breeding centres, pure water only should be used for drinking by the community and various similar precautions should be taken. Not only should the sick-room be disinfected, but the house should be similarly cleansed and the whole neighborhood made as clean as possible by the sanitary authorities. The free use of disinfectants to the discharges from the patient and to the surroundings is now regarded as an imperative duty and the directions given by the sanitary authorities are most explicit and comprehensive. The methods followed by the United States Marine Hospital service, and by the French and German governments are summarized in the report of General Wyman, already freely quoted from.

A few words may be permitted to correct a popular error to which attention has been called by Dr. James Edmunds* of London. The impression prevails among a rather large proportion of the profession and the community that alcohol has a certain antidotal power against infection, and that, if when epidemic disease prevails, it will act as a prophylactic and confer a certain degree of immunity upon those who are under its influence. Alcoholic drinks, therefore, are often publicly recommended, when a community is threatened with an epidemic.

Whatever may be the result of such a course in other infectious diseases, experience does not warrant the view that it would be of any avail when plague is imminent. On the contrary, intemperance is now generally recognized as constituting or favoring a predisposition to the disease. Sydenham's observation is here very much to the point. "Certain it is," he says, "that the free use of wine, and other strong preservatives, taken at stated hours and in the way of regimen, has brought the disease upon many persons who in all probability would have remained safe and sound otherwise."

As the therapeutic and prophylactic problems relating to the plague are at the present day taken out of the province of the private medical practitioner, on account of the very important interests that are involved, and as the problems are now being studied seriously by the sanitary authorities of the various governments of the civilized world, they can have only an academic interest to the members of the profession in general and need not be dwelt upon further. The reader is referred to the publications of the national departments, and particularly to those of the United States Marine Hospital service, for detailed information on these topics.

John V. Shoemaker.

BUCHU.—*Short Buchu.* "The leaves of *Barosma betulina* (Thunberg) Bartling et Wendland, and *Barosma crenulata* (L.) Hooker (fam. *Rutaceæ*)" (U. S. P.). A third species, B. *serratifolia* Willd., "Long Buchu," was also once official, but was dropped because of its inferiority. The British Pharmacopœia rejects also the second-named species, which is greatly lacking in uniformity and which is now but little collected. There are about fifteen species of this genus, all natives of South Africa. The drug was in use by the Hottentots at the time of settlement by the whites. Its introduction to America was in the form of a notorious quack medicine, and was afterward adopted upon its merits by the profession.

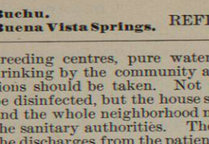

FIG. 1055.—Buchu Leaves. *a*, *B. crenulata*; *b*, *B. betulina*. (After Baillon.)

The leaves of *B. betulina*, the best variety, are mostly one-half to three-quarters of an inch long and two-thirds as broad or more, occasionally broader than long. They are abruptly contracted into a short, narrow basal portion, the broad upper portion being irregularly sub-rotund, the apex blunt, often recurved, the margin sharply and finely dentate. They are very thick, brittle when dry, smooth and somewhat shining, slightly papillose, and of a yellowish-green color. Against the light they are pellucid-glandular-dotted, with larger marginal glands. They have a strong mint-like odor and a warm, aromatic, and mucilaginous taste.

B. crenulata varies from oblong to oval or obovate, usually a little broader than our figure, and is often twice as long as the other, and less blunt. The margin is crenulate. It is also thick and greenish-yellow, and has similar pellucid glands.

B. serratifolia is markedly different from the others, being of a bright green color, thin, sub-three-nerved by the elongated basal pair of veins, narrowly oblong or lance-linear, sharply serrate, the teeth and sinuses curved. The leaf is about as long as the *B. crenulata*. There is a very large gland at the obtuse apex.

There is no adulterant of the official buchu, but when long buchu was official, the leaves of *Empleurum serculatum* Ait. were used for that purpose. They are distinguished by the very acute apex and the straight, incised, salient, longer toothing.

COMPOSITION.—Official buchu contains 1 to 1.5 per cent. of volatile oil, long buchu half as much. There are also resin, gum, and a little of the bitter glucoside *barosmin*, believed to be the same as *hesperidin*. The oil contains a camphor-like body, often called buchu camphor (diosphenin $C_{16}H_{16}O_2$). There is but little of this in oil of long buchu, but that contains much of a body to which the peppermint-like odor is due.

ACTION AND USES.—Buchu acts locally as a mild stomachic. Absorbed, it possesses the ordinary diffusive stimulant properties of volatile oils, its special point of action being the kidneys, by which it is excreted. Its diuretic properties are mild, but it is distinctly sedative and astringent to the urinary organs, as well as slightly antiseptic. Henbane is often combined to increase the sedative effect. It is a mild expectorant. The fluid extract is official, and the dose is 1 to 2 c.c. (fl. ʒ ¼ to ½).

Henry H. Rusby.

BUCKBEAN.—*Bogbean. Menyanthes.* The herb of *Menyanthes trifoliata* L. (fam. *Gentianaceæ*). A widely distributed bog herb, with a creeping perennial rhizome, and thickish bright-green leaves, but which become very thin in drying. They arise from long, sheathing petioles. These leaflets are nearly entire, oblong or ovate, blunt, about 8 cm. long and half as wide (one and one-half by three inches). They have a disagreeable odor when fresh, which disappears upon drying; the taste is bitter and nauseous. The white or pinkish flowers are borne in an upright, spike-like raceme at the end of the rhizome, and are very beautiful.

Buckbean grows in cold swamps and moist places in Europe, Asia, and America, and has naturally been long known and used in medicine, but is now very little called for. Its bitter principle, *menyanthin*, was separated in 1860 by Kromayer as a white, amorphous, bitter powder, and shown to be a glucoside—sugar and a liquid oil, "menyanthol," being the result of its decomposition.

In moderate doses it is a simple bitter tonic, similar to, but less agreeable than, the other Gentianaceæ. In large doses it is cathartic, and sometimes emetic. Dose, as a tonic, 1 or 2 gm. (15 to 30 grains).

W. P. Bolles.

BUCKEYE. ÆSCULUS.—*Horsechestnut* (fam. *Hippocastanaceæ*). A genus of about a dozen species, of America and Asia, growing mostly north of the Equator. The bark and seeds of *Æ. Hippocastanum* L., native of Asia, but largely cultivated for ornament in all temperate countries, have been much used in domestic practice in the treatment of malaria and rheumatism. Both contain considerable tannin, but the activity appears to reside in the bitter glucoside esculin ($C_{15}H_{16}O_9+1.5\ H_2O$) which is crystalline, white, soluble in water and alcohol, and antiperiodic in fifteen-grain doses.

The seeds of the red buckeye, *Æ. Pavia* L., of the southern United States, are reported to have caused fatal cases of poisoning in children, the symptoms being those of poisoning by saponin. It is even said that the former species has acted similarly.

H. H. Rusby.

* "Alcohol and the Plague." The Indian Lancet, December 1st, 1899, p. 472.

BUCKTHORN.—*Frangula.* "The bark of *Rhamnus Frangula* L. (fam. *Rhamnaceæ*), collected at least one year before being used" (U. S. P.). This is a very large shrub or small tree, growing throughout Europe and in adjacent Asia and Africa, and sparingly naturalized near New York City. The wood is very fine-grained, and its charcoal is largely utilized for powder-making, for which the bark must be first removed. The latter thus results as a by-product. It is largely employed in domestic veterinary practice, in the fresh or recently dried condition. It is then a sharply irritating cathartic or even emetic, but its griping properties are greatly mitigated by being kept. It occurs in strongly curved quills, which are commonly more or less flattened by pressure. The bark is very thin for the size of the quill (about 1 mm. = $\frac{1}{25}$ inch). The outer surface presents two forms, the one nearly black, the other dark-gray. Both are commonly marked by numerous transversely elongated white dots, and are somewhat warty-roughened, but never fissured or scaly. The inner surface, bright yellow when first collected, becomes successively dark yellow, brown, reddish, and nearly black with keeping, this being a fairly good way of recognizing its age. Its fracture is weak but not brittle, and is slightly fibrous. It has a slight characteristic odor and a bitter taste.

Composition.—With resin and a small amount of tannin, the important constituent of frangula is the yellow glucoside *frangulin*, or rhamnoxanthin ($C_{21}H_{20}O_9$) and its products *emodin* ($C_{15}H_{10}O_5$) and *isoemodin* ($C_{15}H_{10}O_5$). The development of all three of these substances proceeds as the dried bark ages, and coincidently the drug becomes a milder cathartic or laxative. Emodin and Isoemodin belong to the class of *Anthraquinones*, some one of which appears to give the properties to one large class of laxative drugs. Emodin, derived both from rhubarb and from frangula, is on the market. It is insoluble in water, little soluble in alcohol, but dissolves readily in alkaline solutions. It is not used medicinally in its own form.

Properties and Uses.—Frangula can be used as a cathartic in doses of 4 to 8 gm. (ʒ i.–ij.), but, like cascara sagrada, it acts much better as a laxative in doses of one-fourth or one-third these amounts. The fluid extract is official. Owing to its less mild and uniform action, frangula has almost entirely given way to cascara sagrada as a laxative.

The genus contains some seventy-five species, mostly in the north temperate zone, and gradually decreasing southward, in the mountains, a few in the south temperate zone. Many of them have a similar composition and action to that here described. *R. Cathartica* L. has especially been so used, both the bark and the fruits (buckthorn berries) having been used as cathartics from ancient times. The bark of at least one species, R. Wightii, of India, is a strong astringent.

Henry H. Rusby.

BUDDING.—One of the methods of asexual reproduction in the animal kingdom as well as in the vegetable world.

It differs from fission (*q. v.*) in that the offspring produced from the bud has never formed an integral part of the parent organism, but arises as an outgrowth of some part of the parent.

In its simplest form, as in the case of the fresh-water hydra (Fig. 1056), the process is as follows: Certain cells of the wall of the hydra grow and multiply, forming a hollow outgrowth on the side of the parent (*a*). As this enlarges and develops, tentacles appear at the outer end, and a mouth is formed (*a'*). Later, communication with the digestive cavity of the parent is cut off, and the young hydra feeds itself, and at a still later stage becomes separate from the parent.

In other cases the buds remain permanently attached, and thus are formed colonies, or stocks of greater or smaller size and complexity, often supported by a skeleton. Such are the coral stocks and many others. One example from the protozoa is shown in Fig. 1057, and one from the polyzoa in Fig. 1058.

FIG. 1056.—Hydra (enlarged). Showing buds, *a*, *a'*.


FIG. 1057.—Dinobryon, an Infusorian (greatly enlarged). Showing apical budding.

Buds may be formed at various places on the parent or colony. Very frequently they grow from the side of the parent—lateral budding, as in hydra and most corals; or on the top—apical budding (Fig. 1057). Sometimes buds are formed from stolons developed from the cœnosarc of the colony (Fig. 1058, *b*) or from the cœnosarc directly.

A variety of apical budding, called axial, consists in the production of new segments, which may remain permanently united, as in most worms, or become detached, as in the tape-worm.

In some cases internal buds are produced, as in echinococcus (*q. v.*), and in the redia of the fluke-worms.

Closely united with this last method is the formation of germs, or unfertilized eggs, from organs corresponding to the ovary (parthenogenesis, *q. v.*), which develop into animals like the parent, as in the production of drone bees, plant lice, etc.

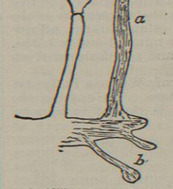

FIG. 1058.—Fredericella, a Polyzoan (much enlarged). Showing adult bud, *a*, and stolon, *b*.

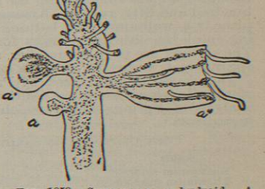

FIG. 1059.—Syncoryne, a hydroid. A nutritive zoöid with medusa (reproductive) buds (*a*, *a'*, *a''*) in various stages of development.

A variety of this method, pædogenesis, consisting of the production of germs from animals still in the larval form, is exemplified in certain flies, as Cecidomyia, Miastor.

In some cases the buds of a colony are of different forms and functions. This is best seen in the hydroids, in which the feeding zoöids are of a different form from the reproductive zoöids (Fig. 1059, *a*, *a'*, *a''*). This method of budding leads to colonial division of labor.

E. A. Birge.

BUENA VISTA SPRINGS.—Logan County, Kentucky.

POST-OFFICE.—Russellville. Springs Hotel. Accessible viâ Louisville and Nashville Railroad (Memphis branch) and Owensboro and Nashville branch to Russellville, thence by stage six miles to springs. The stage meets the train which leaves Russellville for the springs at 8 A.M.

This resort is located in a beautiful and picturesque region, interspersed with lofty hills, deep gorges, beautiful dells, and majestic native forests. The hotel has been rebuilt, and the guests will now find a large and

commodious building, which will meet all the requirements of modern cultivated tastes. The springs, two in number, are situated in the lawn in front of the hotel, where they rise from their subterranean recesses, and flowing forty feet, empty into the creek. The following qualitative analysis of Spring No. 1 was made by Dr. L. P. Yandell, professor of chemistry and physiology in the University of Louisville:

Magnesium sulphate.	Sulphureted hydrogen gas (abundant).
Calcium sulphate.	Carbonic-acid gas.
Calcium carbonate.	
Magnesium carbonate.	

Dr. H. A. Utley's analysis of Spring No. 2:

Magnesium sulphate.	Sodium phosphate.
Magnesium carbonate.	Iron phosphate,
Magnesium phosphate.	Iron chloride, } trace.
Potassium carbonate.	Calcium carbonate,
Potassium phosphate.	Free carbonic-acid gas.
Sodium carbonate.	

The waters have been highly recommended by Kentucky physicians in liver disorders, malarial affections, rheumatism, skin diseases, anæmia, general debility, and other conditions. Various amusements, in the way of a tennis court, croquet grounds, billiard tables, swings, and walks over the hills and through the gorges are at the option of the visitor. *James K. Crook.*

BUFFALO LITHIA SPRINGS.—Mecklenburg County, Virginia.

Post-Office.—Buffalo Lithia Springs. Hotel.

Access.—Viâ Southern Railroad to Clarksville, thence eight miles by private conveyance to springs. Also viâ Atlantic and Danville (branch line), which delivers passengers immediately at the springs.

These celebrated springs occupy a central position in the section of country known as the Buffalo Hills, a broken; rolling district, having an average elevation of five hundred feet above the sea level. The hotel is open from June 15th to October 1st. The buildings are on the cottage plan and sufficient for the accommodation of two hundred and fifty guests. Among the attractions of the place is a well-appointed bathing establishment, affording ample facilities to visitors for mineral-water baths. The springs are three in number, and are designated respectively 1, 2, and 3.

They have been analyzed by Prof. William P. Joury, of the Maryland Institute, Baltimore. We append the analysis of Spring No. 2, which is richest in mineral ingredients:

One United States Gallon Contains:

Solids.	Grains.
Magnesium sulphate	0.88
Aluminum sulphate	9.07
Calcium sulphate	33.06
Potassium carbonate	29.30
Calcium bicarbonate	14.96
Lithium bicarbonate	2.25
Iron bicarbonate	.30
Baryta bicarbonate	1.75
Sodium chloride	4.92
Silica chloride	1.87
Phosphoric acid	Traces.
Iodine	"
Organic matter	Small amount.
Total	98.36
Gases.	**Cubic inches.**
Sulphureted hydrogen	8.30
Carbonic acid	59.20

This analysis shows what might be termed an alkaline-carbonated-aluminous-lithic-calcic mineral water. It possesses sufficient iron to give it ferruginous properties, but hardly enough to class it as a chalybeate. The water undoubtedly possesses valuable medicinal properties. The analysis would show it to be antacid, diuretic, and tonic. It has gained a wide reputation, especially in the treatment of the uric-acid diathesis, gout, rheumatism, renal calculus, stone in the bladder, and nervous and gastro-intestinal disorders. Spring No. 3 is a decided chalybeate, containing 3.77 grains of bicarbonate of iron to the standard gallon. It is also somewhat purgative in its action. On account of a heavy precipitate it is not offered for shipment, as are the waters of Nos. 1 and 2. These latter have an extensive sale throughout the country. *James K. Crook.*

BUGLE.—*Ajuga reptans* L. (fam. *Labiatæ*). A hairy European annual, with a rosette of spatulate, finely serrate leaves near the ground, and an upright, slightly leafy stem. The flowers are small and blue, labiate, but with very small upper and larger lower lips. Stamens four, didynamous, with divergent anthers. The leaves are official in France; they have a slightly bitter and astringent taste, but little odor, and no valuable medical properties. Dose indefinite.

The genus contains about thirty species, a number of which have had their day as medicines. *Ajuga Chamæpitys* Linn. (ground pine) grows also in this country. It is more aromatic than bugle, and reputed to be "stimulant, diuretic, etc." *W. P. Bolles.*

BULPISS.—An affection of the skin occurring in the northeastern part of Nicaragua and called by the natives "bulpiss." The word is derived from "buluy," in the language of the Mosquito Indians meaning *spotted*, and "piss" meaning *gray*—terms that appropriately describe the indivdual affected. The disease was first described in notes sent by Dr. Otto Lerch from Central America to Dr. Isadore Dyer of New Orleans asking for a diagnosis of this unusual affection. The notes were published in the New Orleans *Medical Journal*, 1894–95. Bulpiss appears to be an endemic disease affecting every tribe inhabiting this part of Central America, attacking any individual irrespective of age, sex, or general condition. Cases in very early infancy are, however, rare. It causes no disturbance of the general functions of the body. There appear to be several varieties, two distinct: (1) Black bulpiss; (2) white bulpiss.

The disease commonly starts on the hands and feet, spreading gradually and becoming more marked on the knees, abdomen, neck, and face.

The lesion is a minute reddish papule appearing in crops; they break up gradually, disappear, and leave discolored spots, the pigment of which finally disappearing too, leaves behind a dirty, whitish, dry, scaly patch with a partly discolored and slightly elevated broad margin—the white bulpiss. These patches are round or oval in shape with irregular border. In the black bulpiss the lesions are of a greasy black color, the affected skin having the appearance of being painted, the patches gradually drying and shrivelling. The only and common subjective symptom in both forms is that of itching, which occurs as the disease comes out and after bathing and at night. The disease is not hereditary. It is contagious and the duration seems indefinite. It is more than probable that it is parasitic in nature, as might be inferred from the remedy commonly employed—the red oxide of mercury ointment. *Charles Townshend Dade.*

BURDETT MINERAL WELLS.—Caldwell County, Texas.

Post-Office.—Luling. Hotel.

Access.—Viâ San Antonio and Arkansas Pass Railroad to Burdett Switch, where carriages meet trains for the springs during the summer season. The location is seven miles north of Luling, on the Galveston, Harrisburg and San Antonio Railroad.

Only one well is in use. The water has been employed for medicinal purposes for thirty years. According to a qualitative analysis made in 1877 by H. W. Johnson, of Boston, Mass., it contains the following acids and bases:

Acids.	Bases.
Sulphuric acid.	Calcium.
Carbonic acid.	Magnesium.
Silicic acid.	Aluminum.
Hydrochloric acid.	Manganese.
Boric acid.	Strontium.
Phosphoric acid.	Iron.
	Potassium.
	Sodium.

We cannot positively classify this water from the above ingredients, but it appears to belong to the class of alkaline-chalybeate waters. *J. K. C.*

BURDOCK. LAPPA.—"The root of *Arctium Lappa* L. and of some other species of *Arctium* (fam. *Compositæ*)," U. S. P. Burdock is a native of Europe, but is common everywhere as a garden weed. It is a rank-growing, bitter, disagreeable plant, from 1 to 2 metres (three to six feet) in height, with a stout, branching stem, and great, coarse, heart-shaped leaves. The flower heads are clustered along the stem and branches; they are rather small, and look like miniature thistles. The involucre is ovoid and green; its scales are numerous, imbricated in several rows, with spreading, sharp, stiff, inwardly hooked tips. Flowers are tubular and perfect, rose-purple.

The root is the official portion, and should be gathered at the end of the first season, or the beginning of the second; it is biennial, fleshy, and usually simple. When dried, it is in gray-brown, wrinkled pieces, as large as the thumb, and 20 or 30 cm. long (eight to twelve inches), often split, to facilitate drying. The hairy bases of leaf stalks may remain attached to its upper end, or there may be a cottony or woolly bud at the crown. Internally it is light brown, with a rather thick bark, a distinctly radiated woody zone, and a white, often broken or missing pith. Odor slight; taste mucilaginous and slowly bitter.

Burdock contains *inulin*, *mucilage*, nine per cent. of fat, a slight amount of amaroid, *lappin*, and a little tannin. Its inulin, which is in large amount, up to forty-five per cent., and its fat well adapt it to use as a food, and it is said that many cultivated varieties of it exist in Japan for this use. It is an old medicine, whose reputation depends upon pure empiricism. As an alterative and an antisyphilitic it is still occasionally used, but is more called for as an ingredient in proprietary medicines than in serious medication. Dose from 2 to 4 gm.

A fluid extract is official. *Burdock fruit*, a small, black, curved, rough, seed-like akene, is much less used, but much more efficient. It contains a considerable amount of bitter glucoside and pungent resin. Its action appears worthy of investigation. The dose is 1 to 2 gm. (gr. xv. to xxx.). *W. P. Bolles.*

BURLINGTON.—Vermont, a city of 14,590 (census of 1890) inhabitants, is situated in the northern part of Vermont, upon Lake Champlain, at an elevation of 377 feet above sea level. On the east are the Green Mountains, on the west is the Lake, and beyond this are the Adirondack Mountains. The climate is salubrious, not excessively cold in winter, nor excessively hot in summer. The mean relative humidity for the year is 68.2 per cent. There are frequent high winds, but no fogs. The proportion of bright and sunny days is said to be large. The mortality is 16.38 per thousand. The soil is generally dry and sandy.

The outdoor attractions are, in summer, yachting, rowing, canoeing, swimming, riding, driving, bicycling; in winter, sleighing, coasting, tobogganing, snow-shoeing, skating, and ice-boating. The University of Vermont is situated here. The accommodations are good, there being first-class boarding-houses and two fair hotels.

The annexed table shows the various climatic conditions of this place.

Climate of Burlington, Vt. Latitude, 44° 29′; Longitude, 73° 15′. Period of Observation, Ten Years.

	January.	July.	Year.
Temperature (Fahrenheit scale)—			
Average or normal	18.9°	70.9°	44.8°
Average daily range	18.5	18.0	
Average of warmest	27.4	80.1	
Average of coldest	8.6	61.1	
Maximum or highest	51.0	96.0	
Minimum or lowest	−24.8	47.0	
Humidity—			
Average mean relative	72.3%	66.1%	68.2%
Precipitation—			
Average in inches	1.90	3.76	28.48
Wind—			
Prevailing direction	S.	S.	S.
Average hourly velocity in miles	8.3	5.7	7.2
Weather—			
Average number of clear days	3.2	7.1	63.3
Average number of fair days	12.7	16.2	153.4
Average number of fair and clear days.	15.9	23.3	216.7

Note.—If the above table is not understood, the reader is referred to an explanation of the terms under the article *Baltimore*.

Edward O. Otis.

BURNET.—*Radix Pimpinellæ.* This name is applied to the roots of *Pimpinella saxifraga* L. and *Pimpinella magna* L. (fam. *Umbelliferæ*), both of which are wild as well as cultivated in Europe. They are small tapering roots similar to and of the size of small carrots. They contain the ordinary constituents of the roots of this family, volatile oil, resin, gum, and a bitter principle, and are used like the related aromatics, the dose being 0.5 to 2.0 gm. (gr. viij. to xxx.). *H. H. Rusby.*

BURNS AND SCALDS.—Burns are injuries produced by fire or dry heat and scalds are the results of the application of hot fluids or moist heat. Clinically the results of these forms of injury are very much the same. The degree or severity of the burn varies according to the degree and duration of the heat and the capability of the solid or liquid for retaining caloric. Burns or scalds may be caused by the rays of the sun or by contact with fire, boiling water, oils, heated or molten solids, caustic alkalies, or concentrated acids; the amount of injury caused varying from a simple erythematous blush to the charring of a limb or part. The effect also varies according to the mode of application of the heat. To quote Wilson: "In degree, heat may be feeble but prolonged, or it may be strong and instantaneous, strong and continued for a brief period, or strong and continued for a long period."

The flame of burning ether or alcohol, if momentarily brought into contact with the living skin, causes a superficial burn, while the contact of burning sealing wax or boiling oil, the capacity of which to retain caloric is greater than that of water, because of its greater density, gives rise to much more serious injury. Molten metal when it simply strikes the skin causes vesication; but if it gains access to and surrounds a limb, complete charring and destruction of tissue occur.

A scald, even if severe, may leave the hairs uninjured, and from this circumstance it may often be diagnosticated from a burn; but when the liquid is hot and dense the hairs are often destroyed as in burns.

Concentrated acids and caustic alkalies, either in solid or in liquid form, act with great power on the soft tissues, and so cause injuries of the most serious character. Burns from this cause may be distinguished by the absence of vesication and other symptoms which are present when fire has been the cause.

Phosphorus acts energetically, causing deep and rapid burns and inflammation of surrounding tissues, and fatal results have attended its improper handling. Surface burns from lightning stroke present about the same appearances as burns from other sources. The skin is reddened and blistered, and the hair is singed or entirely destroyed.

Burns from nitric acid produce yellowish stains or patches, while sulphuric acid and caustics generally cause reddish or red-brown discoloration.

Sunburns are generally so slight as to require only a brief notice, yet occasionally a person having a tender skin may suffer severely from only a brief exposure to the sun. This burn is characterized by diffuse redness of the exposed part, with more or less smarting pain. The face, neck, forearms, and hands are usually affected.

Grave symptoms sometimes arise when a large surface (two-thirds) is implicated, and a case has been reported in which death occurred from violent dermatitis, with gangrene, following sunburn.

Burns are usually classified as of the first, second, or third grade. Dupuytren's division into six degrees is too complicated, and, though it was for a long time in vogue, it has been generally discarded by modern writers. The following classification is that of Thomas George Morton, and is the one generally accepted:

Burns of the First Degree.—Characterized by erythema, irritation, and inflammation of the skin without vesicles.

Burns of the Second Degree.—Vesication, inflammation of the skin, and formation of vesicles and bullæ.

Burns of the Third Degree.—Eschars; gangrene, superficial or deep, involving the skin or the subcutaneous tissues; carbonization of a part or of the entire body.

Prognosis.—The prognosis depends upon the depth of the injury and its extent, upon the susceptibility of the skin to the action of heat, and upon the general characteristics and physical condition of the patient. Burns of the first and second degrees generally result favorably, the patient recovering rapidly; in those of the highest degree, however, when the surface involved is very extensive, the prognosis is more grave; and even burns of the first degree may prove fatal when a great extent of surface is involved. It is generally accepted that, if one-half or even one-third of the surface has been burned or scalded, death, from some physiological cause as yet not clearly explained, will be inevitable; and this usually happens during the first twenty-four or forty-eight hours. I think, however, that much depends upon the patient's previous physical condition and mental equilibrium. In two cases which came under observation during my service in Bellevue Hospital, the burns involved more than half of the entire surface of the body, in varying degree at different points; but these patients both recovered. One of them was a strong and healthy engineer, the other a robust Italian laborer. On the other hand, even slight burns, in aged and enfeebled subjects, are sometimes a cause of death through shock. In all these cases, therefore, a guarded prognosis should be given. In burns of the third degree, which result from the application of intense heat, the prognosis will depend not merely upon the depth of the burn, but also upon the part of the body involved, and upon the age, sex, and temperament of the patient.

Symptoms.—*In burns of the first degree* there is more or less redness of the skin, which disappears on pressure, and which is accompanied by swelling and pain. This continues for a longer or shorter period, and then the epidermis is exfoliated and the natural conditions are restored. Recovery generally ensues in a few days and no permanent injury results. The constitutional symptoms are usually slight. Sometimes there is, however, an irritative fever, and if a great extent of surface has been injured, and if the patient is very susceptible, shock may be quite marked and even death may result.

In burns of the second degree the pain, redness, and swelling are more marked than in the first degree, and, the hyperæmia being greater, there is a tendency to exudation, and vesicles are formed. These, when large in size, are called bullæ. They either come on at once or form in a few hours. The serum is usually transparent, though sometimes it may be discolored by blood. Usually, along with the formation of the vesicles, the skin proper receives no damage, but sometimes suppuration and ulceration may take place. The constitutional symptoms vary according to the extent and severity of the injury. Shock is almost always present, and death results in some cases simply from this cause. Sometimes there is found a congestion of all the viscera, and death may result from cerebral effusion with delirium. With the rise in temperature, albumin is commonly found in the urine, and during the period of reaction ulceration of some portion of the mucous membrane of the bowel frequently occurs.

Burns of the Third Degree.—In this group are classed all cases of gangrene resulting from burns affecting the skin or subcutaneous tissue. Now, according to the intensity and duration of the heat, the skin alone, or the muscles, nerves, blood-vessels, and bones also, may be destroyed even to carbonization. This latter is, fortunately, a rare occurrence, but it sometimes happens that portions of limbs are entirely burned off while the individual is in a drunken stupor or is suffering from epileptic coma. The constitutional symptoms are, as may be supposed, severe. If reaction occur at all, the symptoms become at once quite grave, in proportion to the extent of the injury. In some cases death soon takes place from coma, due to cerebral congestion. The lungs, kidneys, and other organs are intensely congested, and this period of inflammation, so called, extends from the period of reaction to the beginning of exhaustion, during which time the dead tissues are being thrown off by suppuration. This exhaustion is sometimes increased by hemorrhages from the necrotic tissues. In all cases of burns of the third degree renal congestion is constant and gives rise to albuminuria.

The complications of burns may involve either the brain, or the respiratory tract, or the intestines. Cerebral irritation often appears quite early, and inflammation may follow and be accompanied by violent delirium. Convulsions and coma may occur in a fatal case.

Laryngitis, bronchitis, or pneumonia may occur from burns or scalds, the first frequently following the inhalation of hot steam. Œdema may be excessive, requiring tracheotomy in order to avert impending death from dyspnœa. Bronchitis and pneumonia are frequently observed to follow burns of the chest and neck.

Intestinal ulceration is one of the peculiar results of severe burns, and follows the intense congestion of the digestive tract that sometimes takes place. The intestinal lesions are present in varying degrees, from the simplest gastric irritation and diarrhœa to severe inflammation of the stomach and intestines, going on to duodenal ulcer, perforation, and death.

Treatment.—This varies in accordance with the severity of the injury. The indications are: First, to relieve the pain and overcome the shock; secondly, to guard against congestion and inflammation of the internal organs; and thirdly, to counteract the exhaustion incident to sloughing and suppuration.

Local Treatment.—In burns of the first degree there are usually no marked constitutional symptoms, but the local ones may be quite severe. These may be relieved by local applications of olive oil, vaseline, oxide of zinc, or other ointments of a soothing nature. Powdered bicarbonate of sodium is a most excellent application, and in simple burns it often affords great relief when freely dusted over the affected surface. Other alkaline applications may be used, among which a mixture of linseed oil and lime water, called "carron oil," may be mentioned as having long been popular. Flour, starch, white lead, paint, or any substance that excludes the air and makes a coating for the nerve filaments that have been irritated or uncovered will relieve the pain. Molasses has been used when nothing better could be found at hand in a case of emergency. The addition of carbolic acid to any of the ointments, or vaseline, or oil, is of much advantage, as it relieves pain and thoroughly disinfects any discharge that may occur. It produces a certain amount of surface anæsthesia, and, as carbolic acid is absorbed but feebly from any mixture with an oil, the danger of poisoning is not great. The urine should, however, be watched for any trace of the acid, as cases of such poisoning have occurred. An ointment made of boric acid and vaseline—*e.g.*, in equal parts—is of great service, as it allays pain and is perfectly safe. These remedies may be spread upon lint or old muslin and laid upon the burned surface, the parts being then enveloped in layers of cotton batting and all held in place by a roller bandage.

In burns of the second degree, in which we have vesication and inflammation of the skin, with the formation

of bullæ, it is absolutely necessary that the injury should be regarded as a wound and treated accordingly; *i.e.*, the burn should be rendered aseptic and kept so, if possible. It is well to bear in mind that only one part of a burned patient should be exposed at a time, in order to avoid surface chilling. Vesicles and bullæ should not be broken, but should be punctured at their lowest point and their contents allowed to drain off, and care should be taken that the cuticle should not be rubbed off, as it affords an excellent protection for the excoriated surface. The burned surface should be thoroughly cleaned; any cinders or any portions of clothing or charred material should be carefully removed, and the part should be rendered as aseptic as possible by washing and by the application of solutions such as mercuric chloride (1 to 10,000 or 20,000), aluminum acetate, etc. After these have been washed off with warm, decinormal salt solution, the burned surface may be covered with sterilized rubber tissue, which in turn is to be covered by a thick layer of sterilized gauze that is held in place by a roller bandage. When the inflammation of the skin is intense, a wet dressing of aluminum acetate or of ichthyol solution (three to five per cent.) should be applied and kept continually moist. Such an application will tend to relieve the pain and to render the burned surface aseptic. The rubber-tissue dressing, with its thick covering of sterilized material, acts as a substitute for the destroyed integument; it excludes the air and makes an excellent and painless covering. If now the wound has really escaped being infected, it will rapidly become covered by a renewed epithelial surface.

The dressings need not be changed oftener than every second or third day, unless the amount of discharge is very great or the odor quite marked.

It is quite proper to mention here the method of treatment of burns of the body, as well as of one extremity, by immersion. The clothing of the patient being removed or cut away, the limb or limbs or the entire body may be placed in a bath of decinormal salt solution, which should be maintained at a temperature of about 100° F. and not allowed to drop below 98.5° F. In cases of extensive burns, in which both legs and portions of the body have been involved, the placing of the patient in a bath of this character produces great relief, particularly as regards the pain and the amount of shock. The solution, which should completely cover the burned part, gives immediate ease, as it excludes the air; and, furthermore, if the temperature of the bath be raised sufficiently, there will be provided a most efficient remedy for the condition of shock. This form of bath not only cleans the injured portion of the body thoroughly, but at the same time renders it aseptic and maintains it in this state for a certain length of time. From time to time, as the solution becomes fouled, it will be necessary to renew it. The patient should not be removed from the bath until all sloughs have been separated and the denuded surface is ready for grafting. Propped on rubber air pillows, the patient may sleep or rest in the bath without danger. Provision must be made, however, for maintaining the temperature of the bath, and for keeping up its proper saline proportions.

In burns of the third degree, I would mention the fact that sometimes it will be found advisable to resort to an early amputation. The adoption of this course is indicated when the area burned is so extensive that the subsequent suppuration might prove too great a drain upon the patient's strength, or when this area occupies such a position that even if perfect healing should take place the remaining cicatrix would be constantly exposed to ulceration through the effects of abrasion or would seriously interfere with the use of the limb.

When the sloughs have separated, the ulcerated surfaces beneath are soon covered by florid granulations, which may require astringent applications or strapping with adhesive plaster. The treatment now becomes that of a simple ulcer, and may be guided by the same rules. Much good may be accomplished and deformity be avoided by keeping the various parts carefully separated, and by maintaining them in an appropriate position either by fixation on splints or by some proper mechanical appliance.

In the ulcerative stage skin-grafting is at times of great service, and large and indolent ulcers may be made to heal quite readily by this means (see article on *Skin-grafting*). Even transplantation of skin, as recommended by Wolf, may be employed with advantage in certain cases. If the patient, for example, has a large denuded surface, grafting becomes imperative; and the method of Thiersch is the best one to employ under these circumstances, provided the patient can be confined to bed in proper quarters. If, however, this is impossible, the epidermization of the denuded surface may be materially hastened by employing the method of engrafting portions of corns or callous portions of the skin upon the exposed granulating surface. As the details of this procedure are given in a later volume it will not be necessary for me to mention them in this place.

Treatment of Burns from Corrosive Acids, Caustic Alkalies, etc.—The corrosive or mineral acids which most often cause burns are sulphuric, nitric, and muriatic. In burns from these acids the application of water is to be avoided, as it causes, when mixed with the acid, a great and sudden rise of temperature. The proper treatment is to apply whiting or levigated chalk, which causes brisk effervescence, and at once neutralizes the acid; after this the part may be washed off with water. If this is done promptly, no more serious injury will result than a faint erythematous redness, accompanied by a slight sensation of smarting. Should by chance any of these substances be splashed into the eye, the organ should be well bathed in lime water, and subsequent inflammation should be treated in the usual manner.

The caustic alkalies are soda, potassa, ammonia, and quicklime. These act by suddenly abstracting moisture from the tissues. A fresh burn of this nature should be treated with vinegar, or with any other mild acid, which neutralizes the alkali, and forms with it an unirritating salt. A burn of the eye should be treated in the same way, care being taken to dilute the acid to a proper degree.

The treatment of shock from burns or scalds should be the same as when this condition arises under other circumstances. (See article on *Shock*.)

When reaction has commenced, a generally supporting plan of treatment is in order. Thirst, which is usually intense, should be allayed by small lumps of ice placed in the mouth, or by occasional sips of carbonated water. Constipation is quite common during the first two or three days following a burn, and a laxative enema affords the best means of relief. The gastric and intestinal disturbance often calls for treatment. The diarrhœa during exhaustion due to the profuse suppuration is best treated by opium combined with astringents, and by pepsin and bismuth. The diet should be simple but nourishing, and absolute rest is to be enforced.

John McG. Woodbury.

BURNS AND SCALDS, THE MEDICO-LEGAL RELATION OF.—The application of a moderate degree of heat to the surface of the body acts as a stimulant to the activity of the cutaneous transpiratory system, through its effect upon the capillary circulation. If the heat be raised beyond this degree, and to one incompatible with the integrity of the tissues, there results what has been denominated a burn or scald. Such difference of designation is based upon no special difference of character, but upon the nature of the causative agent.

For all practical purposes it is not essential to make a distinction between burns and scalds, yet it is sometimes important to decide upon the cause of the lesion observed.

Definition.—A *burn* is an injury resulting from the application to the body of a highly heated substance, flame or radiant heat. A *scald* is an injury produced by the application of a liquid, at or near the boiling-point.

Classification.—Burns are most simply classified ac-