sence of strychnin, the liquid remains colorless. If the reaction is obtained as above described another portion of the residue is moistened with concentrated sulfuric acid and heated in an air oven at 130° C. for five minutes, cooled, and treated with the dichromate or peroxid. Strychnin is not affected by the acid at this temperature, but other substances giving color reactions not unlike those belonging to strychnin are either colored by the acid alone or are destroyed. If the material be too highly darkened or blackened when heated with the acid, the cooled liquid should be rendered faintly alkaline, extracted with chloroform, and the residue tested for strychnin. (See Witthaus and Becker, *Med. Jur.*, iv., 808.)

The reaction is interfered with to a greater or less degree by the presence of sugar, morphin, or other reducing agents, brucin, and other substances; therefore the foreign bodies should be removed as completely as possible before the test is applied.

This color reaction is distinct with gr. $\frac{1}{60000}$ of strychnin.

4. The physiological test, first suggested by Marshall Hall, is also extremely delicate. A small frog is held by the hind legs, the skin of the back over the coccyx is raised by a pair of forceps, and a small incision made through the skin into the lymph pouch with a pair of pointed scissors. A few drops of the solution under examination are then allowed to flow from a pipette into the lymph pouch, and the animal is placed under a glass shade. If the liquid contain strychnin, the animal becomes uneasy in about ten minutes; the respiration is accelerated; and violent tetanic convulsions are provoked by striking upon the table, by blowing upon the animal, or by other slight irritations.

5. A solution of iodic acid in concentrated sulfuric acid colors strychnin brick-red, the color changing to violet.

6. Solution of potassium dichromate causes a yellow, crystalline precipitate in solutions of strychnin or of its salts. If this precipitate be moistened with sulfuric acid, the play of colors described in 3 is produced.

Other reactions of strychnin are the following: With solutions of the alkalies, or alkaline carbonates, a crystalline precipitate of strychnin from moderately concentrated solutions of its salts. With tincture of iodin, or a solution of iodin in potassium iodid solution, a dark red-brown precipitate. With platinic chlorid and with auric chlorid, light-yellow precipitates, gradually becoming crystalline. With potassium-iridium chlorid, a dark-brown precipitate, which disappears on agitation, but gradually reappears in the form of crystals. With potassium platinocyanid, a white, crystalline precipitate. With potassium-cadmium iodid, a white, flocculent precipitate. With potassium iodhydrargyrate, a fine, white precipitate. With phosphomolybdic acid, a yellowish-white precipitate. With picric acid, a yellow precipitate, which gradually becomes crystalline. With tannic acid, an abundant, white precipitate.

Failure of Detection.—The reactions of strychnin are clearly defined, and it is difficult to suppose a case of death from the effects of this poison in which a properly conducted analysis would not reveal the presence of the alkaloid in the cadaver. It is unquestionable that death may result from the action of certain corrosives and poisons, without any trace of the substance remaining in the body after death. In cases in which a mineral acid or alkali destroys life by starvation, weeks or months after the corrosive has been taken, and in cases of death from digitalis, on the fifth or sixth day, the agent which was the remote cause of death has been eliminated before the fatal termination, and consequently will not be detectable by analysis. The duration of a fatal case of strychnin-poisoning is, however, so short (the maximum lapse of time being six and a half hours, and the average less than one hour from the taking of the poison) that it is, to say the least, highly improbable that a person should die from the effects of this poison and no trace of it remain in the body.

Yet cases have occurred in which death has been undoubtedly due to strychnin, and an analysis has nevertheless failed to reveal the presence of the alkaloid in the cadaver. An historical instance is the case of Palmer, tried in London in 1856, in which Professor Taylor, who made the analysis, did not obtain chemical evidence of the presence of strychnin, although the deceased, Cook, was seized with violent tetanic convulsions fifty-five minutes after taking the poison, and died in about fifteen minutes thereafter. The failure of this analysis (for such it must be considered, as complete elimination in so short a time is not possible) was the subject of much bitter controversy, and seems to have permanently warped the mind of Dr. Taylor on the subject of chemico-legal evidence. It was due to two causes, both avoidable. The autopsy was conducted without the commonest precautions necessary in such cases. The defendant was present, and accidentally (?) caused the loss of the contents of the stomach; and the solid viscera were only obtained for analysis at a later date. But the loss of the contents of the stomach, although they probably contained strychnin in larger quantity than the tissues, would not have caused complete failure of the analysis had the analytical processes been properly conducted.

When the amount of strychnin present is large, positive reactions may be obtained even in the unpurified residues; but when the amount is small, as it must necessarily be when absorbed, it is imperative that the alkaloid be freed from other substances as completely as possible before the tests are applied.

Influence of Putrefaction.—Strychnin is one of the most stable of the alkaloids, and remains unaltered in contact with putrefying animal substances for a long time. Cloetta obtained distinct reactions from viscera containing strychnin which had been buried three, six, and eleven and a half months (*Arch. f. path. Anat.*, Bd. xxv., p. 369). Rieckher (*Zeitsch. f. anal. Chem.*, vii., 400) demonstrated the presence of strychnin in a mass of heart, lung, and liver exposed to the ordinary variations of temperature, with which it had been mixed eleven years previously. (See *Ptomaïns*, Vol. VI., p. 792).

Rudolph A. Witthaus.

STRYKER MINERAL SPRINGS.—Williams County, Ohio.

Post-Office.—Stryker. Visitors received in private families.

The village of Stryker is located on the Air Line division of the Lake Shore and Michigan Southern Railroad. The springs are pleasantly located in the village. They have been allowed to languish somewhat, but we are informed that they have recently passed into the hands of Dr. C. F. Mignin, who proposes to repair and refit the bath-houses, with the intention of establishing a first-class sanitarium. The following analysis of the water was made in 1870 by S. H. Douglas, analytical chemist:

One United States gallon contains (solids): Calcium bicarbonate, gr. 68.30; iron bicarbonate, gr. 9.93; potassium sulphate, gr. 185.34; sodium chloride, gr. 231.86; magnesium chloride, gr. 118.96; silica, gr. 2.63; hydrosulphuric acid, gr. 4.49; total, 621.51 grains.

This water is very rich in valuable chemical compounds. It possesses an exceptionally large quantity of potassium sulphate, which with chloride of magnesium gives it efficient laxative and cathartic properties. The water is also a rich chalybeate, and should be valuable in anæmic and debilitated states, especially when attended by sluggishness of the liver and constipation.

James K. Crook.

STYPTICIN, cotarnine hydrochloride ($C_{12}H_{13}NO_3.HCl.H_2O$), obtained by the oxidation of narcotine, an opium alkaloid, occurs in bitter yellow crystals which are soluble in water and alcohol. The solutions slowly darken on exposure to light. Chemically it differs but slightly from hydrastinine hydrochloride ($C_{11}H_{11}NO_2.HCl.H_2O$); and clinically it exerts a similar action on uterine hemorrhage.

Falk, of the Pharmacological Institute of Berlin, states

that it paralyzes the motor cells of the spinal cord, is mildly narcotic, and stimulates peristalsis. It has no direct effect upon the circulation and is depressing to respiration, death being due to respiratory paralysis.

Rousse and Walton, Marfori, and others, however, assert that it stimulates the heart, and that it controls hemorrhage by vaso-constriction. It does not coagulate the blood. As to its effect on uterine contraction there are conflicting statements, MacNaughton-Jones and a few other writers believing it contraindicated in pregnancy, while d'Alessandro, Beadles, and many other obstetricians, have found it most useful in threatened abortion.

The only use of stypticin is to control hemorrhage, and the conditions in which it is especially indicated are: menorrhagia, puerperal hemorrhage, subinvolution, climacteric hemorrhage and hemorrhage dependent upon peri-uterine or adnexial disease. Boldt recommends it highly in the profuse and irregular menstruation of virgins in whom there is no detectable pathological lesion. In hypertrophic endometritis and uterine fibroid it seems to act successfully in only a limited number of cases, though in the latter condition H. D. Ingraham found it better than ergot, hydrastis or thyroid, and MacNaughton-Jones writes: "The hemorrhages in which it proves of most service are those due to uterine interstitial fibroid," . . . etc. The drug has been given with apparent good result in hæmoptysis, hæmatemesis, hæmaturia, and the menstrual neuroses.

The dose is 0.02–0.06 gm. (gr. ⅓–i.) several times a day in pearl, capsule, or solution. In menorrhagia the larger dose is given for two or three days before the expected menstruation. The only ill effects noted by Goldschmidt from a dose of 0.03–0.06 gm. (gr. ss.–i) every two or three hours for a week, were nausea, and heaviness and constriction in the stomach. Where a prompt effect is desired 2 c.c. (ℿxxx) of the ten-per-cent. solution may be administered hypodermatically in the gluteal region. The injection is non-irritating (d'Alessandro).

Locally stypticin has been applied to the cavity of the uterus and to bleeding tooth cavities; and it is used in rectal hemorrhage, nosebleed, and following small operations. A very useful form for local employment is the stypticin-gauze or stypticin-cotton, made by soaking the gauze or cotton in a ten-to-fifty-per-cent. solution of stypticin and allowing it to dry.

W. A. Bastedo.

STYPTICS. See *Hæmostatics.*

STYRON, phenyl-allyl alcohol, ($C_6H_5CH:CH.CH_2.OH$), is a thick brown oily fluid, used as an antiseptic and deodorizer.

W. A. Bastedo.

SUBARACHNOID COCAINE INJECTIONS. See *Spinal Cocainization and Lumbar Puncture.*

SUBLAMINE, ethylene diamine mercury sulphate, is a red, very soluble salt of mercury, which is employed as a non-irritant antiseptic substitute for corrosive sublimate. It is not decomposed by soap, does not readily coagulate albumen, and does not harden the skin; yet many experiments have shown it to possess marked bactericidal properties, with a greater penetrating power than has mercuric bichloride. Being non-irritating, it may be used in concentrated solution. Bischof, Swinburne, Dunlap, Reineke, and many others have spoken highly of its advantages in general surgery. Moir has employed it as a vaginal douche. It is ordinarily used in the same strength as the bichloride.

The ethylene-diamine mercury citrate has practically the same properties, but is a liquid. It is used by Zweifel in his obstetric wards, and by Kronig and by Blumberg in gynecology.

W. A. Bastedo.

SUCCUS ENTERICUS.—This fluid is the secretion of the minute glands present in the wall of the small intestine, and it is probably furnished chiefly by the cells of the glands of Lieberkühn. It was first obtained in a pure condition by Thiry, who employed for this purpose an artificial tube of intestine prepared by cutting across the small intestine at two points about 20 to 30 cm. apart, without interfering with the mesentery, restoring the continuity of the intestine by stitching the upper border of the upper incision to the lower border of the lower incision, and then, after closing the lower end of the isolated portion of gut, attaching the upper end of it to the abdominal wound. In this way a living test tube of intestine is obtained, in which the effects of stimulation upon the secretion can also be studied. This procedure was later modified by Vella, who left both ends of the isolated piece of gut open and attached to the abdominal incision. A fistula obtained by the latter method is commonly called a Thiry-Vella fistula, and is the form now usually employed in experimental work.

Opportunity has also been taken by clinicians of studying the succus entericus in man, in cases in which accidental isolation of loops of gut has occurred.

A different method of observation was introduced by Hermann, who closed both ends of the isolated loop so as to form a ring and then restored it to the abdomen and examined it after several days had elapsed. Voit has also used a similar method, merely suturing the two ends of the loop up and then replacing in the abdomen. In both modes of experiment the continuity of the shortened gut is of course restored, as in making a Thiry-Vella fistula.

Such isolated loops left in the intestine for some days are found to be filled with a solid core of a yellowish-gray color, consisting of inspissated succus entericus and débris of intestinal cells; it also yields a large amount of ethereal extractives which probably are produced in the degenerative changes of the intestinal mucous membrane.

The succus entericus secreted into a Thiry-Vella fistula has frequently been described; it is a limpid, opalescent, light-yellow-colored fluid, of strongly alkaline reaction, and effervesces on the addition of acids. It contains coagulable proteid and mucin. It is yielded more abundantly by the lower part of the small intestine than by the upper, and it is stated that the more copious secretion of the lower end contains less mucin.

Human succus entericus has been investigated by Tubby and Manning, who obtained an average daily yield of 27 c.c. during a period of some months from a length of three and one-half inches of gut situated eight inches above the ileo-cæcal valve. This fluid was opalescent, brown in color, and strongly alkaline to litmus. It contained proteid, and did not reduce Fehling's solution, or give any color tests with iodine. The presence of lactates was shown by increase in color of very dilute ferric chloride solution and by a positive effect with Uffelmann's reagent.

It inverted both cane sugar and maltose, and had a certain amount of diastatic action upon starch. The inverting ferment present in the juice adhered mechanically to the mucin, which was often thrown out of solution.

All authors are agreed as to the presence of an inverting enzyme for disaccharides, but some deny a diastatic action on starch, and there is little doubt that the action here is much feebler than that of the absorbing intestinal cells. Thus Röhmann found that starch disappears from a Thiry-Vella fistula much more rapidly than could be accounted for by the feeble action of the succus entericus, and Brown and Heron state that the dried mucous membrane hydrolyzes starch much more rapidly than do clear watery infusions of the mucous membrane.

The conditions of secretion appear to vary in different animals; thus in the sheep, according to Pregl, secretion occurs continually, although it is augmented in the first two or three hours after a meal, while in dogs in which fistulæ have been established little secretion occurs except when the intestine is stimulated. The taking of food acts as a reflex stimulus, as do also mechanical or electrical stimuli when applied directly to the mucous membrane. The introduction of such substances as starch, sugar, or peptone also evokes a secretion. Certain drugs, such as pilocarpine, also cause a secretion.

If all the nervous connections of a loop of gut are severed, it has been shown that this becomes distended by secretion; but if the inferior ganglia of the solar plexus and their connections on the superior mesenteric artery are left in connection with the gut this paralytic secretion does not take place.

It has recently been shown that the succus entericus contains, in addition to the digestive enzymes above mentioned, others of a peculiar and interesting type.

Thus Cohnheim has shown that it contains an enzyme which he has named *erepsin*, which possesses the power of converting albumoses and peptones into amido-acids which no longer give the biuret reaction. The presence of this enzyme would appear to furnish a safeguard against the loading up of the organism by excess of digested proteids which could not be dealt with by the absorbing cells.

A still more interesting enzyme is that named *enterokinase* by its discoverer Pawlow.

It would appear from these researches that the greater part of the proteolytic enzyme of the pancreatic juice is discharged into the intestine in the inert form of trypsinogen, and that this enzyme, enterokinase, which is present in the succus entericus, possesses the power of converting the trypsinogen into trypsin.

The experimental basis for this view is that pancreatic juice alone is almost inert with regard to proteids, so also is succus entericus; but if the two fluids be mixed, an energetic action at once commences. This power of conferring activity upon the pancreatic juice is lost if the succus entericus has been previously boiled. Extracts of the intestinal mucous membrane also confer activity upon inactive pancreatic juice.

Benjamin Moore.

SUCRAMINE is a soluble ammonium salt of saccharin.

W. A. Bastedo.

SUET.—(*Sevum*, U. S. P.; *Sevum Præparatum* B. P.; *Sebum Ovile*, P. G.; *Suif de Mouton*, Codex Med.; mutton suet, mutton tallow. The Codex also recognizes the similar product of the ox, *Suif de Bœuf*, *Suif de Veau*, as well as the marrow, *Moelle de Bœuf*.) The part of the animal taken for suet is the same that yields the hardest and best lard, or beef tallow, namely, the thick mass of fat lying along the loins and surrounding the kidneys. The whole tissue is suet; the fat melted out and purified is tallow.

The preparation of suet is exceedingly simple, although not always carefully performed. It consists in first cleaning the suet from connective tissue, vessels, blood, etc., then cutting it in small pieces and washing in cold water, or allowing it to soak for a few hours in water; then it is boiled with a little water until the tissue is broken up, strained, and poured away to cool; the last portion of water is then removed by prolonged, moderate heat, which should not be allowed to rise above the boiling point of water. In the laboratory the steam kettles offer the most perfect means of "trying out" lard and tallow.

Mutton suet has no medicinal properties not common also to the other animal fats, excepting greater hardness, a higher melting point, and perhaps superior keeping qualities to most of them. It consists of the usual glycerin fats, *stearin*, *palmitin*, *olein*, etc., with the former in excess, and the latter at a minimum. The pharmacopœial description is as follows:

A white, solid fat, nearly inodorous, and having a bland taste when fresh, but becoming rancid on prolonged exposure to the air.

Insoluble in water or cold alcohol; soluble in forty-four parts of boiling alcohol, in about sixty parts of ether, and slowly in two parts of benzin. From its solution in the latter, kept in a stoppered flask, it slowly separates in a crystalline form on standing.

An alcoholic solution of suet is neutral or has only a slightly acid reaction to litmus paper moistened with alcohol.

Suet melts between 45° and 50° C. (113° and 122° F.), and congeals between 37° and 40° C. (98.6° and 104° F.).

Suet forms about one-fourth of mercurial ointment and one-half of tar ointment. It is also an extensively used domestic cerate.

Allied Substances.—Numerous fats of domestic and wild animals are in common household estimation for one purpose or another, with very little real difference from each other except in odor and hardness. Goose, chicken, and skunk oils are extensively used in country families all over New England. Something more distinctive, and having peculiar claims to attention, are the preparations of grease obtained from the wool of sheep, for which see *Lanolinum*.

W. P. Bolles.

SUGAR.—(*Cane Sugar*, *Saccharum*—$C_{12}H_{22}O_{11}$ = 341.2, U. S., Ger., *Saccharum Purificatum*, Br., *Sucrose*, *Saccharose*.)

The refined sugar obtained from *Saccharum officinarum* L. and from various species or varieties of *Sorghum* (fam. *Gramineæ*); also from one or more varieties of *Beta vulgaris* L. (fam. *Chenopodiaceæ*).

Common sugar is one of a group of similar substances formed in plants and animals, distinguished by their sweetness, solubility in water and diluted alcohol, and insolubility in ether. Like starch, their function in the plant is nutritive. They represent carbohydrate nutriment, in a condition ready for use, as starch represents it in a condition for permanent storage, and they represent the latter substance in a transformed condition. Cane sugar is very widely distributed in the vegetable kingdom, being the variety generally characteristic of stems and roots. In a few plants the percentage is so large as to render the process of extraction and refining commercially profitable. The more important sources are as follows:

Saccharum officinarum L., the *sugar cane*, native of Southern Asia and cultivated in all tropical countries, is the most important. The yield of sugar from a good article is from fifteen to eighteen per cent. Comparatively recent operations in the development of new varieties from seed have resulted in the production of a much greater yield (up to nearly twenty-five per cent.), and the seedlings are in many cases far more vigorous and better capable of resisting disease than the old varieties, which were wholly the product of stem propagation.

Beta vulgaris L. (fam. *Chenopodiaceæ*) yields a number of varieties collectively known as *sugar beet*, which are especially rich in sugar, yielding upward of twelve per cent. For a long time the production of beet sugar was little more than an experiment, but recently the industry has made great strides and beet sugar has come to be a very formidable rival of that from the sugar cane.

Acer Saccharum Marsh. (*A. saccharinum* Wang,—non L.; *A. barbatum* Mich.), the *sugar* or *rock maple* of Eastern and Central North America, is next in importance to the above as a sugar producer in the United States. Maple sugar, as it is called, especially when somewhat imperfectly refined, possesses a peculiar flavor, aside from its sweetness, in which it differs from the other varieties of sugar here considered. This flavor, while not affecting its medicinal or pharmaceutical properties, renders it a great favorite with many persons for table use.

Sorghum sugar, formerly a very important article of domestic manufacture in the Central United States, has declined greatly in production, owing to the increasing cheapness of sugar cane and beet sugars. It is the product of *S. vulgare* Pers. (*Andropogon Sorghum* Brop.; *A. sativus* Hack.), of which there are many varieties. It is believed that broom-corn is merely a variety of the same plant. That which yields sugar is distinguished as *var. saccharatum* (L.) Gray. (*Holcus s.*—L.; *Andropogon s.*—Roxb.). This plant is often known as *Chinese sugar cane*. In tropical Asia and in other tropical countries considerable quantities of sugar are manufactured from *Saguerus Rumphii* Roxb. (*S. saccharifer* Bl.), often known as the *sugar palm*, from other species of palms

and various other plants; but these products are rarely if ever articles of commerce in this country.

The official sugar is thus described:

White, dry, hard, distinctly crystalline granules, odorless, and having a purely sweet taste. Permanent in the air.

Soluble, at 15° C. (59° F.), in 0.5 part of water and in 175 parts of alcohol; in 0.2 part of boiling water and in 28 parts of boiling alcohol; also soluble in 80 parts of boiling, absolute alcohol, but insoluble in ether, chloroform, or carbon disulphide.

The aqueous solution, saturated at 15° C. (59° F.), has the specific gravity 1.345, and is miscible with water in all proportions.

The aqueous or alcoholic solution of sugar is neutral to litmus paper.

Both the aqueous and the alcoholic solution of sugar should be clear and transparent. When kept in large, well-closed, and completely filled bottles, the solutions should not deposit a sediment on prolonged standing (absence of *insoluble salts, ultramarine; Prussian blue*, etc.).

If 1 gm. of sugar be dissolved in 10 c.c. of boiling water, the solution mixed with four or five drops of silver nitrate T.S., then about 2 c.c. of ammonia water added, and the liquid quickly brought to the boiling point, not more than a slight coloration, but no black precipitate, should appear in the liquid after standing at rest for five minutes (absence of *grape-sugar*, or of more than a slight amount of *inverted sugar*).

Preparation.—The essential features of the manufacture of sugar are the rapid expression of the juice, the separation of impurities by various methods, partly mechanical and partly by precipitation, the evaporation of the water by boiling, the separation of the mother liquor or molasses (described below) and the crude sugar, and the refining and crystallization of the latter. These several processes may be performed by various methods. Although such modifications are frequently very slight, from a theoretical standpoint some of those of modern introduction are of so great an economic importance that they have completely revolutionized the industry, and their introduction into certain countries and not into others has even resulted in the complete ruin of the industry in the latter places. One of the most important of these series of modifications consists in the better use of lime or other alkalies for the purpose of neutralizing the acids present, which, under the influence of the heat in boiling, were formerly responsible for heavy losses in the yield of sugar through its conversion into invert sugar.

The large number of commercial varieties of refined sugar, depending as they do chiefly upon the degree of purification, the form and size of the crystals and of the fragments, the processes of powdering, coloring, and so on, are merely incidental and without pharmaceutical or medicinal interest. There are, however, certain of the sugar products which differ enough from ordinary crystallized sugar to be worthy of mention.

Barley sugar (*Saccharum hordeatum*) is sugar brought into the condition of a transparent, non-crystalline, yellowish body, as a result of melting and cooling. In this condition its taste is markedly different from that of the crystalline substance.

Caramel is an empyreumatic product made by keeping sugar at a temperature of 180° to 200° C. (356° to 392° F.) until it turns brown and loses two molecules of water. Caramel possesses a peculiar odor and taste, as well as a brown color, and is chiefly used for coloring purposes. It can, however, be decolorized, this product having been named *caramelan*.

Invert sugar is produced from ordinary sugar by various methods, most readily through the action of dilute acids under the influence of heat. It can also take place as a result of the prolonged action of heat alone upon a mixture of sugar and water. Invert sugar is a mixture of the two products dextrose and levulose, the latter not being capable of crystallization.

Rock candy is a very pure form of sugar, made to form in very large crystals.

The behavior of sugar under the action of certain ferments will be found considered under alcohol. Other changes produced in it are considered under the subject of digestion.

Action and Use.—Sugar has been known from a very remote period in India, where the cane has been used as food from prehistoric times. It found its way into Europe about the beginning of the Christian era, probably as a natural exudation, like manna, from the wounded canes. It was originally an expensive rarity in Europe and used only as a medicine or luxury. Its general use there as a food dates back only two or three hundred years. Even at the present time, its consumption as a food is continually increasing upon a vast scale, partly because of the extension of its uses for preserving purposes, but chiefly on account of the continued cheapening of its price. It has no medicinal importance except for its slight expectorant properties (see below, under *Molasses*). Certain morbid conditions induced by its excessive or improper use are very general. Undoubtedly the human race would be far better off, so far as health is concerned, if the use of pure glucose could be generally substituted for that of cane sugar.

In pharmacy, the uses of sugar are varied, extensive, and highly important. As a preserver of some unstable chemicals, like iodide and suboxide of iron, fruit juices, and other perishable vegetable and animal products, it is invaluable. Mixed with water, it becomes a preservative solvent for many drugs, though if its strength be too greatly reduced it becomes readily fermentable. Its consistence frequently gives required body to preparations, and its taste is of the greatest value in many of its uses as an adjuvant. Finally, it is of great use as a coating for pills.

The only official preparation of sugar itself is *Simple Syrup* (*Syrupus*, U. S P.), made by dissolving 850 gm. of coarsely powdered sugar in enough distilled water to make 1,000 c.c. It may also be made by the percolation of distilled water through sugar. Other official and unofficial syrups are to be regarded rather as syrupy preparations of the drugs themselves than as preparations of sugar.

Other Sugars.—Other kinds of sugar, animal and vegetable, will be found described in this work under the titles *Glucose*, *Honey*, *Manna*, *Milk*, *Sugar of*, as well as in connection with the liver, diabetes, etc.

Molasses or *treacle* is the mother liquor remaining after the separation of all the sugar which can be caused to crystallize after the boiling down of the prepared juice of the plant. The varying color, odor, flavor, and consistence of different varieties and grades of molasses depend partly upon the amount of sugar left in it, the degree of refinement and cleanliness observed in its preparation, and more or less purification to which it may be subjected. The practice prevails very largely at the present time of making molasses out of glucose, the latter chiefly manufactured from Indian corn, or of adding such glucose to natural molasses. Syrup, sugar-house syrup, or crystal drips, is a product of the final draining to which refined sugar is subjected.

In the household, the different varieties of molasses are credited with important and varied medicinal properties. Doubtless molasses or syrup has quite an important action in relieving an irritable cough, and many of the popular proprietary cough syrups probably owe the most of whatever value they possess to the influence of the syrup which they contain.

Henry H. Rusby.

SUGARINE, methyl-benzoyl-sulfimid, methyl-saccharine, is a compound said to have five hundred times the sweetening power of sugar.

W. A. Bastedo.

SUGGILLATION (more properly *sugillation*, from *sugillare*, to beat black and blue).—In the older literature this term is used to designate superficial areas of discoloration, as black and blue spots, ecchymoses, hyperæmic spots,

livid marks or patches, or various spots occurring in the skin in different diseases. The patches of discoloration in the skin of the cadaver due to post-mortem hypostasis or incipient putrefaction were likewise termed suggillations (*sugillatio*). More recently, through the influence of the German school, the term has come to be applied to hemorrhages into or beneath the tissues, of a larger size than ecchymoses; and with this usage there is also conveyed the idea of a *suffusion* of the tissues with blood. The term is, therefore, used interchangeably with *bloody suffusion*, and is applied to more or less flattened, diffuse swellings of the skin due to hemorrhage into the subcutaneous tissues, or to similar hemorrhages occurring in other loose tissues. A suggillation is distinguished from a hæmatoma by the fact that in the former the tissues are infiltrated with blood but not torn apart so as to form a distinct cavity filled with blood. Suggillations are usually due to direct trauma, but occur in cases of both congenital and acquired hæmophilia. In the latter case they may result from the changes produced in the blood-vessel walls through intoxication or infection. Suggillations of the skin may take place in pernicious anæmia, leukæmia, sepsis, chronic icterus, and in the hemorrhagic forms of the acute infections. In typhoid fever suggillations of the abdominal recti may occur as the result of extensive parenchymatous changes (Zenker's necrosis) in the muscle. The sequelæ of suggillation are similar to those of hæmatoma—absorption, organization, or cyst formation. *Aldred Scott Warthin.*

SUICIDE.—The term suicide, to express the act of self-destruction, was probably first employed by Desfontains in the last century. It is derived from the Latin words *sui* (self) and *cædere* (to kill). (Synonyms: Fr., *Suicide;* Ger., *Selbstmord;* It., *Suicidio;* Legal, *Felo de se.* Other rarely employed terms are: Gr., *αὐτοχειρία*; and Lat., *Propricidium.*)

Suicide is a voluntary human act of self-destruction, and it is claimed by some writers that the act is always due to some disorder of the mind at the moment of its accomplishment.

History.—From the earliest times of which we have record the custom of self-destruction has existed to a greater or less degree, and it would appear that the peoples of antiquity were so taught by their religion that they could look upon the act as logical, and perform it with stoicism.

The religion of Brahma justifies suicide, and looks upon it, under certain conditions, as an honorable and praiseworthy act, which is often solemnized in a public manner. Fanatics in India, who believe in the transmigration of souls, seek an improvement in their condition and a freedom from present ills by courting death. The Brahmins have in a great measure given up their terrible custom of prostrating themselves before the car of their gigantic idol Juggernaut, to be crushed to death. Still they occasionally do it, and the women throw themselves upon the funeral pyres of their husbands.

Although held in honor among the people of the Orient, it was always rare in Persia, and is an exceptional occurrence among the Turks. The teachings of the Koran are opposed to it. Mohammed forbade it, and inculcated a spirit of patience in adversity. Here, too, the belief in fatalism probably exercised a marked influence, and the people were not given to philosophic thought, as were those of Greece, where many great men have sought death at their own hands.

When circumstances warranted the act, it was considered, in ancient Greece, a virtue for men to destroy themselves, thus escaping human ills, and, as they supposed, ameliorating their condition.

According to Legoyt,[1] Strabo relates as an historical fact that the inhabitants of the Isle of Ceos, in the Grecian Archipelago, poisoned themselves after reaching the age of sixty, so that the younger could have greater abundance; and Montaigne says that the senate of Marseilles, which then belonged to Greece, placed poison at the disposition of those who wished to commit suicide, when their motives were approved of.

The Hebrews, it would appear, scarcely knew suicide, and few cases are recorded. The Bible gives accounts of the self-destruction of Samson, Eleazar, Saul, Judas, and others.

The Celts were taught the immortality of the soul and their divine origin; still, suicide for the old and infirm was encouraged.

At Rome we find many noted suicides recorded, including that of Junius Brutus, and under the reign of Tiberius they appear to have increased in frequency. From the fifth to the twelfth centuries suicide almost wholly disappeared, but in the next century revolutionary ideas prevailed, and the previous influence of the Christian religion was so far lost that all classes of society suffered from a revival of suicide. Jews now resorted to it freely as a means of escape from hardships and to avoid disloyalty to their faith.

A decided increase is noted from the beginning of the sixteenth century, due to a disregard for religion and a revival of customs of antiquity.

In China and Japan men of honor have long resorted to self-inflicted death.

In Africa it was not rare for individuals and whole bodies of men to commit suicide, and Carthaginian generals often destroyed themselves after defeat.

The increase of suicide in civilized countries during the present century is shown by carefully gathered statistics, and conceded by most writers.

Statistics of suicide began to be systematically collected and studied only in the last century, official statistics being published in several European countries during the first twenty years of the century.

In Captain Graunt's "Bills of Mortality," published in 1665, it appears that 222 persons "hanged or made away with themselves" in the twenty years 1629–38 and 1647–58. This number, however, does not probably represent all the suicides, since there were probably a considerable number among the 827 registered as drowned, 243 found dead in the streets, and 14 poisoned. He estimated the population of London at that time as about 460,000.[26]

The following figures from the registrar-general's report for 1900 show that the suicide rate in England is increasing with a comparative degree of regularity:[3]

Suicides Per Million Living, England and Wales, in Five-Year Periods.

	Rate per million.		Rate per million.
1861–1865	65.2	1881–1885	74.8
1866–1870	66.4	1886–1890	79.4
1871–1875	66.0	1891–1895	88.6
1876–1880	73.6	1896–1900	89.2

The following table presents the death rates from suicide per million inhabitants in the principal countries of Europe, and a few other countries, and in the six New England States:

Death Rates drom Suicide in Different Countries per Million Inhabitants, 1880–1886; 1887–1893; and for the Single Year 1894.

Countries.	Estimated population in 1894.	Deaths from Suicide per Million Inhabitants.		
		1880–1886.	1887–1893.	1894.
Italy	30,818,248	47	54	56
France	38,133,385	196	227	?
England and Wales	30,060,763	76	82	91
Scotland	4,063,959	54	57	62
Ireland	4,600,599	22	25	30
German Empire	48,684,503	248	206	217
Bavaria	5,740,059	134	130	136
Saxony	3,703,600	375	324	312
Austria	24,549,193	164	161	‡154
Switzerland	3,006,886	227	219	235
Belgium	6,341,958	106	125	132
Holland	4,764,279	52	59	69

Death Rates from Suicide.—*Continued.*

Countries.	Estimated population in 1894.	Deaths from Suicide per Million Inhabitants.		
		1880–1886.	1887–1893.	1894.
Sweden	4,873,183	98	125	158
Norway	2,030,000	67	64	70
Denmark	2,259,500	256	251	255
Russia (Europe)	91,248,465	31	31	31
Poland	9,152,830	23	24	24
Spain	17,247,738	29	21	?
Uruguay	776,314	43	64	?
Argentine Republic	4,750,000	13	19	?
Japan	41,810,202	159	162	?
New England States.				1894–1900.
Massachusetts	2,445,604	87	96	116
Rhode Island	378,726	72	68	105
Vermont	336,910	91	81	90
Connecticut	811,100	*106	128	116
New Hampshire	390,555	*88	98	101
Maine	674,450	....	+88	§99

*1883–1886, four years only. +1892–1893, two years only.
‡1896. §1894–1899.

By the foregoing table it appears that suicides have increased in the greater number of countries shown in the table, but the length of time cannot be deemed to be sufficient to make the figures conclusive.[4 18]

F. L. Hoffmann, in a study of the subject, found that the rate had increased, in fifty cities of the United States, from 120 per 1,000,000 in 1890 to 166 in 1901.[5]

The rate differs in these cities from a maximum of 499 per 1,000,000 in San Francisco to 29 in Fall River.[6]

The following list presents the suicide rates per million inhabitants in the year 1900 for cities having a population of more than 200,000:

Cities.	Suicides per million in 1900.	Cities.	Suicides per million in 1900.
New York	221	Pittsburg	121
Chicago	210	New Orleans	139
Philadelphia	114	Detroit	119
St. Louis	226	Milwaukee	207
Boston	135	Washington, D. C.	104
Baltimore	122	Newark	191
Cleveland	149	Jersey City	165
Buffalo	113	Louisville	98
San Francisco	499	Minneapolis	99
Cincinnati	135		

The following table presents the suicides for London, Berlin, Paris, Vienna, and Budapest:

Cities.	1895.	1896.	1897.	1898.	1899.	Annual average per million population.
London [2]	483	425	451	436	485	102
Berlin [23]	446	494	495	462	457	208
Paris [24]	1,030	941	1,004	906	788	372
Vienna [25]	427	429	440	450	463	284
Budapest [25]	227	196	260	261	....	375

According to the London *Lancet*, the number of suicides in France during 1876 was 5,617. Of these, 4,435 were men.

Morselli believes in a law of continual increase, and shows by a table that the increase per cent., from 1827 to 1852, was from 100 to 238.[2]

It is shown by one of his tables that Saxony, which furnishes the largest number of suicides, has suffered an increase from 158 per 1,000,000 inhabitants in 1836–40, to 391 per 1,000,000 in 1877, but the rate had decreased to 312 per 1,000,000 in 1894.

Another table prepared from the statistics of Italy, from 1864 to 1877, shows an increase from 29.2 to 40.6 per 1,000,000, and these had also increased to 65 per 1,000,000 in 1898.

The suicides in Italy were as follows for the five years 1894–98:[22]

Year.	Number.	Per million inhabitants.
1894	1,732	55
1895	1,874	60
1896	2,000	63
1897	1,895	60
1898	2,059	64

The highest rate was that of Liguria, 126 per 1,000,000 in 1898; and the lowest was that of Calabria, 12 per 1,000,000 in 1897.

In the German empire the suicides in the four years 1896–99 were as follows: 1896, 10,484; 1897, 10,692; 1898, 10,559; 1899, 10,418. These were equivalent to an average annual rate of 201 per 1,000,000 inhabitants.[9]

From these and other data the following law is formulated:

"In the aggregate of the civilized states of Europe and America, the frequency of suicide shows a growing and uniform increase, so that generally voluntary death since the beginning of the century has increased, and goes on increasing more rapidly than the geometrical augmentation of the population and of the general mortality."

In the combined central and southwestern states and provinces belonging to Prussia the proportion of 150 suicides in the million is given. Morselli says:

"The synthetic and most certain law which springs out of these facts is that in the centre of Europe, from the northeast of France to the eastern borders of Germany, a *suicidigenous* area exists, where suicide reaches the maximum of its intensity, and around which it takes a decreasing ratio to the limits of the Northern and Southern States."

Nature.—The question of the nature of the act of self-destruction is a difficult and a delicate one withal to decide, but its great importance calls for much careful attention. Morselli says suicide is a social fact, and its nature "may now be reckoned among the most certain and valuable discoveries of experimental psychology"; and, further on, characterizes it as "an effect of the struggling for existence and of human selection, which works according to the laws of evolution among civilized people." But the question arises, is a given suicide, at the moment the act is committed, in the full and free possession of his faculties, and should he be held responsible for his movements? If the act be always due to a morbid condition of mind (as claimed by Dr. Liebman, in a paper read before the Medical and Chirurgical Faculty of Maryland, April, 1881), it should not be punishable as a crime; nor would, in this event, the punishment carry with it the intended restraining influence upon other would-be suicides. The mind which could conceive and plan so foul a deed would not, in all likelihood, be influenced by the thought of legal punishment in case of an unsuccessful attempt.

Insanity is probably present in the vast majority of suicidal attempts, and the number of those who act calmly and in the possession of their faculties must be much smaller than is generally supposed. Many obscure cases are difficult to explain on any other theory. There is a want of motive. The surroundings and station in life of the suicide are the best, and so far as can be learned, the social, financial, domestic, and other relations are only such as would be conducive to life and happiness. Such cases are more common in so-called epidemics of suicide. If the attempt has not resulted in death, evidences of insanity often soon appear, and make it clear that mental irresponsibility existed at the time.

In other cases insanity may have been previously known or suspected from conditions present, either immediately preceding the act or at some more remote period, and still no decided symptoms may have shown themselves until after an attempt at suicide.

An hereditary mental defect may have been known to exist, the person regarded as eccentric, and the attempt not unlooked for.

Organic disease, excesses, venery, onanism, etc., may