

differs from erythema in that it is never accompanied by rheumatic-like pains or by fever. The color of the lesions differs, the erythematous nodes are painful, while the wheals of urticaria are itchy. The course of the two diseases is dissimilar; erythema nodosum lasting two or three weeks, while urticaria disappears in a few days.

It might be mistaken for that rare disease Erythema induratum, but this affection runs a slow chronic course, generally terminating in ulcerations.

The distinguishing characteristics of phlebitis, lymphangitis, and Erythema multiforme should also be borne in mind.

Treatment.—The treatment is according to the symptoms. If there is much fever antipyretics are indicated. The bowels should be kept open and a simple diet should be prescribed. As regards the general therapeutics, the most reliance should be placed upon salol, salicylate of soda, or quinine; phenacetin, combined with any of the above, aids in relieving the muscular and joint pains. It is well to follow this line of treatment with liberal doses of iron and tonics, especially in weak females. External lotions of lead water and opium relieve the burning pain, or, if preferred, a ten to twenty-five per cent. ichthyol ointment can be used.

The prognosis is favorable; relapses are rare.

ERYTHEMA ELEVATUM DIUTINUM.—In 1894 Crocker described a disease to which he gave this provisional name. The eruption occurs in young girls of rheumatic history, and chiefly affects the hands, lips, knees, and buttocks. The lesions are pale, purplish-red in color, and in some cases are sharply defined, in others nodular and irregular in outline. They are firm to the touch and painful when pressed upon. There are few or no subjective symptoms. Cases have been reported in which there was considerable disfigurement from the eruption, the skin being so nodular and infiltrated. The lesions tend to persist, but may undergo gradual involution. Those that do remain become as hard as cartilage. Microscopically there are evidences of inflammatory processes followed by the production of fibrous tissue. It is undoubtedly a mistake to use the term erythema in this disease, for it does not properly apply to the condition, hypertrophic changes being the chief pathological element. The proper classification will be finally decided after further study, but until then it is as well to describe the disease under this caption as elsewhere.

ERYTHEMA INDURATUM, or Erythème induré des scrofuleux, is a disease first described by Bazin. It is a deep-seated nodular eruption situated in the skin over the legs and fingers.

The nodes vary in size, and are round or oval in shape; as a rule they are few in number, but cases have been reported in which they became confluent. They run an indolent course: some disappear by spontaneous involution, while others suppurate or become necrosed, forming deep circular ulcers. Pain, which may be present, is not severe. Young strumous girls with feeble circulation seem to be especially subject to the disease.

In diagnosing this disorder Erythema nodosum and syphilitic gummata must be thought of. It differs from Erythema nodosum in that the lesions are more circumscribed, firmer, and of a darker color; they are more deeply situated in the skin and less tender; they run a chronic course and tend to ulcerate.

Syphilitic gummata are not bilateral, and the patient gives no evidences of other specific symptoms.

Treatment consists of change of air, tonics, and rest in bed.

James Macfarlane Winfield.

ERYTHRASMA.—This is a cutaneous disorder rather than a disease of the skin strictly speaking, and is due to the presence and growth, on and in the superficial layers of the epidermis, of a vegetable parasite. The affection was first described by Burckhardt in 1859 and by von Bärensprung in 1862, who then named it. Later it was studied by Besnier, Balzer, Dubreuilh, Riehl, Crocker, and many others, who all agree that it is a distinct affection. It is an extremely rare though trivial affection; it

produces no inconvenience and is usually only accidentally discovered. During the past six years no instance of it has been noted in the dermatological department of the Vanderbilt Clinic, New York City, where the examinations, at least amongst the male patients, in whom it is said to be most common, is of the most open kind. The parts attacked are primarily those situations of the body—such as the axilla, the inguinal and genito-crural regions, and the cleft of the nates—where, the apposed surfaces of the skin coming in contact, warmth and moisture are most constant. To these situations the parasite may confine itself indefinitely, but sooner or later (if uninterrupted in its course) the growth spreads slowly to contiguous parts and the trunk and limbs become invaded. These parts, however, may be attacked independently. The affection first manifests itself in the form of macules of the size of a pinhead or in patches of a somewhat larger area, the lesions varying in color according to their age and location, but always presenting a sharp contrast to the color of the adjacent normal integument. The younger lesions are vividly red over their entire surface or at their borders only, where a slight elevation above the general surface, due to hyperemia and to the presence of a scanty desquamation, may be detected by the passing finger. The larger and older patches display varying shades of color ranging from a yellowish or light brownish tinge to deep orange, they are circular or rosette-shaped, or they have very irregular outlines. Vesiculation and papulation never occur and the only subjective symptom is possibly that of itching. It is the most chronic in its course of the dermatomycoses and lasts for months or years with but little change. Males are more frequently attacked than females; no case has been noted in childhood. Riehl's youngest case was sixteen years old, the oldest fifty-eight.

The fungus to which erythrasma is due was named by von Bärensprung the *Microsporon minutissimum*, the chief characteristics of which are the fineness of its threads and the minuteness of its spores. A power of six hundred diameters is required to make out the organism well. The threads present an inextricably interwoven mass with the spores scattered throughout in irregular clumps.

Erythrasma is chiefly to be distinguished from chromophytosis, but the different situations usually occupied by the former, its vivid coloring, and particularly the differences observed under the microscope are features sufficiently distinctive to enable one to make a positive diagnosis when in presence of one or the other affection. From chloasma, for which it might possibly be mistaken, it may be shown to differ by the ease with which erosion removes the superficial discolored epidermis.

The following simple plan of treatment will be found all-sufficient. After a preliminary hot bath, during which vigorous friction of the affected parts with scrubbing brush and soap has been maintained, a goodly proportion of the invaded epithelium will be found to have been removed, thus allowing a saturated solution of hyposulphite of sodium in water to do its work effectively. Afterward this solution should be dabbed on twice daily until the last trace of the parasite has been removed, for, as in chromophytosis, if this be neglected, even to the extent of overlooking so small a lesion as a pinpoint-sized macule, a starting-point will be left for reinvasion. Many other remedies are used. The list includes, sulphurous acid pure or dilute, a good remedy; a ten-per-cent. ammoniated mercury ointment; and ordinary sulphur ointment of the Pharmacopœia, to be well rubbed in. None of these, however, can be compared, as regards both cleanliness and effectiveness, with the hyposulphite of sodium treatment.

Charles Townshend Dade.

ERYTHROPHLEUM, ERYTHROPHLEINE. See *Sassy Bark*.

ERYTHROXYLON. See *Coca*.

ESCHSCHOLTZIA.—A genus (fam. *Papaveracea*) of ten or more species, of the western and southwestern United States and of countries lying farther southward

Medicinal properties have been credited to the *E. Californica* Cham., but this was at a time when most of the species were included under that name, so it is not now known certainly to which species (one or more) these properties were said to belong. The plants are very showy and are widely cultivated for ornamental purposes. The herb contains chelerythrine (see *Celandine*) and at least one other alkaloid, and a glucoside. The presence of a small amount of morphine has been claimed, but this is probably not justified. Mild analgesic and soporific effects are obtained from the use of the extract in doses of about 1 gm., which may be increased to three or four times this amount.

Henry H. Rusby.

ESPERANZA MINERAL SPRINGS.—Yates County, New York.

POST-OFFICE.—Pen Yan.

ACCESS.—By steamers on Lake Keuka or by a trolley line between Pen Yan, which is six miles distant in one direction, and Branchport, one mile distant in the other.

The springs are located at the head of the west branch of Lake Keuka, one of the most charming and picturesque of the many series of lakes which give the name of the lake section to this part of central New York. Lake Keuka is 700 feet above the ocean level, and within a mile of the springs an elevation of 1,100 feet higher may be reached. This is the great grape-producing section of New York, and the country about the lake is dotted on every hand with vineyards. Lovely walks, drives, and bicycle paths abound on all sides. The largest of the springs flows about one thousand gallons hourly. The water, which has a temperature of 51° F., has never been examined quantitatively. A qualitative analysis shows the following ingredients: Calcium carbonate, Calcium sulphate, Calcium phosphate, Calcium chloride, Magnesium chloride, Magnesium carbonate, Magnesium sulphate, Iron oxide (trace), Sulphuretted hydrogen gas, and Carbonic acid gas.

The water, when first taken from the spring, has both the taste and the smell of sulphur, but this disappears after a few hours, and the water becomes very palatable. There is no hotel at the springs, though there are many within easy reach. Lake Keuka is well supplied not only with hotels, but with cottages, steam yachts, sailboats, etc. No systematic effort has so far been made to put the Esperanza Spring waters on the market, although large quantities have already been sold.

James K. Crook.

ESTILL SPRINGS.—Estill County, Kentucky. These springs are located 40 miles west of Irvine. We are indebted to the United States Geological Reports for the following analysis, made by Dr. Robert Peter:

ONE UNITED STATES GALLON CONTAINS: *		
Solids.	Red Sulphur Springs (near saloon).	Chalybeate Springs.†
	Grains.	Grains.
Sodium carbonate	1.16	....
Calcium carbonate	11.66	9.32
Magnesium carbonate	4.64	2.93
Iron carbonate .....	....	1.75
Sodium sulphate	9.91	.58
Potassium sulphate	5.24	.58
Calcium sulphate .....	....	16.32
Magnesium sulphate .....	.58	9.91
Sodium chloride	5.24	.58
Alumina .....	....	Trace.
Silica .....	.58	1.75
Organic matter	2.33	8.16
Total	41.34	51.88
Gases.		
	Cubic inches.	Cubic inches.
Sulphuretted hydrogen	0.26	....
Carbonic acid	18.98	15.68

* Converted from parts per 1,000.

† Alkaline calcic chalybeate.

The waters are principally of the light sulphuretted type, with one mild ferruginous spring. Another spring in the neighborhood, termed by Walton the "Irvine" Spring, is purgative, containing about 256 grains of sulphate of magnesium to the gallon. As far as we are able to learn, the place is not at present improved as a resort.

James K. Crook.

ETHER.—In medicine and pharmacy the word *ether*, unqualified, means, as it does in common parlance, the body *ethyl oxide* (C₂H₅)₂O, formerly, but improperly, called *sulphuric ether*. Ether is a product of reaction between sulphuric acid and alcohol, and is obtained by distilling a mixture of these two bodies, and purifying the distillate. Under the simple title *Ether*, Ether, the United States Pharmacopœia recognizes an ether of standard purity, "composed of about ninety-six per cent., by weight, of absolute ether, . . . and about four per cent. of alcohol containing a little water." This ether corresponds to what formerly was called *Ether Fortior*, Stronger Ether, a title abbreviated in the 1890 Pharmacopœia to the simple word "Ether."

Ether is "a transparent, colorless, mobile liquid, having a characteristic odor, and a burning and sweetish taste. Specific gravity: 0.725 to 0.728 at 15° C. (59° F.); or 0.714 to 0.717 at 25° C. (77° F.). Soluble in about ten times its volume of water at 15° C. (59° F.), with slight contraction of volume. Miscible, in all proportions, with alcohol, chloroform, benzol, fixed and volatile oils. Ether boils at about 37° C. (98.6° F.), and it should, therefore, boil when a test-tube, containing some broken glass and half filled with it, is held for some time in the hand. Ether is highly volatile and inflammable. Its vapor, when mixed with air and ignited, explodes violently" (U. S. P.).

Ether tends to decompose by prolonged keeping, developing, as one product, acetic acid. For use as an anæsthetic, ether ought to be pure and of standard strength. In all cases of suspicion, therefore, the surgeon should test his sample by the following simple procedures: 1. Let soak in the ether for ten minutes a piece of pale blue litmus paper, previously moistened with water; the paper should not redden, thus showing the ether to be free from acid. 2. Pour about two teaspoonfuls of the ether upon a piece of clean blotting-paper, free from smell, and let it evaporate; as the last of the ether is dissipated, no foreign odor should be perceptible on the paper, showing absence of impurities. 3. Saturate some water with the ether, and then shake together, in a graduated test-tube, 20 c.c. of such aqueous solution of ether with an equal bulk of the ether itself. Upon standing till the two fluids separate, the layer of ether should not measure less than 19.8 c.c., thus showing an absence of undue amount of alcohol or water—in other words, that the ether is up to standard in strength.

By reason of its extreme volatility ether is best kept in hermetically sealed tins. In bottles, whether cork- or glass-stoppered, leakage by evaporation is almost certain to occur, especially during transportation. Extreme inflammability is another property of ether requiring especial precautions in handling the fluid, and a point often overlooked is that air even moderately charged with ether vapor is explosive. Hence happens every now and then the ignition of an ether inhaler during anæsthetization by the leap of fire through intervening ether-charged air from a candle, or hot cauterizing iron, several feet removed.

Ether is a conjoint local irritant and constitutional narcotic. Being of high diffusion power, it is readily absorbed by living tissues, and so speedily declares its influence. Applied in full strength to the skin, and prevented from evaporating, it quickly reddens, and in time will blister. Absorbed into the blood, ether disturbs nerve function by attacking first and more profoundly the nerve centres, and secondly, and with less intensity, the nerves themselves. Of the nerve centres, the cerebrum seems to be the most sensitive to the ether influence, the disturbance being first a conjoint excitation of

the emotional and blunting of the intellectual faculties, and finally an abrogation of all mental phenomena, and unconsciousness so absolute that upon awaking there is not even that vague appreciation of the duration of the narcosis that follows ordinary sleep. Next to the cerebrum suffers the sensory tract of the spinal cord, the affection being a progressive blunting of perceptivity, and next again the motor tract, suffering first by paresis and irritation, and finally by full paralysis. Lastly, the medulla oblongata becomes involved, its sensory centres, as in the case of the cord, succumbing first and its motor centres last. Upon the nerves ether has a paralyzing power similar to what it exerts upon the centres, but the influence is so feeble as to be producible only by direct application of ether to an exposed nerve. In impregnation of the blood with ether, death of the subject by paralysis of the medulla will take place before there is any obvious impairment of conductivity on the part of the nerve trunks. Of the great functions, *heart action* is stimulated by ether, the pulse of a healthy subject rising in force and frequency, and maintaining such quickened and deepened action even through a long and full narcosis. In profound etherization, however, the heart is weakened, but the effect is always insignificant as compared with the weakening wrought by chloroform, and in death by ether the heart is still irritable. *Arterial tension* is increased at first; in part, doubtless, as a result of the increased heart action, but in part also, apparently, by vaso-motor spasm. Later in the narcosis the blood pressure falls. *Respiration* is primarily stimulated, but secondarily depressed, until in full ether narcosis the breathing becomes slow and shallow; and, in case of overdosing, respiration is the function whose failure produces death. From the experiments of Knoll it would appear that these respiratory derangements are caused by direct action of the ether upon the respiratory centres. Functions presided over by the *sympathetic nervous system* are but little disturbed by ether. The *stomach* is easily upset by ether; full doses given by swallowing are repulsive and sickening; and after ether inhalation nausea and vomiting are common occurrences, especially if the narcosis has been of considerable duration, and especially, further, if an ether of inferior quality has been used.

Clinically, the effects of ether are as follows: In administration by the *stomach*, the medicine is so offensive that enough cannot be given to produce more than a moderate grade of the peculiar ether effect. Doses of from 4 to 8 c.c. (from fl. 3 i. to ij.) can be swallowed, dissolved in a sufficiency of iced water, with the effect of stimulating the circulation and respiration, and producing mild exhilaration. Such a draught is powerfully reviving in conditions of heart failure or of depression of the vital powers generally, and also tends to steady the nervous system and to break spasm. Given by *inhalation of the vapor*, in as concentrated condition as possible, ether produces its full effect. Such inhalation is the common method of administration for the production of ether anaesthesia, and the attendant phenomena are as follows: *Subjectively*, if the attempt be made at the very start to breathe the vapor strongly concentrated, the pungency is intolerable; spasm of the larynx occurs, and despite all willingness to be etherized, the subject involuntarily gasps for breath and fights for release. Soon, however, the mucous membrane of the larynx becomes anaesthetized by the vapor, and then inhalation can proceed without distress. Following the cessation of laryngeal irritation come an indescribable thrilling and tingling throughout the body; a sense of physical lightness and mental exhilaration; a ringing in the ears, and exaggerated appreciation of sounds—phenomena that speedily give way to a consciousness of failure of cerebral power and command. Blunting of tactile sensibility is clearly appreciable, and, in the self-experience of the writer, a sensible interval—whether real or apparent only, it is, of course, impossible to say—occurs between the willing of a motor act and its execution. With ever-progressing rapidity, now, the grasp of the

centre of consciousness upon the outer world through the nerves of sense slackens, until, following a whirl of mental confusion, even the consciousness of consciousness fails, and the next act of cerebrating is the realization of an awakening from a sleep of whose duration the subject has absolutely no conception or even suspicion. In a self-administration of ether in an absolutely quiet room at night, the writer, awakening from what seemed, and was intended to be, a momentary unconsciousness only, found to his utter amazement, on glancing at the clock, that *two hours* had elapsed since the beginning of the inhalation—two hours of a coma as dreamless and blank as that attendant upon a compression of the brain. After awakening from an ether narcosis there is more or less tendency to nausea, headache, and debility and wretchedness generally. *Objectively*, the phenomena are first a rise in the frequency and force of pulse and respiration, a suffusion of the face, and a tendency to emotional excitement, varying with the temperament and disposition of the subject, exactly as in the analogous condition of alcoholic drunkenness. So while the phlegmatic or the self-contained individual may sink quietly into coma, the excitable or the unguarded subject may be outrageously jolly, or fearful, or pugnacious, or amorous, according to natural bent. At this period the proper test will show already a decided blunting of tactile sense and impairment of co-ordinating power. Speedily, next, the emotional displays grow feeble and incoherent, sweat starts out from the brow, the saliva flows, the face congests, the pupils contract, and the muscles at once both stiffen and tremble.

And, now, testing shows tactile perception to be abolished everywhere except in parts of high natural sensitiveness, such as the eye, the "quick" of the nails, and the ano-genital region. If the inhalation continue, the muscular rigidity and trembling give way, often with striking suddenness, to a condition of absolute paralysis and relaxation. At the same time the pulse falls somewhat, the respiration becomes slow and stertorous, the pupils dilate, all outward signs of conscious existence cease, and anaesthesia is absolute even in the most sensitive parts. While this condition lasts the face sweats freely, and the saliva flows in considerable quantities. Such a condition is the extreme to which narcosis should be pushed, since it represents an abrogation of all nerve action save that of the functions of organic life, and that determining the play of the heart and lungs. If the ether be pushed further the respirations become slower and shallower, the sphincters give way, and soon thereafter breathing stops altogether—the heart, however, continuing to beat for a short time still. On withdrawing the ether, sleep may follow, more or less prolonged, according to circumstances and according to the amount of ether consumed. Retching and vomiting may come next, often taking place quite suddenly and while sleep is still profound. On awakening, the subject is generally stupid and miserable, with co-ordination still deranged, and tactile sense blunted. Occasionally, but exceptionally, emotional excitement now appears, and in such cases there is sometimes a strong erotic excitation, with vivid illusions. Deceived by such experiences, female patients have been known honestly but falsely to charge the ether-giver or the operating surgeon with the taking of improper liberties, and even with rape.

Ether narcosis is a therapeutic measure for the production of *anaesthesia*, on the one hand, and of *muscular relaxation*, on the other. And the degree of the narcosis for either purpose will vary according to the circumstances of the case. In the line of anaesthesia, if it be for the relief of existing pain, a few whiffs of ether may suffice, without the production of narcosis at all, or it may be that the pain will yield only to the general unconsciousness of full coma. If it be for the abrogation of sensation during a surgical operation, the grade of narcosis necessary will depend upon the part to be attacked. In the case of all but the highly sensitive parts already enumerated, the ether effect need not be carried farther than the stage characterized by general muscular

rigidity and trembling; but for operations on the very tender regions spoken of, the narcosis must be pushed to the stage of muscular relaxation and stertorous breathing. For the purpose of affecting motility, if it be for the breaking of a cramp or spasm, a few whiffs of ether are often all-sufficient, ether being indeed quite a potent antispasmodic; but if relaxation be sought for the easier reduction of a hernia or a dislocation, full narcosis to the stage of stertorous breathing will be necessary. The actual *quantity* of ether required for narcotizing by inhalation will vary according to the inhaler used, the skill of the administrator, the respiration, the condition of the stomach, whether full or empty of food, and, also, upon the habit of the subject in the use of narcotics, and even upon idiosyncrasy. With a good inhaler; with care to prevent waste by evaporation into the room; with a subject whose susceptibility is not impaired by habitual indulgence in either ether itself or in alcoholics, whose stomach is fairly empty, and who *will and can breathe with forced inspiration and expiration*, so small a quantity as from 20 to 40 c.c. (roughly, from fl. ʒ ss. to i.), may suffice to produce full unconsciousness. But, as conditions commonly obtain, far larger amounts are required, so that it is rarely safe to provide less than half a pound for an intended anaesthesia of even ordinary duration only.

For the production of constitutional effects, ether also can be administered by rectal injection of its vapor. This method was tested experimentally so long ago as 1847 by Pirogoff, of St. Petersburg, and was revived some years ago in association with the names of Axel Yversen, of Copenhagen, and Daniel Mollière, of Lyons—a revival to be followed by a new lease of deserved oblivion. Full narcosis can be produced in this way, and without respiratory distress, and perhaps also with less gastric derangement than by inhalation; but the procedure tends dangerously to irritate the intestines. Diarrhea and bloody dejections have repeatedly followed the practice, with resulting death in at least two instances. In another case, death ensued from rupture of the intestine at the site of an old ulcer, through overdistention by the ether vapor.

The *practical administration* of ether to the development of narcosis is a special topic, treated of in this work in the articles on *Anaesthetics* and *Chloroform*, etc., to which, therefore, the reader is referred. For ordinary medicinal purposes, ether may be administered by inhalation or by the stomach. If given by inhalation, a very little suffices, so that it is enough to direct that a teaspoonful of ether be poured upon a crumpled handkerchief, which handkerchief is then to be held directly against the mouth and nostrils, and the fumes inhaled during a few deep inspirations. In this prescription the precautions must be enjoined, first, that in case of self-administration the subject must lie down or sit so reclining or so braced that, in the event of unconsciousness, he will not fall to the floor; and, secondly, that the whole procedure shall take place at a distance of at least six feet from any exposed flame, such as that of a candle, lamp, gaslight, or open fire. By the stomach, from one to two teaspoonfuls is the average dose, best given in from eight to ten measures of ice-cold water, sweetened, if so preferred. Ether so taken is, however, a repulsive medicine, being offensive to the taste and tending to choke, because of its pungency. But, for internal giving, the common practice is to prescribe the pharmacopoeial preparation entitled *Spiritus Aethæris Compositus*, Compound Spirit of Ether, or Hoffman's anodyne. This preparation is compounded of 325 parts, by measure, of ether, 650 parts of alcohol, and 25 parts of ethereal oil. It is a colorless volatile fluid, smelling and tasting of its three powerful ingredients. It forms a milky emulsion on admixture with water. It is used as an antispasmodic and general nerve and cardiac stimulant, and is given in average dose of from half a teaspoonful to one or two such measures, in water, plain or sweetened. In the United States Pharmacopœia there is also official a preparation entitled *Spiritus Aethæ-*

ris, Spirit of Ether, a preparation consisting of 325 parts, by measure, of ether, and 675 parts of alcohol in mutual solution. This spirit may be given as an internal medicine in doses of one or two teaspoonfuls, administered in a goodly quantity of iced water, plain or sweetened.

A peculiar application of ether is the driving of the fluid, in atomized spray, upon the skin for the purpose of freezing that texture by the cold developed by the evaporation of the ether—such freezing being for the sake of the anaesthesia that attends it. In this application the ether is delivered from an atomizer of good capacity, the nozzle being held about an inch and a half from the skin. The first sensation, that of cold, is followed by a severe burning feeling, which in turn is succeeded, as the skin freezes, by loss of all sensation. When so frozen the skin appears pale, shrunken, and of tallowy hue and feel, and can be cut without pain. The effect is superficial only, and if a deep incision is to be practised, the tissues beneath the skin must, after section of that covering, themselves be frozen, before cutting, by a renewed application of the spray. Freezing by ether spray is quickly done, and, if not maintained beyond a short time, is not followed by any deleterious effect. The procedure is appropriate only for brief and superficial surgical operations, and often is more painful than the knife.

Edward Curtis.

ETHIDENE DICHLORIDE.—*Ethylidene Dichloride*: $C_2H_4Cl_2$. This is an ethereal body, isomeric with and much resembling ethylene dichloride. It has been experimented with as an anaesthetic, and has been found to operate after the general manner of chloroform, including the occasional killing of a subject. It is administered similarly to chloroform.

Edward Curtis.

ETHOXY-CAFFEINE ($C_8H_9N_3O_2 \cdot OC_2H_5$) is prepared by boiling three parts of monobrom-caffeine with two parts of caustic potash in ten parts of alcohol. It forms needles which melt at $140^\circ C.$, are soluble in hot alcohol or cold hydrochloric acid; slightly soluble in water and ether, being less so than caffeine, and insoluble in alkalies. It is decomposed by hot acid, and even in water dissolves easily in the presence of sodium benzoate or salicylate. Filshie found that dizziness, dimmed intellect, and headache resulted from doses of seven to ten grains. Rabbits show narcotic and diuretic effects. The presence of the *ethoxy* group seems to add distinct hypnotic qualities to the diuretic power of caffeine, and the main use of the drug is as a sedative in nervous headache or migraine. Dose, gr. i. to v. (0.06–0.3 gm.).

W. A. Bastedo.

ETHYL BROMIDE.—*Hydrobromic Ether*: C_2H_5Br . This body is a thin, colorless, very volatile ether, of a strong smell and hot taste; practically non-inflammable; sparingly soluble in water, but freely so in alcohol and ether. It is prone to spontaneous decomposition, on exposure, and should be kept in dark-colored and well-stoppered bottles, away from the light. A yellowish tinge means decomposition, and a sample so discolored is unfit for use.

Hydrobromic ether affects the human system similarly to chloroform, with the special features that sensibility is deadened early, and that narcosis comes quickly and pleasantly, but without full muscular relaxation. The latter circumstance is a drawback, since often a continuing of rigidity and even of spasms into the stage of narcosis defeats the use of the agent as an anaesthetic in surgery.

Hydrobromic ether causes fall of blood pressure, and, in overdosage, death, all after the manner of chloroform. It has been used as an anaesthetic, given by inhalation of its vapor, especially in cases in which a momentary narcosis only is needed.

It is given similarly to chloroform.

Edward Curtis.

ETHYL CHLORIDE.—*Hydrochloric Ether*: C_2H_5Cl . Ethyl chloride is prepared by the action of hydrochloric acid on alcohol, the resulting ether being condensed at a

low temperature. When maintained at a temperature below 50° F. it is a colorless liquid having an alliacious taste and smell. Its specific gravity at 32° F. is .9214. It mixes with water, about one part in fifty, and with alcohol and ether in all proportions. Its boiling point is 50° F., and above this temperature it exists as a gas. As a gas it is exceedingly inflammable, burning with a greenish flame and evolving hydrochloric acid.

Following the introduction of ether and chloroform, it was one of the many compounds suggested as suitable for general anesthesia. Being very volatile it was easily administered and its anesthetic action was more rapidly procured. The anesthesia which it produced, however, proved to be very transient, and further experience as well as experimental work has shown that its action is accompanied by marked vascular and cardiac depression. Although strongly advocated by many, its employment never became general and it has now fallen into disuse.

It is now better known as a local anesthetic. Advantage has been taken of its rapid evaporation to utilize the intense cold produced, in dental and minor surgical practice, and for the relief of the pain of superficial neuralgia. It has been used with satisfaction for the extraction of teeth, for opening abscesses, for removing ingrowing toenails, and for similar painful operations, and has been found to give instantaneous relief in facial neuralgia, intercostal neuralgia, and sciatica.

The method of utilizing this property was made simple and easy by M. Mounet, of Lyons, who suggested the storing of the compressed fluid in small capsules and tubes, by which means it may be preserved without alteration for a great length of time. When the drug was required for use the point of the capillary tube was broken off, and the opening directed downward on the part to be anesthetized. These tubes have now been perfected by the addition of a screw cap which allows of any proportion of the contents being utilized, the remainder being preserved for future use. The heat of the hand is sufficient to raise the temperature of the fluid above its boiling point, and a stream of the rapidly volatilizing fluid issues as a spray, and may be applied to any part. The tube should be held at a distance of eight or ten inches from the part, and the surrounding tissues protected to prevent excessive and needless destruction of tissue. The surface of the skin acted upon rapidly becomes blanched and devoid of sensation, and regains its normal state upon the removal of the spray. If the application is persisted in, the vitality of the part is destroyed and necrosis is the result. During the employment of the spray care must be taken that no flame shall be in proximity, on account of the inflammability of the gas.

Beaumont Small.

ETHYL FORMATE.—*Formic Ether*: $\text{H.COOC}_2\text{H}_5$. This is the ethyl ester of formic acid, and is an ethereal liquid smelling like peach kernels. It is soluble in ten parts of water, and boils at 54° C. It is said to be of value as an antiseptic to the upper air passages.

W. A. Bastedo.

ETHYL IODIDE.—*Hydriodic Ether*: $\text{C}_2\text{H}_5\text{I}$. This body is a colorless ethereal fluid, non-inflammable, practically insoluble in water, but freely soluble in alcohol. It has a sharp taste and a smell simply penetrating if pure, but if impure often offensive. Ethyl iodide affects the human system after the manner of the volatile ethers generally, but is used in medicine—so far as it is used at all—either for the sake of *iodizing*, for which purpose some consider it efficacious, or for relieving oppression of breathing in pulmonary complaints. It is administered by inhalation, in dosage of fifteen drops.

Edvard Curtis.

ETHYL PHENACETIN ($\text{C}_9\text{H}_9\text{OC}_2\text{H}_5\text{.NC}_6\text{H}_5\text{.CH}_2\text{CO}$) is prepared by the action of ethyl iodide on phenacetin sodium. It is a yellow-colored oil, almost insoluble in water, readily soluble in alcohol and ether, and boiling at 350° C. As was expected, the introduction into phen-

acetin of an additional ethyl group has increased its hypnotic tendency, but the drug is not of sufficient value to be classed with such hypnotics as trional, chloralamide, etc.

W. A. Bastedo.

ETHYLENE BROMIDE.— $\text{C}_2\text{H}_4\text{Br}_2$. This organic compound was introduced into therapeutics as a convenient means of supplying bromine in cases in which its use is indicated for a prolonged period. The advantage claimed for it is, that it is not combined with potassium, sodium, or any basilius radicle, and its use does not disturb the digestion, the skin, or the mucous membranes, or produce any of the unpleasant effects that the older salts are liable to cause.

It is a colorless or faintly brown liquid, containing 90.9 per cent. of bromine. The odor is agreeable and taste sweetish. Its specific gravity is 2.163 at 69.8° F. Below 48° F. it becomes a solid, forming crystals. It is insoluble in water, soluble 1 in 4 of rectified spirit, and miscible in all proportions with absolute alcohol and oils.

The employment of ethylene bromide in epilepsy was recommended by Dr. J. Donath.¹ He used it in a great number of cases, and reports the details of ten cases in which he was able to watch its effects carefully. As a substitute for the bromides he found it very satisfactory, and the results, in his estimation, were much better. The cases were all of long standing and had been subjected to many forms of treatment. Under the use of the remedy the attacks became milder, shorter, and fewer in number, and in many instances assumed the character of *petit mal*. In three of the cases the convulsions were replaced by simple muscular twitchings without loss of consciousness.

The dose administered was gtt. vi. to xij. three times a day. It may be given in capsules with oil or in solution. The following preparations are recommended: (1) Ethylene bromide, gr. lxxv.; oil of almonds emulsion, ℥ij.; oil of peppermint, gtt. ij.; dose, gtt. xxx. three times a day, in a third of a glass of milk. (2) Ethylene bromide, gr. xxiv.; rectified spirits, gr. lxxv.; oil of peppermint, gtt. ii.; dose, gtt. v. to x. three times a day. In preparing these mixtures the high specific gravity must not be forgotten, it being nearly two and a half times as heavy as water. Before using the drug Donath tested its action on himself, and found that in ordinary doses it did not produce any disturbing effects; but in large doses it was sometimes followed by nausea.

This drug must not be mistaken for ethyl bromide, which it resembles both in name and in appearance. A case is reported² in which such a mistake was made with fatal consequences. A written order for the anesthetic, ethyl bromide, was sent to a druggist, who supplied ethylene bromide. Ten drachms were inhaled without producing any insensibility or anesthesia. The administration was followed by suppression of urine and uncontrollable vomiting, which continued until the patient died, upon the following day. At the post-mortem examination there was found an hyperemia of the meninges of the brain, also of the lungs, spleen, and kidneys. The liver was much enlarged, of a dirty-yellow color, and the cells were affected by a granular degeneration.

Beaumont Small.

¹ British Medical Journal, July 11th, 1891.

² The London Lancet, January 10th, 1891.

ETHYLENE-DIAMINE [$\text{C}_2\text{H}_4(\text{NH}_2)_2$] is a clear, colorless liquid of specific gravity 0.970. It is readily soluble in water, has an ammoniacal odor, and strongly alkaline reaction, and dissolves albumin easily. It has been recommended for the solution of the false membrane of diphtheria, being especially useful, as its efficiency is not destroyed by antiseptics.

Ethylene-diamine-trikresol or *trikresolamine* is a solution of two per cent. each of ethylene-diamine and trikresol. It is a clear colorless liquid of alkaline reaction, becoming slightly yellow and cloudy on exposure to air. On account of this cloudiness, the manufacturers now make

kresamin, a twenty-five-per-cent. solution of these two chemicals from which a one- or two-per-cent. solution may be prepared when wanted (see *Kresamin*).

Ethylene-diamine silver phosphate is argentamine (see *Silver*).

W. A. Bastedo.

ETHYLENE DICHLORIDE.—*Ethene Dichloride*, *Dutch Liquid*: $\text{C}_2\text{H}_2\text{Cl}_2$. This body is a thin, colorless, oily fluid, smelling and tasting much like chloroform; volatile and inflammable; dissolving sparingly in water and freely in alcohol and ether. Its only medical interest lies in its attempted substitution for chloroform, as an anesthetic which should retain the advantages of chloroform while free from its dangers. It seems to operate much like chloroform, and, according to Reichert, has little tendency to paralyze the heart. It is, however, very irritating to the throat. Administration, in mode and dose, is the same as with chloroform.

Edvard Curtis.

ETHYLENE-PHENYLHYDRAZIN-SUCCINIC ACID ($\text{C}_{10}\text{H}_{12}\text{N}_2\text{O}_4$) is prepared by boiling ethylene-phenylhydrazin with succinic anhydride in alcohol. It forms crystalline needles soluble in water, and is used as an antipyretic.

W. A. Bastedo.

ETHYLIDENE CHLORIDE (CH_2CHCl_2).—Chlor-ethylidene; chloriden; ethidene bichloride; Aran's ether; Wigger's ether. This is a colorless ethereal liquid prepared by the action of chlorine on ethyl chloride. It has an agreeable fruity odor, a boiling point of 57° C. (134.6° F.), and specific gravity 1.180. It has been used as a safe and ephemeral general anesthetic for short operations.

W. A. Bastedo.

ETIOLOGY. See *Infectious Diseases*.

EUCALYPTUS.—Blue Gum-tree. "The leaves of *Eucalyptus globulus* Labillardiere (fam. *Myrtaceae*) collected from the older parts of the tree" (U. S. P.). At the close of this article will be found some general infor-

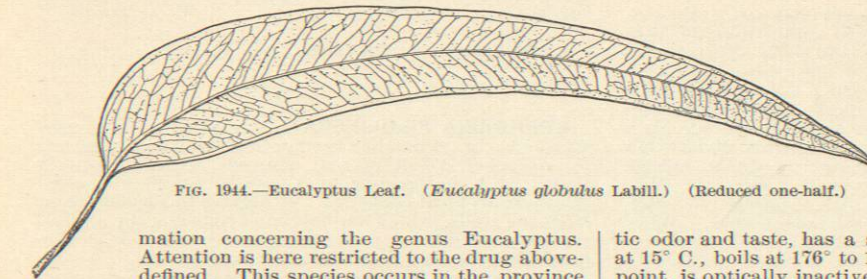


FIG. 1944.—Eucalyptus Leaf. (*Eucalyptus globulus* Labill.) (Reduced one-half.)

mation concerning the genus *Eucalyptus*. Attention is here restricted to the drug above defined. This species occurs in the province of Victoria, Australia, and in Tasmania. It grows to a great size, but is not nearly so large as some of the other species. The exhalations from the tree, where forests of it occur, and especially from the fallen leaves, charge the atmosphere, thereby disinfecting it. This has suggested the idea of planting it in malarial regions, as about Rome, for a similar purpose, but it is doubtful if the experiment has anywhere been performed in a sufficiently thorough manner or upon a sufficiently extensive scale. It was an incorrect notion of this property of the tree which suggested its first use in medicine, that of a specific for malaria. In this direction it proved disappointing, but the other important medicinal uses were found for it. The tree, when young, and the younger portions of it for some time after, bear leaves which to a great extent are wanting in the active constituent. These leaves are broadly ovate, heart-shaped at the base, little or not at all tapering at the apex, and comparatively thin. The official leaves (Fig. 1944) are 15 to 30 cm. (6 to 12 in.) long by 2 to 4 cm. (¾ to 1½ in.) broad, lanceolate and tapering from near the blunt base to an acute tip, strongly scythe-shaped, and

very inequilateral, entire-margined, very thick, leathery, smooth, strongly glaucous, and with a short, stout, flattened and twisted petiole. Against the light they are strongly pellucid-punctate. They are highly aromatic. It is not known how leaves grown in the several countries where the tree has been introduced compare with those of native origin, but some of them are known to be very inferior, and it is certainly a conservative and wise policy to accept only those of native growth.

COMPOSITION.—Besides their active constituent, about six per cent. of volatile oil, they contain wax, resin, and tannin. The medicinal properties and uses of the drug can be best considered farther on, in connection with those of the oil and of eucalyptol.

Oil of Eucalyptus (*Oleum Eucalypti*, U. S. P.) is defined as "a volatile oil distilled from the fresh leaves of *E. globulus* Labillardiere, *E. oleosa* F. von Müller, and some other species." It has a specific gravity of about 0.915 to 0.925 at 15° C., a characteristic odor and taste, and it dissolves freely in alcohol. Since the active constituent of the oil is *eucalyptol* (properly called *cincol*), the determination of the percentage of that constituent constitutes the proper method of valuation. For the same reason, it seems more rational for the Pharmacopœia to drop the oil from its next edition and to specify only the *eucalyptol*. With *eucalyptol*, there is *pinene* (from *E. globulus*) or *cuminol* (from *E. oleosa*), or the two oils may be mixed. Traces of several aldehydes may also be present. The optical rotation will also differ greatly in accordance with the source. The definition is faulty in that it does not specify the "other species," the oils of some of which are very distinct, even to being quite wanting in *eucalyptol*. The action of the oil, except for its being weaker and less regular, is that of *eucalyptol*. *Phellandrene* is its most common impurity, derived from other species of *Eucalyptus*.

Eucalyptol or *Cincol* ($\text{C}_{10}\text{H}_{16}\text{O}$) is defined by the Pharmacopœia as "a neutral body obtained from the volatile oil of *Eucalyptus globulus* Labillardiere and of some other species of *eucalyptus*." The allowance of "other species"

is here not objectionable as in the case of the oil, for the *eucalyptol* will be the same no matter what its source. It is also the active constituent of oil of cajuput and of some other Myrtaceous oils, and occurs in *santonica*, *rosemary*, *peppermint*, and many other oils of this and of other families. It is liquid, colorless, with a characteris-

tic odor and taste, has a specific gravity of about 0.930 at 15° C., boils at 176° to 177° C., crystallizes at freezing point, is optically inactive, and dissolves freely in alcohol. The commonest adulterant is the oil, which at once renders it optically active.

ACTION AND USES.—The action and uses of *eucalyptol* and of the oil must be considered first, as that of the leaves is not quite identical. Their special property among volatile oils (see *Active Constituents of Plants*) is their antiseptic and expectorant properties. As an antiseptic, *eucalyptol* ranks second only to oil of cinnamon, and this property increases somewhat as the oil ages. It is not markedly irritating to the skin unless the surface is abraded or the vapor is confined, but it is markedly irritating to mucous membranes, especially to that of the stomach. As an expectorant, whether taken internally or by inhalation, it is both stimulating and antiseptic. Its antiperiodic action is very similar in kind, but also very inferior, to that of quinine. As a poison it acts as a gastro-intestinal irritant, and as a paralyzant of the vital functions, especially of the heart.

The uses of this drug are all to be regarded as local; even when given internally, it is transported in the circulation to the seat of its action. Externally, it is an excellent application to ulcers which require either disin-