when taken in wineglassful doses or less after each meal. When heated and used for bathing it is valuable in rheumatism. *James K. Crook.*

BDELLIUM.—The bdelliums, for there are two varieties, are gum resins of the frankincense type, from at least two, probably several species of *Balsamea*. The East Indian bdellium is reputed to come from *Balsamea* (*Balsamodendron*) *Mukul* Engl.; that of Africa from *B. africana* Engl. (fam. *Burseraceæ*). The latter is the variety official in France; neither is so in any other country.

Bdellium resembles myrrh in appearance and qualities. It is in small yellowish or reddish-brown tears, or sometimes in larger masses; transparent, fragrant, brittle. It softens between the teeth, and crackles in the flame. The odor and taste resemble those of myrrh, but are weaker. It contains about sixty per cent. of *resin*, between thirty and forty of *gums*, mostly bassorin, and one or two of *volatile oil*.

Bdellium is a mild local stimulant like myrrh, of which it is almost an exact duplicate, though inferior. It is sometimes used as an adulterant of myrrh. It is now and then used in Europe in plasters. *W. P. Bolles.*

BEALL SPRING.—Warren County, Georgia. Hotels and cottages.

ACCESS.—Viâ Macon and Augusta Railroad to Warrenton, thence by hack line to springs. Location eight miles south of Warrenton. This spring was discovered in the early part of the present century, and some rude improvements were made as far back as 1825. The following qualitative analysis gives the principal ingredients of the water:

Solids.	*Solids.*
Calcium carbonate.	Potassium sulphate.
Potassium carbonate.	Magnesium sulphate (trace).
Iron carbonate.	Silica.
Sodium carbonate.	Organic matter combined with sulphur.

Gases: Hydrogen sulphide, small quantity: carbonic anhydride.

Sulphureted hydrogen may be considered the most important ingredient. The combination of ingredients gives the waters many of the advantages of three prominent classes of spring waters, viz., the sulphureted, the chalybeate, and the calcic waters. The flow of water is about one gallon per minute. The spring is located on an eminence, and is surrounded by a fine grove. The improvements are not extensive, consisting of a small hotel and a few cottages. *J. K. C.*

BEARBERRY.—UVA URSI. "The leaves of *Arctostaphylos Uva Ursi* (L.) Sprengel (fam. *Ericaceæ*)." (U. S. P.).

This little gregarious, evergreen shrub, with reclining or creeping stems, and stiff, shining, green leaves, is at home on the dry hills and plains, as well as sandy barrens near the coast, in the colder parts of the entire north temperate zone.

The leaves, the part used, are nearly sessile, about 2 cm. (four-fifths inch) in length; narrowly obovate or spatulate, with entire, slightly revolute margins. They are very thick, dark green, and shining above, pale green underneath. The dried leaves preserve their color well; they have a faint, herby, or tea-like smell, and a not unpleasant bitterish-astringent taste.

Uva ursi contains both *tannic* and *gallic acids*—the former in large quantity; also *ericolin*, to which part of its bitterness is due, *urson*, *arbutin* and *methyl arbutin*. (For the characters and properties of these substances see *Ericaceæ*.)

Uva ursi has the mildly stimulating and antiseptic diuretic action of arbutin, and is rather extensively used.

Dose of uva ursi, from 2 to 4 gm. (ʒ ss. to i.), or more if the digestive organs are not disturbed by it. There is an official fluid extract, as well as an extract, but the decoction is probably a better form of administration. Arbutin is frequently used instead, in Bright's disease, in doses of 0.15 to 0.5 gm. (gr. iiss. to viij.).

Arctostaphylos glauca, a West American species, with larger roundish leaves, has similar qualities, and also contains *arbutin*. *H. H. Rusby.*

BEARSFOOT.—The root of *Polymnia Uvedalia* L., (fam. *Compositæ*), a very coarse perennial herb, common through most of the United States. The alterative properties claimed for it are of the most vague character, and we have no good authority for its use. *H. H. Rusby.*

BECK'S HOT SULPHUR SPRINGS.—Salt Lake County, Utah.

POST-OFFICE.—Salt Lake City. Hotel.

This is a well-known pleasure and health resort of Salt Lake City. It is fitted with a sanitarium, bathhouses, swimming pool, hotel, restaurant, etc. The water has a natural temperature of 128° F. The following analysis was made by Professor Hirsching, of the Salt Lake Mining Academy:

ONE UNITED STATES GALLON CONTAINS:

Solids.	Grains.
Sodium carbonate	14.63
Sodium sulphate	140.96
Magnesium sulphate	26.87
Potassium sulphate	10.61
Sodium chloride	598.33
Potassium chloride	8.45
Magnesium chloride	7.28
Calcium chloride	6.52
Calcium carbonate	23.61
Magnesium carbonate	5.88
Iron carbonate	.46
Sodium borate	.33
Calcium borate	.12
Silica	1.23
Undetermined	3.67
Total	848.85

Sulphureted hydrogen gas, large quantities; carbonic acid gas, large quantities.

In the author's work on "Mineral Waters" this is classified as a muriated and sulphated saline. Although heavily mineralized, it is perfectly clear, and when taken cold is entirely palatable. It has a diuretic and cathartic influence when used internally. The baths here are said to be highly efficacious in chronic metallic poisoning, tertiary syphilis, obstinate rheumatism, gout, and skin affections. *James K. Crook.*

BEDFORD ALUM, IRON, AND LITHIA SPRINGS.—Campbell County, Virginia.

POST-OFFICE.—Bedford Springs. Hotel.

ACCESS.—Viâ Norfolk and Western Railroad to Forest Depot, thence four miles by private conveyance to springs. Also viâ Virginia Midland Railroad to Lawyer's Depot, thence four miles by carriage to springs.

These springs are located within a few hundred yards of Bedford Village, one of the ancient historic spots of the Old Dominion, still redolent with memories of Patrick Henry, John Randolph of Roanoke, Thomas Jefferson, and other great Virginians of bygone days. The healthy nature of the location is attested by the longevity of the inhabitants, persons of threescore and ten and over being almost a rule instead of a rare exception. The landscapes about the springs are of great beauty and interest. The peaks of Otter, twenty miles distant, may be seen raising their lofty crests to an altitude of four thousand feet above the sea. The Natural Bridge is not far distant, and Lynchburg, a city of 20,000 inhabitants, is within ten miles. The location of the springs is about thirteen hundred feet above the sea level, and the average summer temperature is 66° F. The following analysis of the water was made in 1877 by Prof. M. B. Hardin, of the Virginia Military Institute:

ONE UNITED STATES GALLON CONTAINS:

Solids.	Grains.
Copper sulphate	.06
Iron protosulphate (ferrous)	.59
Iron persulphate (ferric)	19.26
Aluminum sulphate	24.18

Solids.	Grains.
Manganese sulphate	.19
Zinc sulphate	.07
Nickel sulphate	.04
Cobalt sulphate	.07
Calcium sulphate	4.99
Magnesium sulphate	12.58
Potassium sulphate	.71
Sodium sulphate	.87
Lithium sulphate	.24
Sulphuric acid	4.01
Silica	1.69
Calcium phosphate	.30
Magnesium nitrate	.26
Ammonium nitrate	.24
Sodium chloride	.20
Calcium fluoride	Trace.
Organic matter	.29
Total	70.84

Gases.	Cubic in.
Carbonic acid	6.98
Oxygen	1.32
Nitrogen	3.33
Total	11.63

Temperature of water, 48° to 56° F.

This water is an acid chalybeate with aluminous properties. The effects of the water are tonic, alterative, diuretic, and somewhat astringent. In small doses internally it has been found useful in diarrhœal disorders. In larger quantities it has an aperient effect. It is used in a wide range of diseased conditions. The spring water as well as the evaporated residue (the "Bedford Mass") is used commercially and forwarded to any point desired. An excellent hotel is maintained at the springs. *James K. Crook.*

BEDFORD SPRINGS.—Trimble County, Kentucky.

POST-OFFICE.—Bedford Springs. Hotel and cottages.

ACCESS.—Viâ Louisville and Cincinnati Short-line Railroad to Sulphur Station, thirty-six miles east of Louisville and seventy-one miles west of Cincinnati, thence six miles by pike road to springs.

These springs are located on a high ridge between the Ohio and Little Kentucky rivers. They are three in number, and yield about three gallons of water per minute. The following qualitative analysis was made by J. P. Barnum, analytical chemist:

Sodium chloride.	Sodium sulphate.
Magnesium bicarbonate.	Lithium carbonate.
Calcium bicarbonate.	Sodium carbonate.

Reaction, alkaline to test paper.

The water is recommended for diseases of the stomach, kidneys, and liver, and in gout and rheumatism. It is sold in Louisville by the gallon or barrel. *J. K. C.*

BEDFORD SPRINGS.—Bedford County, Pennsylvania.

POST-OFFICE.—Bedford. Hotel.

ACCESS.—The Baltimore and Ohio Railroad transfers passengers at Cumberland, Md., and the Pennsylvania Railroad at Huntingdon, Pa.

The Huntingdon and Broad Top Railroad connects with Pennsylvania Railroad trains from the East and West, and runs an express train of parlor cars through to Bedford without stop.

The Bedford Mineral Springs have their source in a beautiful valley on the eastern slope of the Alleghany Mountains, at an elevation of ten hundred and eighty feet above tide water. The location is one mile and a half south of the old historic town of Bedford, the county seat of Bedford County, in a region noted for its pure, invigorating air, salubrious climate, and beautiful and varied scenery. The medicinal virtues of the springs were known as early as the year 1804.

Since those early days the resort has maintained a steady popularity with the tourist, pleasure-seeker, and invalid, and it may to-day be ranked among the best of the many excellent summer watering places which the country affords. In addition to the numerous attractions of climate, scenery, etc., the visitor will find a very comfortable modern hotel, well equipped with the most recent improvements. A good orchestra is maintained during the season. The magnesia spring has been mainly instrumental in giving the place its reputation. It issues from an opening in the rock, about three feet in length and eighteen inches in width, and flows about two thousand gallons of water per hour, without interruption or intermission, the year round. A recent examination of the hitherto somewhat neglected Bowling Alley Spring shows it to be quite as strong in magnesium salts, while carrying less lime. We present analyses of these two springs, made in 1895 by Victor G. Bloede, analytical chemist, of Baltimore:

MAGNESIA SPRING.

ONE UNITED STATES GALLON CONTAINS:

Solids.	Grains.
Sodium carbonate	2.04
Sodium chloride	.72
Magnesium sulphate	32.54
Magnesium carbonate	6.06
Potassium carbonate	.38
Calcium sulphate	107.80
Lithium chloride	.32
Silica	.25
Iron oxide	.05
Alumina	.11
Ammonia	.02
Nitrates and nitrites	None.
Total	150.29
Free carbonic acid	1.85
Water of crystallization and volatile matter	36.41
Total	188.55

BOWLING ALLEY SPRING.

ONE UNITED STATES GALLON CONTAINS:

Solids.	Grains.
Sodium bicarbonate	9.70
Sodium chloride	1.12
Magnesium sulphate	32.96
Magnesium carbonate	5.23
Calcium sulphate	83.20
Silica	1.10
Iron oxide	.04
Alumina	.09
Nitrates and nitrites	None.
Ammonia	Trace.
Total	133.44
Free carbonic acid	2.17
Water of crystallization and volatile matter	37.74
Total	173.35

These analyses show very potent waters of the sulphated-saline and calcic variety. They are laxative in small doses, purgative in larger. Furthermore, they have a considerable diuretic influence, and each contains sufficient iron to counteract the debilitating tendencies often met with in waters of this character. The Magnesia Spring contains also a small amount of the chloride of lithium, which serves to widen the sphere of its probable utility. The Bowling Alley Spring is quite freely charged with that ever-valuable ingredient of saline waters, the carbonate of sodium, which renders it very useful as an antacid and antifermentative, in addition to its cathartic properties. These waters may be counted upon to render good service in flatulent dyspepsia, functional disturbances of the liver, abdominal engorgement, and chronic constipation. They are also highly recommended by many well-known physicians for gouty and rheumatic disorders. They are used commercially. There are several other valuable springs in the neighborhood.

BEDFORD CHALYBEATE SPRING, BEDFORD COUNTY, PA.

ONE UNITED STATES GALLON CONTAINS:

Solids.	Grains.
Calcium carbonate	8.85
Magnesium carbonate	1.20
Iron carbonate	.44
Magnesium carbonate	Trace.
Sodium carbonate	.39

Solids.	Grains.
Potassium carbonate	.13
Calcium sulphate	2.74
Calcium phosphate	.03
Sodium chloride	.12
Hydrogen sulphide	Trace.
Silicic acid	.79
Carbonic acid (free)	5.60
Total	20.29

The physiological action of this water tends to increase the appetite, promote the digestion of food, and improve the quality of the blood. The predominance of the calcareous salts would seem to give the water an astringent and constipating influence. These effects, however, have not been observed by those who have used it freely. It has, in fact, seemed to exert a mild laxative action, and is furthermore quite an efficient diuretic. Its action resembles that of the well-known Bocklet Springs, near Kissingen, in Bavaria. The water is useful in cases of anæmia, general debility, and amenorrhœa, and in convalescence from acute diseases. This water and the residual salts obtained by evaporation are used commercially; an extract and an ointment are prepared from the latter. *James K. Crook.*

BED-SORES (Decubitus; Gangræna per Decubitum), a term applied to gangrene of the skin and underlying soft structures, resulting from pressure of the body upon an object, usually the bed, in long-continued recumbency. The situations in which bed-sores are most frequently seen are over the tuberosities of the ischium, over the sacrum, the scapulæ, the spinal column, the great trochanters, the tuberosity of the os calcis, and in other portions of the body which may have received continuous pressure. Sometimes they are the result of the pressure against each other of contiguous surfaces of integument. They are rarely seen upon the anterior surface of the body, unless the patient has been lying for a long time in the prone position.

Bed-sores are described as being both acute and chronic. The acute form (Charcot) is met with in injury or disease of the spinal or cerebral nervous centres. It appears oftentimes in a few hours after lesions of these parts, and although it comes in portions of the body undergoing pressure, the rapidity of its establishment suggests that other than merely local causes are factors in its production. The chronic form appears at any time after a patient has been lying in bed for a long while.

The manner in which these bed-sores commence varies with the disease or injury which they complicate. Three different methods of formation, at least, are easily recognized: (1) By an erythematous reddening of the skin, especially if the part has been irritated by urine or fæces; (2) by a primary necrosis of the skin, seen in weak individuals; (3) by a phlegmonous inflammation, with the formation of pus and undermining of the tissues.

Whatever may have been the method of formation, the issue in all is the same; as much of the integument as has been compromised sloughs; the sloughs are cast off in shreds or as a whole; there remains an ulcer, oftentimes weak and indolent, with sloping edges, and without any tendency to heal. At times the sloughing does not stop at the integument, but all of the soft parts, and even bony structures, become involved in the necrotic process, leaving a lesion revolting in appearance and disgusting in odor.

Etiology.—In the causation of bed-sores pressure plays the most important rôle, as noted above. Those situations which are subjected to the most continuous pressure are the most frequently affected, and especially those parts which immediately cover bone. Over such places the skin is pressed close against the unyielding bone, the blood-vessels of the part are closed by the pressure, the nourishment of the part becomes imperfect or ceases completely, and as a result sloughing takes place. There are certain predisposing causes, however, which hasten the development of bed-sores. These predisposing causes are: (1) any circumstance which lowers the vitality of a part or of the whole body; (2) the presence of fluids or substances which irritate the skin; (3) diseases or injuries which prevent movement of the patient's body; (4) trophic disturbances (?).

In the first class of causes are included different forms of diseases, as typhus and typhoid fever, phthisis, scurvy, and any long-continued disease.

Of the fluids and substances which irritate the integument, urine and fæces are the most common, either passed in bed involuntarily in cases of spinal trouble, or voluntarily when the patient's morale is lowered. Particles of food, and larger substances, sometimes contribute to the irritation when the patient does not receive proper attention.

The diseases and injuries which prevent movement of the patient's body are all those which cause hemiplegia or paraplegia; in these cases voluntary motion is lost, and in many cases movement of the body by attendants is extremely painful, so that, of necessity, the same position is assumed almost continuously by the patient.

The question of the rôle played by trophic nerves in the causation of bed-sores cannot be satisfactorily discussed, as their presence in the human body has not been proven. The rapidity with which the skin sloughs in injuries of the central nervous system (acute bed-sore of Charcot) makes it evident that nutritive changes have taken place in such parts, which can be explained only by assuming that the nervous power controlling the nutrition of the part has been lost as an effect of the central lesion. This view is substantiated by the tegumentary lesions seen in cases of dementia paralytica (Shaw: St. Barth. Hosp. Rep., vol. xiii., 1878, pp. 130–133) in the last stages. In these cases so-called bed-sores appear, *i.e.*, superficial sloughing of the skin on both the anterior and posterior surfaces of the body, and without reference to the portions of the body pressed upon.

Symptoms.—Bed-sores so frequently occur in patients in whom the sensibility is blunted or lost that subjective symptoms are wanting, and the presence of the sore is only determined, often accidentally, by the attendant. The patient under such circumstances appreciates nothing even though the sloughing of the soft parts be of great extent. In some instances, however, when the sensibility of the parts has not been greatly impaired, the patient experiences itching or burning sensations, with sometimes pains lancinating through the parts affected, the pain at times being severe enough to necessitate the use of anodynes to quiet it. The local symptoms of a bed-sore are those attending gangrene of the skin and soft parts.

It is impossible to estimate how much the general system is affected by bed-sores. It is evident that extensive loss of tissue, from gangrene and suppuration, must have a marked effect in depressing the vital forces, and under such circumstances death has been known to occur either from pyæmic exhaustion or from the involvement of important organs in the sloughing process.

Treatment.—Prevention is the cardinal rule to be observed in the treatment of bed-sores. To carry this rule out successfully, it is necessary to recognize the circumstances under which bed-sores appear, to know the diseases which they most frequently complicate, and, being fully aware of their readiness to appear in such diseases, to combat their appearance by constant care and appropriate treatment. In the large majority of cases, bed-sores result from the neglect of this prophylactic treatment. So well is this fact recognized that in the large hospitals, where the care of the sick is entrusted to trained attendants, it is considered a matter of personal reproach if a patient contract bed-sores, and it is difficult to dissipate the impression that they are not the result of negligence.

This preventive treatment, which is frequently not easy to carry out, consists in:

1. Relieving the pressure to which the parts are subjected.
2. The keeping of these parts clean.
3. The use of chemicals to harden the integuments.

The relief of pressure is, perhaps, the most important of all in the treatment of bed-sores, for in this way the

engorgement or the anæmia of the vessels of a part is relieved. This can be accomplished by getting the patient to change his position in bed from the back to one side or the other. If a patient's mind be dulled by disease, so that he has no desire to move, or if some injury to the spinal cord has occurred, so that the lower portion of the trunk and lower extremities are paralyzed, and not only is voluntary movement impossible, but artificial movement very painful, the difficulties in the treatment of the case are much increased.

The patient usually lies upon the back, and cannot be made to assume any other position. The pressure soon becomes continuous, as relief cannot now be afforded by a change of position, and the weight must be taken off these parts by appliances so arranged as to distribute the pressure upon other parts of the body. This can be accomplished by the use of pillows, rings, or air cushions.

The ordinary air cushion, made in the form of a ring with an aperture in the middle, is of especial service, and is so adjusted that the part from which the pressure is to be relieved falls over the opening in the ring. If no air cushion can be obtained, a ring can be made out of oakum, jute, or cotton, which will serve the purpose, although not so well.

Water-beds are of great assistance in the preventive treatment of bed-sores, because they adjust themselves to the irregularities of the body, and distribute the pressure evenly over its entire surface. In case such a bed cannot be procured, great pains must be taken to see that the bed used is suitable. It must be springy, but still hard enough to prevent hollows and irregularities where the patient lies. The bed-clothes must be perfectly smoothed out, no wrinkles must appear in the sheet on which the individual lies, and an important point is to see that no foreign bodies, as, for example, food, fall into the bed and get under the patient. Cleanliness is a very important factor in the treatment. Especially is it necessary when there is incontinence of either fæces or urine, or both. Either of these discharges is irritating to the skin, and may set up inflammations which are readily converted into bed-sores. There are beds constructed in such a manner that the portion under the genitals can be removed, so that a more or less complete vent for the discharges is afforded; but the best of these appliances are of very restricted value, and only constant care and watchfulness can prevent the patient from being bathed in these inflammation-causing discharges.

Of the medicines which are used to harden the skin, alcohol is the most useful, combined with some astringent, as tannic acid, lead, or zinc. Bathing the parts several times a day with a preparation of this kind often gives a healthy tone to their circulation, and averts the formation of a bed-sore. *William L. Wardwell.*

BEECH DROPS. See *Cancer Root.*

BELKNAP HOT MEDICAL SPRINGS.—Lane County, Oregon.

Post-Office.—Belknap Springs. Hotel and camping grounds.

Access.—Viâ Southern Pacific Railroad to Eugene, one hundred and twenty-five miles south of Portland; thence sixty miles east by stage to springs.

The location of these springs is in the heart of the Cascade Mountains, two thousand feet above the sea level. This is a very fine and picturesque region, and it presents many attractions to the tourist and invalid. The climate is equable, the weather during the summer months being generally clear and pleasant, with cooling winds.

The average summer temperature is 65° F., while it is stated that the average winter range is but twenty degrees lower. The McKenzie River, near by, is famous for its magnificent trout; and deer and other game abound in this region. There is only one spring, but it yields about twelve thousand five hundred gallons per hour. The temperature of the water is 188° F. The following analysis was made in 1894 by Prof. G. W. Shaw, of the Oregon State Agricultural College, at Corvallis:

One United States Gallon Contains:

Solids.	Grains.
Calcium phosphate	13.91
Calcium chloride	62.20
Potassium chloride	7.68
Magnesium chloride	2.90
Sodium chloride	53.93
Manganese chloride	Traces.
Silica	4.72
Iron and alumina	.17
Total	145.51

The bathing facilities comprise medicated, steam, electric, and shower baths, hot or cold, with massage. A large swimming tank is an attractive feature. The baths are attracting considerable attention in the treatment of rheumatism, syphilis, and skin diseases. *J. K. C.*

BELLADONNA.—*Deadly Nightshade.* "*Black Cherry.*" (For a description of the belladonna plant, see article on *Poisonous Plants.*) The belladonna plant yields two official medicinal articles, namely, *Belladonnæ Folia*, "the leaves," and *Belladonnæ Radix*, "the root of *Atropa Belladonna* L. (fam. *Solanaceæ*)."

Belladonna is a native of Europe and adjacent Asia, where the drug is mostly collected from wild plants. In Europe it is also largely cultivated for medicinal purposes. It has become naturalized to a slight extent in the United States. The composition of leaf and root is very similar, the difference being rather in the greater quantitative irregularity of the leaves than in kind. The leaves do, however, contain a rank-smelling principle not present in the root, rendering them objectionable for some purposes, but possibly of greater therapeutic value. They contain also considerable chlorophyll, which enables their extract to impart an objectionable green stain to clothing, when used in plasters. Both articles may be regarded as exceptionally irregular and uncertain in quality. Some of the causes of this irregularity are not known, so that no methods of physical examination of the drug can eliminate them, a chemical assay being requisite. Others are known and can be detected by careful examination. The leaves are said to be adulterated with those of various other plants, but an examination of many samples by the writer has failed to confirm the statement. Those of henbane, digitalis, and verbascum are all hairy, while belladonna is smooth; those of henbane and potato are toothed or lobed, while the margin of belladonna is entire. The leaves of datura, or stramonium, come in a crumpled mass, closely resembling that of belladonna leaf, and one is often mistaken, upon superficial examination, for the other. The belladonna mass is, however, almost invariably of a brownish-green color, a bright green indicating an immature leaf, while that of stramonium is of a clear, usually a dark, green color. Upon soaking and flattening out a leaf, the large, angular teeth or lobes of the latter, with their very unequal base, contrast strongly with the entire margin, regular outline, and nearly equal base of the former. It is probably quite safe to state that the irregular composition and strength of the leaves are due not to adulteration, but chiefly to different stages of maturity when collected and to the varying care taken in preparing and preserving them, conditions which it is very difficult, even if possible, to determine in the drug other than chemically or physiologically. As to the roots, they are greatly subject to substitution, adulteration, and imperfection of quality, which are much more readily detected by physical inspection than is the case with the leaves. Scopolia is very largely substituted for belladonna, especially in Europe. As the two drugs present not the slightest similarity, this action can be regarded only as wilful and deliberate, as is the addition of the roots of burdock, medicago, and of one which appears to be wild, unpeeled marshmallow. The two last named are flexible, while belladonna is stiff and brittle. Burdock has a soft pith or a hollow centre. The three last-men-

tioned forms of adulteration are highly objectionable, as the articles have no properties at all like those of belladonna. Scopolia is a rhizome, composed of joints, each bearing upon its upper surface a conspicuous circular scar a quarter inch or more in diameter. Its composition and properties are very similar to those of belladonna, a fact which soothes the consciences of those who engage in this form of substitution. The imperfection of genuine belladonna root, aside from obviously bad conditions of mould and worminess, relate to its being too young (when less than two-fifths inch in thickness) or old, thick, and woody. The active constituent resides chiefly in the bark; hence old thick pieces, in which the increase of weight is chiefly of inert woody fibre, must be inferior. The two drugs are described as follows:

The Leaves.—From 10 to 15 cm. (4 to 6 inches) long and about half as broad, ovate, abruptly and almost equally narrowed into a petiole of extremely variable length, the apex acute or acutish, but not acuminate or tapering, entire on the margin, smooth, thin, drying brownish green, the upper surface browner, the lower greener and paler, both surfaces minutely whitish punctate; odor slight; taste bitterish, somewhat acrid.

The Root.—In cylindrical, but slightly tapering, coarsely wrinkled pieces, bearing their bark, rarely exceeding 15 cm. (6 inches) in length, having a thickness of 10 mm. (two-fifths inch) to 25 mm. (1 inch), often split; externally of a light brownish gray, much subject to abrasion, which reveals a lighter inner layer, internally whitish; breaking with the characteristic emission of a puff of dust, and exhibiting a nearly smooth and starchy fracture, indistinctly many-radiate near the bark; nearly inodorous; taste sweetish, afterward bitterish and strongly acrid. Portions of the stem and of thick, hard, woody crowns should not be included.

Composition.—The minor constituents of the leaves are starch, gum, wax, and asparagin; and of the roots, starch. The active constituents of both are the mydriatic alkaloids, about one-tenth to one-half per cent. in the leaves, one-fourth to three-fourths per cent. in the root. As regards the identity and precise relative amounts of the different alkaloids, discussion is in the present state of our knowledge unprofitable, and in view of their very similar therapeutic effects, equally unimportant. *Belladonnine* and *hyoscine* (if the latter be really present at all—see *Henbane*) are in such small amounts as to be absolutely unimportant. The only alkaloid other than *atropine* which is present in appreciable amount is *hyoscyamine*, and the action of this is so nearly identical with that of atropine as to render its presence of no importance. Theoretically, the relations of the two last named are of great interest. They are so closely similar that, even when in the pure condition, it is almost impossible to distinguish them. It is believed that very young roots will yield only hyoscyamine, old ones chiefly atropine. It is not by any means certain, however, that the extraction of one proves that it so existed in the living plant. It is, further, very uncertain as to the maintenance of their identity when the respective alkaloids are taken into the stomach or the system. Certainly their practical effects are generally regarded as identical, so that therapeutic interest in the drug centres finally in its percenttage of total alkaloid. Since, according to the above showing, the preparations of belladonna must vary so widely, and as the determination of their strength is no longer difficult, none should ever be used whose percentage of total alkaloid is not known. It is altogether probable that the forthcoming edition of the Pharmacopœia will fix this percentage at thirty or thirty-five hundredths for the drug and its fluid extract, that of the other preparations in proportion to their relative strengths. In considering the properties of belladonna, then, we may restrict our attention to those of the alkaloid atropine.

Atropine or Atropina ($C_{17}H_{23}NO_3$).—"An alkaloid obtained from belladonna. As it occurs in commerce, it is always accompanied by a small proportion of hyoscyamine extracted along with it, from which it cannot be readily separated" (U. S. P.). It occurs in white, acicular crystals, or as a fine white powder, odorless, bitter, and acrid, becoming yellowish on exposure. It is soluble in water to the extent of nearly four grains to the ounce, and freely soluble in alcohol, as well as in fifty parts of glycerin. It readily forms salts. Chemically, it is a compound of the alkaloid tropine (which lacks the properties of atropine) and tropic acid. Hence alkalies, besides acting as precipitants, as in the case of other alkaloids, take away the tropic acid and convert the atropine into inactive tropine. Decomposition also occurs if it be heated with water or acids.

Action.—Atropine has no action upon the unbroken skin unless absorption occur. Its tendency to absorption is very slight, but can be increased by inunction or to an uncertain extent by application in the form of a plaster, for a continuous period, under the influence of the heat and confinement and the friction resulting from natural movements. Mixing it with glycerin or with alcohol or other volatile substance also leads to its absorption. It will then act both locally and systemically, and more or less poisonous symptoms can be thus induced. Its local action, applied thus or to a denuded surface, or injected into the tissues, is that of a paralyzant of the nerve endings, especially the sensory. When pain is present, this sensory depression is increased by the lessened irritation due to slightly decreased muscular movement. The systemic effects will be considered later. The local effects upon mucous membranes are also slightly benumbing, due to sensory paralysis, and inhibitory of the secretions, through paralysis of the nerve endings which excite them. The local effect in the eye is to paralyze the endings of the third nerve, thus allowing the iris to relax, producing wide dilatation of the pupil, and also to destroy the power of accommodation.

The direct systemic effects are entirely upon the nerve tissues, more upon the periphery than upon the centres. The central effects are, moreover, for the most part, rendered inoperative in the net practical results observed, because the peripheral actions are antagonistic to, and more than sufficient to overcome them. Of the centres, the highest are affected most and the lower successively less. The primary effects upon the centres are stimulant, the secondary depressant. The most prominent, therefore, is cerebral stimulation, excitement or delirium. Even in the mildest case, the stimulation can be seen to be of an intoxicant or uncontrolled character. The cardiac centres, both vagus and accelerator, are stimulated. The first result, through the vagus, is a slowing of the heart, which almost at once yields to a quickening, at first probably through the accelerator stimulation, afterward by the secondary depression of the vagus, and lastly, as a result of depressant action on the vagal endings. The vaso-motor centres are stimulated, with a brief rise of blood pressure; this is quickly overcome, chiefly by the peripheral effects, but partly by the secondary depression of the centres. Some claim also that the secondary dilatation of the vessels is due to direct stimulation of the dilator centres, but this action would probably be very brief. The respiratory centres are stimulated, with quicker and deeper breathing at first, followed by reverse conditions. The heat centres are stimulated, and there is a rise of temperature. As heat loss by evaporation of perspiration is wanting, this central action is not fully counteracted at the periphery, even though the superficial vessels are dilated; thus the rise of temperature is maintained.

The peripheral effects of atropine, for the most part, counteract and overcome the central. They are of a paralyzing nature, and relate both to movement and secretion. In regard to movement, inhibitory endings may be paralyzed so as to allow a result which is but apparent stimulation, as in the secondary quickening of the heart due to paralysis of the vagal ends, and the permission of an increase in peristalsis, due to paralysis of the splanchnic terminations. The latter action results in a laxative effect upon the bowels.

The same effect is produced upon the eye as results locally, as above described. All the buccal secretions

are checked, and the mouth and throat are made dry. The pancreatic secretion is similarly checked. The effect upon the production of respiratory mucus is the same as that upon the buccal, and the air passages become comparatively dry. Thus it may be sedative to respiratory irritation; but the effect is apt to be very transient. The same drying effect is produced upon the skin. The skin is red, however, from vascular dilatation, resulting from paralysis of the motor nerve endings in the arterial muscular fibres. This reddening is sufficient to produce a scarlatina-like flushing which has led to errors of diagnosis. Atropine has a strong tendency to dry up the milk.

Most of the therapeutic actions of belladonna are explained by the above pharmacodynamic deductions. Some, however, are still puzzling.

The local uses of belladonna are of almost as great importance as the internal. Prominent among them are the uses of atropine in the local treatment of the eye. The dilatation of the pupil by it permits of intra-ocular examination, checks iritic adhesions or breaks them down if formed, and checks ocular hernia. These results are accompanied by a lessening of pain and even a reduction of inflammation.

Many forms of superficial and some deeply seated pains, as rheumatism and neuralgia, are sometimes relieved by the belladonna plaster, or by the liniment well rubbed in, or by a solution in chloroform or camphor. Cardiac and respiratory pains are often relieved similarly. Toothache is often relieved by direct application of atropine to the nerve. Many forms of itching are promptly relieved and local inflammations scattered. Pain from hemorrhoids is partly relieved. The checking of the milk secretion can sometimes be produced by local application of the plaster. Application of a solution of atropine will often check local perspiration, though it is quite uncertain. In the nature of local applications may be regarded the intramuscular or deep injection of atropine, often combined with morphine, to relieve pain or spasms which cannot be modified by its superficial application. Inhalation of a spray containing atropine, for the relief of asthma, may also be regarded in the same light.

Internally, belladonna is probably more often used, in large doses, to check incontinence of urine, and as an adjunct of cathartics or laxatives, than for anything else. While it alone may act as a laxative, it is very uncertain. Continually used, especially together with nux vomica, it may overcome chronic constipation. Next in importance is its use in respiratory diseases, where it has a wide field of usefulness. In asthma, it often gives relief when nothing else will, and by varying its use with that of its related alkaloids permanent benefit may be secured. A similar benefit may result from its use in whooping-cough.

It checks excessive secretion, especially from the nose. With this result, irritable cough (of suitable causation) is greatly relieved. It is an excellent remedy for relieving the sweats of phthisis. Sore throat, unless of the excessively dry variety, is very favorably influenced. Cardiac inflammation or pain is benefited by its internal administration, as well as by local application. Belladonna is a useful antidote to poisoning by morphine.

The official preparations of belladonna leaves are the extract, of which the dose is 0.008 to 0.03 gm. (gr. $\frac{1}{8}$ to $\frac{1}{2}$) and the 15 per cent. tincture, dose 0.3 to 2.0 c.c. (♏ v. to xxx). Of the extract, there is a 10-per-cent. plaster and a 20-per-cent. ointment. Of the root there is a fluid extract, dose 0.06 to 0.2 c.c. (♏ i. to iij.), and of this we have a liniment, 95 parts with 5 parts of camphor. Children bear larger doses of atropine or belladonna, proportionally to their age, than adults.

Commercial belladonna plasters are usually made either from belladonna root, to overcome the disagreeable stain and odor of the leaf extract, or from the rhizome of scopolia. Probably the very great bulk of them are made from the latter.

H. H. Rusby.

BELLADONNA. (TOX.) See *Atropic Poisons.*

BELL'S PALSY. See *Facial Paralysis.*

BENNÉ OIL.—Oleum Sesami; *Teel Oil.* "A fixed oil expressed from the seeds of *Sesamum Indicum* L. (fam. *Pedalineæ*)" (U. S. P.).

The benné plant is an erect, hairy annual, two to four feet high, supposed to have originated in Africa, but so long and so widely cultivated that knowledge of its nativity has been lost. It has been grown for its edible seeds, and for their oil, of which the yield is sixty or seventy per cent., and which is used as food and for many other purposes. The plant is grown to some extent in our Southern States. The oil is yellow or yellowish, inodorous, and of a pleasant, nut-like flavor. Its specific gravity is 0.919 to 0.923 at 15° C. At −3° C (26.6° F.) it becomes thick, and at −5° C. (23° F.) it congeals. Concentrated sulphuric acid converts it to a brownish-red jelly. Its properties are purely nutritive and demulcent.

H. H. Rusby.

BENTLEY SPRINGS.—Baltimore County, Maryland.

Post-Office.—Bentley Springs. Hotel, Glen House.

These springs are situated on the line of the Northern Central Railroad, a division of the Pennsylvania Railroad, about thirty miles from Baltimore and seventy miles from Washington. The elevation above tide water is about six hundred feet. In addition to the two principal springs there are perhaps as many as one hundred others, some of which have important chalybeate properties. The surroundings of the springs are very interesting and attractive. The following analyses of two of the chief springs are by Professor Aiken, formerly of the University of Maryland:

The "Nucta" or "Station" Spring.

One United States Gallon Contains:

Solids.	Grains.
Calcium carbonate	0.34
Sodium carbonate	.37
Magnesium carbonate	.27
Calcium sulphate	.30
Sodium chloride	.19
Silicic acid	.33
Iron (a trace) / Alumina and loss	.02
Total mineral contents	1.82
Organic matter	.36
Total solid contents	2.18

The Lower Spring.

Solids.	Grains.
Calcium carbonate	0.64
Magnesium carbonate	.68
Sodium carbonate	.46
Iron carbonate	.89
Sodium chloride	.27
Calcium sulphate	.35
Silicic acid	.49
Alumina and loss	.03
Inorganic contents	3.75
Organic matter	0.91
Total contents	4.66

The water is a mild example of the alkaline-saline-calcic class. It has been used for upward of thirty years, in kidney, liver, and stomach disorders, and in chronic bowel affections. It is used commercially.

James K. Crook.

BENZACETINE.—Acet-amido-ethyl-salicylic acid—$C_6H_3.NHCH_3CO.OC_2H_5.COOH$. This occurs in colorless crystals which are almost insoluble in water and have a melting point of 205° C. (401° F.). Frank introduced it as a sedative and antineuralgic of special value in cases of migraine. The dose is gr. viij. to xv., which may be repeated in one hour if necessary. It may advantageously be combined with one or two grains of citrated caffeine.

W. A. Bastedo.