the mother should have milk, animal teas and broths, eggs, gruel, soups of beans and peas, and small amounts of tea, cocoa, or coffee, with toast and crackers. It is well to avoid the limited diet of tea and toast which so many women take at this time. Later on in this period and during that of lactation, the mother should have an abundant supply of water, soups, meats, milk, eggs, and vegetables. Of the latter turnips, carrots, beets, potatoes, spinach, asparagus, and lettuce will aid in the formation of milk. The mothers of the working class will be found to give milk in larger quantity and of a better quality than do those who live under higher social conditions. This is due to their simple mode of living and to their outdoor life.

Systematic exercise in the open air should be taken as soon after confinement as the mother's condition will permit, for by this means the proteids will be diminished in amount and the fat increased, thus creating a milk which is easily digested by the child.

The mother should at the same time avoid those drugs which decrease the milk supply, namely, belladonna, when taken in large amounts or used locally, and saline and hydragogue purgatives; for the removal of large amounts of fluid from the body will greatly diminish the supply of milk. It is also desirable to prevent, as far as possible, any nervous shock or worriment, for the effect upon the mother is likely to be such that her milk will be rendered unfit for the child.

The proper care of the breast during lactation is important. The nipple and breast should be washed with a saturated solution of boric acid both before and after nursing, and these parts should be kept covered with soft sterile lint or gauze held in place by a breast binder which gives support and ease to the breast. If this course is adopted there will be fewer cracked nipples and abscesses of the breast. In cases in which fever occurs during lactation it is often possible to retain the secretion of milk for three or four weeks, if the breasts are gently massaged and emptied three or four times a day with the breast pump. Then, when the temperature returns to normal, the child may again be put to the breast. In those cases in which there has been an abscess of the breast in early infancy, or during a former lactation, the danger of the formation of a fresh abscess is only slightly greater than it is in a perfectly normal breast. If care is taken to keep the parts thoroughly clean, and if they are not allowed to become engorged, we may rightly expect that such a breast will furnish a sufficient supply of good milk. *Stricker Coles.*

GALANGA; GALANGAL.—Lesser Galangal. The rhizome of *Alpinia officinarum* Hance (fam. *Zingiberaceæ*), a perennial herb of flag-like habit and the floral peculiarities of ginger and cardamom plants. It is an inhabitant of Hainan and other parts of Southern China, where it is also cultivated as an article of commerce. Galanga has been long known in Europe, as well as in Asia, and was formerly esteemed as a domestic spice or flavor.

The dried rhizome is cylindrical, often branched, about as large as the little finger, and in pieces two or three inches in length. The nodes are close together and very prominent, as slender annulations. Texture hard, tough; color deep brown; odor aromatic, curcuma-like; taste pungent. It contains an *essential oil* to which its odor is due, and probably some pungent resin. The oil is reddish-yellow, with the odor of cajeput and the taste of camphor. It has a specific gravity of 0.921, and contains cineol. Its qualities as a medicine are essentially those of ginger. As a medicine galanga is obsolete in Europe, and nearly so as a spice, although it is said to be used with other things in flavoring cordials, in veterinary mixtures, etc. *Henry H. Rusby.*

GALBANUM.—"A gum-resin obtained from *Ferula galbaniflua* Boiss. et Buhse (fam. *Umbelliferæ*), and probably from other species" of *Ferula* (B. P.; no longer official in the United States). It is not certain whether the product of the "other species" always comes separately, as it certainly sometimes does, or whether the drug is sometimes a mixed product. The plants are huge perennial herbs of Persia and the adjacent region.

The galbanum exists, like other gum resins, in the plant as a fragrant creamy latex, and exudes spontaneously from the crown and stem, or flows upon puncture, in white drops that soon become thick and sticky, and finally hard and brittle, by the action of the air. As they dry, they also turn to a light yellow-brown or buff color. These drops or tears, collected when nearly dry and not sticking together, compose the "Galbanum in tears"; when collected in a softer state, and running more or less completely into a granular or even homogeneous mass, they are the more common "galbanum in mass." The pharmacopœial description was as follows: "In tears from the size of a pin's head to that of a pea, and larger; mostly agglutinated, forming a more or less hard mass; externally yellowish, or pale brown; internally milk-white, bluish-white, or yellowish, with a waxy lustre; odor peculiar, balsamic; taste bitter and acrid. When moistened with alcohol, galbanum acquires a purple color on the addition of a little hydrochloric acid."

Like other substances of its class, galbanum makes a yellowish emulsion with water, and contains a varying amount of *essential oil* (six per cent., more or less) according to its freshness and softness. It consists, besides, of about three-fourths *resin* and one-fourth *gum*, excluding a variable amount of coarse impurities. The oil is a colorless, pleasant-smelling hydrocarbon of the turpentine type. It is an article of commerce, and described by Schimmel as having a normal specific gravity of 0.930, boiling between 165° and 300° C., and containing *cadinene*. The resin is a yellowish-white amorphous substance, soluble in alcohol, and remarkable for yielding by dry distillation a brilliant *blue*, rather thick *essential oil* (see German Chamomile for similar substance), and the crystalline substance called *Umbelliferon*, which, in its turn, melted with potash, yields the derivative *resorcin*.

Galbanum was used by the ancient Hebrews as an ingredient of some incenses. Along with other gum resins it has had, in its day, some reputation as an emmenagogue and antispasmodic, and it is still occasionally given with these qualities in view. Somewhat more often it is administered in chronic bronchitis or laryngitis as an expectorant. Rarely it is given in rheumatism, with probably no benefit. The principal present employment of this antiquated medicine is as an ingredient of stimulating plasters.

It should be heated and strained, to separate dirt and refuse, before employment in pharmacy. 1 gm. (gr. x.–xx.) may be considered a full dose, and can be administered in pill form or as an emulsion.

Henry H. Rusby.

GALBRAITH SPRINGS.—Hawkins County, Tennessee.

Post-Office.—Galbraith Springs. Hotel and cottages.

Access.—Viâ Southern Railroad (formerly East Tennessee, Virginia, and Georgia) to Russellville, Hamblen County, thence 9 miles north by private conveyance to Springs.

For the last half-century these Springs have been known and resorted to by the inhabitants of the surrounding districts. In *ante-bellum* days they were frequented by hundreds, who made their temporary abodes in pole cabins around the Springs. The location is in a broken, mountainous country, 1,400 feet above the sea-level. The immediate surroundings of the Springs are uniquely charming in their wealth of vale and wood, brooks, rivulets, and waterfalls, and other features to please the fancy. The situation of the Springs is one mile distant from the Holston River, in a romantic glen, 330 feet above the base of Short Mountain. A path leads to the United States Signal Station on the top of Short Mountain, which is 1,320 feet above the Springs and 2,702 feet above the sea-level. From this point one of

the most extended and charming views to be found among the mountains of East Tennessee is revealed to the eye. The hotel is a very comfortable establishment, where the visitor will soon learn that all the needful arrangements for his comfort and diversion are at hand. Among the amusements at Galbraith Springs may be mentioned bowling, dancing, and music. Hunting and fishing may also be indulged in. The springs are four in number. An analysis was made in 1884 by Prof. W. A. Noyes, of the University of Tennessee, with the following results:

Light Calcic-chalybeate.

One United States Gallon Contains:

Solids.	Grains.
Calcium carbonate	3.84
Calcium sulphate	.92
Calcium nitrate	Trace.
Calcium phosphate	Trace.
Magnesium carbonate	.47
Lithium carbonate	Trace.
Sodium sulphate	.26
Sodium chloride	.07
Potassium sulphate	.16
Iron carbonate	.41
Alumina	.03
Silica	.68
Total	6.84

Temperature of water, 55° F.

This analysis shows a very light mineralization, yet the water seems to possess considerable merit as a ferruginous tonic, and can be taken in large quantities. It is also an excellent table water. *James K. Crook.*

GALLACETOPHENONE. — $C_6H_2.CH_3CO.(OH)_2$ A derivative of pyrogallol, $C_6H_3(OH)_3$, one atom of H being replaced by an acetyl group. It is a pale-yellow, crystalline powder, almost insoluble in cold water, very soluble in hot water, alcohol, ether, and glycerin.

It was introduced as a substitute for pyrogallol (Rekowski: *Therap. Monat.*, September, 1891), the advantage claimed for it being its freedom from toxic and irritating action. Pyrogallic acid and its derivatives owe their therapeutic properties to their reducing action which is usually too rapid and causes an excessive irritation. Gallacetophenone possesses this reducing action in a lesser degree than the others, although sufficiently strong to prove an efficient antiseptic. A further advantage is that it does not discolor the skin, the hair, or the linen with which it comes in contact. It also is devoid of any irritating or toxic action.

It was recommended for the treatment of skin diseases, particularly for psoriasis. In this condition its beneficent effects were said to be manifested in twelve hours, the patches becoming paler and thinner, and disappearing after ten or twelve days.

This drug has not been much employed. Dr. Herman Soldenburg (New York *Medical Journal*, February 6th, 1892) reports his success with it in several cases of long duration. It is employed in the form of a solution or in that of an ointment, the strength in either case being ten per cent. *Beaumont Small.*

GALLANOL—gallic acid anilid, gallanilid [$C_6H_2.NH.CO.C_6H_2(OH)_3$]—is obtained by boiling together tannic acid and anilin. It occurs in colorless crystals or gray micaceous scales, slightly soluble in cold water, soluble in boiling water, alcohol, and ether, and insoluble in benzol. It is bitter and astringent. Having found this tannin compound free from the undesirable properties of pyrogallol and chrysophanic acid, yet as effective in treatment, Cazeneuve and Rollet introduced it in 1893 as a remedy in psoriasis, chronic eczema, and other skin diseases. For eczema it is employed in ointment of three to twenty per cent. strength, or with talcum as a dusting powder. For favus, ringworm, psoriasis, or prurigo it is used in twenty-per-cent.-solution in alcohol with a little ammonia. Before this remedy is applied, the skin should always be cleansed with an alkaline soap solution.

W. A. Bastedo.

GALL BLADDER AND GALL DUCTS, DISEASES OF.—(*Krankheiten der Gallenwege; Maladies des voies biliaires.*)

I. Catarrhal Inflammation of the Gall Bladder and Gall Ducts.—(*Catarrhal jaundice; Icterus simplex; Icterus catarrhalis; Icterus gastro-duodenalis; Catarrh der Gallenwege; Inflammation des voies biliaires.*) Since the investigations of Wyss, Charcot, Legg, and others, a broader significance has been given to catarrh of the bile ducts than formerly; and at the present time pathologists are wont to include in the term all forms of jaundice save that due to stenosis and non-inflammatory occlusion of the ducts (by foreign bodies, growths, external pressure, etc.), or to a narrowing occurring as a sequence of a previous inflammation—catarrhal, suppurative, or exudative (see the section on Stenosis, etc., farther on). For a full discussion of these questions, see *Icterus;* suffice it to say that to a catarrh of the finer bile ducts has been attributed the jaundice of acute yellow atrophy of the liver, of phosphorus and other forms of poisoning, and of the various fevers, thus narrowing the limits of hæmatogenous jaundice. This section will be devoted only to an account of catarrhal inflammation of the bile ducts in the common acceptation of the term.

Etiology.—A predisposition to catarrh of the bile ducts is said to exist in persons of a bilious temperament. Persons liable to catarrh of other mucous membranes are prone to this affection. It arises very frequently from an extension of catarrhal inflammation from the stomach and duodenum, and the causes which excite the latter condition are prominent in the etiology of the former. Hence an attack may occur as the result of exposure to cold and dampness, of checking of the perspiration, of errors in diet, of over-eating, and of the ingestion of rich or fatty food, and of acrid substances, as well as of certain drugs and stimulants. A debauch is often followed by an attack, and the inhalation of noxious vapors and foul gases has been known to excite the disease. The so-called "epidemic" jaundice is thought to be due to a poison introduced from without through the food, drink, or air. Some epidemics, however, have the characteristics of an acute infectious disease and are attended with considerable mortality. Mennert's report of the Saxony epidemic of 1889 includes 518 cases, of which 73 per cent. were in children. There were 30 deaths. Weil's disease (infective jaundice) has been considered by some to be a modified typhoid infection. Several cases of typhoid fever with marked jaundice at the onset have been reported by Ogilvie (*British Medical Journal*, January 12th, 1901), and their resemblance to this disease noted. The Widal reaction should be of great value in this regard. Dalgleish[1] speaks of an extensive epidemic of catarrhal jaundice, at Bloomfontein, which bore a strange relation to the prevalent typhoid and dysentery. Whole families might be attacked, but more frequently it was seen that one or two of a household might have jaundice while the others would be affected with typhoid or dysentery. The disease in most instances ran an afebrile course, was attended with marked gastric symptoms, and was not of as long duration as simple catarrhal jaundice. The possibility of this epidemic being a modified typhoid infection has not escaped notice.

An extensive epidemic occurred in Michigan during the summer and fall of 1897. Six hundred and seventy-five cases were observed, mostly in children. The affection was commonly more severe in adults. Whole families were attacked. Usually after a few days of indisposition, slight fever, gastro-intestinal disturbances, and jaundice, more or less marked, would appear, the symptoms then abating. Jaundice in this epidemic was always of short duration. The liver was rarely enlarged.[2]

In addition to the causes which set up the catarrh of the bile ducts, either coincidently with, or secondarily to, the gastro-duodenal catarrh, there are other local

causal conditions existing in disturbances of the portal circulation. Obstructive cardiac disease and impeded pulmonary circulation from lung disease or feeble heart lead to portal congestion, and hence to a venous stasis and consequent catarrh of the mucous membranes. Tumors in the abdominal cavity, enlarged glands, or the enlargement of any of the organs, by interfering with the portal circulation, may set up a catarrh. Dutton Steele reports a case of jaundice apparently due to kinking and obstruction of the bile duct from extreme gastro- and entero-ptosis.

Catarrhal inflammation of the bile ducts, with or without gastro-duodenal catarrh, is frequently caused by malaria, by syphilis (in the secondary stage), and by gout (Murchison). Acute phosphorus-poisoning and lead-poisoning are often attended with gastro-hepatic catarrh. The jaundice that accompanies cholera, typhus, typhoid, pneumonia, pyæmia, septicæmia, and other fevers, is due to a catarrh of the bile ducts.

Direct irritation of the mucous membrane of the ducts by mechanical causes, as by the passage of gall stones or by the presence of parasites, frequently causes a catarrh which may be local or diffused. Finally, it is said that pathological states of the bile itself irritate and excite inflammation of the ducts. In persons who are starving, from choice or necessity, it is said that the bile, which is retained in the gall bladder, becomes acrid and sets up an active inflammation. The jaundice that in rare cases accompanies cirrhosis, amyloid and fatty liver, is due to a catarrh of the ducts.

The season of the year is believed to have some influence on the production of biliary catarrh,—spring and autumn being the favorable periods; hence the terms icterus vernalis, autumnalis, etc. Sex exercises no influence on the frequency (Ewald, von Schüppel); yet, in our cases, excluding "epidemic" jaundice, the males were largely in preponderance. The disease is most frequently seen in the early period of life, and after forty a jaundice is not likely to be due to primary catarrh, although a case of one of the writers was seventy years of age. Firemen, puddlers, stokers, and laborers who are exposed to extremes of temperature are liable to the affection.

Morbid Anatomy.—In the milder forms post-mortem inspection reveals nothing, for, as we often find in a laryngitis so severe as to cause stenosis, the congestion and œdema subside after death. In the more severe varieties, redness, swelling, succulence, and often ecchymosis of the mucous membrane, are observed. The lumen of the ducts, if not occluded by the flaccid lining membrane, is filled with proliferated epithelium and mucus. The latter may be bile-stained, especially at first, or may be clear and viscid. A plug of firm mucus often stops the orifice. The papilla stands out prominently on the duodenal mucous membrane and is red and softened, but a probe readily penetrates the duct, and bile may be forced out by pressure of the hand on the gall bladder, although the feeble "vis à tergo" of the biliary secretion during life is not sufficient to overcome the obstruction. The duct, beyond the seat of the catarrh, is stained with bile. In the more advanced or prolonged cases the ducts are completely blocked by a somewhat firm, gray mucus, intermingled with proliferated epithelium and leucocytes. The congestion is more intense, ecchymoses are more common, and a more marked thickening of the mucous membrane is observed, due to cellular infiltration. Now it is that denudation of the epithelial surface takes place, ulcerations develop, and the terminal ducts undergo inflammation and dilatation from retention of, and irritation caused by, the imprisoned bile. Anatomically, catarrhal inflammation of the ducts may be divided into an acute form of ten days' duration (no lesions after death, or only congestion and œdema), a subacute form, lasting from two to six weeks (with the above lesions, cell proliferation and mucus formation in abundance), and a chronic form, continuing from two to six or eight months (excessive catarrh, abrasion, ulceration, dilatation, stricture, and retention abscesses or cysts). Catarrhal inflammation results either in the return of the parts to a normal condition, or in a stricture of the ducts (see the section on Stenosis of the Ducts, farther on) and its sequences, or in a "biliary" or "hypertrophic" cirrhosis of the liver.[3] Dropsy of the gall bladder occurs also as a sequence of catarrh of the cystic or common duct, with occlusion.

The seat of the catarrhal inflammation may be limited to the finer ducts, to the common duct, or to the cystic duct and gall bladder. Thudichum (1863) describes a catarrhal inflammation of the finer ducts in which perfect biliary casts are formed. Meckel regards such casts as frequently forming the nuclei of gall stones and has given the name of "lithiatic catarrh" to the condition. Robson suggests the term "desquamating angio-cholitis." The *pars intestinalis* was formerly considered to be the only portion of the common duct involved in catarrhal icterus. If the finer ducts are the seat of catarrh, as in phosphorus-poisoning, the larger ducts are pale and covered with a film of mucus or a small amount of thin bile. If the gall bladder be the exclusive seat, its mucous membrane undergoes changes similar to that of the duct; its contents are a dark-colored inspissated bile, and mucus in abundance, or a thin, watery mucus or muco-pus fills the bladder. According to Mayo Robson, catarrhal cholecystitis, or chronic catarrh of the gall bladder, without jaundice, forms a distinct and definite disease frequently mistaken for cholelithiasis and only recognizable at operation, when nothing but thick, ropy mucus is found in the bladder or ducts. This mucus, often in the form of sago-like plugs, gives rise, in its passage, to the gall-stone-like attacks. In these, as a rule, medical treatment is sufficient, but in persistent attacks, in which no gall stones are passed in the fæces, no jaundice develops and no tenderness is present in the gall-bladder region, the operation of opening and draining the gall bladder is urged. Robson reports the cure of several cases by this procedure.

The histological changes in the parenchyma of the liver vary. Either the appearances of a liver long stained with bile are found, or the atrophic and degenerative alterations seen in stenosis of the ducts are observed, or a "biliary" cirrhosis develops (consult these sections).

Symptoms, Course, and Duration.—These depend upon the cause; if this be one that is readily removed or that passes off quickly, the symptoms are mild and the duration is brief, as in the catarrh that succeeds the passage of a gall stone. If the affection arise from obstructive heart or lung diseases, the symptoms are mild, but the duration is long. The catarrh that accompanies malarial disease or a gastro-duodenitis is the most severe and protracted. The mode of onset also varies with the cause. The gastro-duodeno-hepatic form is usually preceded by gastric symptoms for three or four days; while that due to other causes follows the usual manifestations of that cause.

The description which follows is that of a catarrhal inflammation of the ducts supervening upon duodenal catarrh, which may be regarded as a type of the disease under consideration.

The affection may begin in any of several different ways:

The gastro-duodenal symptoms may precede the hepatic by three or four days; or the first observed symptom may be jaundice; or the attack may be ushered in by a chill, followed by fever with gastric symptoms and, in a few days, by jaundice. Loss of appetite, a tongue covered with a heavy yellow fur, pasty and bitter buccal secretions, and an offensive breath, are prominent. Nausea in the mornings, or at the sight of food, and vomiting of a glairy mucus, or, early in the attack, of a bitter, bile-stained, acrid fluid, may occur. At the same time there are epigastric distress, weight and fulness, some tenderness on pressure, soreness, or even marked pain. Later, there are pain and tenderness in the right hypochondrium and over the liver. It is denied by some authorities that the liver and gall bladder are enlarged, but I have observed enlargement of the former constantly in chronic cases. The abdomen is usually distended with gas, and

eructations of gas and the imperfect products of digestion occur. The bowels are constipated, or a diarrhœa from indigestion may occur in the early stage. In a few days jaundice appears; first the conjunctiva, then the face, and in a short time the entire body is discolored. The icterus varies in extent and degree. The conjunctiva alone may be affected, and it may be merely of a faint yellow tinge, or, in chronic cases, of a deep bronze. The fever, which is from 100° to 103° F., generally subsides with the advent of the jaundice, but it may continue for ten days or two weeks as a simple continued fever, the so-called "gastric" or catarrhal fever. The well-known symptoms and effects of obstructive jaundice are present (see article on *Icterus*).

It is important, however, to remark the uniform persistence of the jaundice. Probably the most characteristic symptom is the slow pulse, which often distinguishes this form from other varieties of jaundice. Fagge calls particular attention to this symptom. Headache is present often in the beginning, with or without vertigo. After the jaundice becomes developed, the usual nervous symptoms of the disease are manifested.

If the case be a mild one, the gastric symptoms first subside, and then the jaundice gradually disappears, without any serious disturbances of nutrition. In the more protracted cases, however, anæmia, emaciation, and prostration are marked, the degree depending on the duration of the disease.

The mild idiopathic cases continue for from ten days to three weeks, the more severe ones for from six to ten weeks, and the more obstinate cases as long as five or six months.

Should stricture of the duct take place as a sequence of the catarrh, and should suppuration of the ducts occur, and abscesses form, fever of an irregular type, often with chills, and with exhaustive sweats, will usually be present. A similar fever, or one of an intermitting character, also accompanies the development of secondary cirrhosis. In these instances the liver and gall bladder are enlarged.

Inflammation of the gall bladder alone is characterized by pain and tenderness in the right hypochondrium, by enlargement of the gall bladder, and by slight fever, with, at times, nausea. Jaundice may not be present, but in many cases a gall stone in the gall bladder or cystic duct may give rise to jaundice from an inflammatory occlusion of the common bile ducts by extension. Riedel is quoted by Gumprecht[4] as stating that two-fifths of the cases of jaundice in cholelithiasis arise in this way (Mayo Robson).

Diagnosis.—The presence of one of the causes or antecedent pathological conditions just noted, the early age and previous good health of the patient, the sudden and uniform development and persistence of the jaundice, and the absence of the physical signs of organic disease of the liver, clearly indicate simple catarrhal icterus. Care must be taken not to confound it with the jaundice of acute yellow atrophy, and it must not be forgotten that, in apparently the most simple jaundice, grave cerebral and other symptoms due to acute atrophy may arise. Acute yellow atrophy may occur at an early age in the pregnant female; the more marked epigastric pain, the jaundice of the upper portion of the body, the vomiting of blood, the cerebral symptoms, and the alterations in the size of the liver and spleen serve to distinguish it.

The jaundice due to obstruction by gall stones develops quickly, is quite marked, and varies in its intensity from time to time; paroxysmal and persistent pain is more pronounced than in the simple form; the patient is usually a female, and the attacks occur late in life. The diagnosis must be made between jaundice from simple obstruction and that caused by pressure on the ducts. The physical signs and clinical history of the many forms of external pressure must be considered (see section on Stenosis, etc.). Pain, fever, sweats, increase in size and tenderness of the liver and gall bladder, with prostration and emaciation, occurring late in the disease, indicate stricture and the formation of abscesses, or purulent inflammation of the ducts. If the jaundice continues longer than two months, if the pulse is frequent from the first, if sweats are marked, if emaciation rapidly ensues, and if the patient is over thirty years of age, it is more than possible that some affection other than simple catarrh, and not revealed by physical signs, is present. An important observation in this connection is, that frequently in malignant disease of the liver or bile ducts, jaundice due merely to an associated catarrh may disappear under treatment, the disease meanwhile persisting and progressing. The jaundice due to pressure or obstruction will be little, if at all, influenced by any means (Mayo Robson). It has occurred to the writers that the existence of a diarrhœa in the course of catarrh of the bile ducts would indicate closure at the orifice; for then the pancreatic duct would likewise be occluded, and diarrhœa, a well-known symptom of pancreatic disease, would ensue. The presence of fat and blood in the stools would also point to this conclusion.

Prognosis.—This is usually favorable, but depends more or less on the cause. Gastro-hepatic catarrh terminates favorably. The presence of symptoms indicating purulent inflammation of the duct renders the prognosis grave. Prolonged jaundice, with the advent of marked cerebral symptoms, is very serious. The possibility of the development of icterus gravis should not be forgotten. We are inclined to think that the prognosis is seriously modified by inactivity of the kidneys, and that cerebral symptoms are not so liable to occur if the renal secretion is abundant. Hemorrhage, in any of its forms, is of bad omen.

Treatment.—The line of treatment to be adopted depends entirely on the cause of the catarrhal inflammation. If it arise from cold and exposure and is seen early, a warm bath or a vapor bath, and the use of saline cathartics, or of small doses of tartar emetic, are of service. Full doses of quinine and Dover's powder at bed-time, with a light purge in the morning, will often relieve the general symptoms of "cold," and exert a favorable influence upon the local catarrh. If the cause of the disease is a coexisting gastro-duodenal catarrh, a mechanical emetic, repeated twice on each of the first two days, is often of service. Large draughts of hot water, either at bed-time or repeated throughout the day, are grateful and beneficial. They are made more palatable by the addition of some one of the alkaline citrates. At the same time an alkaline purgative, largely diluted, should be employed, and then gastric sedatives or the mineral acids. Patients with catarrhal jaundice rarely apply for treatment until some time after the jaundice has appeared, and as this is generally due to a gastro-intestinal catarrh, a system of treatment that has usually been successful in these cases may here be presented. First, in the acute form: a mercurial purgative is first administered. We usually prescribe from one-twelfth to one-third of a grain of calomel, in combination with from three to ten grains of bicarbonate of soda every two hours, until eight or twelve powders are taken. If the bowels are not acted on freely by this combination, it should be followed by a saline laxative. At the same time light sinapisms are applied to the epigastrium. After the bowels are freely opened, it will often be found that the tongue has already become somewhat cleaner, and the bad taste, the nausea, and the vomiting have been relieved. If this happy effect has been produced, a weak acid or an alkali and bitter may be used. On the other hand, if the symptoms are not relieved, and the tongue is clean, denuded of epithelium or pointed, and red at the tip, a sedative is indicated. In the more chronic cases in which the gastro-duodenal catarrh has subsided, we have other conditions to deal with, and the indications are to remove the obstructing mucus and reduce the inflammation and thickening of the ducts. These indications may be met by remedies that in a measure increase the secretion of bile and thereby drive away the obstruction, or by drugs that render the mucus less viscid and that relieve the congestion. Among the remedies of this latter class the alkalies are of great service, and may

be given in the form of the alkaline effervescing waters, as the Carlsbad, Vichy, or Hathorn waters, or the salts of ammonium, sodium, or potassium may be used. Bartholow advocates the phosphate of sodium in drachm doses; Guiteras, iodide of potassium in small doses freely diluted, and taken fasting. The muriate of ammonium is one of the most reliable alkalies; it may be given in ten- or twenty-grain doses, three or four times daily, combined with an equal quantity of powdered licorice, and dissolved in water. Ipecacuanha has been advocated in small doses, as one-half of a grain or one grain, frequently repeated, for the same purpose.

To increase the secretion, nitro-hydrochloric acid, the vegetable hepatic stimulants, benzoate and salicylate of soda, and alkaline waters are of service. The alkalies should be taken in a large amount of water, preferably hot, on an empty stomach, and by slowly sipping the fluid. Emetics are also used for their mechanical effect, but care must be observed lest their too free use incite a fresh catarrh or aggravate the one already existing.

Mosler and afterward Krull have successfully treated catarrhal jaundice with enemata of cold water. They inject, once in twenty-four hours, from one to four pints of cold water (59° F.) slowly into the rectum, and require the patient to retain it as long as possible. With each injection the temperature of the water is gradually raised, otherwise it will not be retained.

By pressure on the fundus of the gall bladder, if it be readily grasped, directing the force toward the vertebral column, Gerhardt has succeeded in overcoming the obstruction and relieving the jaundice. The same author recommends the application of electricity. A strong induced current with slow interruptions is used; one electrode is placed over the gall bladder, the other on the back at a point directly opposite, and close to the spinal column. No doubt Kussmaul's treatment of intestinal obstruction, by washing out the stomach, would be of service in this affection.

The diet should be bland and non-irritating. Fats, sugars, and, as a rule, starches, should be excluded, as well as spirituous or malt liquors. Light broths, beef-tea, milk, and later, meats, fish, eggs, and oysters should be the chief articles of diet. Afterward tomatoes, lettuce, spinach, celery, and the like may be used.

The troublesome, and at times serious, effects of the jaundice will be treated of under that heading. (See *Icterus*.)

II. Purulent, Ulcerative, and Croupous Inflammation of the Gall Bladder and Gall Ducts (*Cholecystitis et Cholangitis Suppurativa, diphtherica, exulcerans, and crouposa* (Schüppel); *Exsudative Entzündung der Gallenwege* (Frerichs); *Cholécystite et Angéiocholéite*).

Etiology.—According to Bloch, in disease of the gall bladder and bile ducts the bile soon becomes infected with various micro-organisms, principally B. coli communis, staphylococci, and streptococci. Any condition obstructing the flow of bile invites bacterial infection (Charcot et Gombault, *Archives de Phys. et Path.*, 1876; Netter, *Prog. Méd.*, 1886; Terrier, *Revue de Chirurg.*, 1895). Hence foreign bodies, such as gall stones or parasites, in the biliary passages, stenosis and occlusion of the ducts in any part of their course, readily pave the way for any infecting agent.

Fütterer has shown that in a very few minutes after the injection of organisms into the circulation they appear in the bile. Flexner and Chiari have demonstrated the constant presence of typhoid bacilli in the bile in patients dying of typhoid fever, the latter observer describing acute inflammatory lesions in thirteen of nineteen such cases without any gross obstruction in the biliary passages. Camac records an instance of acute cholecystitis with operation in the first few days of an attack of typhoid fever. Cases of acute cholecystitis due to the Bacillus typhosus without previous history of typhoid fever are reported by Cushing and Mitchell. Hunner describes another occurring eighteen years after an attack of typhoid, with operation and isolation of the typhoid bacillus. It can safely be assumed that bacterial infection exists in all cases, and that acute inflammatory infection of the biliary passages may occur without obstruction in many of the acute infectious diseases. Cases of acute phlegmonous cholecystitis and gangrenous cholecystitis are probably only instances of very severe infection, which may spread so rapidly that general peritonitis may occur in a few days. Pratt,[5] in his recent article, shows the frequency of cholecystitis due to the Bacillus typhosus. It therefore seems probable that cholecystitis may begin as a primary local typhoid infection. Pearce[6] has described an instance of the presence of a leptothrix in an acute cholecystitis, the organism being also found in gall stones present in the gall bladder.

Ulcerations of the biliary passage are most frequently due to gall stones. Carcinoma is a common cause, and ulcerations have been met with in typhoid fever and in cholera. The sequelæ of ulcerations, stricture, perforation, fistula, etc., make the condition more serious than it might otherwise be.

Croupous or membranous inflammation of the gall bladder and ducts may occur as the result of irritation from the passage of a gall stone, or it may be a further stage of catarrhal inflammation. Powell (Med. Trans. Coll. Phys., 1829) noted that membranous enteritis was frequently accompanied by gall-stone-like attacks, and it has been suggested that gall-stone colic may be the exciting cause of membranous enteritis. Robson thinks a membranous or croupous formation in the gall bladder or ducts, with passing of the membrane or pieces thereof, accounts for the painful, gall-stone-like attacks. Fenwick (*Br. Med. Jour.*, April 23d, 1891) discovered a true cast of the gall bladder in the fæces twenty-four hours after a very severe attack of hepatic colic. A similar cast had been found two weeks previously under similar conditions. In all suspected gall-stone attacks, in which no stones are found in the fæces, search should also be made for fleshy, tube-like structures or fragments thereof, as they alone may be responsible. Robson is of the opinion that the gall-stone-like attacks seem not infrequently, in subjects of membranous enteritis, to indicate involvement of the biliary passages in a similar condition. Extension of purulent inflammation from adjoining veins or from hepatic abscesses appears to have been the cause in some instances. It is certainly true that a multiform inflammation of the ducts may occur by extension of inflammation from some one localized focus, as an ulceration due to gall stone. This form of biiiary inflammation is usually met with in advanced life. Croupous inflammation of the biliary passages is also caused by gall stones.

Morbid Anatomy.—The cases that have been observed by the writers presented nearly all the anatomical appearances that occur in cholangitis and cholecystitis.

There are observed a swollen, thickened mucous membrane, of a pale ashen or slate-gray color; uniform or saccular dilatation of the ducts; and abscesses in the periphery of the duct or along its course. Often a gangrenous appearance of the duct wall is seen. The dilated canals and the abscesses contain yellowish-green bile and pus, sometimes thick and ropy, and often ichorous. The dilatation is most frequently confined to, or most marked in, the left lobe of the liver, and Legg says that the dilated pouches and ducts are lined with columnar epithelium. Ulcers are often found, superficial in character, large and irregular, or quite deep and small. From the healing of the ulcers and the contraction of the cicatrix, the ducts beyond the obstruction are obliterated. This may also occur after exudative inflammation; and in the liver fibrous bands, the remains of the biliary channels, are often seen. The tissue of the liver beyond becomes sclerosed, and the cells proper undergo atrophy and degeneration. The abscesses of the liver may extend into a contiguous vein, or may ulcerate toward the surface; hence a perihepatitis is often seen. Sometimes one large abscess alone is found; rarely do abscesses become encapsulated. The ulcers that have formed are often covered with a gray, gangrenous detritus, which is removed with difficulty. This characterizes the diphtheritic form. In the croupous inflammation of the ducts,

fibrin cylinders, well moulded and easily removed, are found. The hepatic structure undergoes some changes: in the mild forms either a connective-tissue overgrowth lights up, or a diffuse hepatitis arises; in the chronic forms with jaundice the liver cells are icteric, compressed into various shapes, and present the appearances of having undergone fatty or granular degeneration.

As a sequence of purulent or exudative inflammation of the gall bladder, marked phenomena are observed. The mucous membrane undergoes the usual changes, the walls become thickened, and the cavity is filled with pus, muco-pus, or pus and bile. Ulcerations, simple or diphtheritic in nature, are formed, and may penetrate to the peritoneal cavity.

Adhesions take place between the gall bladder and neighboring structures, fistulæ develop, and often the adjacent tissues are filled with pus. The ulcers are single or multiform. In mild cases a fibrous thickening of the walls of the gall bladder and its surroundings takes place, followed by contraction and obliteration of the organ. Twice the writers have found the gall bladder firmly contracted around imprisoned gall stones, and in one case numerous sacculi had been formed, each sac containing a gall stone surrounded by bands of fibrous tissue. On the other hand, the gall bladder may undergo extreme dilatation and enlargement, producing an empyema. If the phlegmonous inflammation be confined to the walls, this structure may undergo calcareous degeneration (so-called "ossification").

Symptoms, Course, Duration.—The symptoms are those of the causal condition,—as one of the infective fevers, gall stones, etc.,—combined with the local inflammatory manifestations. Often the condition is not recognized during life, or there may be present only an irregular fever, with rigors. If, after an attack of hepatic colic, fever of an irregular type, chilly sensations, or sharp rigors, occur, and prostration ensues, independently of any paludal affection, we may suspect ulcerative inflammation of the bile ducts. In these cases, the jaundice, which is usually present, deepens, pains in the hepatic region are marked, and a fixed local pain in the right hypochondrium is complained of. If the gall bladder is involved, the physical signs of enlargement of that organ are observed (see the section on Enlargement of the Gall Bladder). As the inflammation proceeds, the symptoms of perihepatitis, local or general peritonitis, occur. In addition to pain in the region of the gall bladder, we have pain and tenderness frequently in the epigastrium. With or without this local inflammation, vomiting is frequent, hemorrhages occur from the stomach and bowel, and often a diarrhœa is started. Budd believed that many cases recovered. If so, the burrowing of the pus must have been in the direction of the stomach or duodenum. An increase of local tenderness, and the presence of tumefaction and redness, show that the direction which the pus is taking is toward the surface. Discharge of the abscess in this position leads to the formation of a cutaneous biliary fistula. If this fortunate termination does not occur, and in a cholangitis it is not to be expected, the fever continues, the gastro-intestinal digestion gives way completely, a typhoid state of the system arises, cholæmia frequently occurs, and finally death. A fatal result may occur from exhaustion, due to the combined influences of the fever, the suppuration, the gastro-intestinal disturbances, and the jaundice; or a peritonitis from perforation or rupture of the gall ducts, or a pylephlebitis, may hasten the fatal termination. Hemorrhages are also liable to occur if the jaundice is of long duration, and they will add to the extreme debility. Cholecystitis, due to foreign bodies or to obstruction of the cystic duct, may run its course, and the contents of the bladder be discharged into the neighboring hollow viscera, or externally, without the supervention of grave general symptoms; local phenomena and physical signs alone indicating its presence. The lodging of a gall stone in a common duct is often and usually associated with a peculiar fever and train of symptoms, the so-called hepatic intermittent fever of Charcot. Osler, Fenger, and Courvoisier describe a ball-valve action of gall stones lodged in the diverticulum of Vater, the bile readily flowing by the stone but becoming easily obstructed and infected under certain circumstances, producing the characteristic ague-like paroxysms which may be frequently repeated (the recurring jaundice deepening with each attack), or may occur at intervals of months or years. Each attack probably represents an infective cholangitis which may quickly subside or may run into the more serious conditions already mentioned as occurring in infection of the biliary passages. Leucocytosis, more or less marked, absence of the malarial parasite in the blood, resistance to quinine, the irregularity of the paroxysms, and the deepening jaundice should distinguish the conditions from malaria. There is usually a history of previous gall-stone colic. Robson states that in his experience several impacted stones were as frequently found as a single stone, freely movable, and acting like a ball-valve.

Diagnosis and Prognosis.—The diagnosis is uncertain, and when the symptoms are latent it is manifestly impossible to make a diagnosis. Pain and swelling of the liver, with tenderness on pressure, irregular chills and fever in a person who is jaundiced, or who has had an attack of gall stones, are strong evidences of exudative inflammation. Cholecystitis may be recognized by local symptoms (see section on Enlargement of the Gall Bladder). The prognosis is very unfavorable on account of the many accidents that may arise.

Treatment.—Stimulants, tonics, quinine, medicines to allay gastro-intestinal irritation and dyspepsia, and morphine or other preparations of opium to relieve pain, are the only means at our command for combating the disease. Unless the disease shows signs of resolution it is now generally advised to open and drain the gall bladder in cases of cholecystitis. In infective and suppurative cholangitis, opening of the gall bladder offers the only chance and is followed in many cases by cure. Terrier (*Revue de Chirurgie*, 1895) and Robson insist upon the value of this proceeding. Removal of stones from the common duct is now performed and is indicated in persisting evidence of obstruction and infection (Halsted).

III. Stenosis and Occlusion of the Gall Ducts.—The canal is occluded when it is completely closed; partial closure, sufficient to cause obstruction, is denominated stenosis. These conditions may be congenital or acquired; the acquired forms alone are treated of in this connection. The causes of each are the same, and the results are similar.

The obstruction may be due to foreign bodies within the duct, to diseases of the duct walls, or to external pressure.

1. The foreign bodies which may find lodgment within the ducts are gall stones, parasites, or, in rare cases—if the orifice of the duct is very patulous, as occurs after the passage of a gall stone,—cherry pits, plum stones, or raisin seeds. The gall stones are generally impacted in the cystic duct, or at the mouth of the common duct. The common round worm has been found in the lumen of the duct. The liver fluke also causes stenosis; but complete obtruction is not effected without the intervention of local inflammatory symptoms. The rupture of an echinococcus sac into the ducts and the discharge of the vesicles cause temporary obstruction. Complete closure is caused by multilocular echinococcus tumors, which cause infiltration, thickening, and ulceration of the wall of the duct. The hepatic and cystic ducts are chiefly involved.

2. The obstruction may be due to chronic catarrhal inflammation, to purulent and ulcerative inflammation, to carcinoma or other morbid growths of the ducts, or to a perihepatitis with thickening of the investing membrane, leading to hypertrophy of the subserous connective tissue and occlusion of the duct. In the inflammatory forms, granulations in apposition coalesce, and the formation of a stricture ensues. When ulceration has previously occurred, the stenosis is due to the contraction of the cicatrix. The causes mentioned in the sec-