

serves as a path of communication between the sensory nerves of the cord and oblongata and the oculomotor nuclei, and the VI. nucleus receives collaterals directly from the sensory root of the V.

All of the oculomotor nuclei receive collaterals from the pyramidal tract which arborize about their cells, and doubtless constitute the paths of conduction of oculomotor impulses from the cortex. The lower cervical and upper thoracic region of the spinal cord contains a "cilio-spinal centre" controlling certain oculomotor movements, particularly dilatation of the pupil, elevation of the upper lid, and protrusion of the eyeball. These connections are effected through the great sympathetic via the rami communicantes of the lower roots of the brachial plexus. All of the oculomotor nuclei of each side are probably intimately related through the fasciculus longitudinalis medialis. Duval and Laborde have described

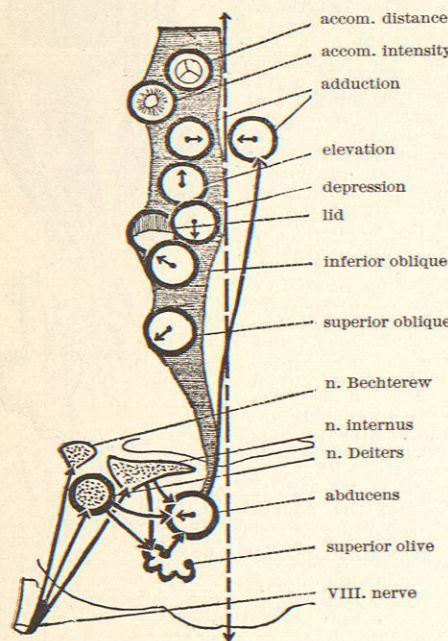


FIG. 1566.—Diagram of the Ampullo-Oculomotor Connections. (After Bonnier.)

also a tract from the VI. nucleus to the III. and IV. nuclei of the opposite side, particularly to the centre for adduction in the III. nucleus, thus providing a direct neural connection for conjugate movements of the eyes in the horizontal plane. The supposed course of the tract is diagrammed in Fig. 1566. Recent degeneration experiments on the lower animals have not revealed this tract; some such connection (either by way of this tract or of the fasciculus longitudinalis medialis to the opposite root fibres of the III. nerve) is, nevertheless, called for by abundant clinical data.

Various connections between the VI. nucleus and the vestibular portion of the auditory nucleus have been described. There is a great mass of clinical and direct experimental evidence for an intimate connection between the primary centres for the ampullae of the internal ear and the oculomotor centres, particularly those for conjugate movements of the eyes in the horizontal plane. It is these horizontal motions which are shown by experiment to be most in need of compensation in order to avoid an underestimate of angular movements of the head due to the inertia of the eyeballs. It is significant

in this connection that the abductors and adductors of the eyeball are in most intimate connection with the vestibular apparatus, according to the results of Duval and Laborde. The accompanying diagram from Bonnier illustrates a possible arrangement of these connections, though it should be remembered that they are all more or less in dispute (Fig. 1566). C. Judson Herrick.

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CREASOTE. See *Creosote*.

CREMATION. See *Dead Bodies, Disposal of*.

CREOLIN is a German proprietary article. Commercial creolin, however, varies much in appearance, and many preparations are sold under that title. The creols form the active ingredients. The following analysis of the German compound is furnished by Dr. Bernard Fischer: Cresols, 20 parts, naphthalene, 18 parts; other hydrocarbons, 20 parts; and non-volatile matter, 42 parts. It is quite free from carbolic acid and other poisonous ingredients, and should not possess any toxic properties. Creolin is prepared by treating these insoluble hydrocarbons with resin and caustic potash, which form a resinous, soapy emulsion. When added to water and agitated the ingredients remain suspended as an emulsion. In appearance it is a dark, resinous liquid, neutral to test

paper, not caustic. Its odor resembles that of creosote. It mixes with oils.

It is said to possess powerful antiseptic and disinfectant properties, and is recommended as a substitute for carbolic acid. It is very extensively employed, and numerous reports speak in its favor in all conditions in which carbolic acid is indicated.

For surgical purposes two solutions are employed, one containing two per cent. of the drug, the other one-half per cent. The stronger is used for disinfecting the hands, the instruments, and surfaces of the body; the weaker solution is used for irrigation, moistening dressings, saturating tampons, etc.

For suppurating and sloughing wounds, and when discharges are offensive the parts may be cleansed and disinfected by the pure drug, and the effect maintained by a weaker solution. To irrigate the bladder, urethra, nose, pharynx, and other mucous surfaces, a solution of one part in a thousand is sufficiently strong.

The objections to its use are, the uncertainty of its action on account of the numerous preparations, and being unctuous it renders the hands and instruments slippery and difficult to handle. Beaumont Small.

CREOSIN is a clear yellow fluid of not unpleasant taste composed of creosote, iodine, calcium hypophosphite, and balsam of Peru. It is free from causticity or other unpleasant by-effects, its taste is not disagreeable, and it is freely miscible with wine, milk, or soup. It was introduced by Bosio as a useful method of administering creosote, and is used like it in phthisis, bronchitis, bronchiectasis, etc. W. A. Bastedo.

CREOSOTE.—The title *creosote* belongs to a product of distillation of wood-tar, and much confusion has arisen from its application also to certain products of distillation of coal-tar, as in the title *coal-tar creosote*. This confusion, furthermore, has been worse confounded by the too frequent commercial trick of selling the coal-tar product in substitution for the wood-tar *creosote* proper. True creosote is recognized by the United States Pharmacopoeia under the title *Creosotum*, Creosote, and is defined to be "a mixture of phenols, chiefly guaiacol and cresol, obtained during the distillation of wood-tar, preferably of that derived from the beech."

Creosote is "an almost colorless, yellowish or pinkish, highly refractive, oily liquid, having a penetrating, smoky odor, and a burning, caustic taste; usually becoming darker in tint on exposure to light. Specific gravity not below 1.070 at 15° C. (59° F.). Soluble in about 150 parts of water at 15° C. (59° F.), but without forming a perfectly clear solution. With 120 parts of hot water it forms a clear liquid which on cooling becomes turbid from the separation of minute oily drops. . . . Soluble, in all proportions, in absolute alcohol, ether, chloroform, benzine, carbon disulphide, acetic acid, and fixed and volatile oils" (U. S. P.). A notable point of difference between creosote and carbolic acid is that creosote does not coagulate albumen or colloidum, while carbolic acid does.

Creosote is closely related, chemically, to carbolic acid, and resembles that body in physiological properties. Creosote, however, while equalling carbolic acid in antiseptic power, is distinctly less poisonous to the animal economy. Because of this circumstance creosote has been used as an internal medicine in such diseases as pulmonary consumption, in the hope of arresting the morbid process through a poisoning, within the body of the patient, of the peccant micro-organism. But whatever good may result from the treatment, it is quite certain that, as creosote is used internally, it does not affect the vital endowments of the tubercle bacillus.

Creosote tends to allay reflex nausea and vomiting, and to benefit pulmonary catarrhs, in the stage of active secretion.

For ordinary purposes creosote is prescribed in doses of a few drops, to be taken preferably in capsule, and upon a full stomach. Considerable quantities, however,

may be borne safely, and so much as several hundred drops has been given daily, and for months, in the treatment of phthisis. But such dosage must be reached gradually, and care should be taken that the sample is pure and derived from the beech.

In the event of poisoning by creosote, the soluble sulphates should be used as antidotes, as in poisoning by carbolic acid.

The United States Pharmacopœia makes official *Aqua Creosoti*, Creosote Water, a simple one-per-cent. solution of creosote in distilled water. *Edward Curtis.*

CREOSOTE, POISONING BY.—Poisoning by creosote has never become either popular or fashionable. The homicide and suicide have sought other means to attain their ends, and even "accident" and "negligence" have given creosote a wide berth. This prejudice against creosote exists on both sides of the Atlantic. Thus, in a table of about fifteen hundred deaths by poisoning occurring in the city of New York during the period 1841 to 1892, there are only two deaths from creosote, and both of them accidental (Witthaus and Becker's "Medical Jurisprudence, Forensic Medicine, and Toxicology"). And in England and Wales for a period of ten years (1888 to 1892) of 6,616 deaths from poison, only one was due to creosote, and this, too, was attributed to accident or negligence (Blyth, "Poisons"). Nor is it the general public and the criminals alone who thus ignore creosote; it is equally neglected by text-book writers. It is true that stray cases of poisoning by creosote are found in medical literature, but the text-books on poisoning and medical jurisprudence, as well as the medical dictionaries, as a rule, either omit the subject altogether or refer the reader to carbolic acid. The reason for this latter course is probably that creosote being a complex body, and its constituents varying so much and formerly containing an uncertain but fairly large quantity of phenol, it was difficult to pronounce on death caused by creosote. At the present day its composition is much more certain, and in medicine it is practically always "beechwood creosote" that is used; but as a set-off to this greater certainty must be added the fact that creosote is in great danger of being entirely replaced by phenol for external use, and internally by guaiacol.

REPORTS OF CASES.—The following are the most important cases: 1. Given by Stevenson (Guy's Hosp. Rep., 1875). A woman in advanced state of pregnancy took an unknown quantity of creosote; whether homicide, suicide, or to produce abortion is not known. Unconsciousness and stertorous breathing soon supervened. She was given tartar emetic and salt, and emesis was slowly produced; vomitus was green, consisting of food, salt, and tartar emetic. Urine like milk and water and ink. Followed by speedy recovery and no signs of aborting.

2. Pürckhauer (Friedreich's *Blätter f. ger. Med.*, 1883) reports that a child ten days old took gtt. xxiv. to xxx. of creosote, became insensible, then convulsed, and finally died in sixteen hours.

3. Marcand's (*Vierteljahrsschr. f. ger. Med.*, 1889). An infant took an unknown quantity and died in fourteen hours with symptoms of irritant poisoning.

4. Freudenthal's (New York *Med. Rec.*, 1892), of an adult female who took gtt. cc., became unconscious, with stertorous breathing, and abolished reflexes, finally recovered. She had been in the habit of taking gtt. c. three times a day, and on this occasion took a double dose.

5. Zawidski (*Centrabl. f. innere Med.*, 1894) mentions the case of a woman, aged fifty-two, who took three six-drop doses of creosote in milk, toxic symptoms then developed, and she died five days after.

6. Cowan (Glasgow *Medical Journal*, 1897) reports that a girl aged three took an unknown quantity in toothache mixture. She suffered from abdominal pain, collapse, and in half an hour fell asleep nearly unconscious. Her stomach was washed out, she vomited two or three times, and was well in six days.

7. Wood reports the case of a woman who took gtt.

dc. of creosote and became unconscious and cyanosed, but recovered without treatment.

LETHAL DOSE.—As individual tolerance for creosote varies, so does the amount required to produce toxic symptoms and fatal effect. The smallest quantity which has been reported as causing death is gtt. iij. to vi.; on the other hand, Wood's case took gtt. dc. and recovered without treatment. (For both these cases see above.) These are probably the extremes. Tolerance for creosote can be acquired; "100cc. a day have been given for a considerable time with benefit" (White, "Mat. Med. and Therap."). Graham (*Brit. Med. Journal*, 1898, i.) reports the case of a patient taking 11 cccxl. every day, and suffering no ill effects therefrom. In the *American Year Book of Medicine and Surgery* for 1899 are quoted cases in which (1) 11 cxx. were given daily; (2) 3 iijss. per day were administered in cod-liver oil, the patient becoming so impregnated with creosote that all the secretions and excretions had the odor of the drug; (3) the dose was increased up to 680 drops a day without causing any disturbance. The reason for these very excessive doses is not given, and it is certainly not apparent.

SYMPTOMS.—Some persons are very sensitive to the action of creosote, and others are very tolerant of the drug; hence the factors to be always taken into consideration, are: the personal idiosyncrasy, the quantity of creosote taken, the rate at which the dose has been increased, and the rapidity of elimination by the kidneys. The symptoms, which may come on very rapidly, are nausea; vomiting, which is not regular and may be slight; severe abdominal pain, gastric disturbance, and purging; malaise; vertigo; headache; prostration; anxious expression; pinched face; subnormal temperature; skin cold and clammy, and covered with perspiration; depressed heart action, with pulse weak and thready or imperceptible; stertorous breathing; dyspnoea; dimness of vision, and contraction of pupils; tendency to stupor; abolition of reflexes; possible cyanosis. The urine may or may not have the odor of phenol; as to discoloration opinions differ. In Stevenson's case the urine was black; Mann ("Forensic Medicine") says creosote will not give a black color to urine; Ringer says the urine is discolored generally at first. It is rarely albuminous, and pigmentation, if present, is probably due to oxidation products of the phenol group. "The occasional smoky urine does not imply disintegration of blood corpuscles, as at one time supposed, but is the result of a harmless chemical reaction, and may be disregarded" (A. H. Smith, *Medical News*, 1899). If there are local symptoms they begin to manifest themselves at once; there may be pain in the region of the kidneys. "Death occurs from failure of respiration, and the heart is arrested in diastole" (*Sajous' Annual*, 1898).

TREATMENT.—In cases of gradual poisoning withdraw the drug; if urine becomes discolored or digestion disturbed reduce the dose. In acute cases wash out stomach, give doses of Epsom or Glauber's salt, and warm demulcent drinks; saccharate of lime (fresh quicklime 15 parts, sugar 25 parts, water 1,000 parts) is also beneficial; apply heat externally, and counter-irritation over abdomen; give respiratory and cardiac stimulants, strychnine and digitalis, and if necessary a hypodermic of ether.

POST-MORTEM APPEARANCES.—Much the same as produced by phenol; there may be stains on skin, eschars on mouth or lips, erosions of mucous membrane of part of œsophagus or stomach, stomach may be red and injected, general inflammation of digestive tract, sometimes passive hyperæmia. These appearances are those of corrosion and vary according to the degree of concentration. The odor of creosote may or may not be present; in Pürckhauer's case it was present, in Marcand's it was absent.

TESTS.—I. As for Carbolic Acid (see article on *Carbolic Acid, Poisoning by*, in Vol. II. of REFERENCE HANDBOOK).

II. A mixture containing carbolic acid, creosote, and cresol should first be subjected to fractional distillation.

III. Differences between carbolic acid and creosote:—

1. Creosote is insoluble (or nearly so) in glycerin; carbolic acid is soluble in glycerin.

2. With collodion creosote mixes freely and does not coagulate; carbolic acid coagulates and becomes gelatinous.

3. With alcohol and ferric chloride creosote gives a green color; carbolic acid gives a brown or dark yellow.

4. If a chip of pine wood be placed in a distillate containing carbolic acid, and on removal be moistened with hydrochloric acid, it will get a blue color in about half an hour; with creosote there is no change of color.

R. J. E. Scott.

CREALOL.—This is the cresylic ether of salicylic acid, and bears the same relation to cresol or cresylic acid that salol does to carbolic acid. It is analogous to betol and salol, and has been introduced by Nencki, the originator of the other two compounds. It is prepared by treating cresylate of sodium and salicylate of sodium with perchloride of phosphorus. Three salts are formed, according as the ortho-, meta-, or para-cresylic acid is present. All three possess the same properties, but the para-cresalol is the one usually prepared. The chemical formula is $C_6H_4(OH)COOC_6H_4CH_3$.

Cresalol is a white, crystalline powder, without taste; odor somewhat resembles salol. It is insoluble in water, slightly soluble in alcohol. The dose is given as from gr. iij. to xxx. daily. It possesses antiseptic properties similar to salol, and, like that salt, is not acted upon by the secretions of the stomach. It is used for intestinal antiseptics, and is said to be more efficient than its analogues. In the system it is decomposed into cresol or cresylic acid and salicylic acid, and its advantage lies in the freedom of these acids from any toxic properties.

Beaumont Small.

CRESOCHIN is a compound of chinolin and tricresol with neutral chinolin-tricresyl-sulfonate. It contains thirty per cent. of chinolin and seventy per cent. of tricresol, and is soluble in 20 parts of water. It is used in 0.1- to 0.2-per-cent. solution for disinfecting instruments and the hands, and as a vaginal douche.

W. A. Bastedo.

CRESEL, CRESYOL, CRESYLIC ACID.—Cresol consists of ortho-, meta-, and para-cresol in variable proportions, having a general formula of $C_6H_4CH_3OH$. Ortho- and para-cresol are crystalline bodies, and meta-cresol is a colorless, thick fluid. Their boiling points are respectively 188° C., 198° C., and 201° C., the similarity of which renders it difficult to separate them. It is the next higher homologue of carbolic acid or phenol, and differs from it by the replacing of one atom of hydrogen by the methyl group CH_3 . It is present in coal tar, with carbolic acid, and is obtained during the process of fractional distillation. Up to 80° C. about four per cent. is separated, consisting of carbon bisulphide, ammonia, amylene, benzene, and other very volatile compounds. From 80° to 210° C. what is termed the light oil is removed; this is made up of benzene and its homologues. Between 210° and 400° C. the heavy oil is formed, consisting of phenol, naphthalene, cresols, and other hydrocarbons. The residue is pitch, about fifty per cent. The phenol, cresol, and naphthalene, and other constituents of the heavy oil, are separated by further distillation. It forms the greater part of the crude carbolic acids of commerce, which might more properly be called crude cresols.

It is a colorless, strongly refractive liquid, and is strongly caustic; its odor resembles that of creosote. It is insoluble in water, soluble in alcohol, glycerin, and ether. The cresols are powerful antiseptics and produce some of the most active preparations of the aromatic series. According to the investigations of Jaeger and Ohlmüller, of the Berlin Board of Health, and Fraenkel, of the Berlin Hygienic Institute, it has been shown that when dissolved in sulphuric acid the most active of such antiseptics is

formed. Being insoluble in water it is difficult to obtain a solution that is stable and applicable to surgical purposes.

Many methods have been devised and numerous preparations have been introduced into commerce under a variety of names; creolin, lysol, solveol, solutol, and others, are all preparations of this kind. Some contain other hydrocarbons in addition to the cresols. Resin and alkali soaps form a favorite means of retaining the active ingredients in solution, but when added to water they produce milky and greasy fluids, very objectionable for surgical uses; the antiseptic properties are, however, effective as deodorizers and disinfectants. Cresotate of soda has been found to retain cresol in solution. For therapeutic purposes a one-and-one-half-per-cent. solution is sufficiently strong, free from irritant or caustic properties, and equal to a five-per-cent. solution of carbolic acid. Cresol is also dissolved in a concentrated solution of salicylate of sodium, which allows of free dilution; no decomposition occurs, a neutral solution of cresol being formed. Lime is recommended as a means of producing a solution which forms a cheap and active disinfectant; one part of lime is treated with four parts of water, and five parts of cresol are added; the resulting liquid contains fifty per cent. of cresol and is miscible in water in all proportions. A simple method of rendering cresol miscible with water is to add three parts of tincture of green soap. The mixture is at first cloudy from the presence of the water in the tincture, but after standing for twenty-four hours all the water settles at the bottom and can be separated.

For internal administration the preparation cresalol has been introduced and is highly recommended.

Beaumont Small.

CREOTIC ACID. See *Salicylic Acid*.

CRESSON SPRINGS.—Cambria County, Pennsylvania.

POST-OFFICE.—Cresson. Hotel and cottages.

ACCESS.—Cresson is a station on the Pennsylvania Railroad, 250 miles west of Philadelphia and 102 miles east of Pittsburg. Through sleeping-car tickets may be purchased from all important points.

On the summit of the Alleghany Mountains, 2,800 feet above the sea level, is located the charming and picturesque resort known as Cresson Springs. This lovely spot has been abundantly endowed with nature's choice attractions, and it is at once a resting-place for the weary and a sanitarium for the weak in body. The bracing mountain air is in itself a speedy antidote to many of the lesser ills of life, and it is said that the early stages of pulmonary trouble are quickly arrested by a sojourn here. The Mountain House, adjoining the Springs, is a structure of imposing proportions and built with a special view to its fitness as a hotel. Its sanitary arrangements are excellent, and it is properly equipped with all the comforts, conveniences, and luxuries of the day. The building is located in an extensive park of magnificent forest trees. The grounds cover an area of 400 acres, much of which is devoted to lawn garden and groves. Adjacent to the hotel are a number of cottages, which may be rented by those who prefer a more home-like seclusion than is attainable in a large hotel. The hotel and its surroundings furnish ample scope for amusement and diversion. Lawn-tennis, croquet, rambles through the woods and mountains, and driving are among its outdoor diversions. During the season daily observation cars are run between Cresson and Altoona, and several times each week between Cresson and Ebensburg, affording to excursionists some of the finest mountain scenery in the country. The romantic beauty of the famous Horseshoe Curve, the inspiring grandeur of the Old Portage Road, the wild charm of the Allegrippus, and the endless vistas formed of forest-crowned peaks and leafy valleys excite the admiration of every lover of nature. Two of the springs at Cresson have been analyzed by Prof. F. A. Genth, of the University of Pennsylvania, with the following results:

MAGNESIA SPRING.

ONE UNITED STATES GALLON CONTAINS:

Solids.	Grains.
Calcium sulphate.....	0.11
Magnesium chloride.....	.56
Calcium chloride.....	1.30
Sodium chloride.....	1.23
Iron bicarbonate.....	Trace.
Manganese bicarbonate.....	.41
Calcium bicarbonate.....	.02
Sodium bicarbonate.....	1.43
Potassium bicarbonate.....	.21
Calcium phosphate.....	Trace.
Alumina.....	Trace.
Silicic acid.....	.91
Nitrous acid.....	Trace.
Carbonic acid (free).....	.66
Total.....	6.86

This water is somewhat aperient in full doses. It also possesses reconstructive and tonic properties.

PURE SPRING.

Solids.	Grains.
Calcium sulphate.....	0.04
Calcium carbonate.....	.35
Magnesium carbonate.....	.24
Iron carbonate.....	.02
Sodium carbonate.....	.12
Potassium carbonate.....	.08
Sodium chloride.....	.16
Silica.....	.25
Phosphoric acid.....	Trace.
Manganese oxide.....	Trace.
Total.....	1.26
Carbonic acid (free and partially combined).....	1.40

This spring is entirely free from organic matter. It emerges in considerable volume from a group of crushed strata formed almost exclusively of silicious elements. It is but slightly mineralized, however, and may be referred to the indifferent group of waters.

James K. Crook.

CRETINISM. See *Goitre*.

CROCKER SPRINGS. — (Formerly White Creek Springs.) Davidson County, Tennessee.

Post-Office.—Cole Building, Nashville, care of A. G. Goodlet.

Hotel destroyed by fire, but there are accommodations for a few visitors.

This resort is situated 12 miles west of Nashville, at the foot of a high plateau running north from the Cumberland River to the Kentucky line. The altitude is about 600 feet above the sea level. The surrounding country is broken, the springs being situated between high hills. The large hotel was destroyed by fire some years since, so that the present accommodations are not what may usually be expected at first-class watering-places. There are, however, several comfortable buildings for the reception of guests. Adjoining the springs is a tract of 200 acres, containing fine orchards of apple, pear, and peach trees, etc. The prevailing meteorological conditions are clear weather and sunny days, with an atmosphere free from malarial or miasmatic influences. Two springs are in use, one known as the "Black Sulphur," temperature 58° F.; and the other as the "Red Sulphur," temperature 56° F. The following analysis was made many years ago (1841) by Dr. Troost, analytical chemist:

ONE UNITED STATES GALLON CONTAINS:

Solids.	Grains.
Calcium carbonate.....	35.42
Sodium sulphate.....	13.20
Calcium sulphate.....	19.64
Magnesium sulphate.....	19.32
Sodium hyposulphate.....	6.50
Total.....	94.08
Gases.	Cubic inches.
Carbonic acid.....	37.99
Sulphureted hydrogen.....	40.25

These waters have been well known in Tennessee for their beneficial effects in hepatic congestion, indigestion, Bright's disease, and the uric-acid diathesis.

Within two or three hundred yards of the building is a cold limestone spring which flows from a cave having a remarkably low temperature. The cave is utilized as a natural cold-storage house.

James K. Crook.

CROCKETT ARSENIC-LITHIA SPRINGS.—Montgomery County, Virginia.

Post-Office.—Shawsville. Hotel.
Access.—Via Norfolk & Western Railroad to Shawsville, thence 7 miles to springs by carriage.

This resort is located in the Alleghany Mountains, 3 miles from the Alleghany Springs. The elevation is 2,000 feet above the sea level, and the atmosphere pure, bracing, and delightful. The hotel is a new and substantial structure of artistic design, with a veranda encircling the main building, and is fitted up with modern conveniences. Ample provision has been made for the entertainment of guests. There are bowling alleys, lawn tennis courts, and croquet grounds. Walks, drives, fishing, and hunting are also enjoyed, while many find pleasure in rambling through the woods to the famous falls, where a bold and sparkling stream leaps for hundreds of feet from rocks and precipices, forming cascades and sprays of great beauty. The scenery about the resort is romantic and picturesque and affords ever varying features to charm the visitor's eye. The waters of the Crockett Springs are close to thermal, having a temperature of 70° F. in the coldest winter months. The following analysis was made a few years since by Prof. Henry Froehling:

ONE UNITED STATES GALLON CONTAINS:

Solids.	Grains.
Magnesium carbonate.....	1.18
Calcium carbonate.....	5.90
Strontium carbonate.....	.09
Lithium carbonate.....	.07
Magnesium sulphate.....	3.04
Calcium sulphate.....	2.25
Potassium sulphate.....	1.25
Iron sulphate.....	.04
Sodium sulphate.....	1.86
Sodium chloride.....	1.23
Sodium bromide.....	.01
Sodium arsenate.....	.02
Aluminum silicate.....	.12
Silicic acid.....	1.29
Barium carbonate, copper carbonate, lead carbonate, zinc carbonate, manganese carbonate, sodium iodide, aluminum phosphate, and ammonium nitrate.....	Traces.
Total.....	18.35
Carbonic anhydride combined with monocarbonates to form bicarbonate.....	3.23
Total.....	21.58

This water is more distinguished for the variety than for the quantity of its mineral ingredients, yet some of its constituents, though minute in quantity, undoubtedly impart to the water an appreciable therapeutic value. It is said that the well-known physiological effects of arsenic, for example, may be readily produced by taking the water in large quantities. In practice the water has been shown to act as an eliminating agent, a nerve sedative, a nerve and blood tonic, and also as an alterative. It has been found particularly valuable in the chronic types of skin disease, especially those characterized by scaly eruptions. In those varied conditions in which arsenic is useful the water meets the indications perhaps more promptly, with more permanent results, and with less constitutional and local irritation, than do the artificial preparations of arsenic. The hotel is amply supplied with bathing facilities at any temperature, and good results have followed the conjoint use of the baths and the internal administration of the water. An office has been fitted up for the resident physician by the management, with the latest and most improved electrical apparatus and other appliances for the treatment of chronic diseases. The water is used commercially.

James K. Crook.

CROTON OIL.—OLEUM TIGLII. OLEUM CROTONIS.

"A fixed oil expressed from the seed of *Croton Tiglium* L. (fam. *Euphorbiaceae*)" (U. S. P.). This species of croton is a small, slender-branched tree, native of China, but very largely cultivated in India, and abounding in the East India Islands. The fruit is a three-celled, three-seeded capsule. The seeds are about 1 cm. long, oblong, rounded on the back, slightly flattened on the face on each side of the median line, where the raised raphe is to be seen running from end to end. Color of seeds yellowish-brown, black where the outer layer is scraped off, not shining. Testa brittle. Embryo large, albumen oily. In structure and shape they are very much like castor-oil seeds. They are much more uniform in size than the latter, larger than the smallest, smaller than the largest. Taste at first oily, then acrid.

The seeds are used in Java for poisoning fish. They are also largely used in Hindoo medicine, but it is directed that the membrane (tegmen) as well as the testa, and also the embryo, shall be first removed. Besides the oil, they contain *crotonin*, a highly poisonous toxalbumin, similar to the ricin of castor-oil seeds. The yield of croton oil is about one-fourth to one-third the weight of the seeds. It can be removed with ether or other solvents, though the official requirement is that it be expressed.

Both the seeds and oil are imported from Bombay, Cochin, etc.; the oil is also expressed in Great Britain from seeds imported from the East.

The oil is thus described:
"A pale yellow or brownish-yellow, somewhat viscid, and slightly fluorescent liquid, having a slight, fatty odor, and a mild, oily, afterward acrid and burning taste (*great caution is necessary in tasting*).

"When applied to the skin, it produces rubefaction or a pustular eruption.

"Specific gravity: 0.940 to 0.960 at 15° C. (59° F.).
"It reddens blue litmus paper moistened with alcohol.

"When fresh, it is soluble in about 60 parts of alcohol, the solubility increasing by age.

"It is freely soluble in ether, chloroform, carbon disulphide, and in fixed or volatile oils.

"When gently heated with twice its volume of absolute alcohol, it forms a clear solution from which the oil usually separates on cooling.

"If to 2 c.c. of the oil 1 c.c. of fuming nitric acid and 1 c.c. of water be added, and the mixture vigorously shaken, it should not solidify, either completely or partially, after standing for one or two days (absence of *other non-drying oils*).

COMPOSITION.—This is one of the most complex of fixed oils in composition, and notwithstanding the very extensive study to which it has been subjected, our conclusions are yet far from satisfactory. It dissolves in an equal amount of alcohol, but if this volume of alcohol is increased a portion is insoluble. It is again soluble in 60 parts of alcohol. As the oil becomes older its solubility in alcohol increases, and, *pari passu*, its irritating properties increase. The most important fact, practically, is that it consists chiefly of a glyceride of crotonoleic acid. This body is purgative, whether in its own state or, as most likely, only through the gradual setting free of the acid in the intestine, is not certainly known. The acid is freely soluble in alcohol, and can thus be removed from croton oil, which always contains some in a free state. It is extremely irritating to the skin and mucous membrane, and it is its gradual formation by decomposition on keeping which renders the older oil more vesicant and more violently drastic. This acid is in a general way similar to ricinoleic acid of castor oil, but is much more active. Glycerides of several other acids, fixed and volatile, have been reported. It is believed that irritating properties reside in some one or more of these volatile constituents, as employees in the factories who do not come into contact with the oil suffer from cutaneous irritation.

ACTION AND USES.—From the above, it will be seen that croton oil is (1) a vesicatory and (2) a drastic purgative. Upon the skin, a drop to each twenty or thirty

square inches produces violent irritation, usually an acute eczematous eruption of numerous closely aggregated blisters, becoming, if the result is intense enough, pustular and scabby. The eruption is usually limited to the region to which the application is made, but in extremely susceptible patients a general vesication of nearly the whole body may follow a limited application. It has been a moderately common mode of counter-irritation in bronchitis and other diseases, but is now only rarely used. It has also been used as a parasiticide in obstinate cases. Absorption and purgation have frequently followed its external application.

As a quick purgative, where the most rapid and complete emptying of the bowels is required, in "congestive" and other apoplexies, in injuries to the head, in uræmic conditions, in short, whenever an intense derivative action to the bowels is required, croton oil was for a long time at the head of the list; its rapidity and the smallness of its dose being great advantages. With the multiplication of purgatives, however, the objectionable features of this oil have led to a steady decline in its use. This is now more generally confined to cases absolutely requiring a powerful local action upon the intestine, such as lead colic or seasickness, or to those in which other purgatives cannot be readily administered, or to those individuals who are in a state of insensibility, or to insane patients. Here the dose can be made effective by simply dropping it upon the back of the tongue. The purgative action of this drug is essentially an irritative one, accompanied by griping pain, and often followed by much inflammation. There is increase of watery secretion and also of motion, and any abdominal or rectal irritation or inflammation is markedly increased. It also irritates the uterus, and is abortifacient. These effects may be moderated by washing it with a little alcohol, and thus removing the free crotonoleic acid. The dose is ʒi . to ʒj , and should not be repeated.

Poisonous symptoms are commonly those of great abdominal inflammation, followed by depression or collapse. In some cases, when purging has not occurred, great depression and progressive blunting of the vital powers have been observed, as is common in the lower animals.

Henry H. Rusby.

CROUP.—Croup is an acute inflammation of the larynx, characterized by the formation of a pseudo-membrane. The principal symptom from which the disease derives its name is a peculiar crowing cough. A similar cough is also found in severe cases of acute laryngitis in children and in laryngismus stridulus; consequently these last two diseases are frequently included under the heading of "croup," although in them there is no formation of a false membrane in the larynx.

ETIOLOGY.—In the great majority of cases the false membrane is due to the action of the Klebs-Löffler bacilli, thereby making croup one of the manifestations of diphtheria, that is, of laryngeal diphtheria (see *Diphtheria*).

The idea prevalent some years ago, that much of the croup was idiopathic and non-diphtheritic in its character, in the last decade has been shown to be false and it is now an established fact that a very large percentage of these cases are diphtheritic.

Billings, after careful bacteriological investigation of two hundred and eighty-six cases of membranous laryngitis, found Klebs-Löffler bacilli in eighty per cent. of them; streptococci and diplococci were the bacteria found in the remaining twenty per cent. of the cases.

Non-diphtheritic membranous laryngitis, or false croup, as it is often called, may result from blows upon the larynx, from the inhalation of hot steam and smoke, or from the introduction into the larynx of caustic alkalies or acids.

PATHOLOGY.—In the early stages the laryngeal mucous membrane is hyperæmic, while later there is a round-cell infiltration into the epithelial and subepithelial layers, followed by a transudation of lymph into these infiltrated regions. The lymph coagulates, and the action of the toxins developed by the bacilli produces a coagulation