaline solutions may be used.

Vomiting is not a feature which often calls for treatment in chronic dyspepsia; sometimes in children it is a persistent symptom. Creosote and carbolic acid in drop doses, a few drops of chloroform or of dilute hydrocyanic acid, cocaine, bismuth, and oxalate of cerium may be used. If obstinate, the stomach should be washed out daily.

Constipation is a frequent and troublesome feature of most forms of indigestion. Occasionally small doses of mercury, podophyllin, the laxative mineral waters, sulphur, and cascara may be employed. Glycerine suppositories or the injection of from half a teaspoonful to a teaspoonful of glycerine is very efficacious.

Many cases of chronic dyspepsia are greatly benefited by the use of mineral waters, particularly a residence at the springs with a careful supervision of the diet and systematic exercise. The strict *régime* of certain German Spas is particularly advantageous in the cases in which the chronic dyspepsia has resulted from excess in eating and in drinking. Kissingen, Carlsbad, Ems, and Wiesbaden are to be specially recommended.

IV. NEUROSES OF THE STOMACH.

(1) **Gastralgia; Gastrodynia.**—Severe pains in the epigastrium, paroxysmal in character, occur (*a*) as a manifestation of a functional neurosis, independent of organic disease, and usually associated with other nervous symptoms (it is this form which will here be described); (*b*) in chronic disease of the nervous system, forming the so-called gastric crises; and (*c*) in organic disease of the stomach, such as ulcer or cancer.

The functional neurosis occurs chiefly in women, very commonly in connection with disturbed menstrual function or with pronounced hysterical symptoms. The affection may set in as early as puberty, but it is more common at the menopause. Anæmic, constipated women who have worries and anxieties at home are most prone to the affection. It is more frequent in brunettes than in blondes. Attacks of it sometimes occur in robust, healthy men. More often it is only one feature in a condition of

general neurasthenia or a manifestation of that form of nervous dyspepsia in which the gastric juice or hydrochloric acid is secreted in excess. I am very skeptical as to the existence of a gastralgia of purely malarial origin.

The symptoms are very characteristic; the patient is suddenly seized with agonizing pains in the epigastrium, which pass toward the back and around the lower ribs. The attack is usually independent of the taking of food, and may recur at definite intervals, a periodicity which has given rise to the supposition in some cases that the affection is due to malaria. The most marked periodicity, however, may be in the gastralgic attacks of ulcer. They frequently come on at night. Vomiting is rare; more commonly the taking of food relieves the pain. To this, however, there are striking exceptions. Pressure upon the epigastrium commonly gives relief, but deep pressure may be painful. It seems scarcely necessary to separate the forms, as some have done, into irritative and depressive, as the cases insensibly merge into each other. Stress has been laid upon the occurrence of painful points, but they are so common in neurasthenia that very little importance can be attributed to them.

The *diagnosis* offers many difficulties. Organic disease either of the stomach or of the nervous system must be excluded. In the case of ulcer or cancer this is not always easy. I well remember the case of a poor fellow who was discharged from the Montreal General Hospital as a malingerer. He had been a soldier, was well nourished, had no vomiting, but had severe attacks of abdominal pain. The examination was negative, and it was thought to be a case of simulation. A week subsequent to his discharge he was readmitted with peritonitis from perforation. The fact that the pain is most marked when the stomach is empty and is relieved by the taking of food is sometimes regarded as pathognomonic of simple gastralgia, but to this there are many exceptions, and in cancer the pains may be relieved on eating. The prolonged intervals between the attacks and their independence of diet are important features in simple gastralgia; but in many instances it is less the local than the general symptoms of the case which enable us to make the diagnosis.

(2) **Nervous Dyspepsia.**—According to Leube, who first separated it from the ordinary gastric catarrh, nervous dyspepsia is characterized by sensations of distress and uneasiness during digestion, and yet the act is accomplished within the physiological time limit. The studies of Ewald, Oser, Rosenbach, and others have greatly extended our knowledge of the condition. The cases are met with most frequently in those who have either inherited a neurotic constitution or have gradually, through indiscretions, brought about a condition of nervous prostration. All grades occur, from the emaciated, skeleton-like subject of anorexia nervosa to the well-nourished, healthy-looking, fresh-complexioned patient whose constant complaint is distress and uneasiness after eating. If in a case of dyspepsia the stomach is found empty seven hours after the test dinner, the supposition is that the trouble is nervous (Leube). The separation of

the different forms can only be made accurately by the chemical examination of the juices.

Clinical Forms.—Leube recognizes three chief types. (*a*) Nervous dyspepsia with normal secretion. There is no dilatation of the stomach, no pain on pressure, and no change in the condition of the acid. The test meal is digested within the normal time. Yet, despite the fact that the motor and chemical functions of the organ are perfectly performed, there are distress and uneasiness during the act of digestion. The patient complains of pressure and distention of the stomach; eructations occur.

(*b*) The condition of subacidity or inacidity. Lack of the normal amount of acid is found in chronic catarrh, and particularly in cancer. According to Leube, reduction in the normal amount of acid may exist with the most pronounced symptoms of nervous dyspepsia, and yet the stomach will be free from food within the regular time. A condition in which the gastric juice is entirely without acid may occur in cancer, in extreme sclerosis of the mucous membrane, and as a nervous manifestation of hysteria, and occasionally of tabes. The most aggravated cases are those associated with hysteria and neurasthenia. In addition to the general symptoms, there are loss of appetite, sleeplessness, and gastric distress, and when the stomach is empty there are uneasy local sensations and general feelings of malaise, headache, and dizziness.

(*c*) Nervous dyspepsia with hyperacidity of the gastric juices. This is a form of dyspepsia which has long been recognized, but of late has been specially studied by Reichman and others. The percentage of acid may be doubled. This increase in the acid may be an intermittent condition or continuous. The periodic form is really a neurosis of secretion—*gastroxynsis* of Rosenbach—which may be quite independent of the time of digestion. Such cases are rare and are associated either with profound neurasthenia or with locomotor ataxia. The attack may last for several days. It usually sets in with a gnawing, unpleasant sensation of the stomach, severe headache, and shortly after the patient vomits a clear, watery secretion of such acidity that the throat is irritated and made raw and sore. As mentioned, the attacks may be quite independent of food. The chronic condition of hyperacidity is more common. Digestion is usually retarded, particularly for the starches, and there are eructations of acid fluid and gastric distress. There are instances also in which when the stomach contains no food there is a secretion of a highly acid juice. In these cases burning acid eructations, or even vomiting, occurring during the night or early in the morning, are quite characteristic.

The relation of hyperacidity to gastric ulcer will be considered later.

(3) **Nervous Vomiting; Peristaltic Unrest; Rumination.**—(*a*) *Nervous Vomiting*—a condition which is not associated with anatomical changes in the stomach or with any state of the contents, but is due to nervous influences acting either directly or indirectly upon the centres presiding over the act of vomiting. The patients are, as a rule, women—

usually brunettes—and the subject of more or less marked hysterical manifestations. A special feature of this form is the absence of the preliminary nausea and of the straining efforts of the ordinary act of vomiting. It is rather a regurgitation, and without visible effort and without gagging the mouth is filled with the contents of the stomach, which are then spat out. It comes on, as a rule, after eating, but may occur at irregular intervals. In some cases the nutrition is not impaired, a feature which may give a clew to the true nature of the disease, as there may be no other hysterical manifestation present. As noted by Tuckwell, it may occur in children. Nervous vomiting is rarely serious. Death may, however, follow, as in the case reported by Garland,* in which a young woman, aged twenty, had had from the age of two attacks of vomiting which lasted for twenty-four hours, and which were very apt to occur when the child was extra well and vivacious. She had St. Vitus's dance at eleven. At about the age of twenty, she had excessive muscular twitchings, clonic in character and uncontrollable, and amounting to violent motion of the muscles. When twenty-two she had severe headache, gradually lost flesh, and became low-spirited. In January, 1884, she had headache, twitchings, and constant vomiting, and died on the 13th. There was slight atrophy of the mucous membrane of the stomach and slight increase in the firmness of the kidneys.

A type of vomiting is that associated with certain diseases of the nervous system—particularly locomotor ataxia—forming part of the gastric crises. Leyden has reported cases of primary periodic vomiting, which he regards as a neurosis.

(*b*) *Peristaltic Unrest.*—This condition, as described by Kussmaul, is an extremely common and distressing symptom in neurasthenia. Shortly after eating the peristaltic movements of the stomach are increased, and borborygmi and gurgling may be heard, even at a distance. The subjective sensations are most annoying, and it would appear as if in the hyperæsthetic condition of the nervous system the patient felt normal peristalsis, just as in these states the usual beating of the heart may be perceptible to him. A further analogy is afforded by the fact that emotion increases this peristalsis. It may extend to the intestines, particularly to the duodenum, and on palpation over this region the gurgling is most marked. The movement may be anti-peristalsis, in which the wave passes from left to right, a condition which may also extend to the intestines. There are cases on record in which colored enemata or even scybala have been discharged from the mouth.

(*c*) *Rumination; Merycismus.*—In this remarkable and rare condition the patients regurgitate and chew the cud like ruminants. It occurs in neurasthenic or hysterical persons, epileptics, and idiots. In some instances it is hereditary. There is an instance in which a governess taught

* Transactions of the Association of American Physicians, vol. iv.

it to two children. The habit may persist for years, and does not necessarily impair the health.

Treatment of Neuroses of the Stomach.—The gastralgia, if very severe, requires morphia, which is best administered subcutaneously in combination with atropia. In the milder attacks the combination of morphia (gr. $\frac{1}{8}$) with cocaine and belladonna is recommended by Ewald. The greatest caution should, however, be exercised in these cases in the use of the hypodermic syringe. It is preferable, if opium is necessary, to give it by the mouth, and not to let the patient know the character of the drug. Chloroform, in from ten to twenty drop doses, or Hoffman's anodyne will sometimes allay the severe pains. The general condition should receive careful attention, and in many cases the attacks recur until the health is restored by change of air with the prolonged use of arsenic. If there is anæmia iron may be given freely. Nitrate of silver in doses of gr. $\frac{1}{4}$ to $\frac{1}{2}$ in a large claret-glass of water taken on an empty stomach is useful in some cases.

Many cases of nervous dyspepsia with marked neurasthenic or hysterical symptoms do well on the Weir-Mitchell treatment, and in obstinate forms it should be given a thorough trial. The most striking results are perhaps seen in the cases of anorexia nervosa, which will be referred to subsequently. It is also of value in the nervous vomiting. In the distressing cases of hyperacidity, in addition to the treatment of the general neurotic condition, alkalies must be employed, either in the form of magnesia or bicarbonate of soda. The burning acid eructations are usually relieved in this way.

Limiting the patient to a strictly meat diet is a valuable procedure in many cases of dyspepsia associated with hyperacidity. The meat should be taken either raw or, if an insuperable objection exists to this, very slightly cooked. It is best given finely minced or grated on stale bread. An ample dietary is 3¼ ounces (100 grammes) of meat, two medium slices of stale bread, and an ounce (30 grammes) of butter. This may be taken three times a day with a glass of Apollinaris water, soda water, or, what is just as satisfactory, spring water. The fluid should not be taken too cold. Special care should be had in the examination of the meat to guard against tape-worm infection, but suitable instructions on this point can be given. This is sufficient for an adult man, and many obstinate cases yield satisfactorily to a month or six weeks of this treatment, after which time the less readily digested articles of food may be gradually added to the dietary. In other instances the use of the stomach-tube is most effectual.

There are forms of nervous dyspepsia occurring in women who are often well nourished and with a good color, yet who suffer—particularly at night—with flatulency and abdominal distress. The sleep may be quiet and undisturbed for two or three hours, when they are aroused with painful sensations in the abdomen and eructations. The appetite and diges-

tion may appear to be normal. Constipation is, however, usually present. In many of these patients the condition seems rather intestinal dyspepsia, and the distress is due to the accumulation of gases, the result of excessive putrefaction. The fats, starches, and sugars should be restricted. A diastase ferment is sometimes useful. The flatulency may be treated by the methods above mentioned. Naphthalin, salicylate of bismuth, and salol have been recommended. Some of these cases obtain relief from thorough irrigation of the colon at bedtime.

V. DILATATION OF THE STOMACH (*Gastrectasis*).

Etiology.—This may occur either as an acute or a chronic condition.

Acute dilatation is rarely seen, though it occurs whenever enormous quantities of food and drink are quickly ingested. Occasionally this leads to extreme paralytic dilatation, and Fagge has described two cases which came on in this way, one of which proved fatal.

Chronic dilatation results from: (*a*) Narrowing of the pylorus or of the duodenum by the cicatrization of an ulcer, hypertrophic stenosis of the pylorus (whether cancerous or simple), congenital stricture, or occasionally by pressure from without of a tumor or of a floating kidney. (*b*) Relative or absolute insufficiency of the muscular power of the stomach, due, on the one hand, to repeated overfilling of the organ with food and drink (*Ueberanstrengung des Magens*, Strümpell), and, on the other, to atony of the coats induced by chronic inflammation or degeneration or impaired nutrition, the result of constitutional affections, as cancer, tuberculosis, anæmia, etc.

The most extreme forms are met with in the first group, and most commonly as a sequence of the cicatricial contraction of an ulcer. There may be considerable stenosis without much dilatation, the obstruction being compensated by hypertrophy of the muscular coats. Considerable attention has been directed in Germany by Litten, Ewald, and others to the association of dilatation with dislocation of the right kidney. Two well-marked instances have come under my observation among a very large number of cases of movable kidney, but in neither was the dilatation extreme.

In the second group, due to atony of the muscular coats, we must distinguish between instances in which the stomach is simply enlarged and those with actual dilatation, the conditions which Ewald characterized as *megastrie* and *gastrectasis* respectively. The size of the stomach varies greatly in different individuals, and the maximum capacity of a normal organ Ewald places at about 1,600 c. c. Measurements above this point indicate absolute dilatation.

Atonic dilatation of the stomach may result from weakness of the

coats, due to repeated overdistention or to chronic catarrh of the mucous membrane, or to the general muscular debility which is associated with chronic wasting disorders of all sorts. The combination of chronic gastric catarrh with overfeeding and excessive drinking is one of the most fruitful sources of atonic dilatation, as pointed out by Naunyn. The condition is frequently seen in diabetics, in the insane, and in beer-drinkers. In Germany this form is very common in men employed in the breweries, who sometimes drink from twenty to thirty litres of beer in the day. The extraordinary size to which the organ attains in some of these cases is well shown by the *papier-maché* models which have been prepared under von Ziemssen's directions. Possibly muscular weakness of the coats may result in some cases from disturbed innervation. Dilatation of the stomach is most frequent in middle-aged or elderly persons, but the condition is not uncommon in children, especially in association with rickets.

Symptoms.—These are very variable and depend upon the cause and the degree of dilatation. Naturally the features in cancer of the pylorus would be very different from those met with in an excessive drinker. Dyspepsia is present in nearly all cases, and there are feelings of distress and uneasiness in the region of the stomach. The patient may complain much of hunger and thirst and eat and drink freely. The most characteristic symptom is the vomiting at intervals of enormous quantities of liquid and of food, amounting sometimes to four or more litres. The material is often of a dark-grayish color, with a characteristic sour odor due to the organic acids present, and contains mucus and remnants of food. On standing it separates into three layers, the lowest consisting of food, the middle of a turbid, dark-gray fluid, and the uppermost of a brownish froth. The microscopical examination shows a large variety of bacteria, yeast fungi, and the sarcina ventriculi. There may also be cherry stones, plum stones, and grape seeds.

Chemically the hydrochloric acid may be absent, diminished, normal, or in excess, depending upon the cause of the dilatation. The fermentation produces lactic, butyric, and, possibly, acetic acids and various gases.

In consequence of the small amount of fluid which passes from the stomach or is absorbed there are constipation, scanty urine, and extreme dryness of the skin. The general nutrition of the patient suffers greatly; there is loss of flesh and strength, and in some cases the most extreme emaciation. A very remarkable symptom which occurs occasionally is tetany, first described by Küssmaul. The spasm affects chiefly the muscles of the hands, arms, and legs. Loss of consciousness may occur. The spasms last for a short time only. Müller has collected eight cases of the kind, two of which occurred in simple dilatation of the stomach.

Physical Signs.—*Inspection.*—The abdomen may be large and prominent, the greatest projection occurring below the navel in the standing posture. In some instances the outline of the distended stomach can be