

tion of the history of the case will prevent this disease being confounded with a foreign body in the air-passages, the symptoms being much the same in both. It is to be distinguished from catarrhal pneumonia by the changes in the sonority of the lungs caused by the latter, but a suspension of judgment will be necessary until the casts are expectorated in those cases of croupous bronchitis occurring in the course of chronic pulmonary affections.

Prognosis.—Opinions must be expressed with caution in any case of the acute type, as fifty per cent. prove fatal. In chronic cases the prognosis is grave, because in so many of them lesions exist, which must eventually destroy life. The prognosis is favorable, however, in the chronic cases without complications, as recovery takes place in a majority of them. The prognosis is rendered grave by these indications: severe dyspnoea, cyanosis, stupor, high fever, great extent of the surface affected in the lungs, the extremes of age, little vigor of constitution, and bad hygienic surroundings.

Treatment.—As the extreme urgency of the symptoms depends largely on the obstruction by the false membrane preventing the access of air, the first requisite is to dislodge and remove this obstruction. Active emesis is the most effective means for immediate result, and the most efficient emetic is apomorphine, which should be injected hypodermatically. Next to this is the subsulphate of mercury, which acts promptly without producing depression. Tartar emetic is too depressing, but it may be employed in the absence of the other agents. Sulphate of zinc is safe and effective. The repetition of the emetic is determined by the dyspnoea and cyanosis. Softening the false membrane by inhalation of the vapor of water, especially of lime-water, is highly serviceable. Merely disengaging steam in the apartment is useful, but the utility of the application is greatly enhanced by the addition of lime. The domestic method of producing vapor and atomizing lime is an excellent plan. This consists in slaking freshly-burned lime, the patient inhaling the vapor as it arises. Lime-water may be atomized in the ordinary way. Such softening and solvent applications should precede the emetic.

Great good has been accomplished in these cases by the administration of the iodides, with alkalies. The author strongly urges the use of the iodide and carbonate of ammonia, in small doses every hour or two. It is highly important to prevent a recurrence of the seizures. Remedies having a direct effect on the bronchial mucous membrane, because eliminated by it in part, at least, afford the best prospect of relief. These remedies are the iodides, the balsams and oils, as copaiba, turpentine, eucalyptol, etc., which should be perseveringly administered for a long time. The effect of these remedies is aided by arsenic, which should also be given persistently. The complications of croupous bronchitis should be treated in accordance with the requirements of each case.

STENOSIS OF THE TRACHEA AND BRONCHI.

Definition.—By *stenosis* is meant a narrowing or contraction of the trachea or bronchi, produced by obstruction within and by pressure from without.

Causes.—The trachea or the bronchi are narrowed by interior obstructions and by exterior pressure. In the second group are included enlarged thyroid or goitre; swollen lymphatic glands at the hilus of the lungs and the bifurcation of the trachea; aneurism of the arch of the aorta, especially of the concave and posterior arch; tumors, abscesses, etc., of the mediastinum; and cancer of the lung. In the first group are cicatrices, indurations, and adhesions; neoplasms or new formations; inflammation and thickening of the walls, etc.

Symptoms.—So far as the symptoms are concerned, the cause of the obstruction is of little moment. The most obvious symptom of stenosis is difficulty of breathing, but not the kind of difficulty produced by emphysema, capillary bronchitis, etc., which is expiratory, whereas that due to this disorder is inspiratory. When there is great difficulty, all of the accessory muscles of respiration are brought into action to fill the lungs, but expiration is easy and unobstructed. Notwithstanding the strong efforts put forth to fill the lungs, this is not accomplished, and hence more or less rarefaction of the air in the lungs takes place, so that on inspiration, instead of expanding, certain parts of the chest are drawn in, viz., the lower part of the sternum and the inferior ribs. The movements of the larynx are very slight in tracheal and bronchial stenosis, and very free in stenosis of the larynx. A peculiar whistling, wheezing, crowing, or musical note is produced by stenosis, and the sound of expiration is higher in pitch than that of inspiration. If the obstruction is sufficiently high up in the trachea, the vibration in the column of air may be transmitted to the walls of the organ, producing a defined thrill. The voice is weak and muffled, because of the interruption in the passage of air to the vocal cords. The vesicular murmur is also weakened, obscured by the tracheal or bronchial sounds, or absent. This change may exist in one lung only, if a bronchus is obstructed. If the stenosis is in one bronchus only, the movements of the corresponding side of the thorax are lessened; the vesicular murmur is diminished, obscured or abolished, and there are loud whistling, sonorous, and wheezing sounds, with more or less thrill, while the sonority of the corresponding lung is undiminished. The healthy lung having an increased amount of work to do, there is more or less expansion, the movements are also greater, and the diaphragm is pushed down somewhat. A laryngoscopic examination separates laryngeal from tracheal stenosis, and under favorable circumstances indicates the position and character of the latter. The ration-

al symptoms are those of difficulty of breathing and obstruction to the entrance of air. The face is anxious, the alæ of the nose work, the skin is covered with a sweat, and there is constantly present a sense of the need of air. Besides this constant difficulty of breathing, the severity of which depends on the amount of the stenosis, there now and then occur acute exacerbations of dyspnœa, due either to a fresh catarrh, to a sudden increase of the compressing force, but especially to an asthmatic attack. The ordinary rate of difficulty of breathing may continue uniform for a long period; but toward the end suffocative attacks come on, which are at first separated by considerable intervals of time, but become nearer gradually, and life is ended by them, or by an intercurrent pneumonia.

Course, Duration, and Termination.—The clinical history is usually divided into three stages: the first consists of the disturbance produced by the growth of the obstruction; the second, the period of difficulty of breathing and the other symptoms due to the completed obstructing cause, which may continue for a long time; the third, consisting of the final suffocative attacks. The duration is protracted, and can not be expressed in definite numbers. The ultimate termination of a large proportion is death; many cases may continue for years without apparently interfering with health, but these are exceptional cases. Cerebral symptoms—coma—may appear toward the end. Death may be caused by pneumonia, œdema of the lungs, etc. Sometimes death occurs suddenly without the warning afforded by severe dyspnœa, caused by the rupture of an aneurism, of an abscess, or rarely without any apparent cause.

Treatment.—The therapeutical management is concerned with the cause of the stenosis, and need not, therefore, be considered here.

ASTHMA.

Definition.—This term has been applied to various morbid states, characterized by spasmodic difficulty of breathing, but it should be restricted to an independent, substantive affection occurring paroxysmally, without any morbid alteration of the breathing organs, and consisting in acute dyspnœa, lasting some hours, and terminating in health. It is appropriately divided into the *idiopathic* and *symptomatic*.

Causes.—Various theories of asthma have been proposed. Without occupying space with details, it will suffice to state that asthma is a *neurosis* of the breathing apparatus, and like other neuroses arises from sources of disturbances in the nervous system, central and peripheral. Like other neuroses, the conditions of the nervous system necessary to its development may be inherited. Nothing is more common than the occurrence of this malady in different generations and

branches of a family—the author has known of many examples. Asthma alternates with other nervous affections—with hemicrania, epilepsy, and angina pectoris. Asthma also alternates with affections of the skin—with urticaria, for example; and succeeds to eruptions of the skin, of the herpetic kind (Waldenburg). The pressure of enlarged lymphatics on the pneumogastric nerve has excited attacks. Various peripheral irritations induce asthmatic seizures. Evil intelligence, the association of ideas as connected with particular localities, and other moral causes, will excite attacks. Curious examples are related in regard to the influence of local associations: thus attacks occur on one floor of a house, and not another; on one side of a street, and not the other, etc. Distention of the stomach, indigestion, and flatulence, nasal polypi, certain odors, dust of a peculiar kind, pollen of plants, etc., will excite attacks. The mechanism is plain. In the case of intestinal irritation, the end-organs of the pneumogastric are acted on, the impression is communicated to the pneumogastric nucleus, and reflected over the bronchial and pulmonary branches of the vagus. In the case of affections of the nasal mucous membrane, the filaments of the fifth nerve receive the impression, and, as the nucleus of the fifth and of the pneumogastric lie in close juxtaposition, and are intimately associated in function, disturbance in the one is easily and quickly transferred to the other. Of this relation numerous examples exist. Asthma is more common in men than in women: according to Hyde Salter, of one hundred and fifty-three asthmatics tabulated by him, one hundred and two were men, and fifty-one were women. The disproportion is greater in advanced life. Asthma is common in childhood and up to middle age, but occurs at all ages. It is rather more common among the well-to-do classes. Surroundings have but little influence, unless a predisposition exists. Change of locality has a remarkable influence on asthma, but the conditions of climate which prove favorable are most diverse. Some do better in the heart of a great city, others on a dry and elevated plateau, others in a humid valley. Mental and moral influences are more potent than mere climatic peculiarities.

Pathogeny.—As asthma is a neurosis, there are no anatomical changes peculiar or essential to it. There are, it is true, morbid states associated with, but are not necessary to it. Bronchial catarrh is often found, also emphysema, but these are sequelæ or results, rather than a part of the disease. During the existence of the asthmatic paroxysm, an intense congestion has been seen on laryngoscopic examination. There are, at present, two dominant theories of the pathogeny of the asthmatic seizures; the *theory of tonic spasm of the diaphragm*, propounded by Wintrich; the *theory of spasm of the bronchial muscles*, which is the oldest theory, but has the support of Salter, Williams, and Trousseau, and is now sustained by the remarkable investigation of

Professor Paul Bert. The new theory of Leyden* has attracted attention by its singularity. He finds in the expectoration brownish cells undergoing granular degeneration, between which are colorless, extremely small but pointed, octahedral crystals, some readily visible, others requiring immersion lenses to find them. These crystals have been examined by Salkowski,† with the result to show that they must be composed of a material analogous to mucin. Leyden supposes the asthmatic paroxysm to be determined by a reflex spasm of the muscles of the bronchial tubes, induced by the irritation of the terminal filaments of the vagus by these minute crystals. A more recent and the latest theory is that of Weber (Riegel‡), which supposes the concurrence of a number of factors in causing asthma, such as bronchial spasm, catarrh of the tubes, tonic spasm of the diaphragm, cardiac lesions, etc., which is, in fact, a combination of the previous theories, and is, probably, the nearest approach to a true hypothesis in that it adopts all the presumed causes.

Symptoms.—The first attack is sudden, but the succeeding attacks are preceded by prodromes, the significance of which presently becomes apparent to the sufferer. These prodromes are usually acute coryza, some bronchial irritation, headache, and general *malaise*; or the preliminary symptoms may be those of indigestion—acidity, pyrosis, flatulence, hiccup, sneezing, etc. The first attack is nocturnal. The victim, after some uneasy sleep, is suddenly aroused by an intense anguish in his chest; he is stuffed up and struggles for air, jumps from the bed and rushes to the window, or he sits up, leaning forward on his arms, and uses all his strength in the effort to get more air. The breathing is accompanied with loud wheezing, the face becomes flushed and at the same time cyanosed, and is bathed in perspiration, the eyes stare, the eyeballs protrude, and the muscles of the neck start prominently up, as they are called on to aid in the effort to get air. The difficulty of breathing soon reaches a point that the inspiration is nothing but a gasp, the lips become pallid, the cyanosis deepens, and it appears to the patient that every minute must be his last. After some minutes or hours the respiration becomes a little easier, more air enters the lungs, the cyanosis subsides, and gradually the paroxysm ceases. Eructations of gas give great relief as the breathing becomes easy, and the bronchial tubes pour out an abundant mucus secretion, the expectoration of which also contributes to the ease of respiration now rapidly increasing. A free urinary discharge also takes place, the urine being pale, and of low specific gravity. The patient, exhausted with the violence of his efforts to get air, sinks into a profound sleep, and is bathed in perspiration. The whole duration of an attack rarely

* Virchow's "Archiv," vol. liv, p. 324, "Zur Kenntniss des Bronchial-Asthma."

† Ibid., p. 344.

‡ Ziemssen's "Cyclopaedia," vol. iv.

exceeds six hours, and may, indeed, be no more than one hour. On the following day there are experienced muscular soreness, languor, and debility, but all unpleasant feelings subside and disappear in twenty-four hours, and a normal condition is maintained until the next attack. Instead of a single paroxysm there may be only slight remissions, and one attack succeed to another, with exacerbations, so that the patient can not lie down at all, can take but little food, and is, after some days of suffering, utterly exhausted. The attacks are not exclusively nocturnal, but do sometimes occur during the day. A diurnal attack must be the rule in those cases brought on by the inhalation of some kinds of dust, gas, or vapor, as from powdered ipecac, etc. On percussion, the sonority of the thorax is increased in the vertical diameter from one to two inches, and also transversely, and does not change either on inspiration or expiration. The percussion-note is highly resonant all over both lungs, and has somewhat the tympanitic quality. The "bandbox-tone," by which it is described by Bamberger, is eminently characteristic. The vesicular murmur is either absent or greatly enfeebled, or obscured by the loud, wheezing, whistling, sibilant sounds. During expiration the sibilant, sonorous, whistling, cooing, sighing sounds are more pronounced and of longer duration. Toward the close of an attack moist sounds occur. The explanation of the physical signs present in an attack of asthma is afforded in the condition of the chest. The diaphragm is depressed below its ordinary position by tonic contraction; the chest, which assumes a distended, globular shape, is fixed in the position of forced inspiration. The lungs are filled with air, but it is residual air, and is not renewed; and, notwithstanding the effort put forth by the patient, the little air which can be introduced only adds to the distention. Expiration is prolonged, laborious, wheezing, and much more so than inspiration. Spasm of the muscular fibers of the bronchi is perhaps only one element in the obstruction to the expiration of air; tonic contraction of the diaphragm contributes not a little to the result. The fullness of the cephalic veins and the cyanosis and lividity of the face are due to the contraction of the cervical muscles preventing the return of blood, and to deficient oxygenation of the blood. While the face is flushed and the head hot, the feet are cold. The sputa are wanting in the beginning, but appear abundantly at the close of the paroxysm; they are frothy, grayish-white, or reddish-white if mixed with blood, and consist of mucus corpuscles, cylindrical and ciliated epithelium, and peculiar "yellowish-green clumps" in which are imbedded Leyden's crystals.

Course, Duration and Termination.—Asthma is an essentially chronic disease, not incompatible with long life, and with good, even vigorous health, during the intervals between the seizures. The paroxysms last from two to six hours, but sometimes they persist for days. Of itself, asthma is never fatal to life, but changes in the or-

ganism are gradually effected by the disturbance in the respiratory function, which may cause death. Emphysema, dilated right cavities, dropsy, or cerebral hæmorrhage, may be brought on by the long-continued operation of the cause. Much depends on the number of the paroxysms. There may be very few or very many. They may be mild at first, and become more severe, or they may commence and persist with the greatest severity. They may disappear suddenly, and never occur again. According to the behavior of the disease will vary the sequelæ. Asthma may also occur as a complication of some existing disease—as, for example, emphysema, chronic bronchitis, etc.

Diagnosis.—It is not possible to mistake asthma when the history is known. The first attack may be confounded with œdema of the glottis or spasm, paralysis of the vocal cords, and stenosis of the trachea. Laryngoscopic examination may serve to differentiate at once, by recognition of the lesion. The most important means of determining, besides the history and the direct exploration of the larynx and trachea, is the character of the dyspnoea. In laryngeal or tracheal obstruction, the dyspnoea is *inspiratory*, in asthma it is *expiratory*. In œdema of the glottis, while inspiration is difficult, expiration is easy and unobstructed; with inspiration there is a loud sibilant or crowing noise, and expiration is silent.

Treatment.—To relieve the paroxysm is the most pressing duty. There is no medication so effective as the hypodermatic injection of morphine (from $\frac{1}{12}$ gr. to $\frac{1}{4}$ gr.). An efficient dose of chloral hydrate is often equally effective ($\mathcal{D}\text{j}$ —3 ss.). As soon as the patient comes under the influence of either remedy, the difficulty of breathing begins to subside. The best results are obtained from a combination of the two remedies—morphine hypodermatically and chloral by the stomach—but in smaller quantity than when administered separately. Nitrite of amyl (by inhalation, three to five minims) sometimes affords relief, but nitro-glycerin solution by the stomach is more effective, and is a highly useful remedy. In many cases iodide of potassium or sodium, in full doses, will arrest the paroxysms very remarkably. From fifteen to twenty grains, every two, three, or four hours, are usually required. It is better practice to give iodide with bromide of potassium, and to each dose of the solution may also be added a drop or two of Fowler's solution of arsenic. This combination is to be commended, especially in the cases which persist for some days. Much relief is afforded by fumes of stramonium and other narcotics; old asthmatics often depend on fumigation to the exclusion of all other remedies. Pastils, or cigarettes containing leaves of belladonna, stramonium, tobacco, grindelia, and poppy, in equal portions, steeped in a saturated solution of nitre and dried, are ignited and the fumes inhaled. Iodide of ethyl inhaled is effective, for to the calmative action of ethyl is added the influence of an iodide. There are proprietary pastils sold, but, under what name

soever they appear, the composition, with unimportant differences, is about as stated above. Belladonna-leaves saturated with nitre afford as good results, usually, as the more complicated pastils. Simple nitre-paper gives ease for a time. The new California remedy, *grindelia robusta*, has undoubtedly great power to arrest a paroxysm of asthma. Three to five grains of the extract or the fluid extract (3 ss.) can be given every hour or two. Grindelia is often useful as a fumigant. The debility caused by asthmatic paroxysms is best removed by quinine and iron, the former in considerable doses. This practice is especially to be commended when the paroxysms recur frequently. To prevent a return of the attacks, arsenic is very useful, and is most effective in combination with the iodides. In debilitated subjects, quinine, arsenic, and belladonna may be given steadily for some weeks or months, as the case may be. Asthma, like other neuroses, is capricious in its behavior toward remedies. The remedy succeeding at one time may fail utterly at another time, so that the treatment must be varied accordingly. Hence it is necessary to be fertile of resources in the treatment of this disease. Besides the methods of treatment already mentioned which are most approved, there are others less desirable which should receive some notice. Nauseants, as ipecac, tartar emetic, and lobelia, afford relief by inducing relaxation consequent on the nausea. When there is much catarrh, or the attack of asthma is due to an acute catarrh, good results are obtained by small doses of tartar emetic ($\frac{1}{16}$ gr.) with morphine ($\frac{1}{12}$). A few drops of wine of ipecac (five to ten) every five minutes, until some nausea is experienced, may lessen the oppression remarkably. During the paroxysm, nauseant doses of lobelia (\mathcal{M} xv—3 ss. of the fluid extract) are very effective in stopping the dyspnoea. Recently quebracho has been brought forward as a remedy for dyspnoea, which it often surprisingly relieves. From twenty minims to $\mathcal{J}\text{j}$ of the fluid extract may be given every hour or two until relief is had.

The application of ammonia to the posterior wall of the pharynx is practiced by the French, but this practice is strongly condemned by Jaccoud. He, however, permits the application of ammonia by impregnating the air of the apartment. The inhalation of oxygen and of compressed air relieves the breathing somewhat, but ether and chloroform are much more effective. Ethyl bromide has lately proved remarkably effective by inhalation.

In the treatment of asthma there is no point of greater importance than careful regulation of the diet. Hyde Salter much insists on this, and the author has had abundant confirmatory observation. The diet should be light and easily digestible, and as little bulky as possible. It should consist, therefore, chiefly of animal food, and to this may be added a little fruit and a few of the succulent vegetables, but starchy and saccharine substances and milk should be excluded. In this pro-

hibition bread is included, as it is particularly apt to disagree. Articles of diet that are fried, pastry, cakes, and sirup, etc., are highly objectionable. Meats should be broiled or roasted. Boiled meats and soups are improper. There should be as little fluid drunk at meals as possible, but a little black coffee may be allowed at breakfast.

DISEASES OF THE LARYNX—ACUTE CATARRH OF THE LARYNX—LARYNGITIS.

Definition.—By *acute catarrh of the larynx* is intended an inflammation involving the mucous membrane—a catarrhal inflammation. There is also a chronic form of the disease—chronic inflammation.

Causes.—The mucous membrane of the larynx is in a position to be quickly and easily affected by external agents of a gaseous or aëriiform kind—such as ammoniacal gas, chlorine, tobacco-fumes, etc. Very fine solid particles may be carried in the air in sufficient quantity to excite an irritation of the laryngeal mucous membrane. But the organ is more frequently affected by the condition of the atmosphere itself. The long-continued inspiration of air contaminated by respiration is very apt indeed to cause congestion of the mucous membrane, especially when to this is added the sudden contact of cold air. Too prolonged exertion of the voice may also excite a catarrhal inflammation, especially when the exertion is made in the open air. "Taking cold" is a fruitful cause of laryngitis. There may be an extension of trouble from the pharynx and from the face (erysipelas). Influenza may extend to the mucous membrane of the larynx. Inflammation of the larynx is not an infrequent complication in the course of the infectious diseases. Climate has an unquestionable influence; humid, cold, and variable climates increase the disposition to affections of the larynx, while warm and equable climates lessen the tendency to these diseases. Affections of the larynx occur at all ages, and both sexes are equally liable in proportion to their exposure to the causes.

Pathological Anatomy.—In the mildest cases there is a transient hyperæmia of the mucous membrane—in certain situations—over the arytenoid cartilages, the ventricular bands, the posterior ends of the vocal cords, and the space between the arytenoid cartilages. In more severe cases there is a good deal of swelling as well as injection of the ventricular bands, the epiglottis, the ary-epiglottidean folds, and the inter-arytenoid space, etc. The color in severe cases, instead of being reddish, is a dark, reddish-brown.

Symptoms.—In the mildest cases there is no constitutional disturbance. The local symptoms consist in heat, rawness, and tickling, referred to the larynx and pharynx. When the thyroid cartilages are pressed, unusual soreness, irritation, and severe pain are experienced. There are also present dryness, and a feeling of a foreign body stick-

ing in the throat. Swallowing causes pain by the upward movement of the larynx, and by the pressure of the bolus on the larynx as it descends to the stomach. In the more severe cases the onset of the disease is announced by some chilliness and general *malaise*, followed by moderate fever, anorexia, etc., for several days. Cough occurs at once, and it is noisy, harsh, hoarse, or toneless; or, in children especially, has a ringing, sonorous, so-called "croupy" character. The cough is dry, and produces a sensation in the larynx as of scratching over a raw surface; but in a short time secretion is poured out, and then the cough has a loose character. At first some frothy mucus is expectorated; it may be streaked with blood occasionally, but in the rare hæmorrhagic form pure blood may be expectorated. The sputa soon assume the appearance of muco-pus, the pus elements predominating; and it contains also cast-off ciliated epithelium, young cells, etc. At first the voice is thick, and becomes hoarse on talking; but as the case progresses the hoarseness deepens, and at length there is aphonia. Dyspnoea rarely occurs to adults in simple mucous laryngitis, but in children spasm of the glottis may come on, when there is extreme dyspnoea in brief paroxysms. But, as this disorder will be discussed in a separate section, its consideration as a symptom of laryngitis is postponed. A sense of oppression and need of air is caused if there be much swelling of the vocal cords or ventricular bands in the case of adults—a condition of things not apt to occur unless there be some effusion into the sub-mucous connective tissue. Besides hoarseness, which may end in aphonia, there may be various alterations in the tone of the voice, high pitch or low pitch, and its timbre may be subjected to corresponding variations. The peculiarities of voice are due to swelling of the mucous membrane, variations in tension of the vocal cords, and the condition of the muscles moving the arytenoid cartilages. The tone of voice is hoarse and rough from swelling of the cords, discordant from the difference in the rate of vibrations of the two cords, high-pitched if the tension in the cords is great, low-pitched if the tension is low; or there is a double tone, now high, now low, if the cords vibrate with opposite tension. On laryngoscopic examination the state of the mucous membrane, of the vocal cords, ventricular bands, etc., can be made out, and the changes described verified.

Course, Duration, and Termination.—Acute laryngitis passes through its course in a week, if mild; but the more severe cases may occupy three weeks to a month. Mild as well as severe cases may continue indefinitely by repeated relapses, and at last assume the chronic form. Under some circumstances a simple laryngitis may assume formidable proportions by the extension to the sub-mucous connective tissue.

Treatment.—Confinement to bed for the more severe cases, and to a uniformly but not too highly warmed apartment for the milder cases,