Boils should be promptly lanced and both they and the abscesses should be carefully watched and treated. Wherever suppuration is present it calls for treatment with quinine, iron and strychnine, wine, and full nourishment.

Complications such as erysipelas, laryngitis, pleurisy, pneumonia, nephritis, etc., are to be treated on general principles.

In severe cases of smallpox the heart muscle usually undergoes fatty and parenchymatous changes. This fact suggests the necessity of guarding the patient against heart-strain by rest in bed and, when needful, by the administration of cardiac tonics, such as strychnine and alcoholic stimulants. Delirium, restlessness, weak and rapid pulse, shrunken features, with great prostration, demand free, even bold administration of alcoholic stimulants and strychnine. The amount of alcoholics and strychnine to be administered in adynamic states of smallpox must be decided by the degree of vital depression to be combated. Convalescence is protracted in those who have had a severe type of smallpox. During this period marked benefit will be derived from taking Aitken's pills of arsenic, iron, strychnine, and quinine, with full feeding and alcoholic stimulants in moderate doses.

Eugene Foster.

SMELL, SENSE OF. See *Olfactory Nerve.*

SNAKEROOT, CANADA, or *Wild Ginger*, is the rhizome of *Asarum Canadense* L., and that of *A. reflexum* Bicknell has probably been more or less used for and with it. These plants are natives of rich woodlands in the Northeastern United States. The rhizomes lie very near the surface of the soil, may become a foot or more in length, branch rather freely, and bear few coarse roots. The leaves are long-petioled, kidney-shaped, and sometimes reach a breadth of six inches. The solitary flower is terminal, cup-shaped, three-lobed, about an inch broad, and of a deep purple color. The dried rhizomes are quadrangular or two-edged, longish-jointed, deep-purple, lightly curved, and about as thick as match-sticks. The odor and taste remind one strongly of ginger. With some resin, starch, gum, and sugar, Canada snakeroot contains an unknown bitter principle and 1.5 to 3.5 per cent. of a volatile oil. An alkaloid is also thought to be present. It is an excellent aromatic bitter, the aromatic element predominating, and a carminative and diaphoretic. The dose is from 1 to 2 gm. (gr. xv.–xxx.), the tincture being the preferable form of administration. The volatile oil is also known to commerce. Its active constituent is *asarol* ($C_{10}H_{18}O$). Under the name "*asarabacca,*" the rhizome of *A. Europeum* L. has long been employed similarly. It is now very little used. Its oil contains *asarone* instead of asarol, and it is distinctly emetic, or even purgative in the dose above specified for the other species. Its ordinary dose is only one-tenth as large.

Henry H. Rusby.

SNAKEROOT, VIRGINIA, OR TEXAS.—(*Serpentaria*, U. S. P.; *Serpentariæ Rhizoma*, B. P.) The dried rhizome and roots of *Aristolochia Serpentaria* L. (True Virginia Snakeroot or Serpentaria) or of *A. reticulata* Nutt. (Texas Snakeroot or Serpentaria) (fam. *Aristolochiaceæ*). These are perennial herbs, a foot or so high, from knotty, horizontal, aromatic rhizomes; stems slender, flexuose, branching at the base; leaves of various shapes between ovate and narrowly lanceolate, with heart- or halberd-shaped base, petiolate, entire; flowers lateral, on slender, straggling, crooked peduncles in the axils of bracts near the surface of the ground, about an inch long, consisting of a dull-purple, single perianth (calyx), whose curved tube has a wasp-like constriction near the middle, and a very oblique, spreading, three-lobed border; stamens six, short, connected with the style in three pairs; ovary three-celled, many-ovuled, inferior. The first named is a native of the Eastern United States, especially of Pennsylvania, Virginia, and Kentucky, where much of the drug is collected. The second named, of Texas and the adjacent region, is somewhat larger and coarser.

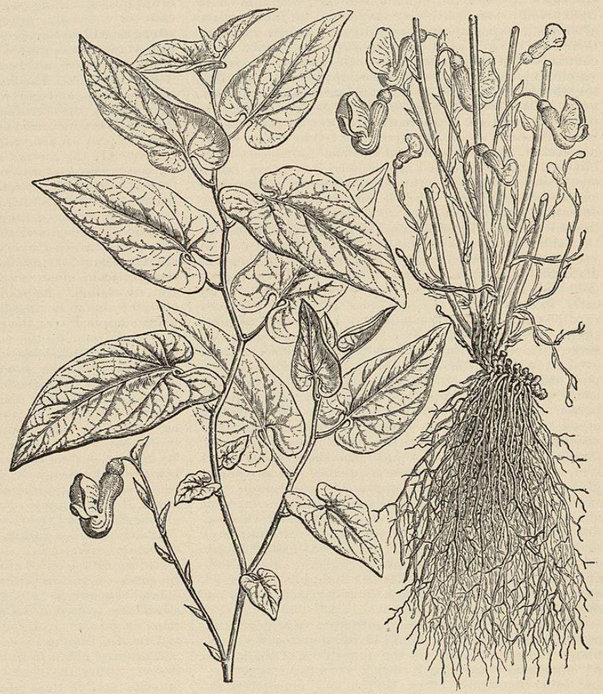

FIG. 4320.—Virginia Snakeroot. About one-half natural size. (Baillon.)

DESCRIPTION.—*Virginia Serpentaria.*—Rhizome of oblique growth, 1 to 3 cm. ($\frac{2}{5}$ to about 1 in.) long and 1 to

2 mm. ($\frac{1}{12}$ to $\frac{1}{12}$ in.) thick, crooked and somewhat branched, bearing on the upper surface approximate, short stem bases, and underneath a dense tress of long, thin, branched roots, which are straightish, except as they are bent and doubled by pressure; dull yellowish-brown, internally whitish, the wood-rays of the rhizome longest in the lower side; fracture of both rhizome and roots weak; odor strong, aromatic, and camphoraceous; taste warm, aromatic, bitter.

Texas Serpentaria is larger, coarser, of a more gray color, and the roots are fewer.

CONSTITUENTS.—Serpentaria owes its aromatic properties to a volatile oil, existing to the extent of from one-half to one per cent., of which *borneol* is the important constituent. Associated with this is five or six per cent. of resin, the greater portion of it soluble in petroleum ether. Tannin, starch, gum, and sugars also occur. The bitter principle is not well known, but is believed to be, in part at least, a very small amount of the alkaloid *aristolochine*, extracted by Hesse from *A. Argentina* Griseb. The amaroid *clematitin* ($C_9H_{10}O_6$), obtained from *A. Clematitis* L., is believed to be identical with a constituent of serpentaria which has been called *aristolochin*, also *serpentarin*, and which is poisonous: but the relationship of these to the alkaloid named above is not known. Hesse also describes *aristinic*, *aristidinic*, and *aristolic acids* from *A. Argentina*, and these are believed also to be present in serpentaria.

ACTION AND USE.—Although aristolochin has been found, as stated above, to be poisonous when pure, it is present in the drug in such small amount that the latter is not poisonous in any ordinary doses. Neither has serpentaria any specific properties, although such have been ignorantly ascribed to it. Its action is merely that of an excellent aromatic bitter and its antiperiodic and antirheumatic reputation is doubtless due entirely to its indirect effects as a general tonic. The dose of serpentaria is 1–4 gm. (gr. xv.–lx.); of the official fluid extract, 1–4 c.c. (♏xv.–lx.). The Pharmacopœia provides also a ten-per-cent. tincture, of which the ordinary dose is 4–16 c.c. (fl. ʒ i.–iv.). Like other bitter stomachics, serpentaria is far better taken in small doses, of the weaker preparations, a short time before eating.

The genus contains a large number of species, many of which have been similarly used in their own homes. Some of them are far more active than serpentaria, large doses acting as emetico-cathartic poisons.

Henry H. Rusby.

SNAKES AND SNAKE-POISON. See *Poisonous Reptiles.*

SOAP.—When natural fats or oils are decomposed by treatment with salifiable bases, they split up into the alcoholic body *glycerin* on the one hand, and a series of *acids* on the other—principally oleic, palmitic, and stearic acids, in varying proportions, according to the nature of the fat, which acids then unite with the base used in effecting the decomposition of the fat, to form salts—oleates, palmitates, or stearates, or all combined, as the case may be. Such salts are generally called *soaps*, but in common parlance the name soap is applied only to the fatty salts of the alkali bases—potassa, soda, and ammonia—which, in contradistinction to the soaps derived from earthy and metallic bases, are soluble in "soft" water and in alcohol. Of the alkali soaps, furthermore, ammonia soap is used only in the preparation called *ammonia liniment*, or *volatile liniment* (see *Ammonia*), so that the soaps in common use as such are narrowed down to soda and potassa soaps.

Between soda soaps and potassa soaps, as distinct classes, the broad distinction is that soda soaps tend to be comparatively hard, and potassa soaps soft, so that the phrase *hard soap* is applied generically to soda soaps, and *soft soap* to potassa soaps. But the consistence of soaps is also markedly affected by the nature of the fat used in the manufacture, in the way that fats rich in olein, as is the case with oils, tend to yield softish soaps, whereas those rich in stearin and palmitin, typified by the solid fats, such as tallow, furnish soaps of greater consistence.

Soaps are bodies of a well-known characteristic odor and disagreeable alkaline taste. They dissolve in alcohol and in "soft" water, but in "hard" waters they suffer decomposition by the calcic salts present, and the resulting lime soap floats in insoluble flocculi on the surface of the water. Soaps are, in general, decomposed by acids, by earthy bases and salts of the earths, and by the heavy metals. The useful property of soaps is that they attack grease, dirt, and dried animal débris, probably by virtue of their free alkalinity, and so affect those substances as to render them soluble in water, and thus readily removable.

The kinds of soap official in the United States Pharmacopœia for use in technical medicine are as follows: Under the simple title *Sapo*, Soap, is recognized "soap prepared from soda and olive oil." Such a soap corresponds to what is commercially called *Castile*, or *Spanish*, soap, and is an opaque, white substance, hard, but when fresh easily to be cut. It has the simple, characteristic smell of soap and an unpleasant alkaline taste. It dissolves readily in water and in alcohol. If the soap, as first separated in the making, be not purified, it presents a marbled appearance from contaminating streaks of an insoluble iron soap. This unpurified soap is stronger than the purified, white soap, since in the process of purification the soap combines with more water.

Castile soap is locally detergent, and, by virtue of its free alkalinity, mildly irritant to tender surfaces. Taken internally, it is innocent in moderate quantity, and tends only to relax the bowels and neutralize acid in the *primæ viæ*. Locally, free ablutions of soap and water are beneficial in certain forms of skin disease, such as acne, and, as regards internal giving, the principal application of soap is as a ready and innocent alkali to administer in cases of poisoning by any of the strong acids. A strong aqueous solution—one part of soap to four or five of water—should in such cases be very freely administered pending the arrival of more powerful and appropriate alkaline antidotes. Soap and water is also much used as a cathartic enema, but in sensitive conditions of the rectum may irritate. Pharmaceutically, soap is much used as an excipient in pill composition, but due regard must be paid to its chemical susceptibilities, as above detailed. From Castile soap are made the following official preparations: *Emplastrum Saponis*, Soap Plaster, is compounded of soap, one part, and lead plaster, nine parts, mutually incorporated when in the fluid condition, and the product evaporated to the proper consistence. Soap plaster is a feebly active plaster, devoid of specific medicinal properties. *Linimentum Saponis*, Soap Liniment, is compounded of soap and camphor with a little oil of rosemary, made into a liniment with dilute alcohol. This preparation makes an excellent gently stimulant embrocation, and takes the place of the *camphorated soap liniment*, or so-called *opodeldoc* of older revisions of the Pharmacopœia, an article substantially the same in composition as the present, but prepared from the common white soap made of animal fat, instead of from Castile soap.

The second variety of official soap is entitled *Sapo Mollis*, Soft Soap, and is made from potassa and linseed oil. It is a soft, unctuous substance of a brownish-yellow color. "*Green soap*" or "*German soap*" is a soft soap made in Europe and formerly imported into America. Its greenish color is due to impurities in the oils from which it is made.

Soft soap is more strongly alkaline, and therefore more detergent on the one hand, and more irritating to sensitive tissues on the other, than the hard soda soaps. Severe pain is easily excited upon tender surfaces, such as that of an eczematous patch of skin, by applications of soft soap. The medicinal use of the soap is as a detergent and "alterative" application in certain forms of skin disease, notably in *eczema rubrum*. The part is com-

monly washed with the soft soap, and afterward dressed with some bland substance, such as ointment of zinc oxide. *Edward Curtis.*

SOAP BARK.—(*Quillaia*, U. S. P.; *Bois de Panama*, Codex Med.) The dried inner bark of *Quillaia Saponaria* Molina (fam. *Rosaceæ*). This bark is derived from a large evergreen tree, native and abundant in Chili. After the removal of the corky layer, the bark is usually flattened out and pressed tightly into bales, in which form it reaches the market. It is imported in considerable quantities for various purposes connected with manufacture—sizing, cleansing, etc.—and has found a not very commendable place in syrups for aërated waters, and in beers, to make them hold their froth.

DESCRIPTION.—In large, flat pieces, 3–8 mm. ($\frac{1}{8}$–$\frac{1}{3}$ in.) thick; outer surface brownish-white, often with larger or smaller patches of the dark brown outer layer adhering, otherwise smoothish or lightly striate; inner surface pale yellowish or whitish, nearly smooth, or often with longitudinally elongated blister-like elevations; fracture tough and strongly splintery, the laminæ oblique to each other; transverse section checkered with pale brownish bast fibres embedded in the white tissue; inodorous, but the powder highly sternutatory; taste persistently acrid. The infusion foams like soap water.

The active constituent of soap bark is saponin (from eight to ten per cent.), which is in turn resolvable into several distinct substances, all of them poisonous. Sapotoxin, the more important of these, is soluble in water but not in alcohol, and is precipitated by basic lead acetate. It is the principal irritating constituent. Quillaic acid is soluble in alcohol and water, not in ether, and is precipitated by the neutral as well as the basic lead acetate.

USES.—Soap bark, or an infusion or tincture made from it, is useful as a detergent in washing fine linens, laces, etc., cleaning the surface of paintings, and other fine work of that kind. It is also an ingredient of some cosmetic preparations—lotions, hair washes, etc. Its use in syrups has been referred to; it has been further employed to a small extent as an emulsifying agent. Physiologically it is a pretty active substance, paralyzing voluntary muscles with considerable rapidity, and producing local anæsthesia. It is also a local irritant. These properties have not, however, been put to therapeutic use. As an expectorant, in small doses, it has been recommended, also as an alterative in place of sarsaparilla, but its value is at least doubtful. *Henry H. Rusby.*

SOAP ROOT.—*Soapwort.* "Bouncing Bet." (*Saponaire officinale*, Cod. Med.). The dried root of *Saponaria officinalis* L. (fam. *Caryophyllaceæ*). This plant is a well-known European perennial herb, freely naturalized in North America, and often a troublesome weed around the edges of gardens, along roadsides, and in rich waste places. It is about two feet high, with ovate, opposite, usually sessile, three- or five-nerved leaves, and cymes of large whitish or pink flowers terminating the branches. All parts of the plant, but especially the roots, contain saponin in large amount, and its properties are very similar to those of soap bark, considered above, though it is scarcely so active as that drug. It is commonly employed in the household in the form of a viscous, suds-like solution for washing or sizing. It is also more or less employed, though less than formerly, as a stimulating expectorant, like senega, or as an alterative, like sarsaparilla. The ordinary dose is from 2 to 8 gm. (℥ss.–ij.) and it is mostly employed in the form of the decoction, one ounce to the pint.

Levant soap root, from various species of *Gypsophila*, of the same family, occurs in pieces of a large root, often two inches in thickness, of a pale yellowish- or brownish-white color. Its constituents, as well as its properties and uses, are similar to those of the ordinary soap root. It is rather more active, however, than the latter. Many other related plants have a similar composition and use. *Henry H. Rusby.*

SODIUM.—I. GENERAL MEDICINAL PROPERTIES OF THE COMPOUNDS OF SODIUM.—From the close chemical alliance between sodium and potassium, theory would assign to compounds of sodium physiological properties similar in kind to the corresponding potassic compounds, but less strongly pronounced. The prediction is true in that the sodic effects, such as they are, are potassic effects weakened; but an inference that all the potassic effects, in kind, will be reproduced to some degree in the action of sodium, will not hold. The notable potassic effects are irritation, catharsis, cardiac paresis, general motor paresis, oxidation quickening, and, toxicologically, general toxæmia. Sodium, in comparison, is irritant, salt for salt, in decidedly less degree; is purgative in only slightly less degree; paralyzes heart and motor function so very little that the action appears only at all in excessive dosage in animal experimentation; scarcely seems to quicken oxidation at all, nor, even in high dosage, to impoverish the blood after the manner of potassium. So far, however, as concerns those compounds of sodium that are alkaline in reaction, or which, as in the case of citrates, acetates, and tartrates, are converted into an alkaline compound in the blood, the degree of alkalinity is but little less than that of the analogous potassic compounds, and hence the effects that follow simply from the fact of such alkalinity are, with sodic compounds, well pronounced. But yet, therapeutically, so far as constitutional alkalizing is concerned, the diseases calling for alkaline medication are also specifically benefited by the specific potassium effects, so that in their case sodic salts, though strongly alkaline, still cannot compete in curative power with their potassic rivals.

II. THE COMPOUNDS OF SODIUM USED IN MEDICINE.—As in the case of potassium, those compounds only will be discussed here whose effects are either *sui generis* to the compound, or are determined mainly by the basic radical. Such salts, official in the United States Pharmacopœia, are the following: *Hydroxide* (hydrate), *carbonates*, normal and acid, (pyro-) *borate, acetate, potassio-sodic tartrate, sulphate, phosphate, pyrophosphate, nitrate*, and *chlorate*. Of these the potassio-sodic tartrate (Rochelle salt) will be found discussed under the title *Potassium*. Other sodic salts, whose properties are derived mainly from the acid radical of the composition, are treated of under the title of such radical. Such pharmacopœial salts are the following: *Arsenate*, see *Arsenic; benzoate*, see *Benzoic Acid; bromide*, see *Bromides; chloride*, see *Chlorides; hypophosphite*, see *Hypophosphites; hyposulphite*, see *Sulphites; iodide*, see *Iodides; nitrite*, see *Nitrites; salicylate*, see *Salicylic Acid; silicate*, see *Silicates; sulphite*, see *Sulphites; sulpho-carbolates*, see *Sulpho-carbolates.*

Sodium Hydroxide (Hydrate): NaOH.—This substance, commonly called *Caustic Soda*, is official in the United States Pharmacopœia, in solid condition, under the title *Soda*, Soda, and in about five-per-cent. aqueous solution, as *Liquor Sodæ*, Solution of Soda. Soda is a white, hard, opaque substance, occurring either in lumps or in moulded cylindrical pencils. It is odorless, but has an intensely acrid, caustic taste. It deliquesces in moist air, but becomes dry and efflorescent in dry air. It dissolves freely in water and alcohol. It should be kept in well-stoppered bottles made of hard glass. Soda is commonly made by evaporating an aqueous solution of the substance, until the water is driven off and the hydroxide remains in a state of fusion, and then either pouring the viscid fluid into cylindrical moulds or allowing it to harden *en masse*. Solution of soda may be made by dissolving soda in water, but is commonly prepared from the carbonate by decomposition with lime in the presence of water. Calcium carbonate precipitates, and the solution of soda, clarified by straining and settling, is separated by siphonage. Solution of soda is "a clear, colorless liquid, odorless, having a very acrid and caustic taste, and a strongly alkaline reaction. Specific gravity about 1.059" (U. S. P.). The solution should be kept in green glass bottles, glass-stoppered, and the stoppers should be coated with vaseline or paraffin.

Soda and its solution are powerfully alkaline and caustic, like potassa, but to a somewhat inferior degree. Soda is available as a caustic, to be used after the manner of potassa, but potassa, being the stronger agent, is generally preferred. Solution of soda is possible as a local alkali for the skin or the stomach, but the carbonates are almost always used in preference. If given internally, the dose of solution of soda would range from 1 to 4 gm. (℥ xv.-lx.), largely diluted. In considerable quantity, undiluted, solution of soda would prove a caustic poison, with symptoms generally similar to those of poisoning by potassa.

Normal Sodium Carbonate: $Na_2CO_3.10H_2O$.—Sodium carbonate in crystals or effloresced powder is official in the United States Pharmacopœia as *Sodii Carbonas*, Sodium Carbonate; and the effloresced powder, baked at a temperature of about 45° C. (113° F.) until its weight is reduced to a fixed standard, is also official under the title of *Sodii Carbonas Exsiccatus*, Dried Sodium Carbonate. Sodium carbonate is the salt commonly called *sal soda* or *washing soda*, and is obtained in part from natural deposits—"native soda," so called—in part from the ashes of certain plants growing in or near the sea, the impure yield of which constitutes *barilla* or *kelp*, and in part by artificial making from sodium chloride, sodium sulphate, or the mineral *cryolite*. Sodium carbonate occurs as large, colorless, monoclinic crystals, which effloresce in dry air and fall into white powder. The salt has no odor, but has a harsh, alkaline taste. It dissolves freely in water, but is insoluble in alcohol. The dried salt of the Pharmacopœia, a fused mass as first prepared, finally presents itself as a white powder. Both forms of the carbonate should be kept in well-stoppered bottles.

Sodium carbonate combines, very purely, strong alkalinity with absence of specific qualities of any kind except the irritation or even causticity in concentrated application which is inherent in a powerful soluble alkali. Its uses are solely those of a local alkali, and are practically confined to external employment in lotion or ointment in skin affections. Lotions average two per cent. in strength, and ointments between two and ten, the basis being lard. For internal use, the acid carbonate, next to be described, is preferred, because of its more agreeable flavor and milder action. In considerable quantity and strong solution the normal carbonate is a corrosive poison.

Acid Sodium Carbonate: $NaHCO_3$.—This salt, the well-known *cooking soda*, so called, occurs in two grades of purity. One, corresponding to 95 per cent. of the pure salt, is the commercial *bicarbonate of soda;* the other, purified to represent 98.6 per cent. of the pure salt, is what is used in medicine, and is official in the United States Pharmacopœia under the title *Sodii Bicarbonas*, Sodium Bicarbonate. This salt is a white powder, permanent in the air, without odor, and of a not unpleasant taste, cooling, mildly saline and alkaline. It dissolves in 11.3 parts of cold water (15° C. = 59° F.), but is decomposed by hot water, losing carbon dioxide, and becoming the normal carbonate. It is insoluble in alcohol.

Sodium bicarbonate is purely alkaline, like the normal salt, but to a less degree, and by reason of that fact is far less irritant. In all ordinary dosage it is indeed practically free from danger. Its taste also is mildly mawkish only, instead of harshly alkaline. For these various reasons this salt is a favorite one for stomachic alkalizing, as in acid dyspepsia or diarrhœa. It is also much used to make alkaline lotions for the skin. Internally from 1 to 4 gm. (gr. xv. to lx.) may be given at a dose in water, and externally washes or ointments may be made in the same manner and of the same strengths, as in the case of the normal carbonate. Both of the carbonates are incompatible with acids and acidulous salts, lime water, ammonium chloride, and salts of the metals and metals of the earths.

Troches of the bicarbonate—*Trochisci Sodii Bicarbonatis*—are official in the United States Pharmacopœia, each troche containing 0.20 gm. (gr. iij.) of the salt. The salt is also an ingredient of the pharmacopœial preparations, *Mistura Rhei et Sodæ*, for which see *Rhubarb*, and *Pulvis Effervescens Compositus* (Seidlitz powder), for which see *Potassio-Sodic Tartrate*, under *Potassium.*

Sodium (Pyro-) Borate: $Na_2B_4O_7.10H_2O$.—This salt—the familiar substance *borax*—is official in the United States Pharmacopœia as *Sodii Boras*, Sodium Borate. It occurs in colorless, transparent, shining, monoclinic prisms, which effloresce in dry air. The crystals are odorless, and of a mild, cooling, and somewhat sweetish taste. The effloresced powder has a more pronounced alkaline flavor. Borax dissolves in sixteen parts of cold water, and freely in boiling water. In alcohol it is insoluble. Borax occurs native in Persia and adjacent neighborhoods as a saline efflorescence on the borders of lakes, and in California as a crystalline deposit at the bottom of a small lake. It is also made from other native borates.

Borax is locally bland and constitutionally innocent, and its medicinal virtues seem to reside in the combination of feeble alkalinity with a fair degree of antiseptic power derived from its acid radical. Borax works well as a mild detergent alkali in skin diseases or catarrhs, and ulcerations of mucous membranes, particularly of the mouth. A lump held in the mouth and slowly sucked seems to excite the secretions of pharynx and larynx, and in case of huskiness from dry catarrh of these parts temporarily restores something of the natural quality to the voice—an important matter to a singer or speaker affected with a cold. Internally, borax may be used as a feeble alkali, and it has been accredited also with a power to promote menstruation, correct dysmenorrhœa, and excite uterine contractions—a power which until better substantiated than at present should not be trusted in an emergency. Borax may be given internally in doses of from 1 to 3 gm. (gr. xv. to xlv.), and, externally, may be applied in lotions ranging from one to six per cent. in strength (limit of solubility in water), or in ointment of thirty-per-cent. strength. Borax has been experimented with, among a host of other substances, for the purposes of "antiseptic surgery," and has been found experimentally to prevent the development of microzymes in aqueous solution of from one-half to one-per-cent. strength.[1]

What is practically a soluble form of borax is the *tetraborate* that forms when borax and boric acid are boiled together in water. Sodium tetraborate makes a fine white powder, of greasy feel, which is freely soluble in water. It may be used locally for the purposes of borax, and is convenient for the making of antiseptic borate solutions. Solutions ranging in strength from two to fifty per cent. have been used.[1]

Sodium Acetate: $NaC_2H_3O_2.3H_2O$.—The salt is official in the United States Pharmacopœia as *Sodii Acetas*, Sodium Acetate. It occurs in large, colorless, transparent monoclinic prisms, efflorescent in dry air. It is odorless, with a bitter, saline taste; dissolves in 1.4 parts of cold water, and freely in boiling water; in 30 parts of cold alcohol and in 2 parts of boiling water. It is rarely used in medicine. Its purpose would be as a constitutional sodic alkali, its acid, as in the case of other alkaline acetates, undergoing conversion, in the blood, to carbonic. It may be administered in doses of from 2 to 4 gm. (gr. xxx. to lx.).

Potassio-sodic Tartrate. (See under *Potassium.*)

Normal Sodium Sulphate: $Na_2SO_4.10H_2O$.—This salt, commonly called *Glauber's Salt*, is official in the United States Pharmacopœia as *Sodii Sulphas*, Sodium Sulphate. It occurs in large, colorless, transparent, monoclinic prisms, rapidly effloresing on exposure to air, and ultimately falling into a white powder. It is odorless, with a cooling but bitter saline taste. It dissolves in 2.8 parts of cold water (15° C. = 59° F.); in about 0.25 part at 34° C. (93.2° F.), and in 0.47 part of boiling water. It dissolves also in glycerin, but is insoluble in alcohol. The salt should be kept in well-stoppered bottles. Sodium sulphate is formed as a by-product in the manufacture of many chemicals. It is a salt of low diffusion power, and hence in full dose, in comparatively strong solution,

is a purgative. As such it is powerful in action, like the other alkaline sulphates, producing watery stools, with nausea and griping. From its sickening taste it has been almost wholly superseded by the less disagreeable magnesium sulphate (Epsom salt). From 15 to 30 gm. (℥ ss.–i.) is a full purgative dose, to be taken in aqueous solution, aromatized or slightly acidified to disguise the nauseous bitter taste of the salt. Sodium sulphate is a purgative ingredient of many mineral waters.

(*Di-*) *Sodium* (*Ortho-*) *Phosphate:* $Na_2HPO_4.12H_2O$.—This salt, the common tribasic phosphate, so-called, or *tasteless purging salt*, is official in the United States Pharmacopœia as *Sodii Phosphas*, Sodium Phosphate. It occurs in large, colorless, transparent, monoclinic prisms, which, on exposure to air, effloresce rapidly and become opaque, losing five per cent. of their water of crystallization. The salt is odorless, with a cooling, saline, and slightly alkaline taste. It dissolves in 5.8 parts of cold water and in about 1.5 parts of boiling water. It is insoluble in alcohol. Sodium phosphate is made from the calcium phosphate of calcined bone, by decomposition by sulphuric acid. It should be kept in well-stoppered bottles in a cool place.

Sodium phosphate is a bland salt, of low diffusion power, whose prominent physiological properties are to purge mildly, and, as animal experimentation has shown,[2] to excite quite notably the secretion of bile. At the same time it is feebly alkaline, and possessed of a clean, non-nauseous, salty taste, quite like that of common salt. Therapeutically this phosphate may be used for the general purposes of the milder saline purges, and, more specially, has also proved of avail, even in non-purgative doses, to correct bowel derangements associated with acidity and assumed sluggishness of the liver. From its mildness and not unpleasant taste it is particularly convenient for giving to young children. Mixed with foods, such as soup, in lieu of common salt, it may be administered in moderate quantity without suspicion. As a purge the dose for an adult is about 30 gm. (℥ i.); but for corrective purposes, much less—even so little as 0.65 gm (gr. x.)—given a number of times through the day, may suffice.

Normal Sodium Pyrophosphate: $Na_4P_2O_7.10H_2O$.—The salt is official in the United States Pharmacopœia as *Sodii Pyrophosphas*, Sodium Pyrophosphate. It is not used in medicine, and is official for pharmaceutical purposes only to prepare ferric pyrophosphate.

Sodium Nitrate: $NaNO_3$.—The salt is official in the United States Pharmacopœia as *Sodii Nitras*, Sodium Nitrate. It occurs in colorless, transparent, rhombohedral crystals, which deliquesce in moist air. It is odorless, with a cooling, saline, slightly bitter taste. It dissolves in 1.3 parts of cold water and in 0.6 part of boiling water. It is slightly soluble only in cold alcohol, but dissolves in 40 parts of boiling alcohol. It should be kept in well-stoppered bottles. Sodium nitrate is the salt called *cubic nitre*, and is obtained from South America, where it occurs native. It is a salt of high diffusion power, and in its physiological relations closely resembles ordinary nitre (potassium nitrate), except that it is, of course, devoid of the characteristic properties of a potassium salt as such. Its use in medicine has so far been an empirical employment in dysentery, in which disease 30 gm. (℥ i.) of the salt has been given divided in frequent doses throughout the day, in dilute aqueous solution. It is not a standard medicine.

Sodium Chlorate: $NaClO_3$.—The salt is official in the United States Pharmacopœia as *Sodii Chloras*, Sodium Chlorate. It occurs in colorless, transparent tetrahedrons of the regular system, permanent in dry air. It is odorless, with a cooling saline taste. It dissolves in 1.1 parts of cold water, and readily in boiling water. It is sparingly soluble only in cold alcohol, and dissolves in about 40 parts of boiling alcohol. If mixed with organic substances or with readily oxidizable chemicals, such as sulphur or phosphorus, trituration or concussion may cause a dangerous explosion, as in the case of the allied salt potassium chlorate. Sodium chlorate should be kept in glass-stoppered bottles. Sodium chlorate has the peculiar medicinal properties of the potassic salt of the same acid, except in regard to the effects of potassium compounds as such. It is important only because of its excess of solubility as compared with potassium chlorate. The medicinal uses are the same as those of the latter-named salt, which see under *Potassium*.

Edward Curtis.

[1] Sternberg: Am. Journal of the Med. Sciences, April, 1883, p. 334.
[2] Rutherford: The Practitioner, vol. xxiii., p. 414.

SODIUM DITHIOSALICYLATE.—This is the sodium salt of an acid formed by the reaction that occurs when salicylic acid and sulphur chloride are mixed together in molecular proportions at a temperature of 120° to 150° C. A large isomeric series is possible, but only two are utilized, the sodium salts of which are known as sodium dithiosalicylate I., and sodium dithiosalicylate II. The acids themselves are not employed for any therapeutic purposes, the sodium salts only being used. No. I. has not been used to any extent except in veterinary practice, in which two-and-a-half and five-per-cent. solutions are used in the treatment of foot-and-mouth disease. No. II. is the salt usually employed. It is a grayish-white powder, very hygroscopic, and entirely soluble in water. On the addition of acids a precipitate of yellow viscid drops is formed consisting of dithiosalicylic acid.

This salt is said to be superior to the salicylates in the treatment of acute and gonorrhœal rheumatism. It is given in doses of three grains, twice a day in mild cases, and more frequently when the attack is severe.

Beaumont Small.

SODIUM OLEATE. See *Eunatrol.*

SODIUM PARA-FLUORO-BENZOATE is a white powder soluble in water and used in tuberculosis in dose of 0.5 gm. (gr. viij.) three times a day. *W. A. Bastedo.*

SODIUM PERSULPHATE. See *Persodine.*

SODIUM SULFORICINATE. See *Polysolveol.*

SOILS IN THEIR RELATION TO HEALTH.—Under this heading we will consider, along with the soil more strictly speaking (that is, the débris of various kinds of rocks and the organic matter from animal and vegetable life forming what is ordinarily called soil), the influence exercised by vegetation.

Soils influence health: (1) Directly, by their component parts and immediate products being taken into the organism; (2) indirectly, by their influence in modifying other surrounding conditions.

(1) The direct influence of soils above alluded to may be exerted (*a*) chemically; (*b*) by introducing pathogenic micro-organisms; (*c*) by acting mechanically on the tissues.

(*a*) Gases and particles of organic matter taken into the organism in various states of chemical change may act by lessening its vitality or by introducing toxic material. The commonest example of this will be found in what are called "made soils." Holes and depressions in the surface of the soil are frequently filled up by street scrapings, garbage, bodies of dead animals, and other refuse, mixed, it may be, with earth, ashes, etc. These after a time are covered with grasses or other forms of vegetation, and eventually may become portions of streets and building sites. In the latter case it will readily be seen how noxious gases may be generated and carried up by the ascensional air of the houses built in and over such sites. Soil so made may also be ground up into dust and inhaled. The same is true in regard to various forms of animal and vegetable organic matter, scattered upon the surface of the ground, especially in our roads and streets.

In the case of houses built on made soil, or soil rich in organic matter, the cellar walls should be made impermeable to gases by the use of cement or other impervious material. A ventilated air space around the foundation wall will be serviceable in this regard, as well as for

securing dryness of the walls. All cellar floors should be built of a sufficient depth of concrete or other similar material.

In those soils which contain a large amount of organic matter, the danger will be increased if they are underlaid with a stratum of impermeable marl, clay, or rock. The decomposing material will be retained in the soil. The writer placed on record, in the previous edition of THE REFERENCE HANDBOOK, in the article on *Sewage Disposal*, a remarkable instance of this in connection with the yard of one of our public schools, and also another instance in which filth had travelled laterally one hundred and forty feet over a substratum, saturating the earth in its course.

(*b*) With regard to *pathogenic micro-organisms* contained in the soil and taken from it directly into the organism, there has been and still is much speculative discussion among bacteriologists, but it may be looked upon as quite certain that some diseases are produced in this way.

It has been pretty well established that the germs of *typhoid fever* may be introduced by this method. The writer was one of a committee charged with investigating the causes of the spread of an endemic of typhoid fever in a small village. By a process of exclusion the committee came to the conclusion that some of the cases were due to the germs from typhoid washings drying upon the soil, being wafted in the dust, and inhaled by those who were attacked.

It is the generally received opinion that *tetanus* is caused by the germs finding their way from the soil into wounds and abrasions. It is also supposed by some that *malignant œdema* is caused in the same manner.

Anthrax, as has been established by frequent observations, is taken from the soil of pasture lands by cattle grazing upon them, and there are numerous instances where men have been attacked from the germs on the surface of the soil or from streams running through these pasture lands. We have not been able to collect data which would enable us to form an absolute decision, but there is no reason to doubt that with carelessness the anthrax germs may be taken into the system from the soil by man as well as by other animals.

By some, *diarrhœa* and *dysentery* are believed to be caused by the dust of infected soil. Dr. E. W. Hope,[1] of Liverpool, is quoted by Harrington as having made some important investigations in this connection. It has been noticed by many observers that a period of long-continued dry hot weather, followed by heavy rains, has been succeeded by endemics of diarrhœa and dysentery among children and others. This has been interpreted differently by different observers, as will be noticed hereafter, but Hope states that the highest death rate from these causes, during a period of twenty years, "occurred in the year whose summer had the least rainfall, and the lowest in that in which the summer rain was greatest in amount, and that the fourteen years with average dry summers, in which the mean June to September rainfall was 10.9 inches, averaged about fifty per cent. more mortality during the quarter than the six average wet summers with a mean rainfall of 13.8 for the corresponding period." Hope believed that the absence of showers allowed an accumulation of dust and filth in the streets, roofs, and elsewhere, and that this floating in the atmosphere was the cause of the increased disease and mortality.

So general is the opinion as to the germs of *tuberculosis* being carried from the soil into the human organism through the respiratory passages and other channels, that it is now enacted in most communities that spitting in streets and other public places shall be prohibited. A case came under the notice of the courts in Toronto in connection with our public schools: A lad who had scrofulous sores was excluded from school, and the action of the school authorities in thus excluding him was upheld by the court, one of the reasons being the probability of the germs being conveyed in the dust of the school-room and premises into the lungs of the other scholars.

Much experimentation and discussion are going on regarding the conduct of many other pathogenic bacteria in the soil and the influence of the soil upon them. These cover too wide a territory and the conclusions are still too uncertain to be profitably taken up in this article.

(*c*) *Mechanical irritations* of certain tracts of the organism are produced by particles of the soil taken in from the air or mixed with drinking-water or other media. Sharp particles in the form of dust inhaled into the respiratory passages give rise to *bronchitic affections;* those blown into the eyes cause *conjunctivitis*. The action of such dust on the respiratory passages is well known where it has been caused in connection with the soil of mines and also in the prosecution of some trade or employment such as stone-cutting, grinding of agricultural implements, etc. When similar effects arise from the natural disintegration of the soil it is more difficult to trace them to this specific cause, inasmuch as it is accompanied by other influences.

The inhalation of coal dust and its deposit in the lungs of miners give rise to the disease known as *anthracosis*.

The mechanical irritation of the mucous membrane of the intestines from sand conveyed in drinking-water is well known, and is more properly considered in connection with the subject of water.

2. (*a*) The *ground water* is very largely influenced by the structure of the soil for receiving, holding, and retaining water, and not only by the structure of the superjacent soil but also by that of the subsoil, and by the configuration of both the soil and the subsoil. It will readily be seen that sandy or gravelly soil will be best adapted for receiving water and allowing it to run through it, and that such percolation of the water would be lessened if it had beneath it an impermeable subsoil, as of clay, marl, or shale, with a flat or concave surface.

Clays and marls are least adapted to allow water to pass through them, and hence retain their dampness for a greater length of time.

These conditions of soil in regard to the water in them influence health in various ways. In the first place, habitually wet soils act by increasing the humidity and coldness of the air at their surfaces, and it has been found by long experience and observation that such soils are conducive to *rheumatism*, *diphtheria*, and *tuberculosis*.

With regard to the last-named disease, statistics were collected by Dr. Henry I. Bowditch,[2] showing that the disease is much increased by dampness of the soil, and is notably lessened by drainage. Similar observations were made independently by Dr. Buchanan in England.

While the Klebs-Loeffler bacillus of *diphtheria* is aërobic and does not flourish in water, it has nevertheless been a matter of repeated observation that diphtheria is more prevalent in the presence of cold, wet soils. Whether this may not be due to a condition of the respiratory mucous membrane produced by such soils, is a suggestion.

We have spoken above of the condition of a concave, impermeable subsoil underlying a more porous structure. To depressions of this kind in an exaggerated form the term "punch bowl" has been applied, and such situations are particularly unhealthy. The condition of a stagnant body of water filling the interspaces of the soil here comes into play.

By similar conditions on a more extended scale marshes are formed, and in addition to the insanitary effects already alluded to they become breeding-places for mosquitoes, and consequently under suitable conditions give rise to *malarial affections*, *yellow fever*, and, it may be, other diseases.

The bad effects of damp soils on habitations may be lessened by the use of weeping drains so constructed and protected as to prevent the introduction of gases through them when there is no moisture in the soil which they are supposed to drain. Air spaces around the foundation walls have been alluded to when speaking of the means for preventing polluted air and noxious gases gaining entrance into houses. A damp-proof course of slate or similar material should also be interposed through the