prophylactic measures. Care and experience will often admit of the engineering work being carried on at a much higher level than would ordinarily be thought possible. The length of time which the workman spends in the compressed air should be intelligently regulated—much depending on the degree of pressure. The "locking-out" process must be attended to most carefully. The workmen ought to be taught how to care for themselves. The following points should be emphasized: the method of inflating the ears; hygienic precautions while in the chamber; rest, and a warm drink, preferably coffee or beef tea, after decompression, together with a change to warm clothing. The chamber should be lighted by electricity.

As to curative treatment, the remedy that Smith proposes for this condition is ergot, with morphine as required to relieve pain. Recompression affords the greatest relief to the pains if the patient is seen soon after their onset. Liniments are approved by some, but discarded by others. Bandaging is often efficacious to relieve pains in the extremities. Salicylate of soda has been used. Inhalation of oxygen has been suggested in view of the theory of retained carbonic acid gas. Electricity has not met with much success. Complications must receive the ordinary treatment indicated in such cases. When vertigo is obstinate and persistent, tonics seem to afford the greatest relief.

Charles E. Hackley.
Emma E. Walker.

CAJEPUT, OIL OF.—*Oleum Cajeputi.* A volatile oil distilled from the leaves of *Cajeputia Leucadendron* (L.) Rusby (fam. *Myrtaceæ*). This species is a rather small, fragrant tree, with irregularly growing slender branches, and a thick, soft, exfoliating bark. The leaves are bright, smooth, narrow, entire, pointed at each end, parallel nerved, and often oblique or curved; they are twisted upon their petioles so as to stand with vertical surfaces, like phyllodia. The tree is a native of numerous islands in the Indian archipelago, especially of Borneo, Celebes, and Amboyna. It is also extensively found, if a broad view is taken of the species, in Australia and on the mainland of Asia. Most of the oil is obtained from Celebes, and exported by way of Javan or Indian ports.

Oil of cajeput is extracted on the spot from the fresh leaves, which are first softened by maceration in water, and then subjected to distillation in rude copper stills. It is filled into once-used wine and beer or other European bottles for exportation. It was first introduced into Europe in the early part of the eighteenth century.

It is a pale green, transparent, mobile fluid, with a fragrant mint or camphor-like odor, and bitterish aromatic taste. It has the usual physical properties of the essential oils. It is very similar to its near relative, oil of eucalyptus, containing the same constituent, cineol, along with terpineol and other bodies. Specific gravity of the oil, about 0.926. The green tint is generally ascribed to some compound of copper received from the still, or introduced into the oil intentionally. The color may be separated by several methods of rectification, and the oil obtained clear and white.

Action and Use.—Cajeput has the stimulating properties of camphor and the essential oils in general, and stands between the most irritant of them, like oil of turpentine, and the milder mint oils. It is more extensively used in the Indies and Eastern islands than here—in some places being given for nearly everything, but is particularly popular for colics, diarrhœas, and even cholera, as well as for chronic rheumatism, chronic vesical catarrh, etc. Here it is not often given internally, but has no doubt some value in non-inflammatory intestinal disturbances, where an aromatic stimulant and antispasmodic is needed, being in these cases very much like camphor, and like this may be very suitably combined with opium. Externally it is a mild rubefacient, and a good ingredient for stimulating liniments in chronic rheumatism, old sprains, etc.; it may be also useful for psoriasis, scaly eczema, etc., and is a fairly efficient parasiticide. As a stimulant diuretic in chronic vesical catarrh it is as good as most others of its class. Cajeput is the basis of numerous toothache and earache drops. It is often adulterated. Dose, from 1 to 5 dgm. (ɱij. to viij.) dissolved in spirit, suspended in mucilage or syrup, or on a lump of sugar. There are twenty or thirty drops to the gram.

W. P. Bolles.

CALABAR BEAN. — Physostigma. *Ordeal Bean, Chop-nut.* "The seed of *Physostigma venenosum* Balfour (fam. *Leguminosæ*)" (U. S. P.). This plant is a large, climbing, perennial vine, with trifolioiate leaves and the general appearance of an enormous bean vine. The stem is woody below and often as large as the wrist. The showy purple flowers are nearly as large as those of the sweet-pea, and hang in loose racemes. The large pods contain two or three seeds each. The "beans" are very hard, oblong, slightly curved or kidney-shaped, from 2 to 3 cm. in length, and about 1.5 cm. broad (.75 to 1.25 in., by .5 in.), and covered with a roughish but shining chocolate-brown or brownish-red testa. A broad, shallow, black groove or furrow extends along the convex border and around one end of the seed; it contains the raphe. The kernel is exalbuminous and consists mostly of the two large, white, brittle cotyledons, whose faces are concave and enclose an air space which enables the entire seeds to float upon water, although when broken the fragments are denser than water. The taste and odor of the seeds are simply bean-like, and give no suggestion of the deadly poison which they contain.

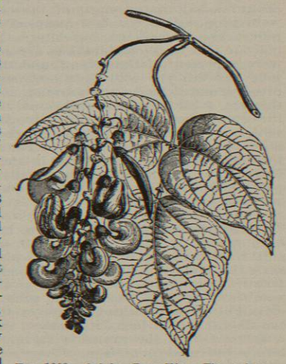

Fig. 1068.—Calabar Bean Vine; Flowering Branch, Reduced. (Baillon.)

The plant grows about the mouths of the Old Calabar and Niger rivers in tropical West Africa. It has been transplanted to India, Brazil, and other places, where it flourishes. Physostigma is an ingredient of the poisonous mixture which persons accused of witchcraft or crime are compelled by the savage chiefs of these African tribes to take as an ordeal or punishment. The draught is usually rapidly fatal, unless vomiting occurs. It was first known in England about 1840 as a curiosity and poison, but not much employed in medicine until Fraser, of Edinburgh, about 1863, discovered its specific power of contracting the pupil, since when it has been in rather frequent use by oculists and in occasional use in internal medicine. Besides forty-eight per cent. of starch and about twenty of albuminoid matters, with a little oil and gum (substances which are contained as well in the common bean, and which are entirely inert), the drug in question contains three alkaloids, with *physosterin*, a fatty or cholesterin-like substance, which occurs in the Calabar bean in common with other leguminous seeds, and which is inert.

Fig. 1069.—Calabar Bean, Two-Fifths Natural Size.

Physostigmine or *eserine* is the principal alkaloid. *Calabarine* is apparently a derivative of the former, while eseridine can be converted into physostigmine. The action of physostigmine dominates that of the drug, especially as that of eseridine is very similar. Calabarine acts antagonistically to the others, but is in such small amount as not greatly to modify the drug's action. The action of Calabar bean will therefore be discussed under *Physostigmine.*

Except in the form of the alkaloid, calabar bean is but little used. It has been rather thoroughly experimented with for its depressing action upon the nerve centres in various diseases involving central excitability, and especially in tetanus; but the results cannot be regarded as encouraging. Some benefit has resulted from its use in checking the paralysis of insanity, and it often does good as an intestinal laxative. We have an official extract, the dose of which is .006 to .03 gm. (gr. $\frac{1}{10}$ to $\frac{1}{2}$), and a fifteen-per-cent. tincture, the dose of which is .6 to 2 c.c. (ɱx. to xxx.).

Physostigmine or *Eserine* ($C_{15}H_{20}N_2O_2$). The chemistry of this alkaloid, and its relations to the bodies associated with it, are but imperfectly known. Formerly, the two names were believed to represent two alkaloids, but it was subsequently ascertained that one was merely an impure form of the other. It is almost always used in the form of its salts. The pure alkaloid occurs in the form of colorless crystals which are soluble in both alcohol and water, slowly in the latter. They are very hygroscopic and quickly lose their characters if exposed to dampness or light. Of the numerous salts, the most important are the hydrochloride, sulphate, and salicylate, the two last being official. The sulphate $(C_{15}H_{21}N_2O_2)_2$.H_2SO_4, a white or whitish crystalline powder, which is the salt most used, is very soluble in both water and alcohol. The salicylate, $C_{15}H_{21}N_2O_2.C_7H_6O_3$, in white crystals, is less soluble, namely, in one hundred and fifty parts of water or twelve parts of alcohol. The hydrochloride, $C_{15}H_{21}N_3O_2HCl$, is soluble in water.

Action.—The physiological action of eserine is powerful and characteristic, and has been very extensively studied. Except in large poisonous doses, its chief action is upon the secretion and involuntary muscular movements, through the cells and fibres, or their nerve endings, or both. The secretions of the entire alimentary system, excepting perhaps the bile, are markedly increased, in which particular a close similarity to pilocarpine has been noted. The perspiration and tears share in this increase. At the same time, the activity of the gastric and intestinal muscles is greatly augmented also. The effect upon the stomach may be such as to cause vomiting, especially by large doses, poisoning being thus avoided. More or less nausea is frequent. If vomiting does not occur, then purgation may, owing to a similar effect upon the intestinal muscles, combined with the increased secretion. Looseness of the bowels is an ordinary symptom. Uterine contractions may be induced. Coincident with these effects, and evidently of the same general nature, is the contraction of the pupil and ciliary muscle. In all these directions, the drug is directly antagonistic to atropine, and one drug can be used to counteract the other, to a great extent. Strychnine, while directly antagonistic to physostigmine in its central effects, strangely enough produces, through the spinal centres, many symptoms similar to those produced by the latter through peripheral action. In the voluntary muscular system, there is increased irritability of the fibre, and apparently stimulation of the nerve endings also. This produces muscular twitchings among the most prominent of the early symptoms of poisoning. It is apparently due to bronchial spasm that respiration is slightly interfered with. This interference acts as a respiratory stimulant, and the respirations are early increased both in number and force. At the same time there is a marked rise of blood pressure, though this is quite irregular. The heart is continuously and powerfully slowed from the start, due apparently to direct action upon it, but the beat is strong. There is the widest disagreement as to whether primary central stimulation occurs and is partly responsible for these symptoms. Whatever may be the primary central effect, depression of the motor centres is early and powerful. If the dose has been large, and is not vomited, paralysis may be very sudden. There may then be almost no preliminary symptoms, or the muscular twitchings may amount almost to convulsions. With increasing cardiac slowness, weakness and reduced blood pressure supervene; but this effect is not so marked as respiratory depression, which is the immediate cause of death.

Uses.—Physostigmine salts have been used, as already stated, for the same purposes as Calabar bean, in doses of .001 to .003 gm. (gr. $\frac{1}{60}$ to $\frac{1}{20}$). Their chief use, however, is for instillation into the eye, in solution of one-per-cent. strength or weaker. The effect is to produce, at the end of a half-hour, a very powerful contraction of the pupil, which lasts for ten or twelve hours, and markedly to decrease intraocular tension, after a brief increase. It thus becomes of service in overcoming the interference with vision induced by the use of atropine. Efforts have been made, with some success, to destroy iritic adhesions by its use.

Pseudo-physostigmine is an alkaloid having apparently the same composition and properties; it is derived from cali-nuts or false Calabar beans, the botanical origin of which is doubtful.

Henry H. Rusby.

CALAMUS. SWEETFLAG.—The rhizome of *Acorus Calamus* L. (fam. *Araceæ*). An endogenous perennial with a thick, fleshy, long and branched horizontal root-stock, and a few very long and narrow (.5 to 1 m.) linear equitant leaves. The flowering scape is also long and flattened, like one of the leaves, and bears at its apex a straight, solid, fleshy, cylindrical spadix from 5 to 10 cm. long. Flowers perfect, small, crowded. A long, leaf-like bract or "spathe" (Bentley and Trimen) arises at the junction of the spadix and scape, and, proceeding in a straight line, looks like a continuation of the scape, while the really terminal spadix is diverted to an angle with the axis, and appears to be lateral. Sweetflag is indigenous in parts of Asia, as Asia Minor, India, etc., and in some parts of Europe and North America, but has been so extensively spread and naturalized by human intervention that it is found in nearly the whole north temperate zone. It grows either in the water or in swampy and shady places, and is very variable in size.

Fig. 1070.—Rhizoma of Acorus Calamus, Showing Cicatrices of Adventitious Roots. (Baillon.)

All parts of the plant are slightly aromatic, the leaves least so, but for medicinal use the rhizome only is employed. It should be gathered in the autumn or spring, washed, cleaned, and dried. In Germany it is generally peeled or scraped before drying; but while the appearance is improved by this process, the strength and quality are deteriorated, and this is not authorized by our

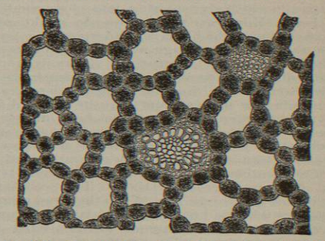

Fig. 1071.—Transverse Section of the Same. (Baillon.)

Pharmacopœia. Although it grows in great abundance in the swamps of the United States, a large portion of what we use is imported from Europe or Southern Russia.

Calamus comes in pieces of from 10 to 30 cm. or more in length, by 1 or 2 cm. in thickness (from 4 to 12 in. × ½ in.); it is shrivelled and lightly flattened, marked by frequent and very distinct rings and remains of leaf scales, and below is covered with the circular scars of the roots. It is pale or reddish brown externally, white and spongy within. Its texture is very light, being traversed by large air spaces separated by only a single row of cells. A cross-section shows these as large holes, and the walls as a lace-like reticulation, varied with occasional woody bundles (see Fig. 1071). The oil cells are like those of the general parenchyma, but larger, and are generally situated in the angles formed by the confluence of three or four of the partitions, as shown in the section.

The principal constituent is the *oil*, of which it contains two or three per cent., a yellowish or brownish, very fragrant liquid of specific gravity 0.9. It also contains the glucoside *acorin*, which is a soft, resinous substance, with a bitter, aromatic taste, resin, starch, tannin, gum, and a minute amount of the alkaloid *calamine*.

Calamus is a pleasant tonic, aromatic-bitter, applicable to all the purposes for which such remedies are used. Dose, from 2 to 4 gm.; of the oil, from gtt. x. to gtt. xv.

No other species of Acorus has any special value.

W. P. Bolles.

CALCIFICATION.—(*Calx*, lime; *fio*, to become.) Conversion of tissue into chalky matter by the deposition of lime salts. It is not unusual for solid particles, either crystalline or amorphous, to be deposited in the tissues throughout the body, and when the area so affected is large enough to be perceptible, it is said to be calcified or petrified. Chemically, calcareous matter consists chiefly of calcic and magnesic phosphates and carbonates. Calcification should be distinguished from ossification; for in the former there is no formation of bone, but merely a deposit of calcareous matter. Under the microscope the tiny particles look dark and opaque by transmitted light, though when in masses they are glistening. Not infrequently they look like fat, but are soluble in dilute mineral acid, and often give off gas bubbles from the decomposition of earthy carbonates. These tissues show a change in staining properties, hæmatoxylin, *e.g.*, producing a dingy bluish-violet color. This applies to the carbonates and phosphates of lime, not to the oxalate. Calcification takes place in various tissues, both in the cells and in the intercellular substance; but the type most apt to be affected is connective tissue which has already degenerated to the hyaline stage and from which the nuclei have entirely or almost disappeared. Dying tissue seems to have a kind of attraction for the lime salts in solution in the body, entering into close combination with them. However, the process does take place at times in tissues which have undergone no apparent change, especially in old age when the lime salts are undergoing more rapid absorption. There is a curious affection called *myositis ossificans progressiva*, in the course of which some of the muscular fibres undergo calcification. Again, the myocardium may be affected by the same type of degeneration, and the heart-muscle fibres become hardened by lime salts. A well-known example of calcification is seen in the walls of arteries where it follows fatty and atheromatous degeneration and sclerosis. "Calcification of the intima is a common terminal process of arterio-sclerosis" (Osler). The coats affected are the intima and the media. When the latter is involved there occurs what is known as annular calcification, in which the artery—most commonly medium-sized—develops into a rigid tube. The arteries most apt to be attacked by calcareous degeneration are the aorta and its larger branches, the arteries of the extremities, of the brain, of the heart, and of the spleen, as well as disused arteries, such as those of a stump and of the senile uterus. Veins are sometimes affected, though rarely, the most common instance being the walls of the varicose veins. The valves and orifices of the heart are a frequent seat of this degeneration. Other tissues undergoing this change at times are fibrous or fibro-serous membranes, *e.g.*, the pericardium, walls of hollow organs, the dura mater, pia mater, and choroid plexuses, when it is known as "brain sand." Cartilage, nerves, and various glands, organs, and tumors are at times the susceptible part. Calcification may occur in tubercle. The cheesy nodules in the crypts of hypertrophied tonsils sometimes calcify. Calcification of areas of tuberculous lungs results oftentimes in "lung stones" which are afterward expectorated (Osler). This form of degeneration is sometimes connected with other morbid processes. These lime-salt deposits may occur in two general ways. They may infiltrate the tissue of an organ which continues to retain its original relation to surrounding parts (*e.g.*, calcification of the membrana tympani), or they may incrust parts of tissue which are separated from their normal surroundings, or foreign bodies which have entered the body previously. In the first instance there results calcification; in the second, concretions or calculi. On the other hand, concretions at first free from surrounding tissue may later become firmly attached, or calcified tissue may separate from its surroundings and become free.

The *Etiology* of this degeneration is generally traceable to a lowered vitality of the tissues, which may depend on various conditions, such as old age or insufficient blood supply with slow circulation. But it is not confined to old age, as it is exceptionally observed in infancy, as well as in adolescence and middle age. In the latter period, it is due to various cachexiæ, such as gouty or syphilitic, while it is always an accompaniment of chronic kidney disease. The precedence of other forms of degeneration has been noted. Sometimes there is an excess of lime salts in the blood. In certain instances the tissues are unable to assimilate the fluid in which the salts are in solution. In other cases the carbonic acid which holds the salts in solution escapes, thus causing the deposit. Certain diseases of bone in which its salts are rapidly absorbed, or in which there is obstruction to renal elimination, are often associated with calcification. In the latter case the kidneys are particularly affected. The kidney epithelium is especially susceptible in corrosive sublimate, bismuth, or aloin poisoning (Ziegler).

The process is attended many times by alarming *Symptoms*, the nature of which depends upon the location and extent of the trouble, *e.g.*, apoplexy, angina pectoris, aneurism, senile gangrene of the extremities, and various forms of cardiac disease. But the symptoms due to simple degeneration of arteries are often very indefinite. Calcification is at times the sign of cessation of some morbid process, as, *e.g.*, in tuberculosis, where the diseased foci may be rendered inert by the development of this degeneration.

The *Diagnosis* of this condition may sometimes be made by touch, as in the case of a peripheral artery. Calcareous particles may be discharged from the body; or the presence of the degeneration must be inferred from the symptoms caused by it.

Treatment of this condition, particularly when it is found to be present in the walls of the blood-vessels, consists in forbidding excitement or excesses of all kinds, both bodily and mental.

Emma E. Walker.

CALCIUM.—1. General Medicinal Properties of Compounds of Calcium.—In the group of metallic elements represented by the metals of the alkalies and of the earths, calcium is distinguished, in its relations with the animal economy, by its comparative inertness. The medicinal characteristics of lime preparations as a class are lowness of diffusion power, and hence difficulty of absorption, slight local tendency to repress secretion, and slight constitutional tendency to oppose degenerative processes in tissues. Individually, the calcic compounds differ greatly in their properties, and thus arise many individual therapeutic applications, to be noted under the several preparations.

2. The Compounds of Calcium Used in Medicine.—The compounds of calcium that enter into the pharmacopœial preparations containing the metal are the *monoxide, hydroxide, carbonate, phosphate, sulphate, hypophosphite, chloride, bromide, sulphide* (in the preparation *sulphurated lime*), and the compounds, whatever they be, that form the substance called *chlorinated lime*. In the present article will be discussed only the *monoxide, hydroxide, carbonate, phosphate*, and *sulphate*. For the other compounds above cited, see, respectively, *Hypophosphites, Chlorides, Bromides, Sulphides*, and *Chlorine*.

Calcium Monoxide: CaO.—Calcium monoxide in the form of the ordinary "lime," or "quicklime" of commerce, is official under the simple title *Calx*, Lime. It is officially described as "hard, white or grayish-white masses, which, in contact with air, gradually attract moisture and carbon dioxide, and fall to a white powder; odorless, of a sharp, caustic taste. Soluble in about seven hundred and fifty parts of water at 15° C. (59° F.), and in about thirteen hundred parts of boiling water; insoluble in alcohol. Soluble in diluted acetic, hydrochloric, or nitric acid. When sprinkled with about half its weight of water, lime becomes heated, and is gradually converted into a white powder (calcium hydrate or slaked lime). When this is mixed with about three or four parts of water, it forms a uniform smooth magma (milk of lime). Even at the highest degrees of heat lime remains unaltered and does not fuse. Its aqueous solution gives an intensely alkaline reaction with litmus paper" (U. S. P.). Because of the strong affinity of lime for water, it should be kept in tightly closed vessels in a dry place. Lime is obtained from some of the varieties of native calcium carbonates, or from white marble or oyster shells, by calcining.

Physiologically the importance of quicklime lies in the fact that because of its intense affinity for water it is caustic. To a moist surface it is powerfully escharotic, and since the product of the caustic action (slaked lime) is a nearly insoluble solid, the action is non-spreading.

In practice, quicklime is rarely used by the surgeon, except in the form of the composite preparation, *potassa with lime* (Vienna caustic), for whose description see under *Potassium*.

Calcium Hydroxide: $Ca(OH)_2$.—Calcium hydroxide is the familiar substance, *slaked lime*, which forms in the shape of a white powder as the product of the chemical reaction between lime and water. The reaction is attended by the development of a high degree of heat. Slaked lime is not official in the United States Pharmacopœia under any distinctive title, but the preparations into whose composition it enters are defined as preparations of lime simply. Slaked lime is a soft, white, bulky powder, of a mawkish, alkaline taste, and having the solubilities detailed above in the pharmacopœial description of lime. Although a powerful free base, it is not caustic to living tissue, because of its difficult solubility in water. Combining as it does, therefore, the qualities of harmlessness and high alkalinity, it is valuable as an antidote—so far as antidotes go—in poisoning by acids. Especially is it to be selected in cases of poisoning by oxalic or sulphuric acid, because of the great insolubility of the salts it makes with these several acids. For medicinal purposes, proper, slaked lime is used in the valuable pharmacopœial preparation commonly known as *lime water*, but officially entitled *Liquor Calcis*, Solution of Lime. This is simply a saturated aqueous solution of slaked lime, easily made by any one by stirring freshly slaked lime into water—fairly pure water free from salts—in any proportion greater than 1 to 750. The vessel containing the resulting solution is to be kept tightly stoppered, with the excess of undissolved lime retained. After the settling of the undissolved portion, the clear, supernatant liquor may be drawn off in small quantities, for use, by decanting or siphoning. The object of having an excess of lime lies in the fact that lime water has a great affinity for carbon dioxide, absorbing this gas from the atmosphere and forming with it the insoluble calcium carbonate. By such reaction the lime of lime water gradually becomes exhausted, but by the device of keeping in the containing vessel an excess of lime, the water of the solution recharges itself therefrom as fast as it loses strength by carbonating, and the solution of lime is thus maintained steadily at saturation. Lime water is "a saturated, aqueous solution of calcium hydrate. . . . The percentage of calcium hydrate varies with the temperature, being somewhat over 0.17 per cent. at 15° C. (59° F.), and diminishing as the temperature rises" (U. S. P.). Although clear when first made, lime water, upon keeping, is certain to become turbid from absorption of carbon dioxide from the atmosphere, and the formation thereby of calcium carbonate. If, however, there be, as above advised, an excess of lime in the bottle, the turbidity does not mean loss of strength, and a sample so affected is perfectly good for medicinal purposes. Lime water is incompatible with alkaline carbonates, sulphates, borates, salts of ammonia and the metals, acids and acidulous salts, and astringent vegetable decoctions or infusions.

Lime water is, of course, alkaline, and at the same time is, physiologically, locally bland and soothing to irritation, with a tendency to check secretion. Taken internally it operates to allay gastric irritability and to control diarrhœa, especially when the diarrhœa is caused by acidity of the intestinal contents. From the conjunction of properties named, lime water is an excellent alkaline wash in skin disease, and is a standard remedy to subdue vomiting and combat the diarrhœa of acidity. In its internal use by far the best way of giving is in mixture with fresh, ice-cold milk. In such mixture, even when "half and half" in strength, the disagreeable lime taste is almost wholly lost, while at the same time the medicinal efficacy of the lime is enhanced, and the patient is nourished by the milk. In obstinate vomiting, indeed, nothing surpasses the administration of small quantities of ice-cold lime water and milk, frequently repeated, to the exclusion of all other medicine and nutriment, both. In ordinary cases, the lime water need not be in greater proportion to the milk than one part to two, three, or four. If the stomach be not too sensitive, such mixtures may be administered quite freely; but yet the *habitual* use of lime water in milk, in milk-fed individuals, such as infants, is objectionable. For occasional use, lime water is so innocent that it is hardly possible to assign any exact dose, but a tablespoonful generally suffices for a single giving, to be taken in at least an equal measure of water or milk. A special application of lime water is based on the fact that the tissue of false membranes immersed in the solution rapidly disintegrates. Hence the practice with some to spray the throat, in croup or diphtheria, with atomized lime water. In such procedure, however, it must be remembered that in the amount of spraying practically possible, the quantity of lime water brought into contact with the membrane is very small, and the duration of the contact short.

Lime water, although decidedly alkaline, is not readily absorbed, and consequently is useless for constitutional alkalizing. For such purpose, alkalies of high diffusion power, such as the basic compounds of potassium or lithium, must be used rather than lime.

Besides lime water, the United States Pharmacopœia offers, as a preparation of lime in solution, *Syrupus Calcis*, Syrup of Lime. This syrup is made by treating a triturated mixture of lime and sugar with boiling water, and bringing the solution after filtration to the standard strength of 6.5 per cent., by weight, of lime. In this procedure the lime and sugar chemically unite, and the product, while retaining the alkalinity and physiological properties of free lime, is yet much more soluble in water, as the percentage strength of the syrup attests. Syrup of lime is therefore, medicinally, a sweetened and at the same time a strong solution of lime, and may be used for the internal applications of lime water, only in much smaller dose—one-eighth, namely, of what would be given of the latter-named preparation.

For local application of the soothing properties of lime solutions, an excellent and ingenious preparation of lime is official in the United States Pharmacopœia under the

title *Linimentum Calcis*, Lime Liniment, often called *Carron oil*, from the Carron Iron Works, in Scotland, where the liniment acquired great reputation for the treatment of burns among the workmen. The preparation is simply an admixture, in equal parts, of lime water and linseed oil, whereby a lime soap is formed, which being insoluble makes an emulsion with the considerable excess of the oil prescribed by the formula. The oil, however, readily separates from the aqueous portion, and hence the preparation should be well shaken each time before use. Lime liniment combines the protection of a fixed oil with the alkaline and soothing properties of lime, and makes an excellent dressing for painful affections of the skin, such as burns, both allaying pain and promoting healing. It is applied clear.

Calcium Carbonate: $CaCO_3$.—Calcium carbonate is represented in the United States Pharmacopœia by two preparations. *Creta Præparata*, Prepared Chalk, is the native article freed from most of its impurities by elutriation; and *Calcii Carbonas Præcipitatus*, Precipitated Calcium Carbonate, is the carbonate obtained as precipitated from a solution of calcium chloride by reaction with sodium carbonate. Prepared chalk is in the form of powder, or of little conical pellets, and the precipitated carbonate is always in the condition of a very fine soft powder. Both preparations are permanent in air, odorless and tasteless, and insoluble in water or alcohol, although soluble, with effervescence, in hydrochloric, nitric, or acetic acid.

Calcium carbonate closely resembles slaked lime in its properties, but, being a salt, is less strongly alkaline, and, being wholly insoluble in neutral fluids of aqueous basis, is, locally, absolutely bland. It is medicinally applicable, in a general way, for the same purposes as lime water, and, in addition, because it is a bland, soft, and alkaline absorbent powder, it makes an excellent "dusting powder" to apply as a dressing to skin affections in which the cutaneous surface is moist and tender. Internally the carbonate is available as an antidote to acid poisoning, especially if the acid be sulphuric or oxalic, and is of use to correct idiopathic acidity of the *primæ viæ*, and to allay nausea and check diarrhœa. Being perfectly innocent, either of the forms of the salt may be given freely. For ordinary use in digestive derangements the single dose ranges from 0.65 to 3.00 gm. (gr. x. to xlv.). The medicine may be given as a powder, but administration in mixture is more common. The following pharmaceutical preparations are official in the United States Pharmacopœia: *Pulvis Cretæ Compositus*, Compound Chalk Powder. This consists of three parts of prepared chalk, two of powdered acacia, and five of powdered sugar, mixed. This powder is probably official as the basis for making the next named preparation, but yet is itself a convenient chalk powder for direct prescription. *Mistura Cretæ*, Chalk Mixture. This is compounded of two parts of the foregoing compound chalk powder and four parts each of water and cinnamon water. The sugar and acacia of the compound chalk powder dissolve and the slightly viscid solution resulting is capable, when shaken, of holding the chalk in suspension. The preparation should be freshly made for use, and should be shaken each time before dispensing a dose. It makes a very convenient basis for diarrhœa mixtures, especially in cases of diarrhœa with acidity. It may be given in tablespoonful doses. *Trochisci Cretæ*, Troches of Chalk. Each troche contains 0.25 gm. (about gr. iv.) of prepared chalk with a flavoring of nutmeg.

Normal Calcium (Ortho-) Phosphate: $Ca_3(PO_4)_2$.—This is the phosphate commonly called, for distinction, *bone phosphate*. It is official under the title *Calcii Phosphas Præcipitatus*, Precipitated Calcium Phosphate, and is made by dissolving the phosphate of bone ash by means of hydrochloric acid, and then precipitating it from the solution by the addition of water of ammonia. Such precipitate, washed and dried, presents itself as "a light, white, amorphous powder, odorless and tasteless, and permanent in the air. Almost insoluble in cold water; partly decomposed by boiling water, which dissolves out an acid salt; almost insoluble in acetic acid, except when freshly precipitated; easily soluble in hydrochloric or nitric acid; insoluble in alcohol" (U. S. P.). When freshly precipitated and still moist this phosphate also dissolves wholly in lactic acid.

Calcium phosphate is an important normal ingredient of the animal body, being the calcareous element of the bones and teeth. The use of the salt in medicine has been its internal administration in conditions of disease where there appears to be a deficiency of the substance in the proper tissues, either from assumed lack of supply or from want of power of assimilation. Such conditions are illustrated by rickets, mollities ossium, caries of the teeth, and possibly by scrofula and phthisis. But, as often happens in medication based on purely chemical considerations, the clinical results frequently fall short of the expectation, so much so that many practitioners put but little faith in the present remedy. Very likely the lack of effect of calcium phosphate is principally due to the difficulty of determining the absorption of the salt, partly because of the salt's entire insolubility in other than acid menstrua, and partly because of its low diffusion power. But inasmuch as the phosphate is wholly innocent, locally and constitutionally, it may with propriety be tried in cases in which it seems indicated theoretically. From 0.65 to 2.00 gm. (gr. x. to xxx.) may be given three times a day, larger doses probably being useless through lack of absorption. A convenient form of the medicine is the official preparation of the United States Pharmacopœia, entitled *Syrupus Calcii Lactophosphatis*, Syrup of Calcium Lactophosphate. Precipitated calcium carbonate is dissolved in dilute lactic acid, and to this solution phosphoric acid is added. After certain necessary trituration, the solution of the lactophosphate is filtered, sweetened, and flavored with orange-flower water, and then brought to standard strength by the addition of water. Twenty-five parts, by weight, of calcium carbonate is used to make one thousand measures of the syrup. Should a gelatinous precipitate tend to form upon keeping, a fluidrachm of hydrochloric acid may be added to each pint of the syrup. The preparation may be given in doses of from two to four teaspoonfuls, representing from 0.20 to 0.40 gm. (gr. iij. to vi.) of phosphate.

Calcium Sulphate: $CaSO_4.2H_2O$.—This salt is used in medical art only in the making of plaster-of-Paris dressings. Calcium sulphate occurs native in several conditions, the commonest being the salt combined with two molecules of water constituting the substance *gypsum*. The valuable property of gypsum is that when dehydrated and treated with water it recombines with the latter, and in such combining sets in a hard, dry mass. Gypsum is dehydrated by heat, which should not exceed 120° C.; for if carried too high (above 204° C.) the gypsum — called then technically *dead-burnt* — recombines with water but slowly and the product does not solidify. As properly dehydrated and pulverized the product is a white powder, without odor or taste, called *burnt gypsum* or *plaster-of-Paris*. Plaster-of-Paris is official in the United States Pharmacopœia under the title *Calcii Sulphas Exsiccatus*, Dried Calcium Sulphate. Mixed with two parts of water, plaster-of-Paris makes a soft, creamy paste, which in the course of from fifteen to twenty minutes gradually stiffens, until at last it sets into a perfectly hard and dry mass. During the setting a moderate degree of heat is evolved (not beyond the range perfectly bearable by the human skin), and the mass very slightly expands. Applied, therefore, as a casing to a limb, the dressing may be perfectly fitted without fear of shrinkage upon setting. After setting, the plaster-of-Paris neither softens nor dissolves by treatment with water, the solubility of calcium sulphate in water being only about one part in five hundred. For use in surgery the plaster-of-Paris paste may be applied by smearing it upon the bandaged limb so as to form a casing, but a far better way is to impregnate a flannel bandage thoroughly with the dry plaster, roll it loosely, and when the dressing is to be fitted dip the roller into a vessel of water until bubbles cease to be evolved and then apply in the

usual manner, but without reverses. Before so applying, however, the skin should be protected by a plain bandage, or, where appropriate, by a thread glove or a stocking.

Plaster-of-Paris should be kept in well-closed vessels, else, attracting moisture from the atmosphere, it will become partially hydrated. *Edward Curtis.*

CALCULI. See *Concretions.*

CALCULI, CUTANEOUS. See *Milium.*

CALEDONIA SPRINGS. — Post-Office. — Caledonia Springs, Ontario, Canada. Hotel, the Grand Hotel.

Access.—From Montreal and Ottawa by Canadian Pacific Railway, or by the Ottawa Navigation Company steamers.

Analysis, by Sterry Hunt. In one thousand parts:

Solids.	Gas Spring.	Saline Spring.	White Sulphur Spring.	Duncan or Intermittent Spring.
Chloride of sodium	6.9675	6.4409	3.5430	12.2500
Chloride of potassium	.0909	.0296	.0230	.0905
Chloride of calcium	....	....	.....	.2870
Chloride of magnesium	....	....	.....	1.0338
Bromide of sodium	.2150	.0169	.0100	....
Bromide of magnesium	....	....	.....	.0238
Iodide of sodium	.0005	.0014	....	....
Iodide of magnesium	....	....	.....	.0021
Sulphate of soda	.0053	.0048	.0183	....
Carbonate of soda	.0485	.1762	.4558	....
Carbonate of lime	.1480	.1175	.2100	.1264
Carbonate of magnesium	.5262	.5172	.2040	.8672
Carbonate of iron	Trace.	Trace.	Trace.	Trace.
Alumina	.0044	....	.0026	....
Silica	.0310	.0425	.0840	.0225
	7.9773	7.3470	4.6407	14.6433

These springs are carbonated saline, mildly charged with carbonic acid gas. There escapes with the water of the Gas Spring a large amount of carbureted hydrogen gas. The water of the White Sulphur Spring contains sulphureted hydrogen equal to about one cubic inch per gallon. The springs are situated on a level plateau which extends for many miles in all directions, the country being open and well cultivated. The Grand Hotel is commodious and comfortable. The management is excellent. All modern methods for utilizing the waters are at hand, and a physician resides at the hotel during the season. There are also a number of boarding-houses and cottages on the grounds, all of which are under the control of the company. The hotels are open from June to October.

The Caledonia Springs are the best known of Canadian mineral springs, and are resorted to by large numbers from Canada and the United States, particularly from the South. In addition to the water consumed at the springs large quantities are bottled and sent to all parts of Canada and the United States. *Beaumont Small.*

Fig. 1072.—Bay of San Diego, Southern California.

CALENDULA, MARIGOLD.—"The florets of *Calendula officinalis* L. (fam. *Compositæ*)" (U. S. P.). These florets are strap-shaped, nearly half an inch long, three-toothed, hairy upon the tube, of a bright yellow color, pistillate, with a two-branched style. The odor is characteristic, the taste aromatic and bitterish. They contain a little volatile oil and an amaroid, with resin and an abundance of the bright yellow coloring matter, *Calendulin*, which is inactive. The drug possesses very slight aromatic-bitter properties, but is chiefly used for coloring purposes. It is now much less used than formerly, and will doubtless be omitted from the next edition of the Pharmacopœia. The dose is 1 to 2 gm. (gr. xv. to xxx.).

The herb possesses similar properties, but is even weaker and contains much more mucilage. It has been used similarly, as well as for making poultices. Through an error, this, instead of the florets, was incorporated in the preceding edition of the Pharmacopœia.

Henry H. Rusby.

CALIFORNIA, SOUTHERN.—In this article only a brief and general account of the climate of Southern California will be given, as the principal resorts and sections will receive especial mention under their respective heads, in regular alphabetical order.

Southern California is an irregular area of territory, equal in extent to England and Wales, lying between latitude 35° 40′ and 32° 30′, with a coast line of 330 miles. It is bounded on the north by the Tehachapi Mountains, which are spurs of the coast ranges and Sierra Nevada; on the east by the Colorado River; on the south by the Mexican frontier; and on the west and southwest by the Pacific Ocean. In the western portion is the southern coast range, forming the eastern boundary of the *coast plain*, which contains numerous beautiful valleys, such as the Santa Clara and Santa Buena Ventura. This coast plain extends for 150 miles, and is from 15 to 25 miles in depth. Between the coast range and the Sierra Madre and San Bernardino ranges lies the *interior plain*, 200 miles in length and from 15 to 30 miles in depth. Here is the great San Gabriel Valley, which has been called the Lombardy of America, and numerous lesser valleys. "Between the coast plain and the long interior valley, the coast range of mountains is broken, and, opposite the Los Angeles plains, entirely disappears for a space. The whole country becomes thus a great open coast-land facing the south, and with the high Sierra for a background." * North and east of the Sierra, or inland range, lie the Mojave and Colorado deserts. It is with the resorts on or near the coast, or with those in the interior plain, that we have especially to deal as climatic stations, such as Santa Barbara, San Diego, Coronado Beach, on the coast; or, farther inland, Riverside, Redlands, San Bernardino, and others. The soil is composed largely of disintegrated granite, which is sandy and porous, and in many localities there are also large patches of adobe or red clay.

* "California of the South," by Walter Lindley and J. P. Widney, 1888.